CLASS 60, POWER PLANTS

SECTION I - CLASS DEFINITION

This is the residual class concerned with the driving of a load by the conversion of heat, pressure, radiant, or gravitational energy into mechanical motion. It includes a motor in combination with its energy supply or its exhaust treatment. It also includes the motors, per se, combinations of motors, and elements specialized for use in such energy conversion that are not specifically provided for elsewhere.

(1) Note. The mere nominal inclusion with the motor of an element or machine driven by the motor is not generally considered sufficient to exclude the patent from the class.

SECTION II - LINES WITH OTHER CLASSES AND WITHIN THIS CLASS

Unless specifically provided for elsewhere, a combination of plural motors of types that would, per se, be classified in different classes is classified in Class 60.

Combustion products generators in which steam or water are added to the combustion zone are classified in Class 60, Power Plants, where it is the sole disclosure that the products of combustion are to be used to produce useful work. See Class 110, Furnaces, and Class 431, Combustion, for combustion products generators of general utility where steam or water is supplied to the combustion zone. Combustion products generators, per se, using solid fuel, having high pressure generator structure peculiar to the generation of high pressure fluid for motive power, are classified herein. Combustion chamber structure of general utility, and structure for fuel preparation and fuel feeding to a conventional combustion chamber not provided for in other fuel preparation classes, as Class 241, Solid Material Comminution or Disintegration, are classified in Class 110, Furnaces.

Combustion product generators in which hazardous or toxic waste is used as the fuel to produce useful work. See Class 588, Hazardous or Toxic Waste Destruction or Containment, subclasses 300-415 and 249-260 for the processes of chemical destruction or containment of hazardous or toxic waste.

LINE WITH CLASS 91 AND CLASS 418

See (4) Note of the class definition of Class 91, for a statement of the line between Classes 60 and 91, the same line being maintained between Classes 60 and 418.

SECTION III - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

73, Measuring and Testing, appropriate subclass for a measuring and testing device in which the measuring or testing means uses pressurized motive fluid that drives an indicator.

74, Machine Element or Mechanism, subclass 16 for power tables or strands comprising portable power units.

91, Motors: Expansible Chamber Type, appropriate subclass for a fluid motor or a combination of such motors that has no more than a nominal pressure fluid source or nominal exhaust means. See (4) Note of the class definition of Class 91 for the line between Class 60 and Class 91.

92, Expansible Chamber Devices, appropriate subclass for an expansible chamber device or plural expansible chamber devices. See (4) Note of the class definition of Class 92 for the line between Classes 60 and 92.

122, Liquid Heaters and Vaporizers, for a liquid heater or vaporizer that generates hot fluid. The minimal inclusion of a motor as the source or utilizer of the treated fluid does not prevent classification in Class 122.

123, Internal-Combustion Engines, appropriate subclass, for an internal combustion engine, per se. A combination of internal combustion engines or an internal combustion engine with an exhaust treating or handling means is in Class 60.

173, Tool Driving or Impacting, appropriate subclass for subject matter directed to driving or impacting a tool when such subject matter includes combined features peculiar to tool driving, but which does not include features limiting the subject matter to a specific tool art, such as specific shape of the work contacting portion of a tool, related tools, or an opposed work support. A combination of plural motors of the same or different types, one of which causes or controls tool advance and the other drives or impacts a tool is classified in Class 173.

185, Motors: Spring, Weight, or Animal Powered, appropriate subclass for a spring, weight or animal powered motor and for plural or composite motor combinations consisting solely of arrangements of such motors. See the notes in the class definition of Class 185 for a statement of the line between Classes 60 and 185.

237, Heating Systems, appropriate subclass for a power plant combined with a heating system.

252, Compositions, appropriate subclasses particularly subclasses 67+ and 71+ for power transmission compositions. Patents are placed in Class 252, Compositions, (1) claiming admixtures of ingredients, or claiming an old compound, limited to use as a hydraulic or other type power transmission fluid, (2) processes of power generation claimed broadly and distinguished solely by the composition or compound used, and (3) power plant apparatus distinguished by the composition of compound therein, i.e., where characteristics of apparatus structure are not claimed. The preceding are placed in Class 252, Compositions, even though freezing or boiling points, temperatures of use, or amount of power transmitted are specified.

290, Prime-Mover Dynamo Plants, appropriate subclass for the combination of a motor and an electric generator in which is included (1) any detail of the generator; (2) any relationship between a generator part and a motor; and (3) any control of the motor by part of the electricity produced by the generator. A motor electric generator combination in combination in which the electric generator is merely a nominal load driven by the motor is not precluded from Class 60.

303, Fluid-Pressure and Analogous Brake Systems, appropriate subclass, for the distribution of fluid to brake motors. See the notes to the definition of subclass 533 of Class 60 for a detailed statement of the line between Classes 60 and 303.

310, Electrical Generator or Motor Structure, appropriate subclass for an electric motor, per se.

318, Electricity: Motive Power Systems, appropriate subclass for a system of electrical supply or control for one or more electrical motors. A residual system comprising an electrical and a nonelectrical motor is in Class 60.

374, Thermal Measuring and Testing, subclasses 187+ for temperature measurement in which the expansion or contraction of a sensing material drives an indicator.

415, Rotary Kinetic Fluid Motors or Pumps, appropriate subclass for (1) a rotary kinetic energy motor, per se, or one with a merely nominal load, motive fluid supply, or exhaust structure; (2) for a plurality of such motors. See the detailed statement of the line between Classes 60 and 415 in the class definition of Class 415, particularly the search class notes to Class 60 in References to Other Classes.

416, Fluid Reaction Surfaces (i.e., Impellers), appropriate subclass for a motor comprising an unconfined impeller driven by a flowing working fluid, e.g., windmill etc.

418, Rotary Expansible Chamber Devices, appropriate subclass for an expansible chamber fluid motor or a combination of such motors. See Lines With Other Classes and Within This Class, above, for the line between Class 418, Class 60, and an additional class.

588, Hazardous or Toxic Waste Destruction or Containment, subclasses 313 through 320 for the destruction of hazardous or toxic waste by combustion in a power plant. Class 60 takes the use of hazardous or toxic waste as a useful fuel for power production.

SUBCLASSES

39.01 COMBUSTION PRODUCTS USED AS MOTIVE FLUID:

This subclass is indented under the class definition. Plants or processes having means to generate combustion products, either continuously or intermittently, whereby said products are usable, at least in part, to perform useful work.

(1) Note. Combustion products generator a device including essentially a chamber in which a suitable fuel and an oxidizer are burned or exploded to produce hot products of combustion, together with accessory means to mix water, fuel and oxidizer, to spray or feed water, fuel, or oxidizer, to ignite the fuel charge, to periodically operate the inlet and exhaust valves, or other means accessory to such chamber.

Continuous combustion type this refers to the operation of a combustion products generator, without cyclically actuated inlet or outlet valves, in which the fuel and oxidizer are supplied to permit combustion to proceed in an unbroken or uninterrupted manner to produce a steady stream of combustion products. This type is also known as a "constant pressure" type.

Intermittent combustion type - this refers to the operation of a combustion products generator, usually having inlet or outlet valves, or both, or their equivalents, in which a fuel charge is periodically exploded or burned to discharge a pulsating stream of combustion products. This type is also known as an "explosion" or "constant volume" type.

(2) Note. This subclass and the indented subclasses include subcombinations peculiarly adapted for power production or solely disclosed for such purpose, unless classification is provided therefor in some other existing class and subclass.

(3) Note. See Lines With Other Classes in the class definition for line between Class 60 and Classes 110 and 431.

SEE OR SEARCH THIS CLASS, SUBCLASS:

272+, for internal-combustion engines which discharge exhaust gases under pressure suitable for use in a motor, in combination with means to act upon the exhaust gases, such as means to store or to conduct such gases, or to add a fluid thereto, or to burn fuel in said exhaust gases.

597+, for plants in which the combustion products are generated by burning a fuel in the expansible working chamber of an internal combustion engine.

SEE OR SEARCH CLASS:

102, Ammunition and Explosives, subclass 202 for means for igniting a missile propellant.

39.08 With lubricators:

This subclass is indented under subclass 39.01. Plants in combination with means to supply a lubricant to movable parts thereof.

SEE OR SEARCH CLASS:

123, Internal-Combustion Engines, subclass 196 for lubrication means for internal-combustion engines.

184, Lubrication, appropriate subclass, for lubrication in general.

39.091 With safety device:

This subclass is indented under subclass 39.01. Plants in combination with a safety device in the form of means to prevent the creation of dangerous or objectionable operating conditions, or to sense and to relieve such conditions.

(1) Note. The conditions referred to do not ordinarily occur during normal operation of the power plants.

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.13, for plants wherein the operation of the generator is stopped and started in response to pressure changes in an accumulator receiving products of combustion.

773, for a process where combustion products are used as motive fluid having power output control.

793 through 39.3, for a process where combustion products are used as motive fluid combined with regulation of power output feature.

SEE OR SEARCH CLASS:

123, Internal-Combustion Engines, subclass 198 for safety devices designed for use with internal-combustion engines.

39.092 Debris anti-ingestion preventer:

This subclass is indented under subclass 39.091. Plants wherein the safety device comprises structure designed to prevent the inflow of foreign material into the air intake or other sensitive structure of the power plant.

SEE OR SEARCH CLASS:

55, Gas Separation, subclass 306 for debris anti-ingestion means for use on aircraft engine inlets not combined with significant engine structure.

39.093 Ice preventer or deicer:

This subclass is indented under subclass 39.091. Plants wherein the safety device comprises structure designed to either prevent the formation or eliminate the accumulation of frozen water on components of the power plant.

39.094 Fuel flusher or drainer:

This subclass is indented under subclass 39.091. Plants wherein the safety device comprises structure designed to either purge a portion of the fuel system of the power plant or to remove areas of abnormally accumulated fuel in the power plant.

39.1 Excess pressure relief:

This subclass is indented under subclass 39.09. Plants in which the safety means senses an excess pressure in the system, and relieves such excess pressure.

SEE OR SEARCH CLASS:

137, Fluid Handling, subclasses 455+ for valves which respond to changes in line condition.

220, Receptacles, subclasses 89.1 through 89.4 for frangible or fusible diaphragms which burst or melt to relieve excess pressure.

39.11 Flame screen:

This subclass is indented under subclass 39.09. Plants in which the safety means includes screens or equivalent means to prevent the flash-back of the flame.

SEE OR SEARCH CLASS:

48, Gas: Heating and Illuminating, subclass 192 for safety devices for preventing, localizing and confining explosions in a gas distributing system.

123, Internal-Combustion Engines, subclass 434 for safety devices used in connection with charge-forming devices of internal-combustion engines.

220, Receptacles, subclasses 88.1+ for flame guards for receptacles.

222, Dispensing, subclass 189.01 for flame guards for dispensers.

39.12 With combustible gas generator:

This subclass is indented under subclass 39.01. Plants in combination with means, distinct from and independent of the combustion products generator, to generate a combustible gas that is delivered to the combustion products generator to be burned.

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.69, for combinations wherein the generator of the combustible gas is not distinct from the combustion products generator, but functions merely as a pre-combustion chamber.

39.71, for means to vaporize a liquid fuel by heat incidental to the operation of the combustion products generator.

SEE OR SEARCH CLASS:

48, Gas: Heating and Illuminating, appropriate subclasses for combustible gas generators, per se.

123, Internal-Combustion Engines, subclass 3 for combinations of an internal-combustion engine and a combustible gas generator.

39.13 Automatic starting and stopping of combustion products generator:

This subclass is indented under subclass 39.01. Plants including means to start and stop the operation of the combustion products generator in response to pressure change in a storage vessel.

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.24+, for plants in which the operation of the combustion products generator is varied, but not stopped, in response to pressure fluctuations in the combustion products accumulator.

281, for combinations of internal-combustion engines and exhaust gas accumulators.

786 through 790, for a power plant where combustion products are used as

motive fluid combined with a starting feature.

39.15 Multiple fluid-operated motors:
This subclass is indented under subclass 39.01. Plants having a plurality of distinct motors, at least two of which are operated by a fluid under pressure.

(1) Note. Distinct motors include (1) two or more turbine rotors on a common shaft receiving combustion products, in parallel, from a common combustion products generator, or each rotor being supplied by a separate combustion products generator; (2) two or more expansible chamber cylinders supplied, in parallel, from a common combustion products generator where the cylinders are more than mere duplicates of each other; (3) a plurality of motors, on separate shafts, which may or may not deliver power to a common output shaft; (4) a plurality of turbine stages in a common housing, or in separate housings, wherein the combustion products pass through the stages in series, involving some treatment of the combustion products between stages; and (5) two or more turbines with means whereby the turbines are selectively operable to rotate power output shaft in either direction. The means whereby the turbines are selectively operable may include one or more clutches or equivalent means to connect the turbines to the power output shaft.

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.22, for plants in which an auxiliary motor controls the cycle frequency of an intermittent combustion type of combustion products generator.

698+, for motors having several modes of operation, each classifiable in different motor classes, or for multiple motors of the same class other than combustion products types.

786 through 790, for a power plant where combustion products are used as motive fluid combined with a starting feature.

SEE OR SEARCH CLASS:

415, Rotary Kinetic Fluid Motors or Pumps, appropriate subclasses for plural or multiple-stage gas turbines, per se, that does not involve combustion products generation means.

39.162 Counter-rotatable:
This subclass is indented under subclass 791. Plants in which two motors rotate in different directions.

39.163 Selectively connectable:
This subclass is indented under subclass 791. Plants having at least two motors which may be selectively interconnected to provide a common power output.

39.17 With treatment between stages:
This subclass is indented under subclass 791. Plants including means to treat the combustion products between successive stages of expansion, as, for example, by heating, cooling, or by the addition of fuel air, water, steam or more combustion products.

SEE OR SEARCH THIS CLASS, SUBCLASS:

643+, and 662, for multiple stage motor plants using mixed fluids other than products of combustion, having means for admitting fluid between expansion stages from some source other than the next preceding stage while fluid is being admitted from the preceding stage.

648, 677, 679, and 684, for multiple stage motors using motive fluid other than products of combustion, including means affecting the motive fluid between stages, as, for example, (1) tapping fluid for external use, (2) reheating, or (3) separation of condensate.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclasses 8+ for multiple expansion type expansible chamber motors having means for permitting a subsequent pressure stage to receive motive fluid other than that discharged from the immediately prior stage, said prior

stage also receiving motive fluid and at least ultimately discharging it into said subsequent stage.

39.181 Different fluids:
This subclass is indented under subclass 39.15. Plants in which unlike motive fluids are utilized in the several motors, at least one of such motive fluids being composed of combustion products.

SEE OR SEARCH THIS CLASS, SUBCLASS:
786 through 790, for a power plant where combustion products are used as motive fluid combined with a starting feature.

39.182 Steam and combustion products:
This subclass is indented under subclass 39.181. Plants having at least one motor operating on steam and one motor operating on combustion products.

39.183 Air and combustion products:
This subclass is indented under subclass 39.181. Plants having at least one motor operating on air and one motor operating on combustion products.

39.19 Different fluids:
This subclass is indented under subclass 39.01. Plants having a single motor in which two or more unlike motive fluids are simultaneously employed without being mixed in the motor, at least one of the motive fluids being composed of combustion products.

SEE OR SEARCH THIS CLASS, SUBCLASS:
486, and 674, for power plants simultaneously using two or more different motive fluids in a single motor, the motive fluids being other than combustion products.

39.21 Plural generators, selectively operable:
This subclass is indented under subclass 793. Combinations in which the quantity of the motive fluid is regulated by varying the number of combustion products generators in operation, viz., by cutting in and out one or more, but not all, of a plurality of combustion products generators.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39.09, for combinations in which the operation of all combustion products generators is discontinued upon the creation of, or to prevent the creation of, dangerous operating conditions.
786 through 790, for a power plant where combustion products are used as motive fluid combined with a starting feature.

SEE OR SEARCH CLASS:
123, Internal-Combustion Engines, subclass 52 for systems for disabling some of the cylinders of an internal-combustion engine in order to vary the power output.

39.22 Varying cycle frequency relative to prime mover speed:
This subclass is indented under subclass 793. Combinations in which the quantity of the motive fluid is regulated by varying the cycle frequency of operation of an intermittent combustion type generator relative to the speed of the prime mover, i.e., the power output motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39.13, for an independent motor for feeding a combustion products generator, the motor being started and stopped in response to the pressure in an accumulator receiving the combustion products.

39.23 With variable oxidizer control:
This subclass is indented under subclass 39.01. Plants having means to vary the rate of flow of oxidizer to the combustor, either for regulating the combustion process or for regulation of the engine power output.

SEE OR SEARCH THIS CLASS, SUBCLASS:
794 through 795, for a power plant where combustion products are used as motive fluid combined with automatic regulation of a power output feature by control of an oxidizer.

39.24 Automatic:

This subclass is indented under subclass 793. Combinations including means to sense a change in condition of power plant operation, wherein the means to vary the rate of power output is under the control of such sensing means.

(1) Note. Control means responsive to (1) pressure and/or temperature of air or combustion products at any point between entrance into the compressor and discharge from the power plant; or (2) rate of flow or quantity of (a) air passing through the compressor to the combustion products generator or (b) products of combustion has been regarded as responsive to a change in condition of power plant operation.

The following has not been deemed significant power plant structure; control means responsive to (1) power plant speed; (2) carburetor or compressor inlet pressure; (3) air inlet temperature to carburetor or compressor; (4) pump speed; (5) fuel inlet or discharge pressure, velocity or volume; (6) altitude.

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.09, for combinations of power plants with means to discontinue the supply of oxidizer, fuel, water, or motive fluid in response to some undesired or dangerous condition of operation.

233+, for a means controlling the thrust of a thrust producing device responsive to a motor condition such as speed, thrust, acceleration, etc.

SEE OR SEARCH CLASS:

137, Fluid Handling, subclasses 16+ for a residual prime mover control system.

236, Automatic Temperature and Humidity Regulation, subclasses 14 and 15, for automatic furnace control.

431, Combustion, subclasses 18+ for a residual automatically controlled device specialized to combustion and disclosed for use for purposes other than for external power.

701, Data Processing: Vehicles, Navigation, and Relative Location, subclasses 99 and 100 for indication or control of power plants, particularly gas turbine compressors.

39.25 Motive fluid to prime mover:

This subclass is indented under subclass 39.24. Combinations wherein the means to vary the rate of power output regulates the rate of flow of motive fluid to the prime mover, i.e., external power output motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.15+, for plants having a plurality of distinct motors wherein means are provided to vary the rate of flow of motive fluid to one or more motors.

39.26 Oxidizer, fuel and water or steam:

This subclass is indented under subclass 39.24. Combinations wherein the means to vary the rate of power output regulates the quantity of oxidizer, fuel and water or steam, comprising the ingredients to produce the motive fluid.

39.27 Oxidizer and fuel:

This subclass is indented under subclass 39.24. Combinations wherein the means to vary the rate of power output regulates the quantity of oxidizer and fuel, separately or as a fuel-oxidizer mixture, comprising the ingredients to produce the motive fluid.

SEE OR SEARCH CLASS:

123, Internal-Combustion Engines, subclasses 319+ for speed regulators for internal combustion engines.

39.281 Fuel:

This subclass is indented under subclass 39.24. Combinations wherein the means to vary the rate of power output regulates the quantity of fuel comprising an ingredient to produce the motive fluid.

SEE OR SEARCH CLASS:

123, Internal-Combustion Engines, subclasses 350+ and 378+ for regulation of fuel to internal combustion engines.

39.282 Torque sensor:
This subclass is indented under subclass 39.281. Combinations wherein the means to sense a change in condition of power plant operation is specially designed to sense the turning moment or turning force of a component of the power plant.

39.3 Water or steam:
This subclass is indented under subclass 39.24. Combinations wherein the means to vary the rate of power output regulates the quantity of water or steam comprising an ingredient to produce the motive fluid.

39.34 Rotating combustion products generator and turbine:
This subclass is indented under subclass 39.01. Plants including one or more rotating combustion products generators and a turbine. The combustion products generator or generators may be an integral part of the turbine, or may form a separate member rotatable in the same or opposite direction.

SEE OR SEARCH CLASS:
416, Fluid Reaction Surfaces (i.e., Impellers), subclasses 20+ for combustion products generators carried by propeller blades, the rotation being effected by the discharge of the products of combustion through reaction nozzles.

39.35 Continuous combustion type:
This subclass is indented under subclass 39.34. Plants in which the combustion within the combustion products generator or generators proceeds in an uninterrupted or continuous manner.

(1) Note. See (1) Note under subclass 39.01 for definition of "continuous combustion type".

39.37 Plural combustion products generators in ring coaxial with turbine:
This subclass is indented under subclass 39.01. Plants in which a turbine is fed with combustion products from a plurality of combustion products generators lying in a ring whose axis is coaxial with the turbine shaft.

SEE OR SEARCH THIS CLASS, SUBCLASS:
35.6, for combinations wherein plural combustion products generators in a ring coaxial with a turbine deliver exhaust gases to a jet reaction nozzle.
39.34+, for rotating combustion products generators and turbine.

39.38 Intermittent combustion type:
This subclass is indented under subclass 39.37. Plants in which the combustion products generators operate in a cyclic manner to intermittently produce and discharge combustion products.

(1) Note. See (1) Note under subclass 39.01 for definitions of "intermittent combustion type".

39.39 Common rotary distributing valve:
This subclass is indented under subclass 39.38. Plants in which the inlet and/or discharge ports of the combustion products generators are opened and closed by a common rotary valve member.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39.38, for plants in which the turbine or compressor rotor is provided with one or more solid portions which cooperate with ports in the combustion products generators to perform valving function.

39.4 Common cam member:
This subclass is indented under subclass 39.38. Plants in which the inlet and/or discharge valves of the combustion products generators are actuated by a common cam member.

39.41 With exhaust pump for combustion products generator:
This subclass is indented under subclass 39.01. Plants including a movable pumping means connected with the combustion products generator to withdraw all or a part of the combustion products. This pump may deliver the combustion products at an increased pressure to a receiver or prime mover, or may serve to scavenge the combustion products generator or to draw in a new fuel charge or air.

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.56+, for jet pumps for mixing steam and combustion products.

39.7, for jet pumps wherein the combustion products from one generator scavenge the combustion products from a cooperating generator or draws a new fuel charge or air into said cooperating generator.

39.42 With reversible turbine:

This subclass is indented under subclass 39.01. Plants having a single turbine rotor with blade structure and flow passages whereby the turbine rotor may be selectively operable in either direction, usually by providing separate forward and reverse blading on the rotor.

SEE OR SEARCH CLASS:

415, Rotary Kinetic Fluid Motors or Pumps, appropriate subclasses for gas operated reversing turbines, per se.

39.43 With dual function turbine:

This subclass is indented under subclass 39.01. Plants wherein the turbine rotor, in addition to its usual function as a power producing element, also serves, at the same time, to compress an oxidizer, fuel, or a fuel charge, for use in the power cycle.

SEE OR SEARCH THIS CLASS, SUBCLASS:

801 through 803, for a power plant where combustion products are used as motive fluid is convertible or combined with a feature other than a combustion products generator or motor.

SEE OR SEARCH CLASS:

415, Rotary Kinetic Fluid Motors or Pumps, subclasses 175+ and 177+ for turbines carrying fan blades for the circulation of a cooling medium.

39.44 With closed pocket turbine:

This subclass is indented under subclass 39.01. Plants including a turbine of the so-called "closed pocket" type. The motive fluid, introduced into these pockets, is trapped therein, and while so trapped is incapable of exerting any useful energy release by expansion, impulse, or reaction. Turbines of this type are considered to be inoperative to produce useful power.

(1) Note. To be classified herein, the patent, in addition to disclosing a closed pocket turbine, should claim the turbine more specifically than merely as a "turbine" or "rotor", or similar broad language.

39.45 With gear, pressure exchanger, or screw-type compressor:

This subclass is indented under subclass 39.01. Plants including a compressor utilizing interengaging impellers, a liquid or gas under pressure which directly contacts a gas to be compressed, or a rotating helix or screw, to compress the air, fuel, or fuel charge used in the plant.

SEE OR SEARCH CLASS:

415, Rotary Kinetic Fluid Motors or Pumps, appropriate subclasses for rotary pumps and compressors, per se, and see the search note to Class 60, References to Other Classes of the Class 415 Class Definition for a statement of the line.

417, Pumps, subclass 64 for a gas pressure pump using a rotary cellular conveyer; and 65+ for pumps of the type having one fluid pumped by another.

418, Rotary Expansible Chamber Devices, subclasses 166+ for a rotary expansible chamber device of the moving cylinder type having intermeshing peripheral surfaces and subclasses 191+ for rotary expansible chamber devices of the interengaging rotating member type.

39.461 Using special fuel or oxidizer:

This subclass is indented under subclass 39.01. Plants using other oxidizer or fuel than air, oil or gasoline, in which parts of the plant are modified to utilize such other oxidizer or fuel.

(1) Note. See Lines With Other Classes in the Class Definition for the line with Class 110.

SEE OR SEARCH CLASS:

44, Fuel and Related Compositions, subclasses 300+ for liquid fuels for various uses.

110, Furnaces, see (1) Note above.

39.462 Monofuel type:
This subclass is indented under subclass 39.461. Plants using a single component fuel which is decomposed into its constituents to form a high pressure working fluid.

39.463 Plural distinct fuels:
This subclass is indented under subclass 39.461. Plants which use two or more different fuels.

39.464 Solid, slurry, emulsive or suspensive type fuel:
This subclass is indented under subclass 39.461. Plants which use a fuel that is either: (a) a substance or material having a definite volume and shape, i.e., a solid; (b) a relatively dense mixture of a particulate solid and liquid, i.e., a slurry; (c) a mixture of liquids in which the liquids are indissolvable in each other, i.e., an emulsion; or (d) a mixture of a particulate solid dispersed in a liquid and in which the solid is indissolvable in the liquid, i.e., suspension.

SEE OR SEARCH CLASS:
516, Colloid Systems and Wetting Agents; Subcombinations Thereof; Processes of Making, Stabilizing, Breaking, or Inhibiting, for colloid systems or agents for such systems or making or stabilizing such systems or agents, especially subclasses 9+ for continuous liquid phase (emulsions, slurries, suspensions), subclasses 98+ for continuous or semicontinuous solid phase (gels, pastes); in each instance, when generically claimed or when there is no hierarchically superior provision in the USPC for the specifically claimed art.

39.465 Gaseous fuel at standard temperature and pressure:
Plants under 39.461 which use a fuel that is a gas at standard temperature and pressure.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39.12, for plants which include means to generate a gaseous fuel.

39.47 Solid fuel containing oxidizer:
This subclass is indented under subclass 39.46. Plants in which the motive fluids or products of combustion are produced by the combustion of a solid fuel which carries sufficient oxidizer incorporated therein to provide at least the major portion necessary to burn the fuel.

SEE OR SEARCH THIS CLASS, SUBCLASS:
632, for one shot explosion actuated expansible chamber type motors.

SEE OR SEARCH CLASS:
102, Ammunition and Explosives, subclasses 530+ for pressure gas generating cartridges.
149, Explosive and Thermic Compositions or Charges, appropriate subclasses for thermic or explosive compositions, per se.

39.48 With fluid pressure feeding of oxidizer, fuel or water:
This subclass is indented under subclass 39.01. Plants including means to apply fluid pressure against oxidizer, fuel, or water, in a receiver, either directly or through a separating member, to forcibly feed a combustion products generator.

(1) Note. By “separating member” is meant a flexible diaphragm or piston follower which functions to transmit the pressure of a fluid to the oxidizer, fuel or water.

SEE OR SEARCH CLASS:
222, Dispensing, subclasses 394+ for fluid pressure discharge in dispensing devices.

39.49 With air injection by fuel or steam jet:
This subclass is indented under subclass 39.01. Plants in which air is delivered to the combustion products generator through a jet type pump, the motivating fluid for the jet type pump being fuel or steam vaporized by the heat in the system.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39.12, for plants in which air is fed into the system by combustible gas generated

in a combustible gas generator distinct from and independent of the combustion products generator.

SEE OR SEARCH CLASS:
239, Fluid Sprinkling, Spraying, and Diffusing, appropriate subclasses, especially subclasses 398+ for a discharge distributor including means to mix a plurality of fluids, even though the distributor is disclosed as burner.
417, Pumps, subclass 158 for jet pumps in combination with means to generate motive fluid therefor, the motive fluid generator, in many cases, comprising means to vaporize a liquid.

39.5 With exhaust treatment:
This subclass is indented under subclass 39.01. Plants including means to act upon or re-use the motive fluid after its discharge from the power elements, as, for example, by cooling, compressing, mixing with another fluid, or recirculating it in the power cycle.

SEE OR SEARCH THIS CLASS, SUBCLASS:
272, for exhaust treating devices in combination with internal-combustion engines.
654, 672, 681, 683, and 685+, for exhaust treatment of steam driven motors.

39.511 Regenerator:
This subclass is indented under subclass 39.5. Plants in which means are provided to transfer heat from the exhausted motive fluid to the air prior to the delivery thereof to the combustion products generator.

SEE OR SEARCH THIS CLASS, SUBCLASS:
96, for air cooling of the exhaust from a steam driven motor.
320+, for air cooling of the exhaust gases from an internal-combustion engine.

39.512 Rotary heat exchanger:
This subclass is indented under subclass 39.511. Plants including rotatable heat exchange structure.

SEE OR SEARCH CLASS:
165, Heat Exchange, subclass 8 for rotary heat exchangers in general.

39.52 Exhaust gas recycling:
This subclass is indented under subclass 39.5. Plants in which some or all of the exhaust gases are returned to the circuit to form a portion of the motive fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39, and 40, for combinations in which a portion of the exhaust is mingled with live motive fluid between the generator and motor, no combustion products fluid being involved.
39.43, in which a portion of the combustion products or exhaust gases is recycled incidental to the dual function of the turbine.
654, 672, 681, 683, and 691, for combinations of a motor with means for returning the exhausted motive fluid, without dissipation of the heat content remaining therein, to the place where energy was originally imparted thereto.

SEE OR SEARCH CLASS:
123, Internal-Combustion Engines, subclasses 568.11+ for devices to mix a portion of the exhaust gases with the fuel charge.

39.53 With addition of steam and/or water:
This subclass is indented under subclass 39.01. Plants including means to add water and/or steam to the motive fluid before its discharge from the prime mover, or to the oxidizer or fuel delivered to the combustion products generator, which fuel and oxidizer are burned to form the motive fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39.3, for plants including means to automatically regulate the water and/or steam.
775, for a process where combustion products are used as motive fluid including introduction of water or steam.

39.54 Added in prime mover:
This subclass is indented under subclass 39.53. Plants in which the steam and/or water is added to the motive fluid within the working space of the turbine or expansible chamber motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39.17, for multiple expansion motors in which steam and/or water is added to the products of combustion between successive expansion stages.
39.58, for plants in which the steam and/or water is added in the turbine nozzle.

SEE OR SEARCH CLASS:
123, Internal-Combustion Engines, subclass 25 for internal-combustion engines with means to supply water or steam to the working cylinder to mix with the products of combustion therein.

39.55 Added in combustion products generator:
This subclass is indented under subclass 39.53. Plants in which the steam and/or the water is added to the products of combustion within the combustion chamber of the combustion products generator.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39.49, for injectors utilizing steam to feed air into a combustion products generator.

SEE OR SEARCH CLASS:
110, Furnaces, subclasses 199+, 296 and 297+ for feeding steam and/or water to furnaces.
239, Fluid Sprinkling, Spraying, and Diffusing, appropriate subclasses for a fluid discharge distributor system even though disclosed as a burner, especially subclasses 128+ for means to heat the fluid or the system, and subclasses 398+ for means to mix a plurality of fluids prior to, at or subsequent to discharge.
431, Combustion, appropriate subclasses for combustion apparatus not disclosed solely for utilization in a prime mover in which water or water vapor is fed to interact with fuel and oxidizer.

39.56 Mixed in space above water:
This subclass is indented under subclass 39.53. Plants in which the union of steam and/or water with products of combustion takes place in a zone above a standing body of water, the water being heated by the products of combustion.

39.57 Combustion products pass through water:
This subclass is indented under subclass 39.56. Plants in which the products of combustion are discharged below the surface of the water in order that they may bubble through the water to the mixing zone.

SEE OR SEARCH CLASS:
126, Stoves and Furnaces, subclass 360.2 for a submerged fluid fuel burner other than a top-accessible liquid heating vessel having direct contact of the liquid by exhaust.

39.58 Added in mixing nozzle or in turbine nozzle:
This subclass is indented under subclass 39.53. Plants in which the steam and/or water is united with the products of combustion in a mixing nozzle between the combustion products generator and motor or place of utilization, or is united in a turbine nozzle.

39.59 Added in separate mixing chamber:
This subclass is indented under subclass 39.53. Plants in which the combustion products and steam and/or water are united in a receiver distinct from the boiler or combustion chamber of the combustion products generator.

(1) Note. The “boiler”, as used above, refers to a receiver for a standing body of water in which the steam is generated, and having a space above the water for the collection of the steam.

39.6 External-combustion engine type:
This subclass is indented under subclass 39.01. Plants including a prime mover comprising a motor of the expansible chamber type, the motor being in communication with an external-combustion products generator by means of a periodically opened transfer valve or equivalent means, to admit products of combustion into the working space on the power

stroke of the motor piston. In an intermittently fired combustion products generator, ignition must be initiated prior to the opening of the transfer valve or equivalent means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

632+, for one shot explosion actuated expansible chamber type motors.

SEE OR SEARCH CLASS:

123, Internal-Combustion Engines, appropriate subclasses, for prime movers of the expansible chamber type having a combustion chamber separated from the working space by a periodically opened transfer valve or equivalent means, the transfer valve or equivalent means being open at the instant of ignition. Note subclasses 253+.

39.62 With plurality of combustion products generator per cylinder:

This subclass is indented under subclass 39.6. Plants in which a power cylinder receives combustion products alternately from two or more consecutively fired intermittent type combustion products generators.

39.63 Continuous combustion:

This subclass is indented under subclass 39.6. Plants in which the combustion within the combustion products generator proceeds in an uninterrupted or continuous manner.

(1) Note. See (1) Note under subclass 39.01 as to definition of “continuous combustion type”.

39.64 Alternate cycle:

This subclass is indented under subclass 39.01. Plants in which an intermittently actuated motive fluid generator discharges combustion products, and alternately therewith, in a regular cyclic manner, also discharges distinct volumes of a different motive fluid, such as heated air or steam.

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.18+, for internal-combustion engines having separate fluid pressure expansion strokes.

801 through 803, for a power plant where combustion products are used as motive fluid is convertible or combined with a feature other than a combustion products generator or motor.

39.76 Intermittent combustion type:

This subclass is indented under subclass 722. Combustion devices, having valves or equivalent means operating in a cyclic manner to intermittently produce and discharge combustion products.

(1) Note. See (1) Note under subclass 39.01 for definition of “intermittent combustion type.”

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.38+, for plants including a plurality of intermittent combustion type generators arranged in a ring coaxial with a turbine shaft.

SEE OR SEARCH CLASS:

123, Internal-Combustion Engines, subclass 657 for combustion chambers for internal-combustion engines.

39.77 Resonating:

This subclass is indented under subclass 39.76. Combustion devices in which a resonating or pulsating condition within the combustion products generator, due to the cyclic combustion of a fuel charge, is utilized to effect the exhaust of the products of combustion and the suction and compression of air or a fuel charge.

39.78 Rotating, oscillating, or reciprocating:

This subclass is indented under subclass 39.76. Combustion devices in which rotating, revolving, reciprocating, or oscillating combustion device cooperates with ports in a stationary or relatively movable valve member to control the cyclic events of the intermittent combustion cycle.

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.34+, for rotating combustion products generator and turbine.

39.79 With fluid actuated valve:
This subclass is indented under subclass 39.76. Combustion devices in which the combustion air, fuel charge, fuel feeding or exhaust valve is cyclically actuated by a fluid under pressure the application of such fluid under pressure being periodically controlled by a valve or similar means.

39.8 With pressure actuated valve:
This subclass is indented under subclass 39.76. Combustion devices in which the combustion air or fuel charge inlet valve, or the combustion products outlet valve, is cyclically actuated by the pressure at which the air, fuel charge or combustion products are delivered to or discharged from the combustion products generator.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39.7, for combustion products generators in which the valves in one generator are operated by pressure fluctuations in another generator.
39.77, for pressure actuated valves in resonating combustion products generators.

39.81 With fuel metering valve:
This subclass is indented under subclass 39.76. Combustion devices in which the fuel or fuel charge inlet valve is provided with means to cyclically feed a measured supply of fuel or fuel charge into the combustion device when actuated.

39.821 With ignition device:
This subclass is indented under subclass 722. Combustion devices in combination with an ignition device in the form of means to provide a source of heat to initiate combustion of a fuel charge or to maintain combustion within a combustion products generator.

SEE OR SEARCH THIS CLASS, SUBCLASS:
776 through 777, for a process where combustion products are used as a motive fluid having ignition or fuel injection after starting.
786 through 790, for a power plant where combustion products are used as motive fluid combined with a starting feature.

SEE OR SEARCH CLASS:
123, Internal-Combustion Engines, subclasses 143+ for igniters for internal-combustion engines.
431, Combustion, appropriate subclass for a residual fuel burner having an ignition means.

39.822 Catalytic type:
Combustion devices under 39.821 wherein the ignition device comprises structure in the form of a substance that increases the rate of chemical reaction of reactants brought into physical contact with the structure.

39.823 Pyrotechnic squib or charge type:
This subclass is indented under subclass 39.821. Combustion devices wherein the ignition device comprises structure composed of explosive-type materials but which has been modified or designed to burn rather than to explode.

(1) Note. The devices of this subclass are very similar to common fireworks and in particular firecrackers which have been ruptured or otherwise modified to cause the device to burn rather than to explode as in normal operation.

39.824 Hypergolic type:
This subclass is indented under subclass 39.821. Combustion devices wherein the ignition device comprises structure designed to bring into contact fuel components which ignite spontaneously upon contact with each other.

39.825 Single shot liquid type:
This subclass is indented under subclass 39.821. Combustion devices wherein the ignition device comprises structure specially designed to deliver a discrete quantity of liquid fuel in to a combustion chamber during a specified time period.

39.826 Pilot or torch type:
This subclass is indented under subclass 39.821. Combustion devices wherein the ignition device comprises a small jet designed to continuously supply gaseous fuel which either

remains constantly burning or is otherwise ignited when desired.

39.827 Spark type:
This subclass is indented under subclass 39.821. Combustion devices wherein the ignition device comprises structure designed to produce an electrical discharge through normally insulative material, e.g., through air or similar atmospheric substances.

39.828 Incandescent type:
This subclass is indented under subclass 39.821. Combustion devices wherein the ignition device comprises structure which either, (a) is capable of being made incandescent prior to and to produce initial combustion operation of the combustion device, or (b) is capable of being raised to and maintained for a sustained period of time in an incandescent state wherein the ignition device is raised to this state during an uninterrupted period of combustion of the combustion device.

(1) Note. A typical example of the type of ignition device provided for in (a) above would be an electrical filament through which an electrical current is passed causing the filament to become heated and incandescent. Similarly, a typical example of the type of ignition device provided for in (b) above would be a ceramic structure which upon being heated by combustion heat retains this heat for a very long time and therefore can be used to re-ignite a combustion device in which combustion has ceased.

39.83 Cooling of auxiliary components:
This subclass is indented under subclass 39.01. Plants having means to cool engine components other than those specifically provided for in preceding subclasses.

(1) Note. Patents classified herein include cooling of the engine casing, auxiliaries (e.g., starter motor, fuel pump, generator), and bearings not specifically disclosed or claimed as integral components of the compressor or turbine element.

(2) Note. An engine shaft is considered an element of either the compressor or motor, and coiling therefor is classified under the appropriate compressor or motor classification. However, cooling of a shaft bearing would be included herein.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39.5, for cooling of the exhaust structure.
39.82, for cooling of the igniter.
726+, for cooling of the oxidizer compressor and associated shaft.
740+, for cooling of the fuel injector.
752+, for cooling of the combustor liner.
806, for a power plant where combustion products are used as motive fluid including a combustion products generator having a turbine and cooling.

200.1 REACTION MOTOR (E.G., MOTIVE FLUID GENERATOR AND REACTION NOZZLE, ETC.):
This subclass is indented under the class definition. Apparatus or process for producing a useful thrust in one direction by the expulsion of a motive fluid therefrom in a opposite direction comprising a means for or step of producing said motive fluid and a means for or step of ejecting said motive fluid.

(1) Note. See (1) Note in subclass 205 for a glossary of terms used in the titles and definitions of subclass 200.1 and indented subclasses.

(2) Note. This definition includes electronic propulsion devices commonly known as “ion motors” wherein a thrust is obtained in one direction by the ejection in the opposite direction of ions accelerated electronically or by other means and expelled into the ambient.

(3) Note. The “means for or step of producing said motive fluid” in the definition may be, for example, any means for imparting energy to the motive fluid such as a heating means, an ion accelerating means, a combustion chamber, a source of such motive fluid such as a tank or merely a pump, and the “means for ejecting said motive fluid” may be merely a pipe, though it is usually a nozzle.

(4) Note. Apparatus under this definition is usually used to cause motion of a vehicle to which it is attached but it may be used to cause merely a thrust without producing movement. Many apparatuses inherently cause a thrust while accomplishing some other function and comprise a pressure fluid producing means and a fluid ejecting means. Such apparatuses are not classified under this definition but in appropriate other classes based on the disclosed function, e.g., Class 239, Fluid Sprinkling, Spraying, and Diffusing, would be the locus for a system comprising a pump connected to a nozzle used primarily to spray water and not to produce a thrust. On the other hand, a device comprising merely a pump and an output pipe which would normally be classified in Class 417, Pumps, or Class 418, Rotary Expansible Chamber Devices, is classifiable under this definition if the disclosure is limited to the use of a device as a reaction motor, e.g., to drive a boat. An exception to the above described use classification is made in the case of those power plants classifiable in Class 60, subclasses 39.01. Even if the sole disclosure of such a power plant is to produce a thrust it is not classifiable under this definition unless the nozzle is specifically described in the claim.

(5) Note. This class provides for the combination of a reaction propulsion device and a vehicular device wherein no more structure of the vehicular device is claimed than is necessary to mount the propulsion device. Any additional significantly claimed vehicle structure will require classification in the proper vehicle class.

(A)In the following instances, the structure of the vehicle was considered not to be significantly claimed: (a) The vehicle is included in the combination by name only (e.g., the vehicle is not modified, other than that required to accommodate the reaction motor, or identified as to any designation of the general class to which the vehicle belongs. (b) The location of the reaction motor or any part thereof, on the vehicle is defined merely by stating a relationship between the vehicle, as a unit, and the reaction motor (e.g., the motor is located at the front, rear, right, left, top, bottom, within or outside the vehicle, bow, stern, at the water line, center of gravity, or center line.

(B)In the following instances, the structure of the vehicle was considered to be significantly claimed: (a) The location of the reaction motor or motors or any part or parts thereof on the vehicle is defined by stating a plurality of relationships, anyone of which alone would be considered insignificant (e.g., one reaction motor on each side, or a reaction motor mounted within the vehicle rearwardly of the center of gravity). (b) The location of the reaction motor or any part thereof, on the vehicle is defined by stating a relationship between a specific part of the vehicle and the motor (e.g., motor located on the wing, keel or rudder of a ship). (c) The structure of the vehicle is modified to an extent greater than that required to position or support the reaction motor or its parts (e.g., claiming the shape of the hull of a ship). (d) The vehicle is provided with means for guiding, deflecting, or reacting with the propulsion fluid subsequent to its discharge from the nozzle of the reaction motor (e.g., the motor is located in an open channel or adjacent a rudder of a ship).

(6) Note. A component part of an apparatus under this definition necessary for its operation often is a motor, which, for example, may drive a compressor furnishing air to a combustion products generator which supplies motive fluid to a means (nozzle) for ejecting the fluid. Such motor may have a shaft output for an external load and the load on the shaft, e.g., a propeller, may even be nominally claimed and the apparatus will still be classified under this definition. However, if an apparatus under this definition has combined therewith an added motor used only for an external load, the whole apparatus is considered a combined reaction motor and other type

motor for classification in subclasses 200.1+.

(7) Note. Under this definition the motive fluid generating means, as claimed, may itself be a motor having a transmission means and a nominal load.

(8) Note. Dual Use Disclosure Patents which claim an apparatus having means to pressurize a fluent and a means through which the pressurized fluent may be ejected and which disclose a dual use for said apparatus, one of the uses being to produce a thrust, (e.g., pump a fluid and produce a thrust) are classified as follows: If the apparatus, in addition to the thrust producing use, is disclosed as used as an electrical energy discharge device, classification is in Class 60. Otherwise, patents are placed in Class 60 only if the sole disclosed use of the apparatus claimed is to produce a thrust or wherein combustion products are generated for use as motive power. Classification of apparatus, for example, which may be used to produce a thrust and also used as a pump is in Classes 415, 416, 417, or 418, or if also used to produce hot gas by a means which burns a fuel in Class 431, or if also used to distribute a hot gas is in Class 239.

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.01+, for power plants employing combustion products as the motive fluid and disclosed as being used with a reaction nozzle means to produce a thrust but not specifically claiming the nozzle means.

SEE OR SEARCH CLASS:

44, Fuel and Related Compositions, appropriate subclasses for a solid or liquid fuel composition including petroleum fuels, such as gasoline, admixed with other materials. The lines between Class 44 and this class are: (1) A patent containing a fuel composition claim and a claim to broadly creating propulsion by burning the fuel is classified in Class 44 and cross-referenced to this class. (2) A patent containing only process claims even if they merely recite burning a definite fuel to broadly produce thrust is classified in this class.

73, Measuring and Testing, subclass 112.01 for turbine engine testing and subclass 147 for wind tunnel; aerodynamic wing and propeller study.

86, Ammunition and Explosive-Charge Making, subclasses 1 and 20 for apparatuses and processes for filling or loading a casing with propellant.

102, Ammunition and Explosives, for devices disclosed as explodable projectiles having an explosive or explosive carrying compartment and having a propelling charge. See in particular subclasses 347+ for skyrockets having explosive charges to give visual effects, flight control means, ground support illuminating means, etc., subclasses 374+ for projectiles having jet reaction propulsion means, subclasses 334 and 366+ for shells adapted to emit an incendiary or smoky substance during flight, subclasses 200+ for fuses, primers and igniting devices, subclass 458 for tracer shells and subclasses 283+ for the shape or structure of powder grains, sticks or bars of an explosive substance arranged for the purpose of modifying the rate or manner of burning or exploding.

105, Railway Rolling Stock, subclass 26 for jet propelled rail vehicles.

110, Furnaces, for a combustion chamber structure of general utility or a method of operating the same with means to burn a solid fuel or solid fuel with auxiliary gas or liquid fuel and with or without means to feed said fuel to the burner means. These furnaces may also convert from a solid fuel burner to a gas or liquid fuel burner.

114, Ships, subclasses 20+ for self-propelled torpedoes, and subclasses 150+ for ships having steering means involving fluid pressure and jet means.

137, Fluid Handling, for fluid distribution systems for control of a motor means. Control of a reaction motor disclosed as the type classified in Class 60

would be classified in Class 60 if the reaction motor is claimed specifically or broadly. To claim, for example, merely a housing or chamber for a reaction motor would not preclude classification from Class 137. However, patents claiming specific motor structure and fuel control means for said motor, structural means interconnecting a motor and fuel control means, or a fuel control means broadly or specifically responsive to a motor condition are classified in Class 60. See subclasses 15.1+ for jet engine intake means, per se, having means to handle fluid therein.

138, Pipes and Tubular Conduits, for tubular members of definite or indefinite length and especially subclasses 40+ for pipes having variable or nonvariable means (e.g., reaction motor diffusers) to restrict the flow of fluid therethrough, subclasses 89+ for a pipe with a closure and subclasses 111+ for plural ducting in a single pipe.

149, Explosive and Thermic Compositions or Charges, appropriate subclasses for propellant compositions containing a fuel and an oxidizer. The lines between Class 149 and this class are: (1) A patent containing a propellant composition claim and a claim broadly creating propulsion by burning the propellant is classified in Class 149 and cross-referenced to this class. (2) A patent containing only process claims even if they merely recite burning a definite propellant to broadly produce thrust are classified in this class.

165, Heat Exchange, subclasses 51+ for heat exchangers associated with an engine.

175, Boring or Penetrating the Earth, subclasses 11+ and in particular subclass 14 for devices for boring earth in situ employing a combustion product generator and a nozzle means to accelerate said products. Also see Note V of the class definition of Class 175 particularly as it refers to Class 125, Stone Working.

180, Motor Vehicles, subclass 7 for a motor vehicle having a special device (e.g., a reaction motor for propelling it; and subclasses 116+ for a motor vehicle having means for maintaining a working fluid mass between a surface of the vehicle and a reaction supporting surface.

220, Receptacles, subclasses 581+ for a high-pressure-gas tank, subclass 13 for receptacles having water jackets and subclasses 265+ for containers having frangible type closures.

222, Dispensing, subclasses 251+ for means to dispense material with discharge assistant means (e.g., impeller, pump, etc.).

227, Elongated-Member-Driving Apparatus, for means to cause engagement between an elongated member and another member.

239, Fluid Sprinkling, Spraying, and Diffusing, appropriate subclass for a terminal flow modifying means, e.g., nozzle for a fluid, especially subclasses 127.1+ and 265.11+ for a reaction motor discharge nozzle, per se, or such nozzle claimed in combination with a mere combustion chamber or other means imparting energy to a fluid in the absence of specific details of the energy imparting means or a specific relationship between the means and the terminal means. Devices claiming specific means by which combustion products are produced in a combustion chamber to be used solely in a motor or thrust device (e.g., fuel injector, solid fuel and, etc.), or specific means by which a pressure is maintained on a stored fluid (e.g., contractible chamber) together with a nozzle for the production of a thrust are, however, classified in Class 60. Condition responsive means controlling flow through a nozzle is classified in Class 239 regardless of the parameter sensed.

244, Aeronautics and Astronautics, appropriate subclasses for machines adapted to be sustained by air or propelled through air, and devices such as air foils which react with the atmo-

sphere for controlling or sustaining flight. See in particular subclasses 3.1 through 3.3 for an aerial missile (including a projectile) with means to stabilize or affect the trajectory or course of the missile, subclasses 7, 12.1-12.6, 14, 15, and 23 for aircraft using jet reaction devices principally to assist in vertical lift, subclass 52 for aircraft having jet reaction devices for steering and propulsion, subclasses 73 and 74 for aircraft having jet reaction propulsion means, and subclass 113 for aircraft provided with jet reaction means to retard motion and subclass 171.1 -171.5 for a spacecraft having a propulsion system that includes a power plant of the type found in this class (60) having a significant relationship to the spacecraft.

248, Supports, subclasses 637+ for machinery supports.

261, Gas and Liquid Contact Apparatus, appropriate subclasses, for the oxidizer and fuel mixing subcombinations of reaction motors.

299, Mining or In Situ Disintegration of Hard Material, subclass 14 for processes involving the use of a fluid unconfined jet stream to comminute hard material (e.g., rock) in situ.

415, Rotary Kinetic Fluid Motors or Pumps, subclasses 80+ for a motor runner having a reaction type jet discharge for causing rotation about an axis.

416, Fluid Reaction Surfaces (i.e., Impellers), for vehicular propulsion devices having significantly claimed propeller structure and broadly recited reaction nozzle means distinct from the propeller for the production of a reaction thrust. On the other hand, the combination of a nominally claimed propeller and a reaction motor is classifiable under this definition. When the propeller and a reaction motor are significantly claimed and the reaction motor produces a thrust which does not drive the propeller, the device is considered a combined type power plant for Class 60, subclasses 6+ However, where the propeller and jet reaction device form a unitary structure or are otherwise structurally related so that substantially all of the output of the reaction device directly or indirectly rotates the propeller, classification is in Class 416, see in particular subclasses 20+.

417, Pumps, for pump details, and particularly subclasses 73+ for pumps of the type in which fluid is pumped by the combustion of a motivating fluid in contact with the pumped fluid, and subclasses 321+ for motor driven pumps, including those in which the pump output is disclosed but not claimed as being delivered to the drive motor (e.g., supercharger) and those wherein the compressor output is claimed as being delivered to the motor and is tapped for use externally of the motor-pump combination, and also pumps having an output which is disclosed as being discharged for a purpose other than that of producing thrust.

418, Rotary Expansible Chamber Devices, for rotary expansible chamber devices, per se.

431, Combustion, for combustion products generators not disclosed for any particular use or disclosed for use other than for external power purposes. A claimed means controlling a Combustion products generator which is responsive to a combustion products actuated motor condition such as speed, thrust, acceleration, etc., is considered to be tantamount to claiming the motor and causes classification in Class 60 rather than in Class 431. See also (8) Note under this subclass concerning dual use disclosures.

440, Marine Propulsion, subclasses 38+ for a boat or ship propelled or steered by a reaction motor.

201 Rotating or cyclic movement during axial thrust:

This subclass is indented under subclass 200.1. Apparatus or process arranged so as to turn about an axis or having any kind of cyclic movement while producing a coaxial thrust component when in operation.

(1) Note. The motors included in this subclass are usually intended to turn or spin continuously about an axis at constant or variable rates in the nature of that necessary to obtain stabilization in flight or for other reasons. Motors having thrust direction modification means which momentarily causes the motor to rotate or turn about an axis, but which is not intended to impart continuous rotation is found below, for example, in subclasses 228+.

(2) Note: Motors in this subclass may be provided with motive fluid ejecting means to produce rotation thereof. However, motors having means such as an air foil which causes the motor to rotate solely as a result of reaction with ambient air are classified elsewhere, as for example in Class 244, Aeronautics and Astronautics, subclass 3.23. See also Class 102, subclass 350 for pyrotechnic rockets having means to cause rotation of the rocket by gas discharge.

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.01+, especially subclass 39.34 for a power plant in which the motor rotates about an axis without producing an axial thrust.

SEE OR SEARCH CLASS:

415, Rotary Kinetic Fluid Motors or Pumps, subclasses 80+ for a motor runner having a reaction type jet discharge for causing rotation about an axis.

416, Fluid Reaction Surfaces (i.e., Impellers), subclasses 20+ for an impeller driven by a fluid reaction jet on the working member.

202 Ion motor:

This subclass is indented under subclass 200.1. Apparatus or process in which charged particles are ejected by application of an electrical force, e.g., an electromagnetic force.

SEE OR SEARCH CLASS:

219, Electric Heating, subclasses 121.36+ for means for heating a workpiece by directing to said workpiece ionized particles which had been created by an electrical arc drawn between two electrodes.

250, Radiant Energy, subclasses 281+ for mass spectroscopy methods and apparatus which ionize the particles through an electrostatic or magnetic field for separation of certain of the particles, subclass 396 for electron or ion beam deflection of focussing methods or apparatus and subclasses 423+ for ion generation methods and apparatus.

310, Electrical Generator or Motor Structure, subclass 11, for dynamo-electric machinery employing a plasma to exert a mechanical force.

313, Electric Lamp and Discharge Devices, subclass 62 for electrical space discharge devices provided with magnetic means for confining the path of the particles discharged and accelerating said particles; subclasses 359.1+ for discharge devices provided with means for generating and accelerating positive ions; subclasses 153+ particularly subclass 161, for space discharge devices having a magnetic field designed to influence a space discharge; subclasses 231.01+ for discharge devices having fluent material supply or flow directing means.

315, Electric Lamp and Discharge Devices: Systems, subclasses 111.01+ for a discharge device having means to supply a fluent material to a discharge area between discharge electrodes.

322, Electricity: Single Generator Systems, subclass 48 for plasma generating means.

324, Electricity: Measuring and Testing, subclasses 300+ for means by which a substance may be ionized and the ionized particles moved through a magnetic field for observation so that the substance may be identified.

376, Induced Nuclear Reactions: Processes, Systems, and Elements, subclasses 100+ for processes and devices that utilize a gaseous or light element fuel material, the particles of which are electrically charged or

excited to the point where they become highly ionized and the forces of repulsion of like nuclei are overcome to the end that thermonuclear fusion of such like nuclei is obtained or sought to be obtained.

417, Pumps, subclasses 48+ for electrical (e.g., ionic) or getter type pumps.

203.1 Electric, nuclear, or radiated energy fluid heating means:

This subclass is indented under subclass 200. Apparatus or process in which the motive fluid is heated directly or indirectly, through a heat transfer medium, by electrical energy, by radioactive decay, or by radiated energy (e.g., solar radiated energy, radio wave energy, etc.).

SEE OR SEARCH CLASS:

219, Electric Heating, subclasses 628+ and 772 for transferring heat to a fluent material by an inductively and capacitive dielectric heated member.

376, Induced Nuclear Reactions: Processes, Systems, and Elements, subclasses 317+ for propulsion systems or processes powered directly or indirectly by induced nuclear reactions.

204 Method of operation:

This subclass is indented under subclass 200.1. Processes.

(1) Note. Subject matter under this definition includes methods for maintaining reaction motors in operative condition.

(2) Note. Methods of making reaction motors are classifiable in appropriate process classes. A patent having a claim to a reaction motor as an apparatus and also a claim to a method of making said motor is classifiable as an original in the appropriate subclass for the apparatus and cross-referenced to the appropriate process class.

SEE OR SEARCH CLASS:

208, Mineral Oils: Processes and Products, subclasses 15+ for a petroleum fuel, such as gasoline, subclasses 22+ for an asphalt tar, pitch or resin mineral oil composition and subclass 39 for making, treating and recovery of asphalt, tar, pitch or resin.

502, Catalyst, Solid Sorbent, or Support Therefor: Product or Process of Making, appropriate subclass for a catalyst composition or a process of making or regenerating such composition.

(1) Note. Terms or phases used in titles or definitions are set forth at the end of this subclass with the meaning each is to have in this group of subclasses (205+).

205 By chemical reaction:

This subclass is indented under subclass 204. Processes directed to producing thrust in a reaction motor by ejecting the products of chemical reaction of propellant material.

(1) Note. This and indented subclasses take (1) processes involving injecting propellant material into the reaction zone in one or more streams, reacting the material and expelling the reaction products to produce thrust; (2) processes involving reacting propellant material in the reaction chamber and expelling the reaction products to produce thrust.

(2) Note. The lines between this and indented subclasses and Class 44, Fuel and Related Compositions, Class 149, Explosive and Thermic Compositions or Charges, Class 208, Mineral Oils: Processes and Products, Class 260, Chemistry of Carbon Compounds, and Class 423, Chemistry of Inorganic Compounds and Class 585, Chemistry of Hydrocarbon Compounds, are as follows: (1) patent containing a propellant material claim and a claim to broadly creating propulsion by merely broadly reacting the propellant material are classified in the appropriate material class and cross-referenced to this and indented subclasses. (2) A patent containing only process claims which merely recite reacting a definite propellant material to broadly produce thrust are classified in this and indented subclasses.

(3) Note. The processes of this and indented subclass include operating the reaction

motor in such media as water, air and vacuum.

SEE OR SEARCH CLASS:

44, Fuel and Related Compositions, appropriate subclasses for a solid or liquid fuel composition. The lines between Class 44 and this class are: (1) A patent, containing a fuel composition claim and a claim to broadly creating propulsion by burning the fuel is classified in Class 44 and cross-referenced to this class. (2) A patent containing only process claims even if they merely recite burning a definite fuel to broadly produce thrust are classified in this class.

102, Ammunition and Explosives, subclasses 530+ for sky-rockets, subclasses 374+ for a projectile having a charge which discharges to propel the projectile after leaving the gun, subclasses 334 and 366+ for shells adapted to emit an incendiary or smoky substance during flight, subclass 458 for tracer shells and subclasses 283+ for inventions in the shape or structure of powder grains, sticks or bars of an explosive substance usually arranged for the purpose of modifying the rate or manner of burning or exploding.

114, Ships, subclasses 20.1+ for fish or automobile torpedoes, the power or propulsion being self-contained.

149, Explosive and Thermic Compositions or Charges, appropriate subclasses for propellant compositions containing a fuel and an oxidizer. The lines between Class 149 and this class are: in particular, see subclass 109.2 for a collection of gas generation and propulsion methods using compositions not provided for elsewhere in the class, subclass 109.4 for a collection of monopropellant compounds, subclass 119 for a collection of oxidizer compounds and subclasses 120+ for a collection of high energy fuel compounds. (1) A patent containing a propellant composition claim and a claim to broadly creating propulsion by burning the propellant is classified in Class 149 and cross-referenced to this class. (2) A patent containing only process claims even if they merely recite burning a definite propellant to broadly produce thrust are classified in this class.

208, Mineral Oils: Processes and Products, subclasses 15+ for a petroleum fuel, such as gasoline, subclasses 22+ for an asphalt tar, pitch or resin mineral oil composition and subclass 39 for making, treating and recovery of asphalt, tar, pitch or resin.

252, Compositions, subclasses 186+ for oxidizing compositions.

440, Marine Propulsion, subclass 45 for devices causing explosive jets of the nature of those used in air and gas engines used for propelling a vessel.

502, Catalyst, Solid Sorbent, or Support Therefor: Product or Process of Making, appropriate subclass for a catalyst composition or a process of making or regenerating it.

585, Chemistry of Hydrocarbon Compounds, for certain fuel compositions containing only hydro-carbons and processes for making them.

GLOSSARY

BIPROPELLANT

A reaction motor propellant consisting of two separate substances (usually liquid) fed into the reaction zone separately. One of the substances is a fuel (e.g., hydrazine); while the other is an oxidizer (e.g., fluorine).

CHEMICAL REACTION

The transformation of the molecules of one or more substances into other kinds of molecules.

FUEL

A single substance or a mixture of substances which react with another substance (called the oxidizer) to form at least one new substance in which at least a portion of the fuel forms at least a portion of the more positive (electron donor) portion of the new substance. e.g.

$H_2 + Cl_2 \rightarrow 2HCl$

Hydrogen is considered the fuel.

$CH_4 \quad 2O_2 \rightarrow CO_2 + 2H_2O$

Methane is the fuel and oxygen in the

oxidizer.

$BE + F_2 \rightarrow BeF2$

Beryllium is the fuel and fluorine in the oxidizer.

HYPERGOLE

A substance (fuel or oxidizer) which ignites spontaneously on contact with the other member of a hypergolic mixture. For example: aniline is hypergolic with nitric acid.

INJECTING

Forcing into the reaction zone one or more streams of material which enter into the action which produces thrust. Extruding a solid or semi-solid into the reaction zone, spraying a stream of finely divided particles into the reaction zone and jetting a liquid or gas into the reaction zone are illustrative but nonlimiting examples of the scope of the term.

METAL

The term includes a free metallic element (e.g., lithium), an alloy of two or more metals (e.g., 25% Na 75% K), and intermetallic compound (e.g., A1Ni) or a mere mixture of particles of two or more metals.

MONOPROPELLANT

A material which contains within itself all of the components which enter into the chemical change which occurs in producing thrust in a chemical reaction motor. A monopropellant may be a pure compound, such as hydrazine, or a mixture of two or more substances which react under the conditions of the reaction chamber.

MOTIVE FLUID

Used in this definition this term means a stream of moving particles, either gaseous or liquid, as it exists in the area in the motor where it is accelerated, pressurized or otherwise caused to become unstable up to and including the point where it exits the end of the ejecting means, e.g., nozzle, through which it is ejected into the ambient to cause thrust.

OXIDIZER

A substance (element or compound) which reacts with another substance to produce at least one new substance in which at least a portion of the oxidizer furnishes at least part of the more negative (electron acceptor) portion of the new substances. e.g.

$BH_3 + NH_3 \rightarrow BN + 3H_2$

ammonia is considered the oxidizer

$2LiH + F_2 \rightarrow 2LiF + 2HF$

fluorine is considered the oxidizer

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

oxygen is the oxidizer

PROPELLANT

The generic term for any or all of the components of the supply of materials which may be converted (by expansion, combustion or other means) into motive fluid.

REACTION ZONE

The space in which the propellant material undergoes chemical change to produce new substances and heat which heat raises the temperature of the new substances. The ejection of these heated substances from the reaction motor produces thrust or propulsive force.

206 Utilizing indirect heat exchange:
This subclass is indented under subclass 205. Process directed to utilizing indirect heat exchange within the system.

(1) Note. To come within the purview of this subclass the patent must specifically claim transferring heat within the system from one fluid to another through a solid material, such as using the incoming fuel to cool the discharge nozzle. The latter is being heated by the products of chemical reaction.

SEE OR SEARCH CLASS:
252, Compositions, subclasses 71+ for a composition designed for use in heat exchange.

207 Utilizing plural reaction zones within a system:
This subclass is indented under subclass 205. Process directed to utilizing a plurality of chemical reaction zones in the system.

(1) Note. Such diverse processes as utilizing a main reaction zone and an afterburner zone and utilizing a plurality of reaction zone in parallel within the same system are within the purview of this subclass.

(2) Note. A process for hydrogenating the fuel and then oxidizing the is within the purview of this subclass.

208 Injecting air into the reaction zone:
This subclass is indented under subclass 205. Process directed to injecting atmospheric air into the reaction zone of the reaction motor.

(1) Note. This and indented subclasses are limited to operating air breathing reaction motors.

SEE OR SEARCH THIS CLASS, SUBCLASS:
211+, for a process in which liquid oxygen or liquid ozone is injected into the reaction zone as an oxidizer component and subclass 220 for a process in which a modifying fluid is injected into a reaction zone containing solid propellant material.

SEE OR SEARCH CLASS:
44, Fuel and Related Compositions, subclasses 300+ for a liquid fuel mixture which may be used in air breathing reaction motors.
208, Mineral Oils: Processes and Products, subclasses 15+ for liquid hydrocarbon mixtures such as: gasoline or kerosene.

209 Including using additive material:
This subclass is indented under subclass 208. Process directed to using an additive material other than air and fuel.

(1) Note. To be classed as an additive the material must be used in a minor amount with respect to the fuel or the air.

(2) Note. Such substances as: (1) a catalyst, (2) a substance hypergolic with air or the fuel, (3) a substance which forms with the fuel and air a multicomponent hypergolic mixture are within the scope of this and indented subclasses.

SEE OR SEARCH THIS CLASS, SUBCLASS:
212, for utilizing an igniter aid with separately injected fuel stream and oxidizer stream.

210 Injected separately:
This subclass is indented under subclass 209. Process directed to injecting the additive material into the reaction zone as a separate stream.

SEE OR SEARCH THIS CLASS, SUBCLASS:
213, for a process of injecting an igniter aid into the reaction zone in a separate stream.

211 Injecting separate streams of fuel and oxidizer (e.g., hypergole, etc.) into the reaction zone:
This subclass is indented under subclass 205. Process directed to injecting into the reaction zone separate streams of fuel and oxidizer.

(1) Note. The injection of separate streams of at least two different substances which react to produce products which are useful to generate thrust is considered injecting separate streams of fuel and oxidizer. The two substances may ignite on contact (hypergolic reaction) or they may be caused to react by various means, such as; a catalyst, an electrical discharge, heat, a substance which is hypergolic with either reactant or the reactant mixture.

(2) Note. For purposes of this and indented subclasses red fuming nitric acid, white fuming nitric acid, fuming sulfuric acid and aqueous hydrogen peroxide are arbitrarily considered pure substances.

(3) Note. For purpose of this and indented subclasses a solution of an amine base in an oxidizing acid is considered a pure substance regardless of the ratio of amine to acid.

SEE OR SEARCH CLASS:
149, Explosive and Thermic Compositions or Charges, especially subclass 1 for a propellant composition including a normally gaseous material which is in the liquid state, subclass 36, for a propellant composition containing hydrazine and subclass 74, for a propellant composition containing oxides of nitrogen or nitric acid.

212 Using igniter aid:
This subclass is indented under subclass 211. Process directed to utilizing an extraneous material to aid the ignition of the fuel and oxidizer mixture in the reaction zone.

(1) Note. The igniter aid includes (1) a coating in the reaction zone which catalyzes the reaction between the fuel and oxidizer, (2) a hypergole added to the oxidizer or the fuel for starting or (3) a material separately injected into the reaction zone.

(2) Note. A patent which claims a material as a pure fuel and as a part of a fuel mixture even if it improves the ignition characteristics of the main fuel is classified in subclass 211 and cross-referenced to subclass 215.

SEE OR SEARCH THIS CLASS, SUBCLASS:
209, for a process of utilizing an additive material in an air breathing reaction motor.

213 Injected separately:
This subclass is indented under subclass 212. Process directed to injecting the igniter aid into the reaction zone as a separate stream.

SEE OR SEARCH THIS CLASS, SUBCLASS:
210, for a process of injecting a separate stream of an additive into the reaction zone of an air breathing reaction motor.

214 Oxidizer in the form of a mixture:
This subclass is indented under subclass 211. Process directed to injecting into the reaction zone a plurality of oxidizing substances in the form of a mixture.

(1) Note. See Notes under subclass 211 for oxidizers which are arbitrarily classified as a pure compound instead of a mixture.

215 Fuel in the form of a mixture:
This subclass is indented under subclass 211. Process directed to utilizing a fuel which is composed of a plurality of materials.

(1) Note. Gasoline, kerosene and the like are mixtures of numerous hydrocarbons and are considered fuel mixtures for this and indented subclasses.

SEE OR SEARCH CLASS:
44, Fuel and Related Compositions, subclasses 300+ for liquid fuels composed of a plurality of materials.
208, Mineral Oils: Processes and Products, subclasses 15+ for mineral oil fuels.

216 One component free metal:
This subclass is indented under subclass 215. Process in which the fuel contains a free metal.

(1) Note. The term “metal” includes free metal (e.g., calcium), an alloy of two or more metals (e.g., 90% Al,10% Mg), an intermetallic compound (e.g., AlNi) or a mixture of particles of two or more metals (e.g., mixture of Mg shot, Fe powder and Al turnings).

(2) Note. Processes within the scope of subclasses 205+, utilizing fuel slurries which are classified elsewhere should be cross-referenced to this subclass.

SEE OR SEARCH CLASS:
149, Explosive and Thermic Compositions or Charges, subclass 22 for an explosive composition containing elemental boron, subclasses 37+ for an explosive composition containing a metal and an inorganic oxide, and subclass 87 for an explosive in which the fuel component contains free metal and a hydrocarbon or halohydrocarbon.

217 Injecting mixture of fuel and oxidizer into the reaction zone:
This subclass is indented under subclass 205. Process directed to injecting into the reaction zone a stream composed of the fuel and the oxidizer.

SEE OR SEARCH THIS CLASS, SUBCLASS:
208+, for a process in which a mixture of fuel and air is injected into the reaction zone.
219+, for a process in which solid propellant material is contained in the reaction zone.

SEE OR SEARCH CLASS:
149, Explosive and Thermic Compositions or Charges, appropriate subclasses for a specific propellant composition.

218 Decomposing a compound in the reaction zone:
This subclass is indented under subclass 205. Process directed to decomposing a single compound in the reaction zone.

(1) Note. To come within the scope of this subclass a single compound must be broken down or rearranged to produce products which will have additional reaction effect. For example, decomposing hydrogen peroxide to produce steam and oxygen gas. For patents claiming the apparatus for producing a motive fluid which is principally steam see subclass 227.

SEE OR SEARCH CLASS:
423, Chemistry of Inorganic Compounds, appropriate subclasses, for inorganic compounds, per se. Note especially subclasses 289+ for binary boron compounds, 407+ for hydrazkine and 584+ for hydrogen peroxide.
568, Organic Compounds, subclasses 943+ for a nitroalkyl compound.

219 Using solid material in reaction zone:
This subclass is indented under subclass 205. Process directed to reacting solid material in the reaction zone.

(1) Note. Producing thrust (1) by burning a cast monopropellant in the reaction zone, (2) by jetting a fuel onto solid oxidizer in the reaction zone, (3) regulating reaction rate of the solid propellant material in the reaction zone by injecting a fluid to change the pressure in the reaction zone are nonlimiting examples of processes within the scope of this and indented subclasses.

SEE OR SEARCH THIS CLASS, SUBCLASS:
217, for a process in which a solid propellant material is extruded into the reaction zone.

SEE OR SEARCH CLASS:
44, Fuel and Related Compositions, appropriate subclasses for specific fuel compositions, especially subclasses 265+ for a solidified liquid fuel.
102, Ammunition and Explosives, subclasses 283+ for powder forms of specific size or shape.
149, Explosive and Thermic Compositions or Charges, subclasses 3+ for an explosive or thermic composition having a specific structure or arrangement of a component or the product.

220 Including injecting modifying fluid:
This subclass is indented under subclass 219. Process directed to injecting a modifying fluid into the reaction zone.

(3) Note. Injecting a modifying fluid into the reaction zone (1) to change the fluid pressure therein to control the reaction rate of the solid propellant material and (2) to react with the solid propellant therein are nonlimiting examples of the scope of this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

208+, for a process in which air is injected into the reaction zone and subclasses 211+, for a process in which solid material and a fluid are injected into the reaction zone in separate streams.

221 Motive fluid principally liquid:

This subclass is indented under subclass 200.1. Apparatus wherein the motive fluid, as it leaves the ejecting means, substantially consists of a liquid.

(1) Note. The fluid leaving the ejecting means is considered to come under this definition if a substantial and important thrust component thereof is a liquid. A fluid not coming under the definition, for example, would be a gas containing a liquid mist. For such a fluid see subclass 264 for motive fluid treated with liquid, and subclass 227 for motive fluid which is principally steam.

(2) Note. The devices classified under this definition are usually boat propulsion devices in which the motive fluid leaving its ejecting means is disclosed as acting against an ambient liquid.

SEE OR SEARCH CLASS:

114, Ships, subclass 315 for reaction motor devices adapted to operate under water having means adapted to be secured to a human for the propulsion thereof through the water.

239, Fluid Sprinkling, Spraying, and Diffusing, for a device having an impeller for moving a fluid and an outlet through which the fluid may be discharged wherein the function of the discharged fluid relates to sprinkling, spraying, etc.

417, Pumps, for devices not otherwise classified operable to move a liquid, however, devices claiming liquid pumping means having a disclosed use as a reaction motor is classified in Class 60.

418, Rotary Expansible Chamber Devices, for rotary expansible chamber devices, per se. However, devices claiming liquid pumping means having a disclosed use as a reaction motor is classified in Class 60.

440, Marine Propulsion, subclass 38 for reaction motors which propel or propel and steer a ship, and see in particular the note (5) in the definition of subclass 200.

222 Plural discharge outlets:

This subclass is indented under subclass 221. Apparatus having more than one means through which motive fluid from a common source may be ejected.

SEE OR SEARCH THIS CLASS, SUBCLASS:

229, for motors having a plurality of selectively usable motive fluid outlets for discharging a fluid for the purpose of modifying the thrust direction.

263, for motors having plural outlets for discharging fluid.

SEE OR SEARCH CLASS:

239, Fluid Sprinkling, Spraying, and Diffusing, subclasses 265.25+ for reaction motor nozzles, per se, comprising plural controlled fluid discharge outlets.

223 With destruction sensing and preventing means:

This subclass is indented under subclass 200.1. Apparatus having means sensing an abnormal condition which might destroy the apparatus and functioning to take corrective action against the destructive condition.

(1) Note. This definition does not include a device which senses a normal variation in conditions to effect a control function, even though such device might be capable of sensing a suddenly presented abnormal condition. For example, a fuel

control device responsive to motive fluid temperature to maintain a predetermined power output would not be classifiable under this definition but would be classified in subclasses 233+. However, a fuel control device designed to function only when the motive fluid temperature reaches a temperature above which it would be destructive to the apparatus would be classifiable under this definition.

SEE OR SEARCH CLASS:

220, Receptacles, subclasses 89.1 through 89.4 for containers having frangible or fusible pressure responsive blow out devices.

224 Interrelated reaction motors:

This subclass is indented under subclass 200.1. A plurality of apparatuses, each, interrelated (1) by a single means to which two or more responds, or (2) by a means or condition in one of the apparatuses upon which another apparatus is dependent for its operation.

(1) Note. A plurality of apparatuses under this definition must each include an individual means for placing its motive fluid under pressure and an individual means for ejecting said fluid. However, a device, e.g., a fan jet, having a unitary device employed to pressurize fluid for two or more ejecting means comes within this definition provided the fluids for each said ejecting means are distinguishable and not intermixed as they are being pressurized or before entering said ejecting means.

(2) Note. Concentric nozzles are not considered plural individual means for ejecting fluid if fluid from one nozzle is discharged within the confines and upstream of the discharging extremity of another of the nozzles.

(3) Note. This definition includes one reaction motor which is controlled in response to the output of another reaction motor.

(4) Note. This definition includes devices in which a component of one reaction motor is effective to operate a component (e.g., compressor) of another reaction motor.

(5) Note. A reaction motor having means by which ambient air is conducted to cool a motor part (e.g., air conducted to cool a combustion chamber, and thereafter discharged to the ambient through a nozzle, and wherein there is no disclosed indication that the coolant air may produce a thrust) is not subject matter for this subclass. Such devices may be found below particularly in subclass 266.

SEE OR SEARCH THIS CLASS, SUBCLASS:

229, for reaction motors wherein motive fluid from a common source may be ejected selectively through one or more of several ejecting means.

244, for devices having a single exhaust nozzle for sequentially ejecting motive fluid produced by diverse motive fluid producing means.

262, for a device having plural means each forming a compressed gas stream, e.g., a fan-jet, wherein at least two of the streams are combined before being discharged through a common ejecting means.

263, for devices in which the fluid from a single motive fluid pressurizing means is separated into several paths of fluid, wherein two or more of said paths are each ejected through separate ejecting means.

225 Sequentially operated:

This subclass is indented under subclass 224. Apparatus wherein one of the apparatuses is started after another one of the apparatuses.

(1) Note. This definition includes devices wherein one apparatus is a ram jet which is considered inoperable (i.e., incapable of producing thrust) when static, and therefore may be started only after having been given motion by another motor. These devices may be arranged serially (e.g., rocket and ram jet) having distinctive motive fluid ejecting means for each. The motive fluid ejecting means may be in the form of concentric nozzles

arranged so that one may be detached from the other when one motive fluid producing means, e.g., for the rocket, is terminated to provide a new nozzle configuration for the ejection of the motive fluid from the next motive fluid producing means to be activated.

SEE OR SEARCH THIS CLASS, SUBCLASS:

246, for reaction motors having diverse means arranged to sequentially produce a motive fluid to be discharged through a single nozzle.

226.1 Air and diverse fluid discharge from separate discharge outlets (e.g., fan jet, etc.):
This subclass is indented under subclass 224. Apparatus wherein at least one of the motive fluids is air.

226.2 Having thrust reverser:
This subclass is indented under subclass 226.1. Apparatus in which the air discharge outlet is supplied pressurized airflow from an fan, and in which a device or mechanism is provided for at least partially reversing the flow direction of the fan airflow to thereby reduce or reverse the thrust of the apparatus.

226.3 Having means to effect a variable bypass ratio:
This subclass is indented under subclass 226.1. Apparatus in which the air discharge outlet is supplied pressurized airflow from a fan, and wherein a device or mechanism is provided to change the relative flow ratio between the air discharge outlet and the diverse fluid discharge outlet.

227 Motive fluid principally steam:
This subclass is indented under subclass 200.1. Apparatus including means for producing a motive fluid which substantially consists of steam to be ejected from the apparatus.

(1) Note. This subclass includes steam generators of the type having catalytically decomposed hydrogen peroxide (H_2O_2) and a nozzle wherein the resulting products discharged through the nozzle being predominantly steam (i.e., H_2O+O). For patents claiming the process of decomposing a compound in the reaction zone see subclass 218.

228 With thrust direction modifying means:
This subclass is indented under subclass 200.1. Apparatus having means which may so direct all or a portion of the motive fluid that the direction of thrust produced by the motor is altered.

(1) Note. Subject matter under this definition includes plural reaction motors having means for controlling them so as to cause a change in the direction of their resultant thrust.

SEE OR SEARCH CLASS:

239, Fluid Sprinkling, Spraying, and Diffusing, subclasses 265.19+ for reaction motor discharge nozzles with means to control the direction of the discharge stream.

244, Aeronautics and Astronautics, subclasses 12.1, 23 and 29 for aircraft sustained by the thrust of a reaction motor and subclasses 15, 52 and 73+ for aircraft propelled or steered by reaction motors.

229 With plural selectively usable motive fluid ejecting means:
This subclass is indented under subclass 228. Apparatus having means whereby motive fluid from a common source may be selectively exhausted through one or more of several ejecting means so that a variation in the direction of the resultant thrust component may be effected.

SEE OR SEARCH THIS CLASS, SUBCLASS:

222, for motors in which the motive fluid is principally liquid and which have a plurality of ejecting means.

SEE OR SEARCH CLASS:

239, Fluid Sprinkling, Spraying, and Diffusing, subclasses 265.25+ for reaction motor nozzle means in which the discharge stream is directed by means of plural controlled outlets.

230 Jet stream deflecting means:
This subclass is indented under subclass 228. Apparatus having a means which causes the motive fluid to change direction of flow relative to the ejecting means thereby to cause a change in direction in the resultant thrust of the motor.

SEE OR SEARCH CLASS:
138, Pipes and Tubular Conduits, subclasses 37+ for means within a pipe for changing the direction of flow of the fluid and subclass 109 for pipe shaped at the end portion to control the direction of flow of fluid before it is discharged.
244, Aeronautics and Astronautics, subclass 52 for aircraft spoilers in combination with jet motor discharge fluid.

231 By secondary fluid injection:
This subclass is indented under subclass 230. Apparatus having means whereby a fluid is injected into the motive fluid stream to change the direction of flow of said motive fluid.

(1) Note. Normally devices under this subclass have a secondary fluid injected into the motive fluid at a point upstream of the nozzle outlet. However, the subclass may also include patents disclosing means to inject secondary fluid into the motive fluid downstream of the nozzle outlet if the disclosure states that the deflected motive fluid is effective to alter the direction of thrust.

SEE OR SEARCH CLASS:
137, Fluid Handling, subclasses 803+ for means to divert or vary the flow of one stream relative to a steam receiver (1) direct contact with at least one other stream or (2) by application of an energy field directly to a stream. Devices known in the art as "fluid amplifiers" and which act to control or vary high energy flows by relatively low energy flow or fields are here included.
239, Fluid Sprinkling, Spraying, and Diffusing, subclass 265.23 for reaction motor discharge nozzles in which the main discharge stream is deflected by a redirected portion of said stream, and subclass 127.3 for mixing a secondary fluid in the main stream.

232 Motive fluid outlet movable relative to motor part:
This subclass is indented under subclass 228. Apparatus having means whereby the motive fluid ejecting means, per se, may be moved to modify the direction of the entire discharge stream which passes through the ejecting means.

SEE OR SEARCH CLASS:
239, Fluid Sprinkling, Spraying, and Diffusing, subclass 265.35 for a reaction motor nozzle in which the discharge stream is directed by adjustably aiming the nozzle.

233 Condition responsive thrust varying means:
This subclass is indented under subclass 200.1. Apparatus in which the thrust of the apparatus during operation may be varied by means which senses a change in (1) the static condition of the ambient or in the relationship between the apparatus and an ambient condition, or (2) a condition of an apparatus part, motive fluid or propellant of the apparatus being controlled, or (3) a condition of a motor other than a reaction motor the output of which is itself controlled responsive to a sensed change in the condition of the ambient or an internal condition.

(1) Note. Apparatus providing means which does no more than to permit the flow of fuel to a combustion chamber for starting after a certain condition has been attained, such as a certain fuel pressure or motive fluid temperature or pressure has been established, so that the motor thereafter may be fully operational, is not classified in this or indented subclasses. Such apparatus is classified below. This and indented subclasses include starting devices, however, if they further control the flow of fuel in accordance with the definition.

(2) Note. Means (i.e., for controlling fuel flow, nozzle area, etc.) controlled positively in response to a manually actuated device through a mechanical fluid link-

age are not included under this definition. For example, a nozzle control responsive to fuel pressure which is controlled by manual means only is not considered to be condition responsive. Devices with such controls are classified on other features.

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.24+, for plants having combustion products generators having automatic means controlling the fuel or oxidizer flow thereto.

224+, for interrelated reaction motors wherein the control of one reaction motor may be responsive to the condition of another reaction motor.

244, for a reaction motor having diverse means for the production of combustion products wherein one is activated only as a result of a sensed condition of another or of a sensed ambient condition where the diverse combustion products producing means are not employed specifically to obtain a variation in thrust.

245, for reaction motors having diverse means for the production of combustion products wherein one means is activated as a result of the depletion of the fuel supplied to another means.

250, for reaction motors having discrete fuel supplies one of which is activated upon the depletion of another.

761 through 766, for a reaction motor having an afterburner.

SEE OR SEARCH CLASS:

431, Combustion, subclasses 18+ for the control of a residual combustion device responsive to burner or ambient parameters. However, if fuel or oxidizer, as claimed, is controlled responsive to a condition of a disclosed but not claimed motive fluid ejecting means classification is in Class 60, Power Plants, on the basis that the structure claimed is incomplete and an ejecting means is required to complete it.

234 Solid propellant depletion control:

This subclass is indented under subclass 233. Apparatus having a solid propellant and means to initiate or terminate the consumption thereof responsive to the condition sensing means.

235 Motive fluid outlet area and fuel flow control:

This subclass is indented under subclass 233. Apparatus in which the condition sensing means controls both the rate of fuel flow to combustion chamber means in the apparatus and the cross sectional area of a motive fluid ejecting means.

(1) Note. Included in this subclass are apparatuses having a fuel control means and a nozzle area control means each responsive to different sensed conditions, or both responsive to the same sensed condition.

236 Plural spool motor-compressors:

This subclass is indented under subclass 235. Apparatus having more than one unit each of which consists of a rotary compressor means for pressurizing the motive fluid, turbine means actuated by the motive fluid and shaft means by which the turbine means may drive the compressor means, wherein the shaft means for at least two of the units are concentrically arranged.

237 Outlet area sensed to control fuel or oxidizer flow:

This subclass is indented under subclass 235. Apparatus having means to sense the area of the motive fluid ejecting means, and in response thereto, control the fuel or oxidizer flow rate for the motor.

238 Motive fluid temperature sensed to control fuel flow or outlet area:

This subclass is indented under subclass 235. Apparatus in which either the fuel flow to combustion chamber means in the apparatus, or the area of the motive fluid ejecting means, or both of these together, are varied in response to a sensed change in the motive fluid temperature.

(1) Note. See glossary under subclass 205 for the definition of “fuel”.

239 Compressor or turbine speed sensed to control fuel flow or outlet area:

This subclass is indented under subclass 235. Apparatus in which the apparatus includes a combustion chamber, a turbine and a compressor driven thereby and either the fuel flow to the combustion chamber, or the area of the motive fluid ejecting means, or both of these together, are varied as a result of a sensed change in the compressor or turbine speed.

(1) Note. See glossary under subclass 205 for the meaning of "fuel".

240 Oxidizer and fuel flow control:

This subclass is indented under subclass 233. Apparatus in which the condition sensing means characteristic of the apparatus including means, responsive to a sensed condition change, to control both the flow of a fuel and a combustion supporting oxidizer (e.g., air).

(1) Note. Means to alter the flow of oxidizer include, e.g., air inlet control as by a diffuser having a variable opening, variable flow retarding baffles, air bleed means, liquid oxidizer valve means or pump control means, or compressor vane setting control means. Means which controls fuel flow or an exhaust nozzle opening, resulting in a change in compressor speed and thus a change in oxidizer flow is not included in this definition. For condition responsive fuel flow and exhaust nozzle area control see subclasses 235+, 241 and 243.

(2) Note. See glossary under subclass 205 for meaning of fuel and oxidizer.

241 Plural burners in series:

This subclass is indented under subclass 233. Apparatus having more than one fuel burning means arranged in the motive fluid stream so that one of the fuel burning means reheats the motive fluid stream issuing from another of the means and the fuel flow to a plurality of said burning means is controlled in response to a sensed condition.

(1) Note. See glossary under subclass 205 for the meaning of fuel.

SEE OR SEARCH THIS CLASS, SUBCLASS:

243, for a disclosure of burners in series but wherein the fuel flow to one of the burners only is controlled in response to a sensed condition.

242 Outlet area control:

This subclass is indented under subclass 233. Apparatus having means to vary the thrust characteristic of the apparatus during operation by varying the area of the opening through which the motive fluid may be ejected in response to a sensed condition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

235+, for motive fluid ejecting means with condition responsive means to vary the area thereof.

SEE OR SEARCH CLASS:

239, Fluid Sprinkling, Spraying, and Diffusing, appropriate subclasses for fluid ejecting nozzles, per se, having means controlling the nozzle area for control of volumetric flow and pattern of flow.

243 Fuel flow control:

This subclass is indented under subclass 233. Apparatus in which the condition sensing means acts to vary the thrust of the apparatus by controlling the fuel flow.

244 Motive fluid from diverse generators alternatively ejected through outlet:

This subclass is indented under subclass 200.1. Apparatus (A) which by relative rearrangement or adjustment of its parts or by the addition or omission of a part is so changed as to become (1) basic subject matter of this class as defined in subclass 200.1 of a different character or having a different mode of operation or (2) basic subject matter of another class, or (B) in which the apparatus as defined in subclass 200.1 is combined with means, which means if claimed, per se, would be classified in another class and which is not merely a part or subcombination of the apparatus.

(1) Note. In this subclass, for example, are apparatus having means by which

motive fluid may be produced by two or more diverse producing means and ejected through a single ejecting means, and having means by which motive fluid from any one of the diverse producing means may be ejected through the ejecting means to the exclusion of the motive fluid produced by another diverse motive fluid producing means.

(2) Note. A mere fuel or ignition control means by which one motive fluid producing means may function to the exclusion of another diverse fluid producing means is not included in this definition. .

(3) Note. The following are examples of diverse motive fluid producing means: ram air fed combustion products generator (athodyd), mechanically compressed air fed combustion products generator, resonating combustion chamber, pulsating valve controlled combustion products generator; mechanically compressed air, non-air breathing combustion chamber, ion acceleration, electrical or wave energy heating means, sublimation, etc.

(4) Note. Motors having plural means for the production of a motion fluid for ejection through a single nozzle wherein one means may not function to the exclusion of another of the means are found elsewhere.

SEE OR SEARCH THIS CLASS, SUBCLASS:

224+, for devices considered to be interrelated motors which may comprise a single casing housing diverse motive fluid producing means but employing distinct exhaust nozzle configurations for the motive fluid issuing from each motive fluid producer.

250, for a reaction motor having plural propellants that burn sequentially.

262, for a reaction motor having an air passage that bypasses a combustion chamber.

761 through 766, for a reaction motor having an afterburner.

245 Propellant supply used in one operation reduced before starting another:

This subclass is indented under subclass 244. Apparatus having means to initiate the production of motive fluid by one means after the propellant supply usable by a diverse motive fluid producing means has been reduced to a predetermined level.

SEE OR SEARCH THIS CLASS, SUBCLASS:

250, for a motor having a plurality of sequentially combustible fuels which does not change its principle of operation as one or the other fuel is burned.

246 Turborocket:

This subclass is indented under subclass 200.1. Apparatus in which the means placing the motive fluid under pressure comprises a compressor driven by a turbine which is driven by combustion products egressing from a non-air breathing combustion chamber.

SEE OR SEARCH CLASS:

244, Aeronautics and Astronautics, subclass 4, for reaction motors having human body attaching means.

247 Intermittent combustion:

This subclass is indented under subclass 200.1. Apparatus in which the means for producing the motive fluid comprises an intermittently operating combustion chamber having means permitting unidirectional flow of oxidizer or fuel to said chamber.

(1) Note. Under this definition the fuel may be caused to burn intermittently either by control of the fuel flow itself or the ignition thereof, or by intermittently admitting into the combustion chamber the air or other oxidizer which supports combustion.

SEE OR SEARCH CLASS:

123, Internal-Combustion Engines, subclass 657 for combustion chambers for internal combustion engines.

248 Air bypass passage:
This subclass is indented under subclass 247. Apparatus having conduit means by which ambient air may flow exteriorly of and from a point before to a point after the combustion chamber.

SEE OR SEARCH THIS CLASS, SUBCLASS:
224+, for interrelated motors wherein air being supplied to one motor may first flow around the combustion chamber for another motor.
262, for motors having means to flow air exteriorly of and from a point before to a point after its combustion chamber forming means.
264, for motors having means to introduce air into the exhaust gas stream.
266, for motors which may be cooled by an air stream.

249 Aerodynamic valve:
This subclass is indented under subclass 247. Apparatus in which the unidirectional flow permitting means comprises a passage means which prevents flow of combustion products therethrough from said chamber in a reverse direction due to its designed configuration and without a physical valve.

(1) Note. The unidirectional flow permitting means which offers minimum resistance to flow of fuel or oxidizers into the combustion chamber but substantially prevents reverse flow therefrom is normally a fixed orifice type restriction which presents a tortuous path to fluid attempting to leave the combustion chamber. Motors having this type of unidirectional flow permitting means are known in the art as "Valveless pulse jets".

250 Plural propellants to burn sequentially:
This subclass is indented under subclass 200.1. Apparatus having two or more separately contained propellants or two or more solid propellant charges having the same or distinct burning characteristics arranged so that one of said propellants may be partially or completely consumed prior to another during the operation of the reaction apparatus.

(1) Note. A solid propellant rocket having an igniter which inherently produces some thrust during ignition, is not included under this definition. See subclass 256 for devices used to ignite solid propellant charges.

(2) Note. Under this definition a plurality of solid propellant charges having the same burning characteristics would include an arrangement of individually formed masses of propellant either in physical contact with each other or separated from one another.

(3) Note. See (1) Note subclass 205 for the meaning of "propellant".

SEE OR SEARCH THIS CLASS, SUBCLASS:
225, for a plurality of reaction motors which are interrelated and which may be operated sequentially.
245+, for reaction motors changeable to operate by one principle of operation from another.

251 Solid and fluid propellant:
This subclass is indented under subclass 200.1. Apparatus in which the motive fluid is produced by the combustion of a solid propellant and a fluid propellant.

(1) Note. A gelatinous propellant is considered to be a solid and to come within this definition.

252 Gel propellant:
This subclass is indented under subclass 200.1. Apparatus wherein the propellant from which the motive fluid is produced is a gelatinous precipitate.

SEE OR SEARCH CLASS:
44, Fuel and Related Compositions, subclasses 265+ for fuel which is normally liquid but rendered solid or semi-solid for better handling and transporting.

253 Solid propellant:
This subclass is indented under subclass 200.1. Apparatus in which the propellant from which the motive fluid is produced is a solid.

254 Including means to terminate or regulate motive fluid production:
This subclass is indented under subclass 253. Apparatus having means to control the consumption of the propellant.

(1) Note. This definition does not include rockets wherein the fuels are packed in a particular manner or inserted with combustion enhancing or inhibiting means to produce a particular burning rate or characteristic. These apparatus are found in subclass 253.

(2) Note. This definition does not include reaction motors employing a plurality of charges which may be sequentially ignited. These devices are found above in subclass 250.

SEE OR SEARCH THIS CLASS, SUBCLASS:
224, and in particular subclass 225 for interrelated reaction motors one of which may employ a solid propellant.
234, for motors having condition responsive means to regulate the consumption of a solid propellant.
244+, for motors having a means to change its principle of operation and which, at one time, may employ a solid propellant.
250+, for motors having plural propellants which burn sequentially one or more of which may be a solid.
251, for motors having diverse reactants one of which is a solid.

SEE OR SEARCH CLASS:
102, Ammunition and Explosives, subclasses 283+ for shapes or mechanical structures of grains, sticks, or bars of explosive material arranged to modify the manner of burning.

255 Including propellant support means:
This subclass is indented under subclass 253. Apparatus having means to position, hold or support the propellant.

(1) Note. A mere wall or casing without any special modification for positioning, holding or supporting the propellant is not included. See Class 239, Fluid Sprinkling, Spraying, and Diffusing, subclass 302.

256 Including ignition means:
This subclass is indented under subclass 253. Apparatus having means to initiate propellant combustion.

SEE OR SEARCH CLASS:
102, Ammunition and Explosives, subclass 202 for means for igniting a missile propellant.

257 Liquid oxidizer:
This subclass is indented under subclass 200.1. Apparatus in which thrust is produced by the combustion of (1) a monopropellant or (2) an oxidizer and a fuel, the oxidizer being supplied to the combustion zone in a liquid state.

(1) Note. This definition is intended to provide an art collection of nonair breathing motors (i.e., rockets) employing an oxidant supplied to the motor in a liquid state. However, no special structure need be claimed for classification in this subclass. Patents whose disclosure or claims relate to the described art group are considered to come under this definition.

(2) Note. A broad disclosure that liquid oxidizer, two or more liquid propellants or liquid monopropellant are used in the motor or that the motor is of the "liquid propellant or liquid reactant" nonair breathing type is classifiable under this definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:
240, for motors having oxidizers stored as a liquid with sensed condition respon-

sive means for controlling oxidizer flow.

258 Including injector means:
This subclass is indented under subclass 257. Apparatus having means to inject the oxidizer into the combustion zone where it is to be consumed during the combustion process.

259 Including pressurizing means:
This subclass is indented under subclass 257. Apparatus having means to increase the pressure of the oxidizer or monopropellant so that it may be introduced into the motive fluid producing area (e.g., burner).

260 Including heating means:
This subclass is indented under subclass 257. Apparatus having means by which a liquid oxidizer or monopropellant may be heated before it is introduced into the motive fluid producing means.

SEE OR SEARCH THIS CLASS, SUBCLASS:
267, for motors having a means to exchange heat between a solid body and a liquid.

262 Air passage bypasses combustion chamber:
This subclass is indented under subclass 200.1. Apparatus in which an air stream is compressed and led into a combustion chamber in which motive fluid is produced, comprising a passage for causing a portion of the air, after it has been compressed, to avoid entry into the combustion chamber and be led back into the stream of motive fluid from the combustion chamber before it is ejected into the ambient.

SEE OR SEARCH THIS CLASS, SUBCLASS:
224, for devices having means to cause a portion of a compressed gas stream to bypass a combustion chamber or other component acting upon the stream together with separate ejecting means for each of two or more of the streams formed.
246, for a device having a compressed air stream bypassing a nonair breathing combustion chamber.
248, for a device having an air passage which bypasses an intermittent combustion chamber.

263 Plural motive fluid generating means or plural outlets:
This subclass is indented under subclass 200.1. Apparatus having (1) two or more motive fluid producing means, means to combine the motive fluid issuing from said producing means, and either single or plural ejecting means through which said combined motive fluid may pass or (2) two or more motive fluid ejecting means receiving motive fluid from a single motive fluid producing means.

(1) Note. Concentric nozzles are not considered plural if fluid from one nozzle is discharged within the confines and upstream of the discharging extremity of another of the nozzles.

SEE OR SEARCH THIS CLASS, SUBCLASS:
201, for reaction motors arranged to turn about an axis when in operation and having a plurality of motive fluid ejecting means.
224+, for a plurality of reaction motors which are interrelated either because one is responsive to a condition of another or two or more reaction motors are responsive to a single means.
229, for motors having plural selectively usable motive fluid ejecting means to vary the thrust magnitude.
262, for motors having plural combustion chambers but wherein passage means is provided for the ambient air supply for one combustion chamber which extends from a point before to a point after another combustion chamber.

264 Including motive fluid treating means:
This subclass is indented under subclass 200.1. Apparatus having means whereby a physical characteristic of a stream of pressurized motive fluid may be changed by the introduction of a substance into said stream to react or mix therewith.

SEE OR SEARCH THIS CLASS, SUBCLASS:

231, for motors having thrust direction modifying means employing a means to inject a fluid into the motive fluid ejecting means.

246, for motors having means to mix pressurized air from the effluent from a nonair breathing combustion chamber.

248, for reaction motors having means to bypass air around an intermittent combustion chamber and to mix said air with combustion products issuing from said combustion chamber.

261, for a motor having means to add oxidizer or fuel to an atmosphere of previously formed combustion products to promote further burning.

265, for motors having means to flow a film of fluid on a motor component surface between said surface and the motive fluid to cool the component, and means whereby the fluid may ultimately combine with the motive fluid.

SEE OR SEARCH CLASS:

239, Fluid Sprinkling, Spraying, and Diffusing, subclass 127.3 for means to mix a cooling fluid with the main discharge stream in a nozzle of a reaction motor, and subclass 265.17 for a means to add a secondary fluid to the main stream upstream of the nozzle outlet.

265 Means to flow film on surface:

This subclass is indented under subclass 200.1. Apparatus having means by which a fluid film, other than air, may be caused to sweep a surface of the apparatus between said surface and the motive fluid presented to said surface.

(1) Note. Included in this definition is a fluid film formed by ablatable material on a motive fluid engageable surface.

SEE OR SEARCH THIS CLASS, SUBCLASS:

257 through 260, for a reaction motor using a liquid oxidizer, especially 258 for an injecting means, that could include the liquid oxidizer flowing along walls of a combustion chamber.

761 through 766, for a reaction motor having an afterburner that could include the fuel flowing along walls of a combustion chamber.

SEE OR SEARCH CLASS:

239, Fluid Sprinkling, Spraying, and Diffusing, subclass 265.15 for reaction motor nozzles having an erodible, frangible or fusible part.

266 Including heat exchange means:

This subclass is indented under subclass 200.1. Apparatus having means to enhance the transfer of heat between a solid body and a fluid flowing in contact therewith.

SEE OR SEARCH THIS CLASS, SUBCLASS:

246, for turborockets having means to bypass air around a nonair breathing combustion chamber.

248, for an intermittent combustion motor in which bypassed air may be used as a coolant.

262, for motors in which a part of the compressed gas may be bypassed around a motor part to cool said part.

264, for motors having a substance to be mixed with the motive fluid but which may also be used to cool a part of said motor.

SEE OR SEARCH CLASS:

52, Static Structures (e.g., Buildings), subclass 232 for a structural component having chemically reactable layers or components which may change physically or chemically with variations in ambient conditions such as heat or moisture.

62, Refrigeration, subclasses 467+ for apparatus comprising means to cause a cooling effect by producing a change in the condition or state of a material.

239, Fluid Sprinkling, Spraying, and Diffusing, subclass 127.1 for reaction motor discharge nozzles having cooling jackets.

244, Aeronautics and Astronautics, subclass 117 for aircraft having an ablatable surface.

267 For a liquid:
This subclass is indented under subclass 266. Apparatus wherein said fluid is a liquid.

268 Including counter rotating rotors:
This subclass is indented under subclass 200.1. Apparatus having a plurality of rotary means two or more of which rotate in opposite directions, each rotary means having a means to compress a propellant and a means driving said rotary means.

SEE OR SEARCH THIS CLASS, SUBCLASS:
236, for reaction motors having counter rotating turbine rotors with condition responsive means which may control the fuel supply and motive fluid ejecting means opening.

SEE OR SEARCH CLASS:
415, Rotary Kinetic Fluid Motors or Pumps, subclasses 60+ for counter rotating rotors in a device of the type there classified.
416, Fluid Reaction Surfaces (i.e., Impellers), subclasses 128+ for oppositely rotating impellers, per se.

269 Including mechanical air compressor or air flow inducing means:
This subclass is indented under subclass 200.1. Apparatus wherein the pressure of air is increased by mechanical means or by means of a pressurized fluid, said air being used as a propellant or as the motive fluid.

(1) Note. Included in this definition are reaction motors which include an impeller for moving a fluid and having an outlet for discharging said fluid having a sole disclosed function to produce a thrust.

SEE OR SEARCH THIS CLASS, SUBCLASS:
221+, for reaction motors having shrouded impellers wherein water is the medium moved.
268, for motors having counter rotating turbine rotors driving plural compressor elements.

SEE OR SEARCH CLASS:
239, Fluid Sprinkling, Spraying, and Diffusing, subclass 265.11 for a device having an impeller for moving a fluid and an outlet through which the fluid may be discharged wherein a function of the discharged fluid relates to spraying, sprinkling, etc.

272 INTERNAL COMBUSTION ENGINE WITH TREATMENT OR HANDLING OF EXHAUST GAS:
This subclass is indented under the class definition. Subject matter having an engine in which fuel is burned in an expansible chamber to produce work and in which at least some of the combusted material going to discharge is handled or treated after it reaches a point where the handling or treatment is more than that necessary to remove the material from the chamber.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39.5+, for the treatment of combustion products making up the exhaust of a gas turbine; subclasses 64+ for the treatment of the exhaust of an engine driven by a single fluid; and subclasses 200+ for a power plant comprising a combustion products generator and a combustion products directing reaction nozzle.
228+, for a reaction motor with thrust modifying means.
595, for a free piston type internal combustion engine, the exhaust of which drives a motor.
597+, for a fluid motor driven by the exhaust or waste heat of an internal combustion engine.

SEE OR SEARCH CLASS:
123, Internal-Combustion Engines, subclasses 568.11+, for an internal combustion engine having a charge forming device that may be heated by exhaust gas; or in which exhaust gas is mixed with the engine fuel; subclass 142.5 for an internal combustion engine in which various parts of the

engine exchange heat; and appropriate subclass for a residual internal combustion engine with the exhaust handled or treated as necessary to evacuate the combustion chamber or to modify operation of the engine.

180, Motor Vehicles, subclass 296 for a motor vehicle having a specific motor-to-body-frame relationship and wherein the vehicle includes means on the motor or body frame for handling exhaust from the motor; subclass 309 for a motor vehicle which includes means for handling exhaust from its motor; and subclass 89.2 for a body for a motor vehicle, which body includes means for handling the exhaust of a motor.

181, Acoustics, subclasses 213+ for a muffler, per se.

273 Methods:

This subclass is indented under subclass 272. Processes of treating or handling the materials discharging to atmosphere or to an external device from the combustion chamber of an internal combustion engine.

SEE OR SEARCH CLASS:

423, Chemistry of Inorganic Compounds, subclasses 212+ for a process of purifying a gas that is nominally the exhaust from an internal combustion engine.

274 Anti-pollution:

This subclass is indented under subclass 273. Processes in which the handling or treatment serves to remove or destroy harmful materials in the exhaust gas.

275 By electrolysis, electrical discharge, electrical field, or vibration generator:

This subclass is indented under subclass 272. Apparatus in which the exhaust gas is treated by a sonic or super-sonic vibration generator, an electrical field device, electrolysis, or by an electrical discharge.

(1) Note. An electrical igniter is not regarded as an electrical field or discharge type gas treater.

SEE OR SEARCH CLASS:

95, Gas Separation: Processes, subclasses 57+ for processes of gas separation involving an electric or electrostatic field.

96, Gas Separation: Apparatus, subclasses 15+ for apparatus for gas separation involving an electric or electrostatic field.

276 Having means analyzing composition of exhaust gas:

This subclass is indented under subclass 272. Apparatus including structure analyzing the chemical composition of the exhaust gas and exerting a control responsive to the determined value or giving an indication of the determined value.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclasses 23+ for a gas analyzer, per se.

200, Electricity: Circuit Makers and Breakers, subclass 61.03 for a smoke responsive switch.

324, Electricity: Measuring and Testing, appropriate subclass for apparatus testing the electrical properties of gases.

422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclass 83 for gas analyzers.

431, Combustion, subclass 76 for a fuel burner controlled by a means analyzing the composition of its combustion products.

277 Having sensor or indicator of malfunction, unsafeness, or disarray of treater (e.g., fusible link, etc.):

This subclass is indented under subclass 272. Apparatus, with means (1) that prevents operation if a necessary state or condition is not sensed or indicated (2) that stops operation if a malfunction or dangerous condition is sensed (3) that takes protective action to protect a system element responsive to a sensed malfunction or dangerous condition (4) or that acts to inform the operator of a dangerous state or malfunction.

SEE OR SEARCH CLASS:

340, Communications: Electrical, subclasses 500+ for electrical automatic condition responsive indicating systems.

278 Material from exhaust structure fed to engine intake:

This subclass is indented under subclass 272. Apparatus having (1) structure by which a part of the gas discharged from the combustion chamber is returned to become a constituent of the engine feed and another part is handled or treated as it is discharged as exhaust gas or (2) structure by which the combustion chamber discharge gas is cooled, purified or separated; and a part of the cooled, purified or separated engine discharge is returned as engine feed and another part is discharged as exhaust gas.

SEE OR SEARCH CLASS:

123, Internal-Combustion Engines, subclass 568.11 for an internal combustion engine having means to return a part of the exhaust gas switching, therefrom back to the engine intake and wherein no means are provided to treat said gas.

279 Separated reactive constituent of exhaust fed to engine:

This subclass is indented under subclass 278. Apparatus in which the combustion chamber discharge is separated into two streams, one richer in reactive material than the other, the enriched part of the separated combustion chamber discharge being returned to the engine and the stream reduced in reactive components being discharged as exhaust gas.

280 Having auxiliary device mechanically driven by exhaust gas:

This subclass is indented under subclass 272. Apparatus including a mechanism or structure driven by the flow of the engine exhaust gas serving to perfect the operation of the engine.

SEE OR SEARCH THIS CLASS, SUBCLASS:

597+, for an internal combustion engine having a motor driven by exhaust from the internal combustion engine.

281 Having exhaust gas collection and storage, or use as a pressure fluid source:

This subclass is indented under subclass 272. Apparatus in which the handling means includes a collection and storage reservoir, or a flow line maintaining the exhaust pressure and connected to a point using exhaust gases as a pressurized motive fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:

613, for an internal combustion engine having a motor driven by its exhaust gases and having means to temporarily store the gases prior to their entry into the motor.

SEE OR SEARCH CLASS:

239, Fluid Sprinkling, Spraying, and Diffusing, subclass 129, for a system using exhaust gas to heat and spray an external material.

282 By means producing a chemical reaction of a component of the exhaust gas:

This subclass is indented under subclass 272. Apparatus having means for chemically reacting at least one of the constituent materials of the combustion products to produce a substance less harmful to living organisms.

SEE OR SEARCH CLASS:

422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclasses 168+ for a chemical or catalytic reactor for treating exhaust gas.

423, Chemistry of Inorganic Compounds, subclasses 212+ for a process of purifying a mixture that is nominally the exhaust of an internal combustion engine.

283 With means handling crankcase, carburetor, or gas tank vapor:

This subclass is indented under subclass 282. Apparatus with structure by which the fumes from the crankcase of the engine, or fuel vapors from the carburetor or fuel tank are handled or treated in conduction with the engine exhaust gas.

284 Automatic or timed reactor purge or heat-up in engine starting operation:
This subclass is indented under subclass 282. Apparatus in which there is a sequence by which the engine is brought into full operation after start initiation without manual intervention; the sequence including a purge period or operation on the reactor, or a special operation to bring the reactor to an effective reacting temperature.

285 Engine fuel, air, or ignition controlled by sensor of reactor condition:
This subclass is indented under subclass 282. Apparatus including a means that senses a condition of the reactor and actuates a device controlling the feed to, or ignition of the engine.

286 Condition responsive control of heater, cooler, igniter, or fuel supply of reactor:
This subclass is indented under subclass 282. Apparatus including a condition responsive device controlling a means heating the reactor, a means igniting the exhaust gas in the reactor, a means cooling the reactor, or a means supplying fuel to the reactor.

SEE OR SEARCH THIS CLASS, SUBCLASS:
284, for an automatic purge or heat-up of an exhaust gas treating reactor in an engine starting sequence.

287 Condition responsive control of reactor feed, pressure, or by-pass:
This subclass is indented under subclass 282. Apparatus including a means sensing a condition of the apparatus and exerting a control on a means feeding a fluid to the reactor, of the pressure of the reactor, or on a means by-passing the reactor.

SEE OR SEARCH THIS CLASS, SUBCLASS:
285, for apparatus in which the engine feed or ignition is controlled by a means sensing a condition of the reactor.

288 Exhaust gas diverted from reactor or treating agent mixer:
This subclass is indented under subclass 287. Apparatus in which the condition responsive means control structure selectively directing exhaust from the engine through the reaction device or a device by which oxidizer is entrained for reaction; or through a branch or bypass avoiding such device.

289 Air feed to reactor modulated or diverted by control:
This subclass is indented under subclass 287. Apparatus controlling the delivery of reactive air to the reactor.

290 Responsive to engine speed or intake manifold pressure:
This subclass is indented under subclass 289. Apparatus in which the feed of reactive is controlled by a means responsive to the speed of the engine or to the pressure in the intake manifold of the engine.

291 Of or by pressure in reactor or of engine exhaust:
This subclass is indented under subclass 287. Apparatus in which there is (1) a means controlling the pressure in the reactor or in the exhaust gas being fed to the reactor; or (2) a means sensing the pressure in the reactor or of the exhaust gas being fed to the reactor and controlling an element of the apparatus.

292 Valve at reactor outlet controlled:
This subclass is indented under subclass 291. Apparatus in which a valve controlling the discharge from the reactor to the atmosphere is actuated by a means sensing the pressure in the reactor.

293 Check valve feeds air to exhaust system:
This subclass is indented under subclass 291. Apparatus in which a valve responsive to the difference in pressure between that of the reactor and the atmosphere open to feed reactive air to the reactor when the pressure in the reactor is below atmospheric pressure.

294 Reactor control correlated with cyclic or external engine control:
This subclass is indented under subclass 282. Apparatus in which a control means that affects operation of the reactor is mechanically connected to the throttle of the engine or to a cyclically controlled element of the engine to be moved along with the throttle or element.

295 Having means for regenerating, replacing, or feeding liquid or solid reagent or catalyst:
This subclass is indented under subclass 282. Apparatus with structure for cleaning, regenerating, replacing or otherwise restoring used, contaminated, or consumed catalytic material or other solid or liquid treating agent or reactant.

296 Flow reversing structure:
This subclass is indented under subclass 295. Apparatus in which cleaning or regenerating is accomplished by reversing the flow of fluid through the agent, reactant or catalytic material.

297 Reactor plus a washer, sorber or mechanical separator:
This subclass is indented under subclass 282. Apparatus having, in addition to the reactor, means to mechanically remove, solid or liquid particles from the exhaust gas; to wash the exhaust gas; or to absorb or adsorb material from the exhaust gas.

298 With means cooling reactor or reactor feed:
This subclass is indented under subclass 282. Apparatus having structure by which heat is removed from the reactor or from the feed to the reactor, generally to prevent overheating of the reactor.

299 Using a catalyst:
This subclass is indented under subclass 282. Apparatus in which the exhaust gas is passed over or through catalytic material to produce the reaction.

SEE OR SEARCH CLASS:
422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclass 168 for a chemical or catalytic reactor for treating exhaust gas.

300 Having a means for heating the catalyst:
This subclass is indented under subclass 299. Apparatus with an external means for supplying heat to the catalyst to raise it to an operative temperature.

301 Reducing type catalyst:
This subclass is indented under subclass 299. Apparatus in which the reaction assisted by the catalyst is of the reduction type, i.e., the removal of oxygen from the substance being treated.

302 Catalyst in engine manifold or at exhaust port:
This subclass is indented under subclass 299. Apparatus in which the catalyst is positioned directly in the exhaust manifold or between the manifold and the combustion chamber of the engine.

303 Having heater, igniter, or fuel supply for reactor:
This subclass is indented under subclass 282. Apparatus in which the reaction of the exhaust gas is initiated or maintained by a heater, an igniter, or a supplemental feed of fuel.

304 Oxidizer feed passage at engine exhaust valve, manifold or port:
This subclass is indented under subclass 282. Apparatus including structure by which air is fed to the exhaust gas at a region immediately associated with an engine exhaust valve or port, whereby the high temperature produced by combustion in the engine produces the reaction.

305 Distributed to plural individual ports or valves:
This subclass is indented under subclass 304. Apparatus in which oxidizer from a common supply structure is fed separately to the exhaust valves or ports of spaced engine combustion chambers.

306 To port zone and downstream of port:
This subclass is indented under subclass 304. Apparatus in which oxidizer is fed both to a region of reaction adjacent the combustion chamber and to a reactor downstream of and spaced from the port region.

307 Pressurizing means feeds reactive air to reactor:
This subclass is indented under subclass 282. Apparatus having a pump or other fluid impelling structure feeding air into the combustion

products from the engine to react chemically therewith.

308 Exhaust actuated air aspirator:
This subclass is indented under subclass 307. Apparatus in which the air is caused to flow by an aspirating effect of the exhaust gas.

SEE OR SEARCH CLASS:
123, Internal-Combustion Engines, subclass 41.64 for an internal combustion engine in which cooling air is aspirated across the engine by a jet pump generally powered by exhaust gas.

309 Having retainer or flow director for exhaust gas condensate:
This subclass is indented under subclass 272. Apparatus with structure for receiving or handling liquid condensed from the exhaust gases.

SEE OR SEARCH CLASS:
91, Motors: Expansible Chamber Type, subclasses 236+, for a cyclically operable expansible chamber motor having plural exhaust passages, for example, separate air and condensate discharge passages.

310 Treated by washing, or having liquid contact structure:
This subclass is indented under subclass 272. Apparatus in which the exhaust gas is treated by being washed by liquid, or is handled by structure within which it comes into contact with liquid.

SEE OR SEARCH CLASS:
181, Acoustics, subclass 235, for a muffler having an underwater discharge; and subclasses 221 and 260+, for a muffler into which liquid is fed to assist in muffling the sound.
261, Gas and Liquid Contact Apparatus, appropriate subclass for gas and liquid contact apparatus not specialized to handling the exhaust of an internal combustion engine.

311 By sorber or mechanical separator:
This subclass is indented under subclass 272. Apparatus treating the exhaust gases by absorbing or adsorbing one of the liquid or gaseous components; or by separating a liquid or solid component by a filter, a centrifugal device, or a gravitational device.

SEE OR SEARCH THIS CLASS, SUBCLASS:
299+, for apparatus in which exhaust gas is passed into or through a catalytic bed that may also filter the gas or sorb one of its components.

SEE OR SEARCH CLASS:
55, Gas Separation, appropriate subclass, for a gas separator of general utility.
96, Gas Separation: Apparatus, for gas separation apparatus, per se.

312 Pulsed, timed, tuned or resonating exhaust:
This subclass is indented under subclass 272. Apparatus correlating, or correlated with the pressure waves or pulses produced by the regular, intermittent discharge from an engine's exhaust port or ports.

SEE OR SEARCH CLASS:
181, Acoustics, subclasses 277+, for a muffler, per se, tuned to silence or muffle pressure pulses.

313 Correlated exhausts from plural cylinders:
This subclass is indented under subclass 312. Apparatus receiving pressure pulses from successively firing cylinders.

314 Two-cycle engine:
This subclass is indented under subclass 312. Apparatus in which the waves or pulses aid in the scavenging or charging of a combustion chamber of a two-cycle engine.

315 Pump draws exhaust gas from engine:
This subclass is indented under subclass 272. Apparatus receiving exhaust gas from the engine and forcibly moving it toward discharge.

SEE OR SEARCH THIS CLASS, SUBCLASS:
281, for an exhaust system that collects exhaust gas or uses it as a pressure fluid source.

316 Fluid jet or stream aspirates exhaust gas:
This subclass is indented under subclass 315. Apparatus, in which exhaust gases are moved toward discharge entrainment in a separately supplied rapidly moving fluid stream.

317 Exhaust and external fluid mingling structure:
This subclass is indented under subclass 272. Apparatus having structure in which the engine discharge is mixed with a second fluid prior to emission into the atmosphere.

SEE OR SEARCH THIS CLASS, SUBCLASS:
282+, for a system in which engine discharge is mingled with a fluid with which it reacts.

SEE OR SEARCH CLASS:
181, Acoustics, subclasses 219 and 259+ for a muffler in which gas is mingled with another gas to muffle the sound by diluting the moving fluid.
239, Fluid Sprinkling, Spraying, and Diffusing, subclass 129, for a system in which exhaust gas is the carrier for a material to be diffused.

318 External fluid is steam:
This subclass is indented under subclass 317. Apparatus, in which the material mixed with the exhaust gas is water in the vaporous state.

319 Exhaust aspirates external fluid:
This subclass is indented under subclass 317. Apparatus in which exhaust gas flowing in the structure entrains and carries along the external fluid.

SEE OR SEARCH CLASS:
123, Internal-Combustion Engines, subclass 41.64 for an air cooled internal combustion engine in which the cooling air is caused to move by a jet pump actuated by exhaust gas.

320 Exhaust gas or exhaust system element heated, cooled, or used as a heat source:
This subclass is indented under subclass 272. Apparatus having structure for the transfer of heat to or from exhaust gas or to or from exhaust gas handling structure.

SEE OR SEARCH CLASS:
123, Internal-Combustion Engines, subclasses 41.01+, for the cooling of the parts of an internal combustion engine other than the exhaust system; subclasses 434+ for a charge-forming system having means for heating the charge or for a device vaporizing oil to form a charge, for a device vaporizing oil to form a charge; and subclass 142.5 for an internal combustion engine having means using heat from one part to heat another part by exchanging heat between the parts.
126, Stoves and Furnaces, subclass 19.5 for a stove, oven or heating vessel heated by exhaust gas.
165, Heat Exchange, subclass 52, for a heat exchange means for transferring heat from exhaust gas to engine feed structure.
237, Heating Systems, subclass 12.3 for an automobile heated by the exhaust of an engine.
261, Gas and Liquid Contact Apparatus, subclass 145 for a gas-liquid contact engine supply device heated by exhaust gas.

321 Cooled manifold:
This subclass is indented under subclass 320. Apparatus in which an element collecting exhaust gas from a plurality of cylinders is cooled.

322 Having vibration attenuating, or expansion and contraction relieving structure:
This subclass is indented under subclass 272. Apparatus with provision for dimension variation produced by temperature change or having means absorbing, preventing, or limiting the transmission of vibration.

323 Common receiver having inlets from plural cylinder (i.e., exhaust manifold):
This subclass is indented under subclass 272. Apparatus comprising a chamber or flow line fed by branch inlets from a plurality of distinct combustion chambers.

324 Divider, collector, valve means, or boundary layer device controlling exhaust gas flow:
This subclass is indented under subclass 272. Apparatus having distinct structure dividing, modulating, or providing for nonturbulent flow of exhaust gas.

SEE OR SEARCH CLASS:
138, Pipes and Tubular Conduits, subclass 37 for a tubular conduit having a flow regulator or baffle.

325 PRESSURE FLUID SOURCE AND MOTOR:
This subclass is indented under the class definition. Apparatus having a means or source capable of flowing or pressurizing a liquid or gaseous motive fluid, and motor means responsive to the pressure of the flow or of the fluid to convert such pressure or flow to useful mechanical work, said motive fluid being capable of transmitting energy from said source to said motor.

(1) Note. See Glossary at the end of this subclass definition.

(2) Note. Except as noted below, this and indented subclasses include those pump-motor combinations in which the pump creates a pressurized motive fluid to be transmitted to the motor to output useful work because of the pressure differential of the working fluid between the fluid inlet to and outlet from the motor.

(3) Note. Expansible chamber motors having a nominal pressure source and an exhaust treating means are classified in Class 60 subclasses 654, 681, and 685+, dealing with motors combined with exhaust treating means, on the theory that the device would be classified in Class 91, Motors: Expansible Chamber Type, or some other motor class, except for the claimed exhaust treatment feature and would not be classified on the grounds of a motor with a nominal pump combination.

(4) Note. The combination of an internal combustion engine and means to induce or create flow of exhaust gases or to treat exhaust gases from the combustion chamber of the internal combustion engine is not considered to define a motor having a working member actuated by motive fluid. Such a combination is regarded rather as directed to exhaust treatment classified in subclasses 272+.

(5) Note. A fluid motor in which the exhaust thereof passes through a heat exchanger or condenser arranged to induce additional flow in the motive fluid is excluded from this subclass and will be found under subclasses 685+, exhaust treatment.

(6) Note. This and indented subclasses include patents claiming motive fluid pressurizing means combined with means to convert the pressurized motive fluid to useful work.

Output Transmission. In general gearing or linkage may be included as part of the power output means or transmission of the claimed motor means. However, when the transmission includes some part which does not always partake of a given motion in accordance with the motion of the motor working member, such as a selectively engageable clutch, this no longer constitutes subject matter for this class. See Class 74, Machine Element or Mechanism Class 188, Brakes, Class 192, Clutches and Power Stop Control, 475, Planetary Gear Transmission Systems or Components.

Motive Fluid Source

(1) Pumps

The inclusion in a claim of a pump broadly which provides motive fluid for utilization by fluid motor does not preclude classification in a fluid motor class (See the Search Class notes below.).

The following examples of terminology have been considered to be nominal inclusion of a pump and if so claimed would not preclude classification in a fluid motor class: (a) a pump, (b) a rotary

pump, (c) a motor driven pump, (d) a motor driven rotary pump, (e) an internal combustion engine having an intake manifold (as a source of vacuum); (f) a plurality of pumps arranged in parallel; (g) a circuit comprising a pump, pumps, and motor.

The following examples have been considered to be significant inclusion of a pump and if so claimed would cause classification in Class 60 if otherwise appropriate: (a) a pump which is characterized as to type, e.g., centrifugal, eduction, constant displacement, variable displacement, pulsator, etc., (however, see (b) in preceding paragraph) (b) a motor driven pump in which the motor is characterized as to type e.g., turbine, electric motor, internal combustion engine (however, see (e) in preceding paragraph),(c) a pump which has any detail thereof recited as, for example a "piston," (d) a plurality of pumps in series, (e) a particular physical relation between a nominal pump, and (1) a motor supplied thereby, or (2) with a pump, reservoir or tank forming part of the circuit supplying the pump. For example, this particular physical relation may include their relation in space or mechanical interconnection means.

Accumulators A motor having its working chamber in constant communication with an accumulator for pressurized motive fluid is not precluded from a motor class regardless of the specificity with which the accumulator is recited, the accumulator in this case being considered to be merely a part of the expansible chamber.

However, unless the accumulator is claimed so broadly as to amount to a mere conduit, these subclasses of Class 60 take an accumulator combined with a fluid motor in which a control valve is interposed between the accumulator and the motor, if otherwise appropriate.

Also Class 91 subclass 5 takes an expansible chamber type motor having as a part thereof a storage chamber that holds only a sufficient quantity of motive fluid for one stroke and that must be recharged for each succeeding stroke.

(7) Note. When the pump-motor combination is claimed so broadly so that the recitations applicable to either the pump or the motor can not form the basis for classification in a pump or a motor class, then classification is in this class.

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.01+, for fluid pressure generator-motor combinations wherein the fluid pressure generator is a means for bringing together fluids from different sources or of different qualities and using them in a motor. The motor may be a turbine or an expansible chamber type. (See (7) Note.)

39.01+, for a system in which a combination device is a pressure fluid source feeding combustion products to the motor. (See (5) Note.)

595, for a system in which a free piston type of internal combustion engine is a pressure fluid source for a motor. (See (5) Note.)

597+, for a system in which an internal combustion engine is a pressure fluid source for a motor. (See (5) Note.)

597+, for fluid pressure generator-motor combinations wherein the exhaust from an internal combustion engine means is in fact the motive fluid which is convertible to useful work by the motor means which may be a turbine or an expansible chamber type motor. (See (7) Note.)

643+, for a system in which indirectly applied heat energize motive fluid for a motor. (See (5) Note.)

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, for pertinent subclass(es) as determined by schedule review.

92, Expansible Chamber Devices, for pertinent subclass(es) as determined by schedule review.

415, Rotary Kinetic Fluid Motors or Pumps, for pertinent subclass(es) as determined by schedule review.

416, Fluid Reaction Surfaces, for pertinent subclass(es) as determined by schedule review.

418, Rotary Expansible Chamber Devices, for pertinent subclass(es) as determined by schedule review.

GLOSSARY

MOTIVE FLUID

Includes expansible or nonexpansible fluids, entrained in a system including a pump and motor, or fluents whose characteristics permit a transmission of energy or flow between a pump and motor which is not inconsistent with that of the fluents.

MOTIVE FLUID RESPONSIVE MEANS

Comprises means actuated by the flow or pressure of the fluid or by the absence of such flow or pressure between the pump and the motor.

WORKING MEMBER POSITION RESPONSIVE MEANS

Comprises means positively actuated by the motor working member when it attains a given predetermined position in the working chamber. Such position includes a position of the working member attained after a predetermined number of strokes or revolutions of the working member.

A VARIABLE DISPLACEMENT PUMP OR MOTOR

Includes an expansible chamber and means to vary the volume of fluid admitted to or discharged from the chamber. The means which varies the volume of fluid will be generally either (1) means which physically displaces either the piston or working member or the cylinder or housing of the expansible chamber to vary the effective stroke of the piston or working member, or (2) means which alters the timing of the inlet or exhaust valve with respect to the piston or working member timing to vary the effective stroke of the piston or working member.

326 Utilizing a mixture, suspension, semisolid or electro-conductive liquid as motive fluid:

This subclass is indented under subclass 325. Apparatus in which the fluid medium used to transmit energy from the pump to the motor means is (1) composed of two or more substances which do not dissolve one in the other or otherwise chemically react with each other but which together flow as a fluid, e.g., oil and air, oil and iron particles, etc., or (2) a liquid having a normally high degree of viscosity or electroconductivity such as mercury.

327 Methods of operation:

This subclass is indented under subclass 325. Methods.

328 Having a signal, indicator or inspection means:

This subclass is indented under subclass 325. Apparatus having (1) signals, indicator, registers, recorders, or gauges for indicating a condition or the position of a motor or pump part such as a piston, control member, valve etc., such devices consisting of a relatively movable, changeable or audible information giving parts, or (2) transparent viewing means whereby the motor or pump operation or the condition of some part thereof may be observed.

(1) Note. For classification under part (1) of this definition there must be either an indicia or an audible or visual signal. Relative to indicia, there must be graduation or markings in the disclosure as claimed. Where it is indicated that the mere position of a motor part is indicative of a condition of the motor (e.g., valve handle position corresponds to motor or pump position) classification under this definition does not result unless some cooperating indicia are included.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclasses 232+ for expansible chamber type volume or rate of flow meters and see Lines With Other Classes of the class definition of Class 91, Motors: Expansible Chamber Type, for a general statement of the line between Class 91 and Class 73.

91, Motors: Expansible Chamber Type, subclass 1 for fluid motors, signals and indicators, and see Search Class 73 note above.

92, Expansible Chamber Devices, subclass 5 for signals, indicators or inspection windows for expansible chamber devices.

340, Communications: Electrical, subclasses 500+ for electrical automatic condition responsive indicating systems.

329 Condition responsive control means responsive to, or compensating for, motive fluid compressibility, temperature variation or viscosity variation driven master:

This subclass is indented under subclass 325. Apparatus having means by which the motive fluid or the apparatus may be controlled or adjusted responsive to a change in the compressibility, temperature or viscosity of said motive fluid to maintain a desired output work rate or to avoid apparatus failure.

(1) Note. Apparatus or motive fluid control means responsive to motive fluid pressure variations, per se, are not included in this subclass even though it may be argued that pressure variations are the result of compressibility, temperature or viscosity variations of the motive fluid.

330 Coaxial impeller and turbine unit:

This subclass is indented under subclass 325. Apparatus comprising means for transmitting torque from a first rotating shaft to a second coaxial rotatable shaft, to which shafts are secured shroud elements, each of which is generally concave (e.g., hemispherical or hemitoroidal) and provided with generally radial vanes secured within the concavity, the elements being capable of forming a spheroidal toroidal enclosure for a mass of liquid material, in which device rotation of the first shaft (and of the vanes carried thereby, i.e., impeller) causes particles of the liquid mass or working fluid to circulate in a small circle that lies in a plane coincident with (or parallel to) the axis of rotation of the shafts and simultaneously circulate in a larger circle that lies in a plane at right angles to said axis, which circulation of the mass causes rotation of the second shaft and the vanes i.e., turbine carried thereby are moved by the fluid.

(1) Note. The devices herein provided for are known in the art under various names including “vortex flow drive”, “fluid drive”, “fluid coupling”, “fly wheel”, “torque convertor”, “hydrokinetic torque transformer”. Such devices generally fall into one of two categories. In one of these (e.g., “fluid coupling”) the angular velocity of the driven shroud element referred to in the definition for this subclass cannot be greater than that of the driving element (and is usually less due to slippage); thus the torque is not increased. In the other category (e.g., “torque converter”) an additional radially vaned element is interposed in the flow of fluid to modify, direction of movement and velocity in the fluid and thereby change the torque transmitted from the first shaft to the second shaft.

(2) Note. Frequently the devices classified in this and indented subclasses (e.g., fluid couplings, torque converters, etc.) are combined with clutches and/or gearing and/or brakes among other mechanisms.

(A)The line between Class 192, Clutches and Power-Stop Controls, and this class (Class 60) is not intended to be changed as a result of the establishment of this subclasses (330+). Class 60 (subclasses 330+) is intended to be the locus of patents to a vortex-flow drive, per se, and may include a brake means which may be applied to an element interposed in the path of fluid in the vortex flow to prevent rotation of said element relative to the input member, output member or a stationary member. The brake means in this situation is of the type found, per se, in Class 188, Brakes. For the combination of a vortex-flow drive and a clutch to connect either element to its associated input or output shaft see Class 192, subclasses 3.21+. Where the clutch is used to connect one of the elements to a stationary member to prevent rotation of said element see Class 192 subclasses 3.34+, but see (B) below.

(B)Class 188, Brakes, (particularly subclass 296) is the locus of patents to a “fluid brake”, wherein the structure is superficially similar to a vortex flow

drive as described in the definition of this subclass above. However, in the disclosures found in Class 188 subclass 296, one of the elements is fixed to its supporting structure to retard rotation of the other element. But see (A) above.

SEE OR SEARCH THIS CLASS, SUBCLASS:

327, for methods of operating fluid couplings of the type which are classified in this subclass.

329, for coaxial impeller and turbine units having means to control the unit or the motive fluid in response to changes in compressibility, temperature or viscosity of the motive fluid.

435+, and notes therewith for nonvortex flow transmission units having associated brakes or clutches.

645, prime mover and control for driving fluid drive and gearing.

655, fluid drive is included as part of internal mechanism of a single gearing unit.

677, where the fluid drive either divides or combines the plural power paths to or from a planetary gearing system.

687+, for devices in which a fluid coupling is included in one of plural power paths to or from a planetary gearing.

710, for fluid drives which either divide or combine alternate plural paths to or from a nonplanetary gearing.

720, where a fluid coupling is included in one of plural power paths to or from a nonplanetary gearing.

730+, fluid drive combined with gearing.

SEE OR SEARCH CLASS:

74, Machine Element or Mechanism, for the locus of patents claiming a fluid drive in combination with nonplanetary gearing.

475, Planetary Gear Transmission Systems or Components, for the locus of patents claiming a fluid drive in combination with planetary gearing.

331 Reversible turbine or turbine system:

This subclass is indented under subclass 330. Apparatus wherein turbine means is provided with means by which it may be rotated so that the driven member may be rotated in either clockwise or counter-clockwise direction with respect to the direction of rotation of the driving member.

332 Having pitch control or motive fluid flow guide or reaction blade means:

This subclass is indented under subclass 331. Apparatus wherein rotational direction of the turbine means may be controlled because of the ability to change the pitch of the vanes associated with either or all of the impeller means, turbine means or guide means in the motive fluid circuit.

SEE OR SEARCH THIS CLASS, SUBCLASS:

342, for units having means to change the pitch of a flow directing guide in combination with a means to brake said guide against relative rotation with one of the parts of the unit.

354+, for hydrokinetic units having means to change the pitch of flow directing guide means in order to vary the power output of the unit.

333 Having means to brake or free flow guide means:

This subclass is indented under subclass 331. Apparatus wherein rotational direction of a turbine means may be altered by either releasing for free rotation or braking or otherwise securing against rotation certain vane means which may rotate about the axis of the unit and which is effective in the motive fluid path.

SEE OR SEARCH THIS CLASS, SUBCLASS:

341+, for means to brake a rotating part of a hydrokinetic unit to control the speed of rotation thereof.

334 Having means to remove or insert flow guide means from or into motive fluid flow path:

This subclass is indented under subclass 331. Apparatus having vane means which may be inserted into or removed from the motive fluid circuit to effectively change the direction of the motive fluid flow and thus the rotational direction of the turbine means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

353, for a hydrokinetic unit having motive fluid guide vane means transferable axially of said unit into or out of the motive fluid flow path to control flow of said fluid other than to cause the driven member to reverse rotational direction.

335 Having plural individually actuatable units:
This subclass is indented under subclass 331. Apparatus having plural hydrokinetic units with means whereby one or another of the units may be activated and thus establish the rotational direction of the driven member.

SEE OR SEARCH THIS CLASS, SUBCLASS:

363, for plural impeller-turbine units.

336 Having filtering, de-aerating, cleaning or bleeding structure:
This subclass is indented under subclass 330. Apparatus having means by which air or other foreign matter may be removed from the working fluid.

337 Having heating or cooling means:
This subclass is indented under subclass 330. Apparatus including means whereby the temperature of any of the components of the apparatus may be changed other than as a result of the normal functioning of any of said components.

SEE OR SEARCH THIS CLASS, SUBCLASS:

329, for hydrokinetic transmission units having means to vary the temperature of the working fluid responsive to the sensed temperature of said working fluid either by adding or withdrawing working fluid to or from the system or otherwise exchanging heat with said working fluid.

338 Having shock, vibration or surge control structure:
This subclass is indented under subclass 330. Apparatus having means to dampen, attenuate or otherwise control any shock surge or vibration which may develop in the transmission unit or its supporting means as a result of starting, stopping or continuous operation.

339 Having lubricating means:
This subclass is indented under subclass 330. Apparatus having means by which any part of said transmission unit may be lubricated.

340 Plural turbines drive relatively movable output members:
This subclass is indented under subclass 330. Apparatus wherein a plurality of turbines are provided in a system which may comprise a plurality of separate or separable motive fluid circuits, and wherein the turbines of each of the units are adapted to be connected to separate output members, which members may be driven at different speeds.

341 Having brake or clutch controlling movement of a flow guide located in the impeller-turbine flow path:
This subclass is indented under subclass 330. Apparatus having guide vane means, other than the impeller or turbine vane means, located in the circulatory flow path of the fluid to give a certain direction of flow to said fluid, being axially rotatable with and independently of the impeller and or turbine, and having brake or clutch means whereby said guide vane means may be held against relative rotation with respect to the turbine, impeller or a stationery member.

(1) Note. The brake or clutch found in this subclass may be of the type which are found, per se, in Class 188, Brakes, and in Class 192, Clutches and Power-Stop Control. For the line between this subclass and Classes 188 and 192 see the notes to subclass 330 above.

SEE OR SEARCH THIS CLASS, SUBCLASS:

333, for hydrokinetic units having means to brake or retard rotation of one of the vane means located in the motive fluid flow path whereby the direction of rotation of the turbine means may be reversed.

342 With means adjusting blade orientation or blade exposure in flow path:
This subclass is indented under subclass 341. Apparatus having additional means to vary the pitch or otherwise vary the exposure of one or more of the members to flow of the motive fluid in its flow path.

SEE OR SEARCH THIS CLASS, SUBCLASS:
332, for fluid couplings having means to control the pitch of the vanes of any of the impeller, flow guide or turbine units to reverse turbine rotation.

343 Speed or fluid condition responsive brake or manually adjustable brake:
This subclass is indented under subclass 341. Apparatus having a condition responsive or manual means operable to adjust the clutch or brake means.

344 Braked casing:
This subclass is indented under subclass 343. Apparatus in which at least part of the casing, which houses the members in the motive fluid flow path or which is integral with one or more of said members, may be held against rotation in order to alter a characteristic of the flow of the motive fluid.

345 One-way clutch between the movable guide, an impeller, turbine or a second movable guide:
This subclass is indented under subclass 341. Apparatus having a clutch means which permits relative rotation in one direction only between any two or more of the rotatable members which are in the operative path of the motive fluid.

346 Plural movable guides, one having a one-way clutch to frame:
This subclass is indented under subclass 341. Apparatus having a plurality of rotatable guide members in the operative path or the motive fluid and which are not impeller or turbine members, and having clutch means to permit rotation thereof in one direction only relative to the casing or frame means.

347 Having condition responsive or manually settable control means to regulate unit output:
This subclass is indented under subclass 330. Apparatus having manual means or means actuated in response to a condition to actively regulate or control the output of the unit.

348 Distributes motive fluid between plural units, stages or guides:
This subclass is indented under subclass 347. Apparatus in which a plurality of hydrokinetic units are axially spaced from each other, wherein the rotating members of the units rotate about the same axis and have means to selectively control the flow of motive fluid to the units.

349 Adjusts impeller or turbine axially:
This subclass is indented under subclass 347. Apparatus wherein the output of the unit is controlled by adjusting the turbine or impeller means or both relative to one another in a direction parallel to or coaxial with the axis of rotation of the turbine.

350 Variable face clearance:
This subclass is indented under subclass 349. Apparatus wherein the output of the unit is controlled by moving the turbine and/or impeller unit relative to one another in a direction of the axis of rotation to thereby vary the axial spacing between the turbine and the impeller members.

351 Controls scoop operation for removing liquid from rotating casing:
This subclass is indented under subclass 347. Apparatus having means which may be moved into or out of contact with the working fluid through which means the quantity of said working fluid circulating in the unit between the impeller and turbine members may be varied.

SEE OR SEARCH THIS CLASS, SUBCLASS:
357+, for additional means whereby the quantity of working fluid in the transmission unit may be varied.

352 Of means within an impulse, reaction or energy transfer flow path being adjustable to modify flow of motive fluid:
This subclass is indented under subclass 347. Apparatus wherein the output of the unit is controlled or regulated by means placed in the motive fluid circuit to alter the flow, either in rate or direction, which said motive fluid would otherwise assume.

353 Motive fluid guide vane transferable axially into or out of motive fluid flow path:
This subclass is indented under subclass 352. Apparatus wherein at least one guide vane designed to act upon the motive fluid to change its normal direction of flow in the motive fluid circuit may be moved axially of the impeller and turbine units to a position wherein the effectiveness of said guide vane on said motive fluid is reduced or eliminated.

(1) Note. The rotating members include the impeller, turbine and guide or reaction members positioned between the impeller and turbine.

SEE OR SEARCH THIS CLASS, SUBCLASS:
331, for a reversible driven turbine with adjustable flow diverting means.
349, wherein the turbine or impeller may be axially adjusted.

354 Pitch or orientation of flow directing guide or blade controlled:
This subclass is indented under subclass 347. Apparatus wherein the pitch of any or all of the vanes associated with the impeller, guide or turbine means of the transmission unit may be changed to alter the angle of incidence between said fluid and said vanes to vary the power output of said unit.

SEE OR SEARCH THIS CLASS, SUBCLASS:
332, for units having means to vary the pitch of the flow guide or reaction blade means to the point where the rotational direction of turbine component may be reversed.

355 Speed responsive:
This subclass is indented under subclass 354. Apparatus having means which will, in response to sensed speed of a component of the transmission unit, set the pitch of said vane means.

356 Motive fluid pressure responsive:
This subclass is indented under subclass 354. Apparatus having means which will, in response to sensed pressure of said motive fluid of the transmission unit, set the pitch of said vane means.

357 Of means adjusting the mass of level of motive fluid at the impeller energy transfer zone:
This subclass is indented under subclass 347. Apparatus having means whereby the quantity of motive fluid employed in quantity the fluid transmission may be varied.

SEE OR SEARCH THIS CLASS, SUBCLASS:
351, for transmission units having a scoop means insertable into the working fluid through which a quantity of said working fluid may be removed from said unit.

358 Including continuously driven auxiliary pump:
This subclass is indented under subclass 357. Apparatus including a pump means which is in continuous operation to pressurize a fluid, not for the purpose of transmitting power to the work output member, but instead to pressurize said fluid to the point where it may be added to or subtracted from the fluid employed as the motive fluid in a fluid transmission unit and thereby control the power transferred through said unit.

359 Exhaust valve:
This subclass is indented under subclass 357. Apparatus having valve means whereby a quantity of motive fluid may be extracted from the transmission to reduce the quantity employed thereby and thus reduce the power output from the transmission.

360 Motive fluid pressure responsive:
This subclass is indented under subclass 359. Apparatus having means to control the valve means in response to a sensed fluid pressure.

361 Having separate guide or reaction means in circuit including impeller and turbine:
This subclass is indented under subclass 330. Apparatus having other vane or vane like means located in the circulatory flow path of the motive fluid to give a certain direction of flow to said fluid, and wherein said other vane means is disassociated from said impeller and or turbine and act independently therefrom.

362 Rotatable guide or reaction means coaxial with the impeller:
This subclass is indented under subclass 361. Apparatus wherein said other vane means may rotate independently of said impeller or turbine but coaxially therewith.

363 Plural impeller-turbine units:
This subclass is indented under subclass 330. Apparatus having plural distinct fluid transmission units interconnected to output torque to a single output shaft.

(1) Note. A fluid passage may interconnect the working fluid of the various units to equalize levels in the units.

SEE OR SEARCH THIS CLASS, SUBCLASS:

335, for plural impeller-turbine units with means to activate one or another of them in order to change the rotational direction of the driven member.

364 Impeller or turbine integral with unit housing:
This subclass is indented under subclass 330. Apparatus wherein either the turbine or the impeller component of the fluid transmission unit is an integral part of the housing enclosing the components which react within the motive fluid circulatory path.

365 Fluid deflecting means:
This subclass is indented under subclass 364. Apparatus having means associated with any component of the unit and being designed to react in a special way with the motive fluid to give it a distinct flow direction.

366 Toroidal impeller and turbine:
This subclass is indented under subclass 364. Apparatus wherein the impeller and turbine components of the fluid transmission unit are shaped so that the motive fluid will assume a toroidal flow path in its operation.

367 Having core or ring member at interface:
This subclass is indented under subclass 366. Apparatus wherein both the turbine and impeller components are provided with motive fluid flow confining means cooperating at the interface of the two components which creates a core or void in the circulating path of said fluid which lies in a plane at right angles to the axis of rotation of the transmission unit.

368 Control by independently operated punch card, tape, digital computer, counter, template, or programmer cyclic control:
This subclass is indented under subclass 325. Apparatus including means separate from the motor or pump to cause or permit the pump or motor to operate or not to operate for a period of time and then act to start, stop or change the mode of operation of the motor or pump; or, cause the motor or pump to operate through a given cycle of operation, the operation of said means being independent of and not controlled by the operation of the motor or pump or a pressure or flow condition of the motive fluid supplied to or exhausted from the motor or pump and not requiring the intervention of a human operator.

(1) Note. The means is not considered to be independent of the motor or pump and is not included under this definition if its operation is initiated by the motor or pump.

(2) Note. The means separate from the motor or pump may not be another motor or pump which produces power for external use such as the first stage of a multiple expansion engine or pump.

SEE OR SEARCH CLASS:

700, Data Processing: Generic Control Systems or Specific Applications, subclasses 286 through 298 for the application of power generation or distribution which includes turbine or generator control. Note, where significant power plants structure is recited, classification is in the appropriate art device class.

369 Cyclically operable reciprocating or oscillating motor or output stroke device:

This subclass is indented under subclass 325. Apparatus having a pump or other means, not otherwise provided for, to place a gaseous or liquid motive fluid in a condition so that subsequently it may be expanded or contracted or otherwise cause the activation of a transducer or motor means having (1) a cyclically operable oscillatable or linearly reciprocable work output member and (2) means to control the flow of said motive fluid to cause said work output member to do work cyclically.

370 Pneumatic motor:

This subclass is indented under subclass 369. Apparatus wherein a gaseous working fluid is employed for at least a portion of the cyclic movement of the motor means.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclass 5, for a self-cycling expansible chamber motor having as a part thereof a storage chamber that holds only a sufficient quantity of motive fluid for one stroke and that must be recharged in the cycle for each succeeding stroke.

371 Having means to store and release energy usable to energize motor work output means:

This subclass is indented under subclass 369. Apparatus comprising means to store some of the energy available to activate or output from the motor means during part of the time while the motor working member is in motion whereby said stored energy may be released to motivate the working member during another part of the time when it is in motion.

372 Pneumatic counter-balance of gravity load on motor (e.g., deep well pump rod, etc.):

This subclass is indented under subclass 371. Apparatus wherein the energy resulting from the gravitational force on the load is stored during a part of the cycle of operation of the motor means for release to aid in the activation of the working member during another part of the cycle of operation of the motor.

373 Progressive change of stroke length in successive strokes:

This subclass is indented under subclass 369. Apparatus having means controlling a pump and/or a motor means whereby the stroke of a motor working member is caused to change in length from one stroke to another.

374 Correlated independently movable output members:

This subclass is indented under subclass 369. Apparatus having a plurality of fluid motor output means wherein the cyclic movement of one is coordinated with the cyclic movement of another.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclasses 170+, for fluid motors having relatively movable working members with one having motive fluid controlled by, moveably interconnected with or moved by another.

375 Correlated power input pumps and/or pressurized fluid sources:

This subclass is indented under subclass 369. Apparatus having a plurality of motive fluid pressurizing means operable in concert or individually to motivate the output means of a fluid motor.

376 Motor control means having timer or time delay means:

This subclass is indented under subclass 369. Apparatus having means to cause the speed of the working member of the output motor means to cyclically vary in its cycle of operation either before or after it has begun to do work but subsequent to the activation of the means provided to initiate operation of the apparatus in the first instance.

377 Provides dwell or press period at end of stroke:

This subclass is indented under subclass 376. Apparatus wherein the output motor delay is caused to occur at that point in the cycle of its operation between the point where the work stroke of the motor working members has been completed and the return stroke of the working member is begun.

378 Having purging, surge accommodating, or leaking handling or replenishing structure:

This subclass is indented under subclass 369. Apparatus having means accommodating the motive fluid required for efficient operation of the apparatus such as, means to purge the motive fluid of excess fluid air or other ingredients, means to attenuate shocks or surges in the motive fluid, or means to manage from the motive fluid system of motive fluid in system.

379 Having condition responsive cycle abort means or means for manual control of motor output:

This subclass is indented under subclass 369. Apparatus wherein control of the motive fluid may be usurped from the motive fluid control means which causes the motor means to operate cyclically by a means either responsive to a predetermined condition being sensed or by means for manual take-over of the cyclic or other motive fluid control means to actively control the motor actuation.

(1) Note. Manual means to merely activate or stop the motor means, even if means are provided to return the motor means to a retracted or some other predetermined position when a manual stop means is activated, is not included under this definition.

380 With means to shut down system after a complete to and fro cycle of the motor means:

This subclass is indented under subclass 369. Apparatus in which a working member of the motor means operates from a given position through a forward stroke and a return stroke to the starting position, the motor having control means which when operated causes the working member to move through the forward and return stroke and then stop even though the control means is maintained in the operated position.

SEE OR SEARCH THIS CLASS, SUBCLASS:

368, for devices which control motor operation upon sensing a predetermined number of output strokes of the motor.

381 Having condition responsive control of variable displacement pump:

This subclass is indented under subclass 369. Apparatus wherein the motive fluid is pressurized by a variable displacement pump means which is controlled in response to a sensed condition of the motive fluid or to the position of the motor means activated by said motive fluid.

382 Cam or gear carried by stroke device varies displacement pump:

This subclass is indented under subclass 381. Apparatus wherein the pump displacement is controlled through a cam or gear means actuated by the end directly and responsive to the position of the motor means.

383 Automatic or cyclic means provided plural distinct motor speeds in cycle:

This subclass is indented under subclass 369. Apparatus having means either in the form of pump control means, motive fluid flow control means to the motor, motor exhaust control or other means to cause the output speed of the motor to be varied during its normal cyclic operation.

(1) Note. Means provided to cause a reciprocating motor to gradually decelerate and/or accelerate at the end of the stroke are included in this subclass.

384 Expansible chamber type volumetric responsive measuring device in series with or driven by output motor operates the motor controller:

This subclass is indented under subclass 325. Apparatus including a source of pressurized motive fluid for driving an output motor and having a distinct expansible chamber device: (1) in series with the output motor actuating a control terminating the flow of motive fluid when it has passed a selected volume of fluid; (2) in series with the output motor establishing the rate of flow through the motor by externally

operating the displacement device to pass fluid at a selected rate; or (3) connected to be driven by the output motor to measure the movement of the motor, the displaced liquid actuating a means controlling operation of the motor.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclass 388, for an expansible chamber motor having a fluid operated feedback to the motive fluid controller responsive to the working member position.

385 Manual pump pressurizes fluid to position output motor motive fluid control valve:

This subclass is indented under subclass 325. Apparatus including a source of motive fluid, an output motor, a reversible servo-motor controlling the flow of motive fluid to the output motor and a reversible manually operated pump that supplies actuating fluid to drive the servo-motor.

386 Manual pump supplies motive fluid to output motor when power motive fluid pump is inactive:

This subclass is indented under subclass 385. Apparatus in which the output of the manually operated pump is supplied to and drives the output motor in the absence of input from the source of motive fluid.

387 Distinct structure metering and dispensing a stroke length determining volume of motive fluid to the motor:

This subclass is indented under subclass 325. Apparatus having means whereby the motive fluid may be pressurized or transmitted to or admitted to the motor means in volumetrically definable charges which may be varied in magnitude at will to produce a predetermined increment of movement of the motor output member.

388 Full range correspondence of position of external manipulator and motor positioned member effected by feedback linkage:

This subclass is indented under subclass 325. Apparatus having output motor; an externally operated manipulator means movable over a range for causing the motor to position an output member in a corresponding position along a selected path or in a selected area; and an electrical or mechanical connection between the output member and the manipulator correcting any discrepancy between the position assigned by the manipulator and that attained by the output.

SEE OR SEARCH THIS CLASS, SUBCLASS:

384, for a system in which a fluid means measures the movement of the output and gives a feedback to the motor controller.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclasses 358+, for a motor having working member position feedback to the motive fluid controller.

172, Earth Working, subclass 465, for an earth working tool having a tool lifting motor with follow-up controls.

180, Motor Vehicles, subclasses 132+ for a motor vehicle provided with steering gear of the fluid power assist type, which may involve feedback.

389 Positioned member is displacement controller of second motor pump:

This subclass is indented under subclass 388. Apparatus in which the manipulated output motor is an auxiliary that positions a displacement adjustor of a main pump or motor.

390 Electrical feedback means:

This subclass is indented under subclass 388. Apparatus in which electrical means are used in the discrepancy sensing linkage.

391 Feedback linkage controls variable displacement pump:

This subclass is indented under subclass 388. Apparatus in which movement of the manipulator initiates the delivery of motive fluid to the output motor from a variable displacement pump by changing the displacement from zero, the linkage from the output member returning the displacement to zero upon the attainment of the selected position.

392 Feedback includes plural movable valve parts:

This subclass is indented under subclass 388. Apparatus in which movement of the manipulator moves one surface of a valving means to

initiate flow of motive fluid to the output motor, the movement of the output motor to its selected position moving or carrying the other surface of the valving means to a position stopping the flow of motive fluid.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclasses 374+, for a motor having working member feedback to motive fluid control having plural movable valve parts.

393 Manipulator for motive fluid control valve having load feel or motor pressure feedback:

This subclass is indented under subclass 325. Apparatus including an attendant actuated controller biased in one direction and having structure by which a force indicative of a motor condition or motor pressure reacts on the controller usually to give the operator a feel of the load on the apparatus.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclasses 385+, for a motor having a working member position feedback to motive fluid control having a bias type of input and feedback signal means.

394 Having apparatus control by timer or delay means:

This subclass is indented under subclass 325. Apparatus whereby the time in which, or length of time taken to perform an operation is controlled.

SEE OR SEARCH THIS CLASS, SUBCLASS:

376, for a self-cycling reciprocating output system having a timer or time delay means.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclasses 35+, for a motor controlled by a timer, delay, pattern or cyclic control.

417, Pumps, subclass 12, for the control of a pump motor by a timer or delay means.

395 Control relative to independently driven oscillator, speed standard or pacer device:

This subclass is indented under subclass 325. Apparatus in which the difference between (A) criteria or condition of a motor, pump, motor-pump system, or another self-sufficient device, a condition of a motive fluid in said motor, pump or motor-pump system, or a means driven by said motor, and (B) the criteria or condition of a comparable functional counterpart of a separate motor, pump, motor-pump system or separate self-sufficient device, its output or motive fluid, is continuously or intermittently detected whereby a means responsive to the detected difference acts to control the motor, pump, etc., in a sense or direction to decrease the difference.

396 Utilizing lubricant, starter motor, cooling fluid, or fluid used for combustion in an internal combustion engine:

This subclass is indented under subclass 325. Apparatus having an internal combustion engine as a part of the pressure fluid source and which uses in its operation the lubricant, cooling fluid, or combustion air of the engine or which drives the system pump by the starter motor of the engine.

397 Vacuum generated by internal combustion engine intake manifold powers motor:

This subclass is indented under subclass 396. Apparatus in which air is withdrawn from the output motor by the suction of the intake manifold of the engine.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, appropriate subclass, in which the motive fluid is moved through the motor by a nominal "internal combustion engine having an intake manifold." See (4) Note, B, (1) e of the class definition of Class 92.

398 Utilizing natural energy or having a geographic feature:

This subclass is indented under subclass 327. Apparatus physically related to some feature of the earth or in which pressure or kinetic energy of nature energizes motive fluid.

(1) Note. This subclass includes devices providing a head of liquid that furnishes pressurized motive fluid to a motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

495+, for a motor driven by a buoyant working member;

639+, for a motor actuated by accumulating and dumping liquid or fluent material;

641, for a device in which natural heat energizes motive fluid.

SEE OR SEARCH CLASS:

415, Rotary Kinetic Fluid Motors or Pumps, subclasses 2.1+, for a rotary kinetic fluid motor* or pump* with means for controlling casing* or flow guiding means in response to natural fluid current force or direction.

416, Fluid Reaction Surfaces (i.e., Impellers), subclass 6, for an impeller driven by waves or impulses and subclasses 9+, for an unencased impeller adjustable in a fluid current.

417, Pumps, subclasses 330+, for a pump driven by a tide or wave motor; 334+, for a pump driven by a fluid current motor; and 337, for a pump driven by a buoyant motor.

399 Unsafeness, unreadiness or disarray prevent manual change or operative state:

This subclass is indented under subclass 325. Apparatus in which a precedent condition must be sensed or indicated as satisfied to permit the operator to change the operative state of the system.

SEE OR SEARCH THIS CLASS, SUBCLASS:

368, for a system controlled by a programmer to provide a series of operations in a desired order.

400 Selective or simultaneous power and manual energy inputs:

This subclass is indented under subclass 325. Apparatus having a manual energy input and a nonmanual energy input.

SEE OR SEARCH THIS CLASS, SUBCLASS:

428, for a system having an automatic control means and a plurality of separately operable pumps or other pressure fluid sources.

486, for a residual system having plural energy input means.

401 Fluid motor and directs manual drive of output device:

This subclass is indented under subclass 400. Apparatus having structure by which the manual energy means may be mechanically linked to the output member to move it by direct mechanical action.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclass 391, for a motor having means for alternative manual manipulation of the load.

100, Presses, subclasses 269.01+, for a reciprocating press having fluid pressure actuation combined with mechanical actuation.

402 Separate manual and motor driven pumps supply motive fluid to output motor:

This subclass is indented under subclass 400. Apparatus in which the output means is moved by a motor supplied with motive fluid from a manually driven pump and from a separate power driven pump.

SEE OR SEARCH THIS CLASS, SUBCLASS:

386, for a system in which a manual pump driving a control actuating servomotor furnishes the motive fluid to drive the main motor when the main pump is inactive.

403 Apparatus having means responsive to or ameliorating the effects of breakage, plugging, mechanical failure or power failure:

This subclass is indented under subclass 325. Apparatus with (1) means that reacts to a condition of the system produced by breakage, plugging, or mechanical failure of an element; or to power failure, and exerts a control that tends to lessen an undesirable effect of the malfunction or power failure; or (2) distinct, nor-

mally inactive means operable to lessen harmful effects of malfunction.

SEE OR SEARCH THIS CLASS, SUBCLASS:

399, for a system in which unsafeness, unreadiness, or disarray prevents a manual change of the operative state of the system.

400+, for a system operable selectively by power or manual energy inputs.

459+, for a system having a safety valve relieving excessive pressure.

404 Stand-by stored energy means activated responsive to malfunction or power failure:

This subclass is indented under subclass 403. Apparatus including structure holding a standby reserve of energy that is released upon sensed malfunction of the normal energy supply means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

408+, for a pneumatic system in which expansible fluid is alternately compressed into a storage reservoir and expanded from the reservoir to run a motor.

413+, for a system having structure controlling the release of stored work driving energy.

405 Second motive fluid supply means takes load responsive to failure of first:

This subclass is indented under subclass 403. Apparatus comprising (1) an output motor, (2) one source of motive fluid for normally driving the motor, (3) a second source of motive fluid; and (4) a means responsive to a failure of the first source of motive fluid feeding motive fluid from the second source to the motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

386, for a system in which a manual pump driving a control actuating servomotor furnishes the power to drive the main motor when the main motive fluid pump is inactive.

406 Output means locked, positioned or released on failure of motive fluid supply means:

This subclass is indented under subclass 403. Apparatus in which an output means is locked, braked, released or moved to and retained in a desired position responsive to power failure, or loss of motive fluid supply or pressure.

SEE OR SEARCH THIS CLASS, SUBCLASS:

460, for a system having a holding or braking valve in the exhaust line effective upon discontinuance of motor feed pressure to lock the motor in position.

407 Pneumatic motor with gas supply or removal device:

This subclass is indented under subclass 325. Apparatus in which a gas is the motive fluid driving the motor and in which the gas is supplied to or removed from the motor by a pump or some other structure that is more than a mere feed or discharge line.

SEE OR SEARCH THIS CLASS, SUBCLASS:

370, for an air driven self-cycling stroke device.

397, for a motor driven by the air being drawn into the intake of an internal combustion engine.

408 Convertible motor-pump device selectively charges and is driven by gas from storage vessel:

This subclass is indented under subclass 407. Apparatus having a storage vessel serving as the gas supply or removal device and a unit usable as either a motor or as a pump, the unit at one time serving to charge the vessel and, at another time being driven as a motor by gas from the charged storage vessel.

409 Having automatic control:

This subclass is indented under subclass 407. Apparatus with structure sensing an external condition or a condition of the apparatus and controlling the apparatus.

410 Responsive to condition in gas storage vessel:

This subclass is indented under subclass 409. Apparatus in which an element of the apparatus is actuated responsive to a change in a condition in or of a vessel in which a store of gas under pressure or vacuum is selectively accumulated or released.

411 Suction pressure on motor regulated:

This subclass is indented under subclass 409. Apparatus in which the suction on one side of a motor element having atmospheric pressure on the other is controlled in response to a sensed condition.

412 Having pump device:

This subclass is indented under subclass 407. Apparatus in which the gas supply or removal device is a pump.

413 With control means for structure storing work driving energy (e.g., accumulator, etc.):

This subclass is indented under subclass 325. Apparatus including structure that stores energy to be used to move the load and a manual or condition responsive means (1) controlling the input of energy to the storage means or (2) controlling the discharge of energy from the storage structure to the output motor of the apparatus.

SEE OR SEARCH THIS CLASS, SUBCLASS:

404, for a system having a stand-by stored energy means activated responsive to malfunction or power failure.

469, for structure accommodating pressure or volume surges that does not have means controlling the input or discharge from the structure.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclass 5, for an expansible chamber motor having as a part thereof a storage chamber that holds only a sufficient quantity of motive fluid for one stroke and that must be recharged for each succeeding stroke and subclasses 361+, for an expansible chamber motor having an electrical working member position feedback to motive fluid control.

414 Energy of braking or of reversed load on motor stored:

This subclass is indented under subclass 413. Apparatus so arranged that energy taken from the output in reducing its speed, lowering its load or resisting over-run is controllably stored for future use.

SEE OR SEARCH THIS CLASS, SUBCLASS:

408, for a system using air as the motive fluid and having a convertible motor-pump device selectively charging or being driven by gas from a storage vessel.

415 Accumulator pressurized by gas pump or external gas supply:

This subclass is indented under subclass 413. Apparatus in which a store of compressed gas is produced by a pump acting on the gas or in which the storage vessel is charged with compressed gas from an external source.

416 Plural accumulators:

This subclass is indented under subclass 413. Apparatus having more than one accumulator.

417 Stroke device driven by successively operated energy input structure and stored energy structure:

This subclass is indented under subclass 413. Apparatus including a storage vessel for compressed gas and a motive liquid pump both arranged to deliver motive liquid to an output motor; and a manual or automatic controller that selects the energizer or combination of energizers to produce both a rapid and a slow movement in a stroke operation such as a slow press and rapid retraction or a rapid advance to contact the work and a slow press.

418 Control by sensor of accumulator condition:

This subclass is indented under subclass 413. Apparatus including a means sensing a condition of an accumulator or of a fluid in the accumulator and exerting a control.

419 Motor driven by motive fluid of system drives pump pressurizing motive fluid of system:

This subclass is indented under subclass 325. Apparatus in which a pump that furnishes pressurized fluid to an output motor is driven at least in part by a motor operated by pressurized fluid of the system.

420 Having condition responsive control in a system of distinct or separately operable outputs or output drive units:

This subclass is indented under subclass 325. Apparatus having a plurality of separately operable motors, motor pistons, motor rotors or means delivering energy externally of the apparatus and including a control for the apparatus responsive to a condition of the system or to an external condition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

340, for a coaxial impeller and turbine system in which plural turbines drive relatively movable output members.

374, for a self-cycling system having a plurality of correlated independently movable output members.

421 With plural pump or motive fluid source relationships selected by multiway valve:

This subclass is indented under subclass 420. Apparatus including plural motive fluid generating pumps and plural output motors and in which an externally operated multiway valve or a valve network controlling motive fluid flow provides for different interconnections of the pumps and motors.

422 Independently actuatable outputs with condition responsive means insuring sufficiency of feed of motive fluid:

This subclass is indented under subclass 420. Apparatus with selectively operable motors and including means responsive to a condition of the apparatus that insures that the demand for motive fluid of a favored one of or group of motors of the plurality of motors is satisfied before any of the motive fluid from the generator is fed to any less favored motor.

423 Including means for controlling or for reversing input pump drive:

This subclass is indented under subclass 420. Apparatus including manually or automatically operable structure for controlling or providing for the reversing operation of a motor driving a power input pump.

424 Serially connected motors controlled to establish parallel operation or to by-pass a motor means of the series:

This subclass is indented under subclass 420. Apparatus in which motor means are connected in series in one condition of operation and in which the control means is effective to open a by-pass around one of the motor means or to cause one of the motors to be connected in parallel with another to serve as a by-pass for the other.

425 Condition responsive means establishes number of motor sections driving a common output:

This subclass is indented under subclass 420. Apparatus having an output member, a plurality of motors or motor sections and a condition responsive means that in response to the sensed condition, makes all or less than all of the motor or motor sections effective in driving the output member.

426 Speed of, pressure in, or position of one output motor or motor section controls another:

This subclass is indented under subclass 420. Apparatus in which one motor or motor section is modulated or actuated separately from a second motor or motor section by a means sensing the speed, pressure in, or position of the second motor or motor section, or the relative condition of the sections.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclasses 511+, for plural motors the motive fluid for one working member being controlled responsive to a condition relating to another.

427 With manual control or selection of motor, motor speed or motor load:

This subclass is indented under subclass 420. Apparatus including an external control means for selecting or controlling one or several of the plurality of motors separately from others of the plurality.

428 Having condition responsive control in a system of separately operable power input pumps, pump motors, pump cylinders or pressure fluid sources:

This subclass is indented under subclass 325. Apparatus including plural motive fluid pressurizing structures or pressure fluid sources including one, the delivery or output of which may be varied relative to that of another; the apparatus including a means responsive to a condition of the apparatus or to an external condition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

375, for plural correlated pumps in a system including a self-cycling reciprocating output device.

402, for a system in which separate manual and motor driven pumps supply motive fluid to the output motor.

405, for a system in which a standby motive fluid supply means takes the load responsive to the failure of the main supply means.

SEE OR SEARCH CLASS:

417, Pumps, appropriate subclass for the condition responsive control of a pump system.

429 With externally operated multiway valve changing the relationships of the motive fluid pressurizing or supplying means:

This subclass is indented under subclass 428. Apparatus including a multiway valve that is externally manipulated to provide different operative relationships of the pressurizing means or pressure sources.

430 Pressure or volume responsive means shifts the relationship:

This subclass is indented under subclass 428. Apparatus in which the relationship of the plural pump or source means to each other is changed by a means sensing a change in pressure or volume in a part of the apparatus.

431 Condition responsive control of or by input to input pump drive means:

This subclass is indented under subclass 325. Apparatus including a prime mover driving a motive fluid pump, there being a control in the apparatus (1) responding to a change in a condition of energization of, or of the feed to the prime mover; or (2) effecting a control of the feed to or energization of the prime mover.

SEE OR SEARCH THIS CLASS, SUBCLASS:

405, for a safety system in which a second motive fluid supply means takes the load responsive to the failure of the first.

423, for a system of plural motors with an automatic control including means for controlling a drive of the motive fluid pump.

SEE OR SEARCH CLASS:

417, Pumps, subclasses 1+, for a pump having a condition responsive control of the pump drive motor.

432 Pump drive means deactivated responsive to position of output stroke device:

This subclass is indented under subclass 431. Apparatus in which energy input to a motive fluid energizing pump is initiated by an externally operated means and terminated by a means sensing that the stroke device has reached a selected position in its stroke.

433 Having correlated or joint actuation of controller of input to motive fluid pressurizer and of controller of motive fluid floow:

This subclass is indented under subclass 325. Apparatus including means for pressurizing motive fluid the arrangement having structure interlinking or correlating the actuation of a motive fluid flow control element and a controller of the pressurizing means.

434 Interlinked pump drive controller and manipulator of stroke device:

This subclass is indented under subclass 433. Apparatus in which the control means for a motor driving a motive fluid generating pump is connected for actuation along with a motive

fluid flow controller that positions a stroke device.

435 Having a mechanical clutch or brake device in the power train:
This subclass is indented under subclass 325. Apparatus including a releasable device for mechanically securing together or resisting relative movement of two parts of the power train of the apparatus or for mechanically connecting an output member to an input member for direct drive of the output.

(1) Note. A brake or clutch that is operated by the output member of the pressure fluid source motor system is regarded as merely a nominal load for the system and does not make the organization classifiable in this subclass.

(2) Note. A clutch connecting a prime mover to a motive fluid pump has been treated as part of a means controlling input to the pump. See subclasses 423, 431, 433+, etc.

(3) Note. In the absence of a significant pump or other pressure fluid source the combination of a fluid motor and a clutch or brake device is classifiable in Class 91 or 192 in accordance with the line established between these classes by the search notes in Class 91, subclass 41. It is noted that a pump and turbine making up a vortex flow device combined with a brake or clutch, is classified as indicated in the search notes to subclass 330.

436 Correlated control of device and motive fluid flow controller:
This subclass is indented under subclass 435. Apparatus including structure by which an actuator controlling the device and structure controlling motive fluid flow are caused to move together or in a fixed relationship.

SEE OR SEARCH CLASS:
91, Motors: Expansible Chamber Type, subclasses 41+, for a motor with correlated control of motive fluid and locking means.

437 Selective fluid and mechanical drive of output from input:
This subclass is indented under subclass 435. Apparatus in which the device includes means by which an input drive member may be directly connected to mechanically drive the output structure.

SEE OR SEARCH THIS CLASS, SUBCLASS:
401, for a system having selecting or simultaneous fluid motor and direct manual drive of the output.

SEE OR SEARCH CLASS:
91, Motors: Expansible Chamber Type, subclass 391, for a motor with alternative actuation of the load.
192, Clutches and Power-Stop Control, subclass 3.32, for a vortex-flow drive and clutch providing alternative fluid and direct drive of the output.

438 Condition responsive selection:
This subclass is indented under subclass 437. Apparatus in which the direct connection is made responsive to a condition of operation without manual intervention.

439 Device acts on intermediate reactive rotor to modify speed ratio or direction:
This subclass is indented under subclass 435. Apparatus including a motive fluid control member in the assembly that can rotate independently of the pump or motor of the system and its rotation being controlled by a clutch or brake device attached to the frame to permit or prevent rotation, the release or immobilization of the member being effective to change the speed ratio of the pump to the motor or to reverse the direction of the motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:
341+, for a coaxial impeller turbine unit having a brake or clutch controlling movement of a flow guide located in the impeller turbine flow path.

440 Condition or direction responsive device:
This subclass is indented under subclass 439. Apparatus in which the device controlling the rotation of the independently rotatable member

is controlled by a condition sensor or comprises a one way brake or clutch.

SEE OR SEARCH THIS CLASS, SUBCLASS:

343+, for a condition responsive brake controlling the movement of an intermediate flow guide in a coaxial impeller turbine unit.

441 Condition or direction responsive device:

This subclass is indented under subclass 435. Apparatus in which the device is actuated by structure responsive to an external condition, a condition of the system or a position of an element of the system.

442 Device holds output in adjusted position:

This subclass is indented under subclass 435. Apparatus in which the device secures an output device against movement.

SEE OR SEARCH THIS CLASS, SUBCLASS:

406, for a system that locks the output means responsive to breakage, plugging, mechanical failure or power failure.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclasses 41+, for a motor with correlated control of motive fluid and mechanical locking means.

443 Servo-motor having externally operated control valve sets motor or pump displacement:

This subclass is indented under subclass 325. Apparatus in which the displacement of the input pump or output motor of a pressure fluid source-motor system is adjusted by an externally operated servo-motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

389, for a displacement controlling servo-motor having feedback linkage to the manipulating lever.

444 Having auxiliary pump or external source of motive fluid supplying servo motor:

This subclass is indented under subclass 443. Apparatus in which the servo-motor has an external source of operating fluid or an auxiliary pump so that it is independent of the operation of the controlled pump or motor.

445 Condition responsive control of pump or motor displacement;

This subclass is indented under subclass 325. Apparatus having means by which the amount of motive fluid displaced for each stroke or revolution of a pump or motor device can be adjusted and having structure sensing a condition or position controlling the adjusting means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

423, for a system in which variable delivery to a motor is produced by automatically combining in different ways the outputs of plural pumps or pump sections.

446 Pump displacement varied responsive to position of motor or output device:

This subclass is indented under subclass 445. Apparatus in which the displacement adjusted is that of the pump and the adjustment means is responsive to the position of a motor element or of an output member.

SEE OR SEARCH THIS CLASS, SUBCLASS:

381, for a condition or position responsive control of pump displacement in a self-cycling reciprocating output device.

391, for a system in which the displacement controller of a pump is moved a selected distance from “no delivery” to start a stroke of selected length and moved back to “no delivery” by a linkage to the motor or output when the selected stroke has been completed.

447 Control actuated by a servo-motor fed by a speed indicating auxiliary pump:
This subclass is indented under subclass 445. Apparatus in which the displacement controller of the motive fluid pump or motor is driven by an adjunctive fluid motor receiving its pressurized fluid from an adjunctive constant displacement pump, the output of which is directly proportional to its speed.

SEE OR SEARCH THIS CLASS, SUBCLASS:
444, for a system in which the displacement is adjusted by a manually controlled servo-motor.

448 By means sensing rotational speed of output motor:
This subclass is indented under subclass 445. Apparatus in which the controlling structure is actuated by a sensor measuring the rotary speed of a rotary output motor.

449 By means sensing rotational speed of prime mover or pump:
This subclass is indented under subclass 445. Apparatus in which the controlling structure is actuated by a sensor measuring the rotary speed of a rotary input pump or of an input prime mover driving the input pump.

450 Choke in motor feed or discharge line establishes displacement control pressure (e.g., rate of flow responsive, etc.):
This subclass is indented under subclass 445. Apparatus in which a pressure actuated displacement controller responds to a pressure directly established by a means restricting the flow of motive fluid in a motor feed or discharge line.

451 Controlled by torque of motor or motor discharge pressure:
This subclass is indented under subclass 445. Apparatus in which the displacement varying structure responds to changes in the twisting force of the motor or to pressure of motive fluid being removed from the motor.

452 Pump displacement controlled by pump discharge or motor feed pressure:
This subclass is indented under subclass 445. Apparatus including a variable displacement pump the displacement of which is controlled by structure responsive to the pump discharge pressure.

SEE OR SEARCH CLASS:
417, Pumps, subclasses 212+ for a pump having a condition responsive displacement adjusting means.

453 With means purging, cleaning or separating undesirables from motive fluid:
This subclass is indented under subclass 325. Apparatus including structure for the separation or absorption of entrained impurities from the motive fluid; for discharging such impurities from the system; or for cleaning a part of the system.

SEE OR SEARCH THIS CLASS, SUBCLASS:
336, for a coaxial impeller and turbine unit having filtering, deaerating, cleaning or bleeding structure.
378, for a cyclically operating reciprocating stroke device having purging structure.

454 Solids from liquid separator:
This subclass is indented under subclass 453. Apparatus in which the structure separates a solid impurity from a motive liquid.

455 Having leakage collecting structure:
This subclass is indented under subclass 325. Apparatus including structure for collecting motive fluid leaking or escaping through a seal or passing through an intended fluid retaining part of the apparatus.

SEE OR SEARCH THIS CLASS, SUBCLASS:
378, for a cyclically operating reciprocating output device having a leakage collector.

456 Having distinct cooling or lubricating structure:

This subclass is indented under subclass 325. Apparatus with (1) distinct structure for lubricating a part of the apparatus; or (2) distinct structure for cooling motive fluid or a part of the apparatus.

SEE OR SEARCH THIS CLASS, SUBCLASS:

329, for a system having a condition responsive control of the temperature of the motive fluid.

337, for a coaxial impeller and turbine unit having heating or cooling means.

339, for a coaxial impeller and turbine unit having lubricating means.

396, for a system using a part of the lubricant or cooling fluid of an internal combustion engine as motive fluid.

SEE OR SEARCH CLASS:

165, Heat Exchange, appropriate subclass, for a heat exchanger, per se.

184, Lubrication, appropriate subclass, for a lubricating system, per se.

417, Pumps, subclass 228 for the condition responsive control of the lubricant or coolant of a pump, per se.

457 Collapsible joined device having fluid trapping valve in joint:

This subclass is indented under subclass 325. Apparatus that is foldable to a collapsed position and having valving means in the joints used in folding the device that are closed by the folding to hold the motive liquid in place in the collapsed apparatus.

SEE OR SEARCH CLASS:

92, Expansible Chamber Devices, subclass 58.1 for a knockdown expansible chamber device.

458 Having assembly or repair structure:

This subclass is indented under subclass 325. Apparatus having means designed to facilitate the removal, replacement or repair of a part of the apparatus.

459 Condition responsive control of motive fluid flow:

This subclass is indented under subclass 325. Apparatus having structure sensing a condition of the apparatus or an external condition and effecting a control of a flow or condition of the motive fluid of the apparatus.

SEE OR SEARCH THIS CLASS, SUBCLASS:

369, in which motive fluid is controlled to produce an oscillating or reciprocating cycle of a stroke device.

403+, for a system with means responsive to breakage, plugging, mechanical failure or power failure.

420+, for a condition responsive control in a system having plural motors.

428+, for a condition responsive control in a system having plural pumps.

431+, for the joint control of motive fluid flow and of the input to a motor driving the pump.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclasses 392+ for a motor with a working member responsive motive fluid control means; and 418, for a motor having a motive fluid control valve.

417, Pumps, subclasses 279+ for a pump with condition responsive pumped fluid control.

460 Holding or braking valve in motor exhaust line controlled by pressure in motorfeed line:

This subclass is indented under subclass 459. Apparatus that controls a valve restricting or preventing exhaust from a motor and said valve being responsive to the pressure of motive fluid being fed to the motor.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclasses 404+ for a motor having an exhaust valve controlled responsive to the working member position.

461 Discharge from contracting cylinder of double-acting motor controlled:

This subclass is indented under subclass 459. Apparatus including a flow directing or modulating means controlling the flow of motive fluid being removed from an expansible chamber of a stroke device during its contraction; said means being responsive to a condition of the apparatus.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclass 420 for a motor in which the exhaust valve of the contracting chamber is controlled by the expanding chamber pressure or flow.

462 With externally operable multiwasy valve means directing flow to a stroke device:

This subclass is indented under subclass 459. Apparatus including a stroke type motor having an externally operated multiway valve for manipulating the device, and a device controlling flow of motive fluid in the apparatus responsive to a condition of the apparatus resulting from an external adjustment of the valve.

SEE OR SEARCH THIS CLASS, SUBCLASS:

392, for a system in which a follow up linkage from the output motor or member closes an externally opened valve.

463 Sensor of external condition controls valve:

This subclass is indented under subclass 462. Apparatus in which the externally operated multiway valve is actuated by a means sensing a condition of a substance or structure that is not a part of the means supplying motive fluid of the motor, or of the interconnecting lines.

464 Of motive fluid transfer between a reservoir and a recirculating path of a pump motor loop:

This subclass is indented under subclass 459. Apparatus in which condition responsive structure controls the supply of motive fluid to or its discharge from a recirculating system made up of a pump, a motor and interconnecting flow lines; the transferred motive fluid being taken from or supplied to a reservoir out of the recirculating path.

465 Having externally operable means for setting motor or pump displacement or direction of rotation:

This subclass is indented under subclass 459. Apparatus in which the displacement of a variable displacement pump or motor is set by external means and flow of motive fluid in the apparatus is controlled by a means sensing a condition of the apparatus resulting from the external adjustment of the displacement.

SEE OR SEARCH THIS CLASS, SUBCLASS:

389, for a displacement controller positioned by a servo-motor having follow-up linkage assuming full range correspondence of the displacement adjuster and the manually set actuator;

443+, for a servo-motor setting a displacement controller.

445+, for a condition responsive displacement adjuster.

487, for a system with no automatic control having a manual displacement adjuster.

466 Of braking or holding valve in motor discharge line:

This subclass is indented under subclass 459. Apparatus having a means sensing the pressure or rate of flow of motive fluid in a motor discharge line and effective to shut-off or restrict the discharge of the fluid from the motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

460, for a holding or braking valve in a motor exhaust line controlled by the pressure in the motive feed line.

461, for a system in which the discharge from the contracting cylinder of a double acting motor is controlled.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclass 47 for a motor having constantly applied motive fluid with controlled venting; and 404+ for a motor having a working member position exhaust control.

188, Brakes, subclasses 293+ for a brake driven in which the braked element drives a pump forcing brake fluid through a restriction.

467 Stroke cylinder open to exhaust responsive to position of output member:

This subclass is indented under subclass 459. Apparatus including a motor moving an output device along a path, there being structure that diverts the motive fluid driving the motor back to a container from which the motive fluid pressurizer is supplied upon the output device reaching a selected point in its path.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclasses 400+ for a motor in which the expanding chamber is vented responsive to the position of the working member of the motor or of the output.

468 Of by-pass of motor, pump or flow control element:

This subclass is indented under subclass 459. Apparatus in which the flow of motive fluid through a passage by-passing a motor, pump or restriction in a motor feed or discharge line is controlled by a condition responsive means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

424, for serially connected motors one of which has an automatically controlled bypass.

456, for a bypass arrangement including cooling structure.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclasses 399, 400+, and 407 for motors having bypasses responsive to the position of the working member.

137, Fluid Handling, subclasses 108+ for a self controlled branched flow system.

417, Pumps, subclasses 307+ for a pump having a pressure responsive relief or by pass valve.

469 Having means controlling or attenuating shock vibration, sticking or chattering:

This subclass is indented under subclass 325. Apparatus with a structure (1) ameliorating or suppressing the efforts of shock or vibration, (2) preventing sudden movement or release of pressure or load or (3) controlling noise or sticking.

SEE OR SEARCH THIS CLASS, SUBCLASS:

338, for a coaxial impeller and turbine unit having shock, vibration or surge control structure.

371, for a resilient means storing and releasing energy in the cycled reciprocation of a stroke device.

413, for a structure for controllably storing and subsequently releasing of energy.

461, for automatic means controlling the discharge from the contracting cylinder often to prevent chattering, jumping or shock.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclass 399, for a double acting motor cushioned at the end of a stroke by the opening of a bypass between the expanding and contracting chamber; subclasses 405+, for a working member position responsive cushioning valve in a motor exhaust; and subclasses 429 and 430, for a motor having an anti-sticking motive fluid control valve.

417, Pumps, subclass 312, for a pump with a muffler acting on the pump fluid.

470 Externally operated multiway valve or interconnected control elements control motive fluid for a limited stroke to-and-fro device:

This subclass is indented under subclass 325. Apparatus including structure controlling flow of motive fluid between a pressure fluid source and an output device to move the output member between plural positions, the structure comprising a multiway valve or a system of valves mechanically or electrically interlinked for correlated action under the control of an operator.

SEE OR SEARCH THIS CLASS, SUBCLASS:

388, for a motor positioning manipulator with a feedback linkage providing full range correspondence of the position of the manipulating handle and the output.

393, for a system having structure to impress a feel of the load or pressure in the motor on the manipulating handle to give a feel of the load.

429, for an automatic system having a multiway valve changing the relationship of separately operable input pumps.

434, for a system in which a pump drive controller is connected for joint operation with the valve manipulating handle.

462, for a stroke device controlled by an externally operated multiway valve and that has condition responsive structure.

463, for a system in which a multiway valve manipulating a stroke device is responsive to an external condition.

471 Having plural distinct or separately operable output means:

This subclass is indented under subclass 470. Apparatus including (1) two outputs one of which may operate separately from the other or in a diverse manner; or (2) two distinctly identifiable outputs.

SEE OR SEARCH THIS CLASS, SUBCLASS:

421, for a system having automatic control means in which a manually operated multiway valve selects various combinations of plural pumps or motive fluid sources.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclasses 508+ for a motor system having plural working members and a single member that selectively controls the motive fluid for each working member.

472 Flow to opposed expansible chambers having a common output reversed:

This subclass is indented under subclass 470. Apparatus in which the output member is carried by two opposed expansible chamber devices mechanically connected thereto; the connection being such that an increase in pressure in one chamber moves the output member in the opposite direction from that caused by an increase of pressure in the other chamber and the control structure acting to select the chamber to which pressure fluid is supplied.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclasses 462+ for a double acting motor with a motive fluid control valve arrangement.

473 Pump means moves motive fluid from one chamber to an opposite chamber of opposed expansible chambers having a common output:

This subclass is indented under subclass 325. Apparatus including a single to and fro output member driven by opposed expansible chambers and a pump for transferring motive fluid from one chamber to the other, to drive the output.

SEE OR SEARCH THIS CLASS, SUBCLASS:

369, for a reciprocating output driven in a repeating cycle by opposed expansible chambers.

474 Valve or restriction controls gravity or spring return of output:

This subclass is indented under subclass 437. Apparatus in which the pump moves the piston in one direction only, its return being produced by gravity or stored energy and controlled by a valve or restriction means adjusting the rate of flow of motive fluid between the chambers.

SEE OR SEARCH THIS CLASS, SUBCLASS:

461, for a double acting motor having a condition responsive valve controlling the discharge from the exhausting expansible chamber.

475 With means compensating for charge leakage or volume difference between discharging and receiving chambers:

This subclass is indented under subclass 437. Apparatus in which fluid is moved between two cylinders, one of which is increased in size while the other is decreased in the to and fro operation of an output member, the system having a structure that compensates for the difference in volume of the two cylinders or which corrects for any unbalance caused by leakage between parts of the system.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclass 463 for a double acting motor with means to provide unequal flow rates to or from opposed working chambers.

476 Reversible delivery from pump means:

This subclass is indented under subclass 437. Apparatus with means by which the pump or its delivery may be reversed to reverse the direction of movement of the to and fro device.

SEE OR SEARCH THIS CLASS, SUBCLASS:

472, for a double acting motor manipulated by a multiway valve means or by interconnected control elements that control the flow between the opposed chambers.

477 Ram driven by fluid pumped from reservoir:

This subclass is indented under subclass 325. Apparatus comprising an output motor of the piston-cylinder type, the motor being caused to produce a pull or thrust by pumping motive liquid from a reservoir into or from the cylinder.

SEE OR SEARCH THIS CLASS, SUBCLASS:

369, for a cyclically operated reciprocating ram.

387, for a ram with distinct structure metering and dispensing a stroke length determining volume of motive fluid.

432, for a ram device in which the motor driving the motive fluid pump is deactivated responsive to the position of the ram.

437, for a ram device in which one side of the piston is the reservoir from which motive fluid is pumped to the power cylinder.

462, for a ram having coordinated manual and automatic controls.

467, for a ram cylinder opened to exhaust or reaching the end of its stroke.

470, for a ram controlled by an externally operated multiway valve or interconnected control elements.

SEE OR SEARCH CLASS:

254, Implements or Apparatus for Applying Pushing or Pulling Force, subclass 93 for a pushing or pulling implement including a ram driven by fluid pressure.

478 Having means pressurizing, vacuumizing or venting reservoir:

This subclass is indented under subclass 477. Apparatus having structure by which motive liquid in the reservoir is kept at a pressure above or below atmosphere or has distinct structure providing for the flow of air into or out of the reservoir as the volume of liquid in the reservoir varies.

SEE OR SEARCH THIS CLASS, SUBCLASS:

464, for an arrangement in which a compressed gas accumulator supplies energy to the body of motive fluid driving the motor.

479 Having selective or variable pump displacement or pump drive leverage:

This subclass is indented under subclass 477. Apparatus with structure by which the amount of motive fluid discharged from a pump means toward the ram for each revolution of the pump or for each equal length stroke of a pump handle may be selected or adjusted.

480 Telescopic ram:

This subclass is indented under subclass 477. Apparatus in which the ram is made up of concentric cylinders that move axially relative to each other under the pressure of the pumped fluid.

481 Having fluid trapping means with a manual release or by-pass holding ram:

This subclass is indented under subclass 477. Apparatus in which the fluid pump into the ram is retained therein by structure that must be released or by-passed manually for retraction of the ram.

482 Release valve and pump actuated by a common handle:

This subclass is indented under subclass 481. Apparatus having a common handle for actuating the pump and the ram release structure.

483 Having selecting means distributing motive fluid between plural motors or cylinders rotatating a common output shaft:

This subclass is indented under subclass 325. Apparatus in which a plurality of motors, motive sections or motor cylinders are arranged to rotate a common shaft, and having manually operable means to modify the relative operation of the motors, motive sections, or motor cylinders relative to each other.

SEE OR SEARCH THIS CLASS, SUBCLASS:

425, for a condition responsive means establishing the number of motors or motor sections driving a common output.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclasses 476+ for a rotary output device driven by three or nine cylinders with separate motive fluid control of the delivery of motive fluid from a nominal source to each working chamber.

484 Having plural energy outputs (e.g., plural motors, etc.):

This subclass is indented under subclass 325. Apparatus which the energy put into apparatus from the pressure fluid source is discharged from the system by more than one means; e.g., plural motors, a motor and a pressure line, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:

374, for correlated independently movable output member in a cyclically operable stroke cycle.

419, for a system including an output motor and a motor driven by the motive fluid driving a pump raising the pressure of the motive fluid in a branch line.

420, for a system of distinct or separately operable outputs or drive units including a condition responsive control.

471, for a system of plural motors including a ram device manipulated by a multiway valve or interconnected control elements.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclasses 508+ for a system of plural expansible chamber motors with a merely nominal source of motive fluid.

105, Railway Rolling Stock, subclass 96.2 for railway rolling stock having a fluid transmission driving a wheel or axle.

180, Motor Vehicles, subclass 308 for a motor vehicle which includes a traction motor of the kind driven by a noncompressible fluid received under pressure from a pump and wherein each surface-engaging member which is powered for driving the vehicle is provided with such a motor.

485 Unit having coaxial rotary output shafts and pump means in a common housing (e.g., automobile differential, etc.):

This subclass is indented under subclass 484. Apparatus having a pump as the pressure fluid source and two rotary motors, the motors being coaxial and the pump and two motors being in the form of a compact unitary assembly.

486 Having plural energy input means, pumps or diverse pump outlets:

This subclass is indented under subclass 325. Apparatus in which (1) there are plural pressure sources, (2) in which the pressure source includes separately operable pump means; or

(3) a pump means driven by separately operable energy input devices.

SEE OR SEARCH THIS CLASS, SUBCLASS:

375, for correlated power input pumps and/or pressurized fluid cyclically operated in driving a reciprocating stroke device.

386, for a power boosted manual pump system.

397, for a motor operated by the intake manifold of an internal combustion engine with a means for furnishing extra energy to the motor.

400, for a system having selective or simultaneous manual or power energy inputs.

405, for a safety system in which a second motive fluid supply means takes the load responsive to the failure of a first supply means.

413, for a system with means for controllable feeding stored energy to the motor.

419, for a system in which motive fluid in the system is pressurized by a pump driven by the motive fluid of the system.

421, for a system with an automatic control including plural motors and plural pumps or motive fluid sources with relationships selected by a multiway valve.

428, for a system of separately operable power input pumps, pump cylinders or pressure fluid sources that has automatic control means.

444, for a system including a nonpower pump supplying control pressure to a displacement adjusting servo-motor.

447, for a system including a run-power pump supplying pressure proportional to spread to a servo-motor controlling the displacement of a power pump or output motor.

464, for an automatically controlled motive fluid replenishing arrangement for a recirculating power pump and motor loop.

SEE OR SEARCH CLASS:

417, Pumps, subclasses 199+, for an assembly of diverse pumps; subclass 374, for motor driven pump having a manual or diverse drive; and subclasses 426+, for plural pumps with individual or relative control.

487 Input pump and rotary output motor system having displacement varying type of direction or speed selector:

This subclass is indented under subclass 325. Apparatus comprising a pump feeding a rotary motor, either the pump or motor including externally settable internal structure by which the amount of motive fluid moved therethrough on each cycle or revolution may be selected or by which the direction of flow therethrough may be reversed.

SEE OR SEARCH THIS CLASS, SUBCLASS:

389, for a system in which a displacement adjuster is positioned by a servo-motor having a feed-back linkage.

443, for a system in which a displacement adjuster is positioned by a manually controlled servo-motor.

445, for a system in which a displacement adjuster is positioned by a condition responsive means.

465, for a system having a manual displacement adjuster in combination with a condition responsive motive fluid flow controller.

488 Including auxiliary system feed pump:

This subclass is indented under subclass 487. Apparatus having an additional pump that delivers motive fluid from a reservoir to replenish or augment the motive fluid being circulated between the energy input pump and the motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

455, for a system including structure for collecting leakage.

464, for the automatic control of motive fluid transfer between a reservoir and the recirculation path of a pump-motor loop.

489 Having valve means controlling flow between pump and motor:

This subclass is indented under subclass 487. Apparatus having in addition to the displacement varying structure an adjustable flow con-

trolling means in a flow line of the circuit including the rotary pump and motor.

490 Both motor and pump have displacement adjustment means:
This subclass is indented under subclass 487. Apparatus in which the displacements of both the motor and pump are variable.

491 Having common or intercontrolled adjuster actuating means:
This subclass is indented under subclass 490. Apparatus including a mechanism that simultaneously or in a desired sequence adjusts the displacements of both the pump and the motor.

492 Motor swash plate and pump swash plate intercontrolled:
This subclass is indented under subclass 491. Apparatus in which both the pump and motor are of the swash plate type.

493 Valve means reverses flow from pump to reversible rotary motor:
This subclass is indented under subclass 325. Apparatus including a pump supplying motive fluid to a rotary motor and having valve structure between the pump and motor to change the direction of flow through the motor to reverse its direction of rotation.

SEE OR SEARCH THIS CLASS, SUBCLASS:
369, for a cyclically reversed to-and-fro stroke device.
472, for a valve means reversing the flow to and fro a stroke type motor.

494 Including by-pass or restrictor controlling flow circuit:
This subclass is indented under subclass 325. Apparatus with structure by which the flow of motive fluid may be adjustably retarded or be apportioned between branches.

SEE OR SEARCH THIS CLASS, SUBCLASS:
459+, for the condition responsive control of fluid flow.
470, for a multiway valve or interconnected control elements reversing flow to, stopping and starting or by passing a stroke type motor.
493, for a valve reversing flow from a pump to a reversible rotary motor.

SEE OR SEARCH CLASS:
91, Motors: Expansible Chamber Type, subclasses 418+ for an expansible chamber motor with a motive fluid valve.

495 MOTOR HAVING A BUOYANT WORKING MEMBER:
This subclass is indented under the class definition. Apparatus having a working member which may be made buoyant or which is buoyant in a fluid and which may be caused to be moved by the fluid, because of the difference in specific gravity between the member and the fluid, to have a vertical component of motion and thereby adapted to do work, through a mechanical output means, either (1) because of a means which may make said buoyant member more or less buoyant so that it may be moved either against or by the pull of gravity in said fluid, or (2) though its specific gravity remains constant, the buoyant member may be given a vertical component of motion as a result of the rise and fall of the surface of said fluid.

(1) Note. The rise and fall of the surface of the buoying fluid may be the result of a natural phenomenon or under the control of other means.

(2) Note. The buoying fluid may exist in nature as a stream or ocean, or it may be confined wholly within a container wherein the flow to or from the container from any source of supply may be controlled, or it may be partially confined in a means which permits constant or controlled communication with a naturally existing body of fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:
398, for devices employing tide or wave actuated devices which elevate or pressurize a fluid so that it may be usable as a motive fluid to actuate a fluid motor.
495+, for tide or wave motors combined with a spring or weight motor to wind

or supplement said spring or weight motor.

SEE OR SEARCH CLASS:

185, Motors: Spring, Weight, or Animal Powered, subclasses 27+ for motors in which kinetic energy is derived from the movement of a mass by virtue of the effects of gravity.

251, Valves and Valve Actuation, subclass 11, for fluid flow regulators actuated by energy from a variation in buoyancy of a body.

290, Prime-Mover Dynamo Plants, subclass 53 for dynamos including a tide or wave motor.

405, Hydraulic and Earth Engineering, for devices for and methods of controlling water in open channels or reservoirs, and subclasses 75+ for means to modify fluid directing channel means for the utilization of the water flowing therethrough to operate some form of motor.

415, Rotary Kinetic Fluid Motors or Pumps, subclass 7 for means buoyantly sustaining rotatable runner means in a confined stream of liquid.

416, Fluid Reaction Surfaces, i.e., Impellers, subclasses 84, 85+ for impellers which float and which operate by the impact resulting from the horizontal waves or flow of an unconfined stream of water.

417, Pumps, subclass 100 for liquid piston pumps operated by tides or waves and 330+ for fluid pumps actuated by tide or wave motors.

496 With means to vary buoyancy of working member:

This subclass is indented under subclass 495. Apparatus wherein the working member may be actuated in a buoying fluid by either adding to or withdrawing a substance from the confines of said working member to change its specific gravity relative to the fluid.

497 Working member actuated by the rise and fall of a surface of a body of fluid:

This subclass is indented under subclass 495. Apparatus having a buoyant working member which is actuated by the vertical rise and fall of the surface of a body of fluid.

498 Having tide responsive working member positioning means:

This subclass is indented under subclass 497. Apparatus operable in a body of fluid whose surface rises and falls both in cycles of short periods, e.g., ocean waves, and in cycles of long periods, e.g., oceanic tides, said device having separate means responsive to each of said cyclic movements to cause said working member to move.

499 Having means responsive to lateral impulse of fluid:

This subclass is indented under subclass 497. Apparatus having means whereby mechanical work also may be produced from the lateral movement of a flowing fluid or the lateral movement of a wave on the surface of a body of fluid.

500 Having articulated buoyant members:

This subclass is indented under subclass 497. Apparatus having at least two buoyant working members adapted to be moved relative to one another by the vertical movement of the surface of a body of fluid and said members being pivotally interconnected to each other whereby mechanical work may be performed as a result of the relative movement of said members only.

(1) Note. Classification in this subclass includes only those relatively movable interconnected buoyant members which produce work because of their relative movement, per se. For devices having relatively movable working members wherein work is produced as a result of relative movement between one or more of the working members and a stationary means secured to or supported by the earth see subclass 504 or 505.

501 Motor is free floating unit:

This subclass is indented under subclass 497. Apparatus having a unitary buoyant member having means actuated in response to the relative movement between said member and a means supported entirely by said member.

(1) Note. The device may be in the form of a free hanging weight carried within the buoyant member, or it may be a means in

the form of a sea anchor, or other means, which is suspended from the member outside the member or in the fluid (not in engagement with the earth) to dampen the movement of the means given it by the member so that work may be produced as a result of the relative movement between the member and the means when the member is caused to change its vertical position responsive to the vertical movement of the free surface of the fluid.

502 Having fluid flow or wave controlling, confining or directing means:
This subclass is indented under subclass 497. Apparatus together with at least one surface means which is designed to (1) restrain, direct, or control the flow of a body of fluid or a portion thereof or restrain or direct the movement of waves traveling on the surface of said body of fluid, or (2) confine a portion or all of a body of fluid so that the surface of said fluid may change its vertical position.

503 In which the control means is variable:
This subclass is indented under subclass 502. Apparatus having means whereby the fluid flow, the surface wave movement or amplitude, or the volume of confined fluid may be variably controlled.

504 Having flexible strand working member motion transmitting means:
This subclass is indented under subclass 497. Apparatus having a flexible means which engages or is engaged by the buoyant member to transmit motion of said member.

505 Having relatively movable working members:
This subclass is indented under subclass 497. Apparatus having a means supporting a plurality of buoyant working members so that they may move relative to each other and to the supporting means.

SEE OR SEARCH THIS CLASS, SUBCLASS:
500, for articulated buoyant working members.
504, for motors having a plurality of relatively moving buoyant working members having flexible means to transmit the motion of members.

506 Working member pivotally supported:
This subclass is indented under subclass 497. Apparatus wherein the buoyant working member is supported to pivot about an axis.

SEE OR SEARCH THIS CLASS, SUBCLASS:
507, for other buoyant motors having one way clutch type devices as part of the power transmission means.

507 Having one-way clutch power transmission means, e.g., ratchet, etc.:
This subclass is indented under subclass 497. Apparatus having means to transmit movement of the buoyant working member as it moves in one vertical direction and permit the member to move free of the transmitting means as it moves in another direction.

508 FLUID WITHIN EXPANSIBLE CHAMBER HEATED OR COOLED:
This subclass is indented under the class definition. Apparatus comprising a motor having a working chamber and a working member therein with means affecting the temperature and thus the pressure of fluid after being supplied to and isolated within the working chamber to actuate the working member.

(1) Note. The motor working chamber and member includes a cylinder and piston or its equivalent.

(2) Note. See Class 92, Schedule, section II for a definition of a working chamber and member for an expansible chamber type motor.

(3) Note. See Class 415 for a definition of a Rotary kinetic fluid motor.

(4) Note. An indeterminate motor (Black box) having internal generation not classified elsewhere is classified under this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:
516+, for motors activated by expanding and contracting a confined mass by means

changing the temperature of said mass.

SEE OR SEARCH CLASS:

123, Internal-Combustion Engines, for motors wherein unburned hydrocarbons are cyclically introduced into an expansible chamber device, isolated therein and then ignited to increase the pressure of said isolated material. See Class 123 subclass 22 for motors which may operate as an internal combustion engine or a hot air motor, of the type herein classified, alternating between the two modes of operation either selectively or as the result of a predetermined cyclic operation.

509 Special motive fluid:

This subclass is indented under subclass 508. Apparatus of a motor whose working member is actuated after the introduction of unburned vapors, of liquids other than water, into the working chamber and the change in temperature and therefore pressure of said vapors caused by vapor heating or cooling means within said chamber.

510 Air rarefied by combustion:

This subclass is indented under subclass 508. Apparatus of a motor in which air and burning gases are admitted into the working chamber wherein the combustible components of the air are consumed or the hot products of combustion cooled so that a vacuum is produced within the working chamber by the resultant rarefied gases and the working member is actuated.

SEE OR SEARCH THIS CLASS, SUBCLASS:

515, for a cooling jacket disposed about a cylinder with means to control fluid flow through the jacket.

SEE OR SEARCH CLASS:

123, Internal-Combustion Engines, for motors wherein, cyclically, unburned hydrocarbons are introduced into an expansible chamber device isolated therein and then ignited to increase the pressure of the isolated material.

511 Fluid mingling (e.g., condensation):

This subclass is indented under subclass 508. Apparatus of a motor comprising a working member and a working chamber having a first fluid therein and means to introduce a second fluid into said first fluid to produce a change in pressure of said first fluid whereby the change in pressure actuates the working member.

(1) Note. Usually water is injected into the working chamber to condense steam therein and the resultant reduced pressure actuates the working member due to a higher pressure on the opposite side of the working member, usually atmospheric pressure.

(2) Note. A fluid such as hot water or hot air may be introduced into the working chamber to superheat the motive fluid therein and the change in pressure actuates the working member.

512 Having means within the working chamber to effect the pressure of fluid therein:

This subclass is indented under subclass 508. Apparatus of a motor with means located within the working chamber to change the temperature of the working fluid subsequent to isolation therein to affect the pressure of the fluid therein so that the change in pressure produced thereby is utilized to actuate the working member.

513 Electric heating means:

This subclass is indented under subclass 512. Apparatus wherein the means within the working chamber is a resistance element heated by the passage of an electric current therethrough to heat the working fluid therein and thus increase the pressure of the working fluid.

(1) Note. The fluid within the working chamber may be air or steam which is to be heated or superheated or the motive fluid may be a liquid as water which is introduced into the working chamber and instantaneously flashes into steam upon contact with the electric coil or plate.

514 Concurrent fluid supply and vaporization:
This subclass is indented under subclass 508. Apparatus of a motor comprising a working member and a working chamber having liquid supplied thereto with means to vaporize the liquid concurrently with its introduction into the working chamber whereby the pressure produced actuates the working member.

(1) Note. Two or more fluids may be introduced into a preheated working chamber so long as at least one fluid is a liquid to be vaporized (e.g., air and water, water vaporized; oil and water, both vaporized).

SEE OR SEARCH THIS CLASS, SUBCLASS:

511, for motors wherein a second fluid is injected into a working chamber having a first fluid therein to result in a change in pressure in said chamber.

512, for means within the working chamber to affect the pressure of the fluid therein.

SEE OR SEARCH CLASS:

123, Internal-Combustion Engines, for motors in which a combustible material is burned with a chamber and the pressure produced thereby is converted into work, and subclass 22 for internal combustion engines having working chamber into which air, per se, may be introduced and expanded to do work as a result of its contact with the hot walls of the chamber either as a step in the cycle of the internal combustion engine chamber or during a time when the chamber is converted to act as a hot air engine from internal combustion engine operation.

515 Having control means for heating or cooling means:
This subclass is indented under subclass 508. Apparatus of a working chamber having means exterior of working chamber heat exchange therebetween and means to control the rate of BTU transfer to the chamber.

(1) Note. The means disposed exteriorly the working chamber may include a jacket spaced from the working chamber or a coil which may be an electrical resistance element or a pipe having fluid flow therethrough for the purposes or heating or cooling.

(2) Note. The control means includes a valve which controls the flow of fluid through the jacket or coil or an electrical control for the resistance.

(3) Note. A working chamber disposed within the furnace chamber is properly classified under 515 where a control for the furnace is disclosed.

SEE OR SEARCH CLASS:

92, Expansible Chamber Devices, subclass 144 for an expansible chamber type motor in which the working chamber is jacketed for heat transfer therebetween but where there is no control valve for either the motor or the jacket fluid.

123, Internal-Combustion Engines, subclasses 41, 72+ and 195 for a jacketed cylinder or end closure therefor for receiving circulating heat exchange liquid to cool the operating parts of an internal combustion engine. A specific disclosure that a jacketed cylinder or end closure therefor is to form a part of an internal combustion engine is sufficient for classification in Class 123.

165, Heat Exchange, appropriate subclasses for a heat exchange modifying space or jacket of general utility. Class 165 takes a nominally claimed cylinder or working chamber forming member of an expansible chamber device, where the claim is otherwise directed to a surrounding space or jacket designed to modify the heat exchange properties of the cylinder or member.

220, Receptacles, subclasses 592.01+ for a receptacle having means to maintain its contents above or below ambient temperature.

516 MOTOR OPERATED BY EXPANSION AND/OR CONTRACTION OF A UNIT OF MASS OF MOTIVATING MEDIUM:

This subclass is indented under the class definition. Apparatus having means which may heat, cool or otherwise cause a defined unit of matter as a working medium in the gaseous liquid, or solid state to expand and contract cyclically to do useful work.

(1) Note. The confined matter may change state during expansion or contraction thereof.

(2) Note. The distinction between the plants in this subclass and the plants in subclasses 508+, where a motive fluid is introduced into an expansible chamber and heated or cooled therein to expand or contract said chamber, is that in the latter a definable mass is not isolated as a motive fluid which is subject to heating and cooling and thus expansion and contraction for more than one cycle.

SEE OR SEARCH CLASS:

62, Refrigeration, subclass 6 for "Stirling" cycle refrigeration producers, and subclasses 498+ for compressor-condenser-evaporator circuits for refrigerator producers.

236, Automatic Temperature and Humidity Regulation, subclass 68, for temperature regulators which include a thermal expansion and contraction device whose operation is effected by a heater set into operation by a heat responsive initiator.

251, Valves and Valve Actuation, subclass 11, for heat motor actuated valves.

374, Thermal Measuring and Testing, subclasses 100+, for thermometers, especially subclasses 187+ where an ambient temperature is measured using a solid or fluid having known properties of expansion or contraction in response to given changes in temperature.

517 Unit of mass is a gas which is heated or cooled in one of a plurality of constantly communicating expansible chambers and freely transferable therebetween:

This subclass is indented under subclass 516. Apparatus in which the unit or working medium is a gas which is confined to circulation between two communicating expansible chambers, one of said expansible chambers is a working chamber wherein said gas expands or contracts to energize a working member to do useful work, and the other of the expansible chambers acts as a displacer or transmitting means for said working medium.

(1) Note. Engines which operate by the principle set forth herein have been known variously as: Air Engine, Caloric Engine, Compressor Engine, Compressed Air Engine, Hot Air (Gas) Engine, Stirling Cycle Engine.

SEE OR SEARCH CLASS:

62, Refrigeration, subclass 6, for "Stirling Cycle" refrigeration producers.

518 Having means to change operational phase relationship of working member and displacer:

This subclass is indented under subclass 517. Apparatus having means to change the cyclic phase relationship between the power or working member and the displacer mechanism.

519 Expansible chamber having rotatable or oscillatory displacer:

This subclass is indented under subclass 517. Apparatus in which at least one of said expansible chambers is provided with a member which either rotates or oscillates about an axis so that said chamber either expands or contracts as a result of motion of said member.

520 Having free floating displacer or transfer piston:

This subclass is indented under subclass 517. Apparatus wherein at least one of said expansible chambers is provided with a piston which is freely movable therein, and without connection to any other means, having the function to cause the working medium to flow from that chamber to another of the expansible chambers.

521 Having means to increase or diminish quantity of motivating mass:
This subclass is indented under subclass 516. Apparatus having a particular means whereby gas may be added to or withdrawn from the unit of gas employed as the working medium.

522 Having means to control rate of flow of mass between chambers:
This subclass is indented under subclass 517. Apparatus provided with means adapted to control the rate of flow of said gas from one to another of the expansible chambers.

523 Having electrical heating means for mass:
This subclass is indented under subclass 517. Apparatus wherein heat is supplied to one of said expansible chambers as a result of the conversion of electric current to heat.

524 Having means to control temperature of heating or cooling chamber:
This subclass is indented under subclass 517. Apparatus having condition responsive or manually controlled means to vary the temperature of a chamber in which the working gas is heated or cooled.

525 Motor having plural working members:
This subclass is indented under subclass 517. Apparatus having more than one chamber in which expansion or contraction of said gas is converted into useful work.

526 Motor having regenerator for mass:
This subclass is indented under subclass 517. Apparatus having means in the path of flow of said working gas as it passes back and forth from a cooling chamber to a heating chamber whereby heat is removed from said gas as it passes therethrough in one direction and then returns said heat to said gas as it passes back through said means in the opposite direction.

SEE OR SEARCH CLASS:
62, Refrigeration, subclasses 115+ for processes for compressing, condensing and evaporating a refrigerant.
165, Heat Exchange, subclasses 4+ for regeneration, per se.

527 Mass is a solid:
This subclass is indented under subclass 516. Apparatus which the unit of matter is a solid.

(1) Note. This subclass includes patents which employ a mass which is in a solid state during at least a portion of a cycle of its operation. During other portions of the cycle of its operation, a given mass (e.g., wax) may change to a liquid state, or another mass (e.g., metallic hydride) may change to a gaseous state.

SEE OR SEARCH CLASS:
310, Electrical Generator or Motor Structure, subclass 26 for magnetostrictive motors wherein a magnetic field is employed to cause a material to expand and contract to do work.
337, Electricity: Electrothermally or Thermally Actuated Switches, subclasses 333+ and 382+ for switches actuated by the expansion or contraction of bimetallic or other metallic members.
374, Thermal Measuring and Testing, subclass 187 for temperature measurement in which the expansion or contraction of a sensing material drives an indicator.

528 Mass heated because of resistance to flow of electric current:
This subclass is indented under subclass 527. Apparatus wherein the solid is arranged to conduct an electrical current whereby said solid may be made to expand or contract in proportion to the current flow therethrough.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, subclass 117 for a motor comprising a member that undergoes a substantial change of shape when heated and means for heating it electrically.

529 Mass is bimetallic:
This subclass is indented under subclass 527. Apparatus in which the mass consists of at least two interrelated pieces of material each characterized by a different coefficient of expansion.

SEE OR SEARCH THIS CLASS, SUBCLASS:

528, for devices having bimetallic members through which an electrical current is passed which either expands or contracts because of the resistance to the flow of current therethrough.

530 Mass is a liquid:

This subclass is indented under subclass 516. Apparatus in which the working medium is a liquid during at least a portion of a complete cycle of the operation of the motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

527, for apparatus employing a mass which is in a solid state during a portion of its cyclic operation and which may or may not change to a liquid state during another part of its cyclic operation (e.g., wax).

SEE OR SEARCH CLASS:

337, Electricity: Electrothermally or Thermally Actuated Switches, subclasses 306+ for switches actuated by thermally expanded or vaporized fluid.

374, Thermal Measuring and Testing, subclasses 201+ for temperature measurement in which an expanding or contracting fluid drives an indicator.

531 Liquid is vaporized:

This subclass is indented under subclass 530. Apparatus having means whereby said unit of matter is a fluid which is vaporized so that through the device, work may be accomplished.

532 Shock or resonant wave type of energy transmission:

This subclass is indented under subclass 325. Subject matter in which the input energy is transmitted to an output through a mass of fluid in the form of a compressional wave or a series of such waves moving at the speed of sound.

SEE OR SEARCH CLASS:

116, Signals and Indicators, subclasses 137+ for a residual mechanical sonic or supersonic generator for wave transmission through media.

366, Agitating, appropriate subclass for a stirring or agitating device utilizing a sonic or super sonic vibrator.

533 Pulsator:

This subclass is indented under subclass 325. Apparatus comprising (1) a system including structure to trap a definite volume of motive fluid between two expansible chamber devices for movement back and forth, one expansible chamber device functioning as a transmitter or master to pressurize the fluid and the other as a receiver or slave actuatable in response to the pressurization of such fluid, wherein any movement of a working member of one device results in movement of the working member of the second device and the systems provides (a) at least two different cross-sectional areas through which the pressurized fluid must pass or (b) the volumetric displacement of the master and slave are unequal; or (2) subcombinations specialized to such system not specifically classified elsewhere.

(1) Note. The output of the pulsator must be the final output of the organization claimed and not merely an intermediate link, or ancillary to a larger organization.

(2) Note. The following are examples of specialized subcombinations of pulsators classified in Class 60: (a) An expansible chamber type motor device for which the claimed nominal load is an expansible chamber solely disclosed as the master of a pulsator; (b) An expansible chamber device having an associated holder for a reserve supply of liquid and solely disclosed as the master of a pulsator, i.e., master cylinder; (c) A piston or diaphragm device disclosed in a pulsator line acting to limit the travel of fluid between the master and slave to a back and forth movement equal to the displacement of the diaphragm or piston; (d) A pressure responsive unit disclosed in a flow line between a master and slave that first passes fluid from the master toward the slave and then, responsive to pressure, acts as a master driven by the first master to drive fluid toward the slave.

(3) Note. A glossary of terms related to this and indented subclasses is at the end of this subclass.

SEE OR SEARCH CLASS:

74, Machine Element or Mechanism, subclass 583 for a residual machine element for transmitting motion by push and pull movement including a trapped body of fluid.

91, Motors: Expansible Chamber Type, subclass 280 for a motor having a pulsator cyclically distributing motive fluid to the motor; subclass 384 for a pulsator feeding back a working member's position to a motive fluid controller; subclass 460 for a motor having a pulsator controlled valve; and appropriate subclass for a valved expansible chamber motor per se, or driving a merely nominal load. However if a claimed nominal load is solely disclosed as the master of a pulsator the combination is classifiable in Class 60 subclasses 533+.

92, Expansible Chamber Devices, subclasses 61+ for a system of plural expansible chamber devices of the Class 92 type not in a master-slave relationship. (See Paragraph A of (4) Note of the Class 92 definition for a statement of the line); and appropriate subclass for a master or slave device, per se. See (3) Note, above for exceptions to this line between Classes 60 and 92 (e.g., relating to a master cylinder etc.).

188, Brakes, subclasses 151+ for a specific motion stopping or retarding means operated by a fluid pressure system and subclasses 266+ for an internal resistance motion retarder (e.g., hydraulic shock absorber, dash pot etc.).

251, Valves and Valve Actuation, subclass 57 for a valve actuated by a fluid link or column (e.g., pulsator, etc.).

267, Spring Devices, subclasses 118+ for a fluid type spring device. Class 267 takes a device comprising a chamber provided with a movable wall (e.g., piston and cylinder) and adapted to contain a fluid designed to contact and exert a force against said movable wall, or an element of such device (e.g., piston) when there is a disclosure that such device is used as a spring device.

303, Fluid-Pressure and Analogous Brake Systems, appropriate subclass for a system specialized to the distribution of fluid in a brake system. The line between Class 303 and subclasses 533+ of Class 60 as to pulsator structure in a brake system is as follows:

(1) A pulsator with structure specializing it for use in braking; or in which the output of the pulsator includes more than nominal brake structure is in Class 303. The following are examples of features in a pulsator device specializing the pulsator for use as a brake system for Class 303. (a) A valve controlled by the inertia of an element braked. (b) A structure responsive to the load on the vehicle to modify the brake action. (c) A distributor not itself a master, that apportions fluid between differently loaded brake cylinders. (d) A device responsive to the disconnection of a trailer from a tractor for actuating the trailer brakes.

(2) A complete pulsator comprising a master and slave not specialized as in 1 above; or in which the slave drives merely a nominal brake is in Class 60 subclasses 533+. The following terms are examples of brake recitations which are considered to be nominal and will not preclude classification in subclasses 533+. (a) Wheel cylinder; (b) Brake means; (c) Brake cylinders; (d) Hydraulic vehicle brakes; (e) Vehicle brakes (f) Disc brakes; (g) Brakes (h) front and/or rear wheel brakes; (i) Dual brakes.

(3) Class 60 subclasses 533+ will take a master subcombination of a pulsator that is of the type specified in above and in the search class references to Classes 92 and 417

even though disclosed as a part of a brake system.

(4) Class 303 takes fluid brake systems or subcombinations thereof not classifiable elsewhere; e.g., an air brake system or a specialized distributing valve, per se, etc. See the reference to Class 137 in the class definition of Class 303 for the line between classes 137 and 303.

417, Pumps, subclasses 321+ for a residual motor driven pump not solely disclosed as a master and subclasses 383+ for a pump that is more than a mere nominal load driven by a pulsator.

GLOSSARY

MASTER

An expansible chamber device which provides a contracting volume to expel fluid from the chamber or to place the fluid therein under pressure. All valve means or chamber means associated with the expansible chamber device are included under this definition.

MASTER CYLINDER

An art term applied to a unitary assembly of a master and its associated holder of a reserve supply of make-up fluid.

MOTIVE FLUID

Fluid that acts to drive a motor. The term is generic to "pulse" fluid and "power" fluid.

OUTPUT MEMBER

An element of the system by which driving or loading force is delivered for utilization by means other than the system itself.

POWER FLUID

An externally energized fluid that powers a pulsator system. Pulsator circuit: The combination of elements in which the pulse fluid is trapped.

PULSATOR SYSTEM

An organization of which a pulsator circuit is merely a part.

PULSE FLUID

The definite volume of fluid trapped in the pulsator.

SLAVE

An expansible chamber device which provides an expanding volume to receive pressurized fluid or a pressure transmitted through a passage connecting the slave to the master transmitter. The slave includes all valve means or chamber means associated therewith.

534 Having signal, indicator or recorder of apparatus condition:

This subclass is indented under subclass 533. Apparatus including (1) as indicating, registering, signalling or claim means for conveying information about a condition of the apparatus or (2) means that permits an inspection of normally hidden parts or operating fluid of the apparatus.

SEE OR SEARCH CLASS:

116, Signals and Indicators, subclass 227 for a nonelectrical liquid level indicator of general utility.

200, Electricity: Circuit Makers and Breakers, subclass 82 for a fluid pressure switch actuated by a piston.

340, Communications: Electrical, subclasses 450+, 451+ for an electrical system indicating the condition of a fluid.

535 Responsive to leakage of pulse fluid:

This subclass is indented under subclass 534. Apparatus including a signal or alarm responsive to means sensing a loss or insufficiency of pulse fluid.

536 Plural correlated pulsators transmitting unlimited rotary input to unlimited rotary output:

This subclass is indented under subclass 533. Apparatus in which a plurality of noncommunicating master-slave units have their input members interconnected to be driven by a common rotating device and their outputs interconnected to drive a common rotary device, the

arrangement being such that both devices are capable of continuous rotation in one direction.

537 Programmed, self-cycled or self-pulsed:
This subclass is indented under subclass 533. Apparatus including means (1) to cause the apparatus to operate through a given cycle of diverse operations repetitiously; (2) operative upon initiation to perform a series of diverse operations and return to a starting position; or (3) continuously oscillate an output means.

SEE OR SEARCH THIS CLASS, SUBCLASS:
532, for a pulsator transmitting energy by shock or resonant waves; and subclass 545 for an apparatus including a pulsator driven or controlled by electrical means.

SEE OR SEARCH CLASS:
100, Presses, subclasses 269.01+ for a reciprocating press having fluid pressure actuation.

538 Including electrical control or actuation:
This subclass is indented under subclass 537. Apparatus in which the apparatus or its control has an electrically operated element.

539 Cam drive of plural masters:
This subclass is indented under subclass 537. Apparatus in which a plurality of pulsator pumps are operated in a program or cycle by cam means.

540 Including timer or time delay means the cycle:
This subclass is indented under subclass 537. Apparatus in which a step in the cycle is controlled by a period establishing device or a time of day clock.

541 Having means terminating cycle at parking or holding position:
This subclass is indented under subclass 537. Apparatus including structure effective to bring the apparatus to rest at a fixed standby position upon a shutdown of operation of termination of the cycle.

542 Pneumatic device having pulse air bleed or supply means:
This subclass is indented under subclass 537. Apparatus in which the pulsator fluid is air and having structure by which air is fed to or removed from the system.

SEE OR SEARCH CLASS:
173, Tool Driving or Impacting, subclass 116 for an impacting device driven by a pulsator.

543 Self-operated pulse fluid purge or quantity adjustment structure:
This subclass is indented under subclass 537. Apparatus including structure by which fluid is transferred automatically during the cycling of the apparatus into or out of a master-slave unit or between two master-slave units.

SEE OR SEARCH CLASS:
417, Pumps, subclasses 385+ for a pump driven by a pulsator, the pulsator having structure by which it is supplied with pulse fluid or vented.

544 Continuously acting self-pulsing master with manually settable slave release or output control valve:
This subclass is indented under subclass 537. Apparatus including a continuously reciprocating master pump connected to feed a slave unit, there being (1) a manually settable means to inactivate the slave while the pump continues to reciprocate; or (2) a settable valve in the pulsator fluid to control the output of the slave.

545 Having electricity or magnetically operated structure:
This subclass is indented under subclass 533. Apparatus utilizing an electrical or magnetic element as a part of the apparatus, as a part of the power source driving the apparatus, or as a part of a circuit controlling the apparatus.

SEE OR SEARCH THIS CLASS, SUBCLASS:
538, for a programmed, self cycled, or self pulsed pulsator system having an electrically operated element.

546 Pulsator synchronizes movement of plural outputs:

This subclass is indented under subclass 533. Apparatus having two distinct output members each having an expansible chamber driving or being driven by its output member, the two chambers being connected to form a pulsator that serves to enforce a definite relative movement of the two outputs.

547.1 With control of or by a separate power fluid, etc.:

This subclass is indented under subclass 533. Apparatus in which a motor driving the working member of a master is operated by a power fluid separate from the pulse fluid, the apparatus including structure controlling flow of the power fluid or responsive to a condition of the power fluid.

(1) Note. A power circuit and a pulse circuit that are replenished from the same supply and regarded as separate of the fluids of the two circuits remain operatively separate.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, appropriate subclass for an expansible chamber motor per se or driving a nominal load. Howeverthe combination of a expansible motor and its driven expansible chamber device disclosed solely as a master is in Class 60, subclasses 547+.

188, Brakes, subclasses 355+, for a power operated fluid pressure system actuating a specific motion retarding device.

547.2 By pressure responsive valve dividing flow between motor and an auxiliary load:

This subclass is indented under subclass 547.1. Apparatus in which the structure controlling flow of the power fluid or responsive to a power fluid condition includes a valve having a face exposed to fluid pressure, the valve being movable in response to pressure variation for dividing power fluid flow between motor driving the working member and a separate motor driving an auxiliary load (e.g., power steering, etc.).

547.3 By manually operated valve dividing flow between motor and an auxiliary load:

This subclass is indented under subclass 547.1. Apparatus in which the structure controlling flow of the power fluid or responsive to a power fluid condition comprises a valve which is manually moved for dividing power fluid flow between the motor driving the working member and a separate motor driving an auxiliary load (e.g., power steering, etc.).

548 Flow in recirculating circuit controlled:

This subclass is indented under subclass 547. Apparatus in which fluid in the power circuit is constantly moved during standby through a closed recirculating system and the master is driven by the diversion or restriction of the circulating fluid.

549 Master structure provides non-overlapping periods of pressurization of diverse pressure ranges in distinct pulsator circuits:

This subclass is indented under subclass 547. Apparatus in which the system is provided with structure providing for pressurization of distinct output circuits such that (1) there are periods when only one of the circuits is being pressurized or (2) the pressures in the distinct circuits vary in relative magnitude.

550 Master driven by manual power control lever on power failure and having means adjusting lever throw or master resistance responsive to failure of power fluid supply:

This subclass is indented under subclass 547. Apparatus, including structure effective upon a sensed failure of the power driven motor or of the motor energy supply to increase the leverage of the operator driven means, to lengthen the stroke of such means, to disconnect the motor, or in some other manner reduce the effort required in the use of the manual operating member.

551 Manual master and controller of motor driven master actuated by separate linkages to a common operating lever:

This subclass is indented under subclass 547. Apparatus in which the manual and power energy input means are controlled or actuated by a single lever; there being separate mechanical connections from the lever to a manually

driven pulsator pump and to a power energy controller.

552 Mechanical feedback to manual control controls power fluid to establish position of working member of master:
This subclass is indented under subclass 547. Apparatus with a manual controller for the feed of power fluid to the motor there being structure moved or carried by the working member of the master to discontinue the feed of power fluid upon a movement of the working member proportional to the movement of the manual controller.

SEE OR SEARCH THIS CLASS, SUBCLASS:
388+, for a nonpulsator pressure fluid source and motor having a full range correspondence of the position of an external manipulator and a motor positioned member effected by feedback linkage.

SEE OR SEARCH CLASS:
91, Motors: Expansible Chamber Type, subclasses 358+, for motor, per se, or with a merely nominal output having a working member position feed back to motive fluid control.

553 With distinct piston or diaphragm exposed to pulsator pressure imparting feel to manual control:
This subclass is indented under subclass 552. Apparatus including a piston or diaphragm structure by which the pressure produced in the pulsator fluid by the actuation of the motor is directly imposed on a means opposing movement of the motor controller in a pressure increasing direction; whereby a "feel" of the condition of the pulsator liquid is conveyed to the operator of the device.

554 Having load deformable means between master working member and motor thrust means adjusting bias of manual control:
This subclass is indented under subclass 552. Apparatus including a load deformable means transmitting the thrust of the motor to the piston of the master, the deformation of the means under load serving to modify a bias means opposing the loading motion of the manual actuator whereby an indication of the load on the master is given to the operator of the device.

555 Master movement of master produces a pressure that controls the power fluid:
This subclass is indented under subclass 547. Apparatus including a manual actuator that moves either a power master or a separate master and in which the increase in pressure produced by such movement controls the supply of power fluid to the power driven master.

556 Power fluid input controller operated by piston or diaphragm acted on one side by pressure of a manual master and on the other by pressure of a power driven master:
This subclass is indented under subclass 555. Apparatus with a separate manual master and including a piston or diaphragm by which pressure from the power master is imposed on the manual master whereby a "feel" of the condition of the power pulse fluid is conveyed to the operator of the device.

557 Pressurized fluid from manual master charges slave and controls power fluid to separate master:
This subclass is indented under subclass 555. Apparatus including a manually operated master and a separate downstream motor driven master, the arrangement being such that fluid delivered from the manual master charges the pulsator with motive fluid, takes up slack and starts the motor of the motor driven master.

558 Fluid from the manual master fed to slave through a passage in the working member of the power master:
This subclass is indented under subclass 557. Apparatus in which the pressurized fluid from the manual master flows longitudinally through the working member of the motor operated master.

559 Passage extends across the expansible chamber of the motor of the power master:
This subclass is indented under subclass 558. Apparatus wherein the pressurized fluid from the manual master flows longitudinally through the motor piston, traversing the motor cylinder and passing into the expansible chamber of the motor driven master.

560 Power fluid also fed into a separate expansible chamber directly driving output means:
This subclass is indented under subclass 547. Apparatus including a distinct expansible chamber motor means arranged to drive the output driven by the slave, the external power fluid being admitted directly into the chamber of said motor.

561 Pressure balancing free piston or diaphragm between parallel pulsators:
This subclass is indented under subclass 533. Apparatus including two pulsators having means by which they are simultaneously pressurized and having a diaphragm or floating piston acted upon on one side by the fluid of a first pulsator and, upon the other side, by the fluid of a second pulsator, the piston or diaphragm acting to establish a relationship between the pressures of the two pulsators.

562 Master piston of one pulsator circuit drives master piston of a parallel circuit through a resilient, fluid or lost motion connection:
This subclass is indented under subclass 533. Apparatus in which two separately movable pistons pressurize fluid diversely for independent delivery to separate output slaves, one of the pistons being driven by the second piston mechanically through a resilient or lost motion connection or by the fluid pressure generated by the second piston.

563 Expansible chamber of output pressurized directly by motive fluid and indirectly by a master driven by the motive fluid:
This subclass is indented under subclass 533. Apparatus including an expansible chamber motor and means by which pressure fluid from a source is at one time fed directly into the expansible chamber and at another time into the motor of a master fluid drives the expansible chamber motor as its slave.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclass 6 for an expansible chamber motor provided with motive fluid at different times through supply paths that are different under different operating conditions, and see the search notes to for the line between the two classes as to this subject matter.

564 Delivery pressure of master lower than pressure driving master:
This subclass is indented under subclass 563. Apparatus in which the master includes a piston or diaphragm means forming an expansible chamber motor and expansible chamber pump, and in which the effective area of the pump working member is larger than that of the motor.

565 Master and diverse non-pulsator drive of output member or members:
This subclass is indented under subclass 533. Apparatus providing for the driving of an output or outputs by a pulsator and also in some other way.

(1) Note. The return to its biased position of an output advanced against bias is not regarded as a diversely driven movement of the output. However, the controlled release of pressure fluid from an accumulator in driving the output is proper subject matter for this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

560, for an output driven by a pulsator driven by an external power fluid and by a separate expansible chamber fed by the power fluid.

563, for an output driven directly by motive fluid and indirectly as the slave of a master driven by the motive fluid.

SEE OR SEARCH CLASS:

100, Presses, subclasses 270+ for a reciprocating press having fluid press actuation combined with mechanical actuation.

566 Manual master and alternate nonmanual pressure fluid source feed output motor:
This subclass is indented under subclass 565. Apparatus in which a single output member is driven at one time by a motor serving as a slave of a manually operated master and at another time by the same motor supplied from another source of pressurized fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:

550, for a power driven master that is manually driven on power failure.

551, for a slave driven by a power driven master and a manual master having a common actuating lever.

555+, for a system in which the pressure produced in a slave by a manual master controls the power supply to a power master feeding the slave.

567 Including plural separately operable master actuators or master units driving a common slave:

This subclass is indented under subclass 533. Apparatus in which pulse fluid fed to a slave is supplied from separately operable masters.

SEE OR SEARCH THIS CLASS, SUBCLASS:

547, for a pulsator system having both manual and motor energy input means.

568 Having distinct means for holding a pulsator element in set position:

This subclass is indented under subclass 533. Apparatus including (1) means for mechanically securing a movable element of the system against movement or (2) a distinct valve sealing pulse fluid in an element to prevent its movement.

569 Distinct externally operable valve sealing pulse fluid in slave:

This subclass is indented under subclass 568. Apparatus in which the securing means is a separate externally operable valve that prevents flow into or out of the slave.

SEE OR SEARCH CLASS:

137, Fluid Handling, subclass 598 for a hydraulic brake line with a valve to trap a column of liquid in the line having no structure specializing the system to brakes.

188, Brakes, subclass 353 for a fluid pressure brake for a vehicle having means to trap fluid in the brake system to hold the brakes applied.

303, Fluid-Pressure and Analogous Brake Systems, subclasses 75+ for a fluid brake system having a valve for preventing release of the brakes and subclass 89 for a fluid brake system including a lock for maintaining parts in position of application or release.

570 Mechanical latch, brake or detent:

This subclass is indented under subclass 568. Apparatus including a mechanical means that engages and prevents movement of a pulsator element.

571 Double-acting slave unit or opposed slaves having a single output:

This subclass is indented under subclass 533. Apparatus including (1) a motor piston in a cylinder and a first master feeding pressure fluid to one side and a second master feeding pressure fluid to the other side of the piston, the piston moving a single device; or (2) two separate expansible chamber slave motors driven by separate master units, the separate system being so interconnected that one expansible chamber expands and the other contracts in positioning a common device.

572 Having pulse fluid pressure or quantity compensating or adjusting means:

This subclass is indented under subclass 571. Apparatus including structure (1) by which the apparatus may be adjusted to obtain a desired pressure or quantity of fluid in a part of the pulsator system; or (2) by which a compensation for a change in volume or quantity of pulsator fluid in a part of the system is made.

573 Self-acting phase balancing means acting at midpoint or end of stroke:

This subclass is indented under subclass 572. Apparatus in which the pulsator fluid in the opposed pulsators is automatically adjusted between the two during the operation of the device to cause the driving and driven members of the apparatus to stay in phase, such adjustment being accomplished by means associated with the driving or driven member that is effective as the means passes a center position or reaches the end of its stroke.

SEE OR SEARCH THIS CLASS, SUBCLASS:

543, for a programmed or self cycled pulsator having a self operated pulse fluid purge or quantity adjustment structure.

574 Automatic control of plural stage pressure generation or utilization:

This subclass is indented under subclass 533. Apparatus comprising structure of the master or slave that, responsive to the position of an element or condition of the fluid provides a shift in the rate of movement of the actuator driving the master or of the output member of the slave relative to the rate of displacement of pulse fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:

557+, for a system in which pressurizing fluid from a manual master provides the initial drive of a slave and starts a power driven master for subsequent drive of the slave.

563+, for a system in which motive fluid first drives a motor directly and subsequently drives a master that drives the slave.

565+, for an output driven successively by a master and nonmaster means.

SEE OR SEARCH CLASS:

188, Brakes, subclass 347 for a fluid brake for a road vehicle operated by a pulsator having a quick slack take-up operation followed by a slower high pressure actuation.

575 Automatic trapping of fluid back of delivery piston forms temporary pulsator driving piston during one stage:

This subclass is indented under subclass 574. Apparatus in which for one stage of operation a body of liquid is trapped back of a master piston feeding the output slave, the trapped body of liquid forming with the piston an ancillary pulsator of which the piston is the slave.

576 Of separate movement of plural delivery pistons:

This subclass is indented under subclass 574. Apparatus in which relative movement of two pistons or fluid displacers that deliver fluid toward a slave produce the staged pressure generation.

577 Central externally driven piston drives surrounding piston means through a load responsive connector:

This subclass is indented under subclass 576. Apparatus including a central piston and a second displacer unit in the form of a sleeve about the piston, the sleeve being moved by the piston through a resilient load responsive connecting means.

578 Unitarily movable displacer delivers fluid from two delivery chambers, one chamber being ineffective under high pressure delivery:

This subclass is indented under subclass 574. Apparatus in which a single movable element forms a piston means that displaces fluid from two chambers toward the slave initially and later displaced it toward the slave from only one of the chambers.

579 Slave of first master drives master of another slave:

This subclass is indented under subclass 533. Apparatus including a piston or diaphragm, fluid from a master pump acting on one side of the piston or diaphragm to move it to pressurize a separate body of pulsator fluid on the other side.

SEE OR SEARCH THIS CLASS, SUBCLASS:

562, for a system in which the master piston of one pulsator circuit drives the master piston of a paralleled circuit through a resilient, fluid, or lost motion connection.

563+, for a structure in which initially communicating bodies of fluid on opposite sides of a diaphragm or piston are separated responsive to an increase in pressure, the diaphragm or piston then acting to pressurize the separated body of pulsator fluid.

575, for a system in which a temporary pulsator formed in a master structure by the closing of a condition or position responsive valve means drives a master piston.

580 Parallel masters driven by first pulsator:
This subclass is indented under subclass 579. Apparatus including parallel diaphragms or pistons receiving pressure fluid from a common master and supplying pressure toward distinct slave units.

581 Plural structurally related master pistons, cylinders or pulsator circuits:
This subclass is indented under subclass 533. Apparatus comprising interrelated master-slave systems or a plurality of interconnected master cylinder devices.

SEE OR SEARCH THIS CLASS, SUBCLASS:
536, for plural correlated pulsators transmitting unlimited rotary input to unlimited rotary output.
539, for the programmed cam drive of plural masters.
549, for distinct pulsator circuits operated by external power fluid.
561, for a pressure balancing free piston between parallel pulsators.
562, for a tandem master.
571+, for a double acting slave or opposed slaves having a single output.
576+, for plural separately movable pistons providing plural stage pressure generation.

SEE OR SEARCH CLASS:
188, Brakes, subclass 345 for multiple master cylinders operating a specific motion retarding structure.

582 Having safety standby structure becoming operative upon apparatus malfunction:
This subclass is indented under subclass 533. Apparatus comprising normally inactive means that becomes effective upon the occurrence of a malfunction of a pulsator to ameliorate the effect of the malfunction.

SEE OR SEARCH THIS CLASS, SUBCLASS:
550, for a combined manual and power operated system having means that eases manual operation responsive to malfunction of the motor.
552, for a combined manual and power system in which the manual system becomes operative upon malfunction of the power system.
568, for a pulsator with distinct means for holding a pulsator element in a set position.

SEE OR SEARCH CLASS:
137, Fluid Handling, subclasses 456+ for a fluid system having a safety cut-off valve requiring reset.

583 Pulse fluid vessel embracing output piston and fluid displacing element:
This subclass is indented under subclass 533. Apparatus in which a master device and a slave device are incorporated in a unitary structure.

584 Having separately and manually operated structure for charging, discharging bleeding, or adjusting pulsator volume:
This subclass is indented under subclass 533. Apparatus with distinct separately and externally operated structure used in preparing, adjusting or maintaining the apparatus, such structure charging the pulsator with fluid; purging the pulsator; or removing fluid from the pulsator.

SEE OR SEARCH THIS CLASS, SUBCLASS:
572+, for a double acting slave or opposed slaves having a single output and having pulse fluid pressure or quantity compensating or adjusting means.

SEE OR SEARCH CLASS:
188, Brakes, subclass 352 for a fluid pressure brake for a vehicle having a filling or bleeding device.

585 Holder for reserve liquid feeds master:
This subclass is indented under subclass 533. Apparatus comprising a piston cylinder liquid pressurizing device having communicating

with its inlet a means holding a reserve supply of motive liquid.

SEE OR SEARCH THIS CLASS, SUBCLASS:

543, for a programmed self cycled or self pulsed device having self operated pulse fluid quantity adjustment structure.

572+, for a system including double acting or opposed slave units that drive a single output having pulse fluid pressure or quantity adjustment means.

581+, for plural master cylinder piston devices of plural pulsators fed by a common reservoir.

584, for a pulsator having separately and externally operated structure for charging, discharging or bleeding it.

592, for a pulsator having a fluid supply means, or means compensating for fluid expansion, contraction or leakage.

586 Having means to establish holding pressure in pulse liquid:

This subclass is indented under subclass 585. Apparatus in which the master cylinder device or the reserve liquid holder includes a valve, diaphragm or piston by which pressure of the liquid in the line to the slave is kept at a pressure above atmospheric even while the pressurizing structure is in its nonoperating or standby position whereby slack in the slave device is taken up and leakage of air into the pulsator is prevented.

587 Pressure maintained through inlet or piston cylinder of master:

This subclass is indented under subclass 586. Apparatus in which the above atmospheric pressure is maintained at least up to the passage by which the liquid from the reservoir is fed to the master cylinder.

588 Master piston traps liquid on advance across a feed port in cylinder wall:

This subclass is indented under subclass 585. Apparatus in which on inlet to the pulse volume of liquid from the reserve liquid holder is a part in the cylinder wall that connects the reserve liquid and the pulse liquid when the piston of the master is in its nonpressurizing position and which is traversed by the piston during its initial advance so that the port is on one side of the piston and the pulse liquid on the other during pressurization.

589 Master piston or its actuator mechanically operates valve between holder and master cylinder:

This subclass is indented under subclass 585. Apparatus with a cut-off valve controlling flow between the reserve supply holder and the cylinder of the master that is mechanically opened or closed by the movement of the working member of the master or by a connection to the means driving the working member.

590 Condition responsive device limits return flow from biased slave:

This subclass is indented under subclass 533. Apparatus including structure between the master and slave that (1) stops flow from slave toward the master after a measured quantity has been forced from the slave by the bias or (2) stops flow from the slave when the discharge pressure produced by the bias has dropped to a predetermined value.

SEE OR SEARCH THIS CLASS, SUBCLASS:

586+, for means associated with a master reservoir assembly establishing a standby pressure in the pulsator fluid.

SEE OR SEARCH CLASS:

137, Fluid Handling, subclass 493 for a bidirectional line condition responsive valve of general utility and subclass 598 for a valve, per se, disclosed as in a brake line.

188, Brakes, subclass 351 for a fluid pressure operated brake having a hydraulic automatic slack adjustor.

303, Fluid-Pressure and Analogous Brake Systems, subclasses 81+ for a system distributing fluid to brakes having means controlling the release of pressure.

591 Having valve, director, or restrictor in pulse fluid flow path:

This subclass is indented under subclass 533. Apparatus with distinct valve or restrictor structure in the flow path between the master and slave controlling the rate of flow of the pulse fluid or controlling flow between pas-

sages in the flow path to establish a rate of movement of the slave or to control or relieve pressure in the apparatus.

SEE OR SEARCH THIS CLASS, SUBCLASS:

569, for a pulsator having a valve in the flow line for maintaining the position of a slave by sealing pulse fluid in the slave.

590, for a device limiting the return flow of pulse fluid from a spring biased slave.

SEE OR SEARCH CLASS:

137, Fluid Handling, subclasses 455+ for a line condition responsive valve, per se; and subclass 561 for a fluid handling system of general utility.

188, Brakes, subclasses 297+, for an internal resistance motion retarder comprising a resistance means retarding flow between two chambers to dampen motion (e.g., shock absorber, dashpot, etc.).

303, Fluid-Pressure and Analogous Brake Systems, appropriate subclass for a valve, per se, or in combination with a nominal slave specialized for use in distributing fluid between branches in a brake system.

592 Having, surge chamber, fluid supply means, or means compensating for fluid expansion, contraction or leakage:

This subclass is indented under subclass 533. Apparatus (1) with structure by which a change in volume of the pulsator fluid is accommodated by addition of fluid, by relieving or absorbing expansion, by means following contraction; (2) with a reservoir for receiving fluid from or supplying it to a pulsator; or (3) having a fluid supply structure.

SEE OR SEARCH THIS CLASS, SUBCLASS:

542, for pneumatic self cycled pulsator having pulse air bleed or supply means.

543, for a self cycled pulsator with a self operated pulse fluid purge or quantity adjustment structure.

572+, for a double acting output motor or opposed motor units having pulse fluid pressure or quantity adjusting means.

584, for a pulsator having separately and externally operated structure for charging, discharging or bleeding it.

585+, for a master device combined with a liquid reservoir feeding liquid to the master.

593 Having fluid motor driving piston of master unit:

This subclass is indented under subclass 533. Apparatus wherein a master cylinder working member is actuated by a rotary motor or an expansible chamber driven by a fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:

537+, for a self-cycled or self pulsed device.

545, for a pulsator having electrically operated structure (e.g., electrical motor, etc.).

547+, for a master powered by a motor driven by an external fluid and having manual or automatic means controlling the external fluid.

579+, for a system in which the master of one pulsator is driven by the slave of a second pulsator.

594 Having cam, or lever system driving master:

This subclass is indented under subclass 533. Apparatus in which the piston of a master cylinder is driven through a mechanical linkage or lever system, or by a cam.

SEE OR SEARCH THIS CLASS, SUBCLASS:

539, for a self cycling system having a cam drive of plural masters.

550, for a power control lever that drives a master on power failure and having means adjusting the lever throw or pump resistance responsive to power failure.

595 INTERNAL COMBUSTION TYPE FREE PISTON DEVICE SUPPLIES MOTIVE FLUID TO MOTOR:

This subclass is indented under the class definition. Apparatus comprising an internal combustion free piston device that produces pressurized fluid and a fluid motor operated by the pressurized fluid.

SEE OR SEARCH CLASS:

123, Internal-Combustion Engines, subclass 46 for a free piston internal combustion device, per se.

596 INTERNAL COMBUSTION TYPE FREE PISTON DEVICE WITH PRESSURE FLUID STARTING MEANS:

This subclass is indented under the class definition. Apparatus comprising a device operable as a free piston internal combustion device having provision by which it may be driven by compressed elastic fluid for starting it in operation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

595, for a free piston device the exhaust of which drives a motor.

597 FLUID MOTOR MEANS DRIVEN BY WASTE HEAT OR BY EXHAUST ENERGY FROM INTERNAL COMBUSTION ENGINE:

This subclass is indented under the class definition. Apparatus comprising the combustion of (1) an internal combustion engine of the type where fuel is burned in an expansible working chamber means, said engine may or may not do work other than to produce combustion products; and (2) a fluid actuated motor means actuated in whole or in part by (a) motive fluid comprising said combustion products, or (b) motive fluid generated by said combustion products or by other energy which is unused to do work but which is exhausted or otherwise lost by said engine.

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.01+, for expansible or nonexpansible chamber type combustion products generators, per se, and in combination with fluid motors activated by the products of combustion generated in the combustion products generator.

200+, for the combination of nonexpansible chamber and expansible chamber combustion products generators and reaction motors (jet).

595, for fluid motor supplied with motive fluid by an internal combustion type piston device.

SEE OR SEARCH CLASS:

123, Internal-Combustion Engines, for piston free internal combustion engines, per se.

188, Brakes, subclass 154, for fluid pressure operated brakes in which the operating fluid is obtained from the exhaust of an internal combustion or other vapor engine.

417, Pumps, subclasses 236+, for fluid motors which may be converted to pumps and which may be motivated by energy of the exhaust combustion products of an internal combustion engine.

598 With supercharging means for engine:

This subclass is indented under subclass 597. Apparatus, having means to pressurize the oxidant charge for the internal combustion engine prior to its introduction into the combustion chamber of said engine.

SEE OR SEARCH CLASS:

123, Internal Combustion Engines, subclasses 568.11+, for internal combustion engines having superchargers driven directly through mechanical means by the output shaft of the internal combustion engine or by any means other than the exhaust gases after they have left the internal combustion engine.

599 With means to change temperature of supercharged flow:

This subclass is indented under subclass 598. Apparatus, having heat exchange structure or control means therefor to vary the temperature of the pressurizing oxidant supply for the internal combustion engine.

600 With condition responsive valve means to control supercharged flow and exhaust products:

This subclass is indented under subclass 598. Apparatus, wherein the internal combustion engine oxidant pressurizing means is driven by a fluid motor activated by the exhaust from an internal combustion engine, and wherein condition responsive valve means are provided to control both the exhaust flow from the internal

combustion engine and the pressurized oxidant flow.

SEE OR SEARCH THIS CLASS, SUBCLASS:

606, for apparatus having means to introduce other fluids into the ICE exhaust stream.

601 With coordinated engine fuel control:

This subclass is indented under subclass 600. Apparatus, wherein a fuel control means other than the cyclic control means for the internal combustion engine is coordinated with the means to control the oxidant flow and/or the internal combustion engine exhaust flow.

(1) Note. Included in this subclass are devices having means to vary supercharger speed resulting in a change in intake manifold pressure which in turn determines fuel flow.

602 Having condition responsive valve controlling engine exhaust flow:

This subclass is indented under subclass 598. Apparatus, having condition responsive valve control means to control the flow of exhaust combustion products between the internal combustion engine means and the fluid motor.

(1) Note. A cyclic internal combustion engine exhaust valve is considered a control valve for this subclass if condition responsive means are provided to vary the timing of the cyclic operation of said valve.

SEE OR SEARCH THIS CLASS, SUBCLASS:

615, for a nonsupercharged internal combustion engines in combination with an exhaust gas driven fluid motor having condition responsive means to control the exhaust gas from the combustion engine.

603 With coordinated fuel control means for engine:

This subclass is indented under subclass 602. Apparatus, with condition responsive means for noncyclic control of the fuel flow for the internal combustion engine.

(1) Note. Included in this subclass are devices having means to vary supercharger speed resulting in a change in intake manifold pressure which in turn determines fuel flow.

604 With heat exchanger to transfer energy from engine exhaust to motive fluid for motor:

This subclass is indented under subclass 598. Apparatus, wherein a motive fluid, not the engine exhaust, that drives the supercharger is generated in a device employing the heat energy of the exhaust from engine as its source of energy.

SEE OR SEARCH THIS CLASS, SUBCLASS:

616, for a motor of general utility driven by a motive fluid generated by the heat energy of the exhaust from an ICE.

605.1 Supercharging means driven by engine exhaust actuated motor:

This subclass is indented under subclass 598. Apparatus wherein the means pressurizing the oxidant for the internal combustion engine is driven at least in part by a motor which employs, as motive fluid, the exhaust from the internal combustion engine.

(1) Note. This subclass includes devices having means to increase the energy in the ICE exhaust products, e.g., by introducing fuel in said exhaust to be burned therein.

605.2 With exhaust gas recirculation:

This subclass is indented under subclass 605.1. Apparatus in which part of the combustion products exhausted from the engine are returned to the engine combustion chamber for subsequent reburning.

SEE OR SEARCH CLASS:

123, Internal-Combustion Engines, subclasses 568.11+ for nonsupercharged internal combustion engines having exhaust gas recirculation.

605.3 With motor bearing lubrication or cooling:
This subclass is indented under subclass 605.1. Apparatus in which a cooling or lubricating fluid is supplied to the motor bearings.

606 With means to provide additional motive fluid for motor:
This subclass is indented under subclass 605. Apparatus, in which a nonexhaust fluid is supplied separately or mixed with the exhaust products to a motor driving a supercharger.

607 With additional drive means for supercharging means:
This subclass is indented under subclass 605. Apparatus, in which a single unitary oxidant pressurizing pump is driven by a motor of one type operated by the exhaust of the engine and by (1) a second motor of another type; (2) a second motor of the same type operated by a different fluid or energy or energy source; or (3) by a mechanical drive from the engine.

608 With condition responsive drive means control:
This subclass is indented under subclass 607. Apparatus, wherein the internal combustion engine exhaust driven fluid motor may assume a larger proportion of the load of the means pressurizing said oxidant than the diverse drive means actuating the oxidant pressurizing means in response to a second condition.

(1) Note. This load assumption may be produced by an over riding clutch which in effect senses the relative speed of the ICE vs. the auxiliary drive means for the supercharger or the load may be assumed or dropped responsive to a particular ICE temperature or pressure, etc.

609 Fluid motor and engine each drive at least one means to supercharge the engine:
This subclass is indented under subclass 605. Apparatus, having one oxidant pressuring means driven mechanically or directly by the internal combustion engine being supplied the pressurized oxidant, and another oxidant pressurizing means actuated by a fluid motor motivated by the exhaust from said internal combustion engine.

610 Supercharging means convertible from series to parallel:
This subclass is indented under subclass 609. Apparatus, wherein at least two of the plural pressurizing means are arranged either in series or in parallel one with the other and have means whereby they may be rearranged from their original relationship to cooperate in another of said arrangements.

611 Having condition responsive means to control supercharged flow to engine:
This subclass is indented under subclass 605. Apparatus , having means to control the quantitative flow of the pressurized oxidant in response to a sensed condition.

(1) Note. Internal combustion engine cyclic or fuel control means are included herein when the operation of said control means is varied in response to a sensed variable condition.

(2) Note. Flow of the supercharged flow may be by means of controlled valving or by means bleeding off a portion thereof after leaving the compressor or by controlling the inflow to the compressor.

SEE OR SEARCH THIS CLASS, SUBCLASS:
608, for condition responsive means to control one of a plurality of means to drive a supercharger to create a desired supercharge flow rate.

612 Plural superchargers:
This subclass is indented under subclass 605. Apparatus, wherein more than a single unitary means is provided to pressurize the oxidant charge for the internal combustion engine, at least one of said means being motivated by exhaust energy from the internal combustion engine.

613 With means to store combustion products prior to entry into fluid motor means:
This subclass is indented under subclass 597. Apparatus, wherein an a accumulator is utilized to temporarily store the combustion products discharged from the internal combustion

engine, before said products enter said motor means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

281, for an internal combustion engine with structure that collects and stores exhaust gas or uses it as a pressure fluid source.

614 Having fluid motor motive fluid treating, controlling or conditioning means:

This subclass is indented under subclass 597. Apparatus, with structure by which motive fluid for the motor is generated, cleaned, mixed, separated, heated, cooled, controlled or electrically treated.

SEE OR SEARCH THIS CLASS, SUBCLASS:

272, for an internal combustion engine with treatment or handling of the exhaust gas but not having a fluid motor driven by energy of the exhaust.

615 Having condition responsive control of motive fluid:

This subclass is indented under subclass 614. Apparatus wherein the flow rate, pressure, temperature or composition of the motive fluid for the fluid motor means is changed in response to some sensed condition.

616 Having means to transfer heat energy between engine exhaust and motive fluid for fluid motor:

This subclass is indented under subclass 614. Apparatus, wherein the motive fluid for the fluid motor is generated, heated, or cooled in a heat exchange which employs, as its source of energy, the exhaust energy from the associated internal combustion engine or other waste heat from the engine.

SEE OR SEARCH THIS CLASS, SUBCLASS:

604, for a fluid motor in which heat from the exhaust of an internal combustion engine generates the motive fluid, the motor driving a pump supercharging the engine.

617 And having means to add fluid to motive fluid:

This subclass is indented under subclass 616. Apparatus, having additional means by which a gas, liquid or vaporized liquid is added to the motive fluid for the fluid motor prior to its admission into the fluid motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

619, for fluid motors motivated by the exhaust combustion products of an internal combustion engine having means to introduce a diverse fluid to the products.

618 Motive fluid is vaporized liquid:

This subclass is indented under subclass 616. Apparatus, wherein the motive fluid for the fluid motor is a vapor from a liquid.

619 Having means to add a diverse fluid to combustion products:

This subclass is indented under subclass 614. Apparatus, having means by which a fluid which is unlike the combustion products is mixed with the combustion products prior to entry into the fluid motor, said fluid, where mixed, not acting as fuel or oxidizer.

SEE OR SEARCH THIS CLASS, SUBCLASS:

617, for fluid motors having means to transfer the heat of the combustion products exhausted from an internal combustion engine to the motive fluid for said motor as well as means to introduce a diverse fluid into said motive fluid.

620 Fluid motor means is expansible chamber type with movable parts of motor and engine being interconnected:

This subclass is indented under subclass 597. Apparatus, wherein the internal combustion engine, and the other of said motor means each has at least one working member and the working members of the diverse motors are mechanically interconnected.

621 Movable wall portions are rigidly interconnected:
This subclass is indented under subclass 620. Apparatus, in which the mechanically interconnected working members comprise rigidly interconnected pistons or diaphragms.

622 Expansible chamber of fluid motor means receives exhaust alternately from two or more expansible chambers of engine means:
This subclass is indented under subclass 620. Apparatus, wherein the pressurized fluid actuated motor is charged with pressurized combustion products successively from a plurality of internal combustion engines, combustion chambers, (e.g.), the exhaust from each cylinder of an ICE is fed directly to the fluid motor.

623 Fluid motor is rotary type:
This subclass is indented under subclass 620. Apparatus, wherein the fluid actuated motor is of the rotary expansible chamber type.

624 Fluid motor means is a turbine with output means mechanically interconnected with internal combustion engine output:
This subclass is indented under subclass 597. Apparatus, in which the fluid motor is an impulse type motor actuated by the impact of the motive fluid against a working member which is mechanically interconnected with the output means of the internal combustion engine.

625 INTERNAL COMBUSTION ENGINE WITH STRUCTURE ROTATING OR STARTING IT BY PRESSURE FLUID:
This subclass is indented under the class definition. Apparatus comprising an internal combustion engine with ancillary structure for supplying pressure fluid other than the combustible charge to the expansible chamber of the engine to bring the engine from rest to a speed at which it operates as an internal combustion engine or with an ancillary fluid motor that functions to bring the engine from rest up to operating speed.

SEE OR SEARCH THIS CLASS, SUBCLASS:

712, for a motor operating on a cycle combining internal combustion and pressure fluid source energization or that is convertible to be either an internal combustion engine or a fluid motor driven by motive fluid from a pressure fluid source.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclass 53, for a disengageable fluid motor for turning or starting the rotary shaft of a no more than nominally recited engine.

123, Internal-Combustion Engines, subclasses 179.1+, for an internal combustion engine with means for starting it from rest mechanically or by modified internal combustion.

290, Prime-Mover Dynamo Plants, subclasses 31+, for a prime-mover dynamo plant including a dynamo electric machine which acts as a motor for starting the prime mover and as a generator; subclasses 36+, for a prime-mover plant having a separate generator and an electric starting motor; and subclass 48, for a plant comprising an internal combustion engine and having an electrical starting motor.

320, Electricity: Battery or Capacitor Charging or Discharging, subclass 63, for a battery charging generator used as a starting motor.

417, Pumps, subclass 323, for a pump system in which the pump is started by a motor driven by pump fluid.

626 Having means for compressing, generating or storing pressure fluid:
This subclass is indented under subclass 625. Apparatus, including a motive fluid compressor, generator, or storage vessel.

627 Having condition responsive control of means:
This subclass is indented under subclass 626. Apparatus, in which structure by which fluid for use in the motor is energized or collected, the condition sensor controlling the storage or energization means.

628 Storage vessel charged by internal combustion engine acting as a pump:

This subclass is indented under subclass 626. Apparatus, including a vessel for receiving and storing motive fluid from an internal combustion engine cylinder converted to act as a pump.

SEE OR SEARCH CLASS:

417, Pumps, subclass 237, for an internal combustion engine one cylinder of which is convertible to be a pump.

629 Pressure fluid motor convertible to pressure fluid pump:

This subclass is indented under subclass 626. Apparatus, including an internal combustion device and a separate expansible chamber device by which it can be set to operate as an expansible chamber motor to drive the output of the apparatus or as a compressor driven by the internal combustion elements of the apparatus.

SEE OR SEARCH CLASS:

417, Pumps, subclass 324, for a pump operated as a motor to start a nominal recited prime mover.

630 Having manual selector of engine valve settings or of fluid flow branches:

This subclass is indented under subclass 625. Apparatus, having manually settable valve means for the control of the flow of either the fuel and/or pressurized fluid to the working chamber means for the rotation of the working member means.

631 Including means selecting direction of engine rotation:

This subclass is indented under subclass 630. Apparatus, in which the valve means can be selectively set to provide for clockwise or counterclockwise rotation of the motor shaft.

632 ONE SHOT EXPLOSION ACTUATED EXPANSIBLE CHAMBER TYPE MOTOR:

This subclass is indented under the class definition. Noncyclic motor in which pressure fluid resulting from an explosion of a fuel charge within or in direct communication with the working chamber of an expansible chamber type motor during the explosion produces a single power stroke of the output member of the motor.

(1) Note. To be considered a motor under this definition, the member moved by the explosion produced pressure fluid must, at least by disclosure, remain after being so moved, as a part of the motor. Devices in which the member moved by the pressure fluid is ejected or projected from the rest of the device, so as to become detached therefrom are not included as motors under this definition. (See such classes as Class 42, Firearms, and Class 89, Ordnance).

(2) Note. To be considered in direct communication with the motor working chamber, the explosion must occur within an enclosed space or chamber having, at the instant of explosion, an open fluid flow path to the motor working chamber so that the explosion produced pressure fluid may act immediately on the motor working member. The fluid flow path between explosion chamber and motor working chamber may include a transfer valve, providing such valve is opened at the instant of explosion or prior thereto.

(3) Note. Motors under this definition are limited to motors of the type specified, alone, or in combination with their pressure fluid producing means, which are incapable of causing a repetition of the pressure fluid producing explosion, or cyclic operation of the motor, without an intervening operation of some part of the motor or some part of the pressure fluid producing means by a nonperiodic force which is neither produced nor controlled by the explosion or by operation of the motor. Such motors or combinations may include means for holding plural fuel charges and/or means to place the motor and/or fluid producing means in condition for a subsequent operation.

(4) Note. Power plants of more comprehensive nature than specified in (3) Note above, and which include as a subcombination thereof a motor of the type

included under this definition, will be classified in other appropriate subclasses of this class on the basis of the features of the more comprehensive power plant.

(5) Note. Combinations in which explosive actuated motors of the type included under this definition act as the power means for operating particular art devices are classified with the various art devices, if any significant features of the art device are claimed. Generally, a load device for the motor, claimed by name only, will not exclude a patent from classification under this definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

253, for a reaction motor driven by a charge of solid propellant, subclass 39.47, for a motor using combustion products from a solid charge or motive fluid; and subclass 415, for a pressure accumulator energized by a gas pump or external gas supply.

SEE OR SEARCH CLASS:

29, Metal Working, subclasses 254+, for explosion operated pullers or pushers in assembling or disassembling apparatus.

42, Firearms, appropriate subclass for a device in which the member moved by the pressure fluid is projected so as to become detached therefrom.

89, Ordnance, subclasses 1.51+, for a device for discharging a bomb, plane, or signal device from an aircraft; and subclass 1.818, for a rocket launcher using an auxiliary rocket launching charge.

102, Ammunition and Explosives, subclasses 530+, for blank cartridges for generating a gas.

123, Internal-Combustion Engines, subclass 24, for a cycling engine using an explosive solid substance; and subclass 183, for a starting device for an internal combustion engine in which gases resulting from a gum powder explosion act upon the working piston of the apparatus to provide a starting force for the engine.

149, Explosive and Thermic Compositions or Charges, appropriate subclass for explosive compositions, per se.

166, Wells, subclass 63, and the search there noted for explosive devices in wells.

175, Boring or Penetrating the Earth, subclasses 2+, for devices or methods of boring by below ground explosions and including a device for firing a bullet or exploding a shaped charge in an inaccessible bore to penetrate the earth formation or to perforate or cut a tubular casing or other wall member in the bore.

227, Elongated-Member-Driving Apparatus, subclasses 8 and 9+, for apparatus for driving a member, e.g., stud, by fluid pressure generated by an explosion.

633 Having means for feeding fluid fuel:

This subclass is indented under subclass 632. Apparatus, with structure by which fluid to form the explosive charge is fed to a combustion chamber of the apparatus.

634 Having plural charge holding means:

This subclass is indented under subclass 632. Apparatus, including means to hold plural separately explodable fuel charges in exploding positions, or which includes means to hold plural unit fuel charges and to move them successively into exploding position.

635 Having mechanical means securing working member in fired position:

This subclass is indented under subclass 632. Apparatus, having structure with which the working member of the motor becomes engaged when it reaches its fired position and which holds the working member in its fired position.

636 Having latch, rupture or safety means resisting movement of working member or firing means from unfired position:

This subclass is indented under subclass 632. Apparatus, with means positively preventing movement of the working member of the motor or of the firing mechanism, the member being movable only after the deformation or rupture of a destructible element, the release of a latch or the deactivation of a safety device.

637 Having orifice or conduit restricting flow of combustion products from combustion zone to motor chamber:

This subclass is indented under subclass 632. Apparatus, in which the charge burns in a zone separated from the expansible chamber of the motor, the combustion products flowing through a restricted conduit or orifice from the zone to the chamber.

638 Having shock absorbing, damping or slow down means for working member:

This subclass is indented under subclass 632. Apparatus, with a structure (1) ameliorating or suppressing the effects of shock or vibration (2) damping the movement of the working member or (3) providing a cushioned slow-down of the working member.

639 MOTOR ACTUATED BY ACCUMULATING AND DUMPING LIQUID OR FLUENT MATERIAL:

This subclass is indented under the class definition. Apparatus wherein the motor comprises movable means for accumulating and discharging a quantity of fluent material or a volume of liquid material from a flowing stream of the material which means moves under the influence of gravity in response to a predetermined accumulation of material from a first accumulating position to a second discharge position to provide power and in which a surface of such accumulation is open to the atmosphere during movement of the movable means.

(1) Note. The subcombination in a metering device of accumulating means of the type noted above is included in this subclass if the meter is not claimed but merely disclosed.

SEE OR SEARCH CLASS:

185, Motors: Spring, Weight, or Animal Powered, subclasses 27+ for a motor in which kinetic energy is derived from the movement of a mass by virtue of the effect of gravity.

640 Rocking member having opposite accumulating means:

This subclass is indented under subclass 639. Apparatus, in which the movable means comprises a pivoted member supporting a pair of accumulating means spaced on opposite sides of the point about which the member pivots and each such means is supplied with the material independently of the other.

SEE OR SEARCH CLASS:

177, Weighing Scales, subclasses 94+, for an automatic weighing scale in which an oscillating structure carries weight chambers that alternately accumulate and dumps fluid or liquid material.

641.1 UTILIZING NATURAL HEAT:

This subclass is indented under the class definition. Subject matter operating by means of heat evolved from natural sources, such as from the sun, air, water, earth, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:

398, for a power system including a pressure fluid source and motor utilizing natural energy other than heat.

495, for a motor having a buoyant working member, a tide or wave motor, for example.

SEE OR SEARCH CLASS:

126, Stoves and Furnaces, subclasses 561+, 569+, and 714 for a solar heater, per se.

136, Batteries: Thermoelectric and Photoelectric, subclass 206 for a solar energy type of electrical generator.

165, Heat Exchange, subclass 45 for a heat exchanger related to the earth or sun.

641.11 With elevated structure:

This subclass is indented under subclass 641.8. Apparatus in which the motor or power plant operates at least in part by energy derived either from a substance confined or constrained to move in a desired path by a significant vertically extending man-made structure (e.g., house, chimney, etc.) or from a solar heat receptor mounted on such structure.

641.12 Air is working fluid:

This subclass is indented under subclass 641.11. Apparatus wherein the substance is air.

641.13 With single state working substance:
This subclass is indented under subclass 641.8. Apparatus wherein the heat heats a substance (solid or liquid) for producing work, the substance remaining in its solid or fluid state at all times.

641.14 Gaseous:
This subclass is indented under subclass 641.13. Apparatus wherein the substance is either air or gas.

641.15 With solar concentration:
This subclass is indented under subclass 641.8. Apparatus provided with significant solar ray focusing means.

641.2 Geothermal:
This subclass is indented under subclass 641.1. Apparatus wherein the heat is evolved from the earth's interior.

641.3 With direct fluid contact:
This subclass is indented under subclass 641.2. Apparatus wherein the heat of geothermal fluid is transferred to a working fluid by the physical contact of the two fluids (e.g., direct contact heat exchange).

641.4 With deep well turbopump:
This subclass is indented under subclass 641.2. Apparatus wherein the heat is delivered to the earth's surface by a subsurface turbine-driven pumping unit.

641.5 With fluid flashing:
This subclass is indented under subclass 641.2. Apparatus in which a controlled, pressurized fluid having heat is at least partially vaporized (flashed) upon a controlled reduction of pressure at the earth's surface.

641.6 With natural temperature differential:
This subclass is indented under subclass 641.1. Apparatus in which power is generated as a result of a variance in temperature occurring naturally from two distinct geographical locations.

(1) Note. Devices such as “drinking birds” are here classified.

641.7 Ocean thermal energy conversion (OTEC):
This subclass is indented under subclass 641.6. Apparatus wherein the geographical location is a large (e.g., sea, ocean) body of water.

641.8 Solar:
This subclass is indented under subclass 641.1. Apparatus wherein the source of heat is the sun.

641.9 With distillation:
This subclass is indented under subclass 641.8. Apparatus wherein solar heat is used to heat a mixture for separating a more volatile part from at least one other part.

642 MOTIVE STEAM GENERATED FROM HOT WATER CHARGE BY REDUCING PRESSURE ABOVE CHARGE:
This subclass is indented under the class definition. Subject matter operated by steam from a receptacle charged with hot water under pressure, as distinguished from those in which pressure is generated within a boiler by the application of heat.

(1) Note. The charge of this subclass must come from an external supply and not be that collected in storage vessel or accumulator permanently a part of a heat operated plant to accommodate fluctuations in demand. For this subject matter see subclasses 652 and 659.

643 MOTIVE FLUID ENERGIZED BY EXTERNALLY APPLIED HEAT:
This subclass is indented under the class definition. Subject matter comprising (1) apparatus having (a) means to cause motive fluid to be increased in energy by the indirect addition of heat thereto and (b) a motor which is actuated by said motive fluid; and (2) a method of operating such apparatus.

SEE OR SEARCH THIS CLASS, SUBCLASS:

616+, for a fluid motor the motive fluid for which has been energized by the heat of the exhaust of an internal combustion engine; subclasses 39.18 and 39.19, for multiple fluid operated motors, one operated by combustion products and another one operated by

a different fluid generally energized by heat exchange with the combustion products in the first motor; subclass 641, for a heat operated power system where the source of energy is natural heat; subclasses 516+, for a motor operated by the expansion and/or contraction of a unit of mass of motivating medium; and subclasses 508+, for a motor operated by the heating or cooling of a fluid within an expansible chamber.

SEE OR SEARCH CLASS:

136, Batteries: Thermoelectric and Photoelectric, subclasses 200+, for the direct development of electrical power from indirectly applied heat.

644.1 Heating motive fluid by nuclear energy:

This subclass is indented under subclass 643. Subject matter in which externally applied heat is obtained from a radioactive decay or indirectly from a nuclear reactor.

(1) Note. Class 376 provides for all patents involving a nuclear reactor which is more than nominally recited, e.g., by reciting details of the reactor core or by reciting a coolant as flowing through the nuclear reactor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

203.1, for a reaction motor energized by electric, radioactive decay, or radiated energy fluid heating means.

SEE OR SEARCH CLASS:

376, Induced Nuclear Reactions: Processes, Systems, and Elements, subclasses 317+ for a nuclear reactor wherein steam is conducted exterior of the reactor and used in a heat exchanger or power-producing means.

645 Process of power production or system operation:

This subclass is indented under subclass 643. Process, involving steps performed in operating a power plant having motive fluid energized by indirectly applied heat.

646 Including start up, shut down, cleaning, protective or maintenance procedure:

This subclass is indented under subclass 645. Process, including a manipulation that (1) puts a nonoperating power producer into operation; (2) that takes an operating power producer out of operation; (3) maintains a power producer in a nonoperating state but in condition for a rapid start; (4) protects the apparatus from damage; or (5) maintains it in operating condition as by cleaning or purging.

SEE OR SEARCH THIS CLASS, SUBCLASS:

656, for apparatus energized by externally applied heat having ancillary structure for starting; and subclasses 657+, for a heat operated apparatus having cleaning, sealing, lubricating, purging, standby or protecting feature.

647 Including operating at or above critical pressure:

This subclass is indented under subclass 645. Process, in which motive fluid in the course of power production reaches a pressure at or above that at which its vapor and liquid have the same density (i.e., critical pressure).

648 Including production of withdrawable product or steam for external use:

This subclass is indented under subclass 645. Process, including a step of withdrawing steam or other product for delivery out of the plant to external use or preparing it for such use.

649 Including mixing or separating materials of different chemical compositions in a motive fluid flow path:

This subclass is indented under subclass 645. Process, in which the motive fluid material of the plant comprises two materials of different chemical composition that are brought together or separated in the apparatus.

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.01, for a system in which mixed materials are combusted outside of a motor and the combustion products used directly as motive fluid in a motor; and subclasses 682+, for a power system

energized by externally applied heat using a single state motive fluid.

SEE OR SEARCH CLASS:

123, Internal-Combustion Engines, appropriate subclass for a motor in which mixed materials are burned within an expansible chamber and directly expanded to drive the motor.

650 Producing power by heating and cooling a single phase fluid:

This subclass is indented under subclass 645. Process, in which a liquid or gas has its pressure or volume increased by the addition of heat and reduced by the removal of heat, the pressure or volume increment being used to produce mechanical work and the gas or liquid remaining as such throughout the procedure.

SEE OR SEARCH THIS CLASS, SUBCLASS:

517+, for a motor operated by the expansion and contraction of a unit mass of gas; subclass 530, for a motor operated by the expansion and contraction of a unit mass of liquid; and subclasses 682+, for a power apparatus actuated by externally applied heat using a single state motive fluid.

651 Including vaporizing a motive fluid other than water:

This subclass is indented under subclass 645. Process, in which a motive fluid other than water or steam is changed from a liquid to a vapor in the power producing operation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

671+, for a power apparatus energized by indirectly applied heat using a motive fluid that is or includes a material other than steam or water.

652 Of accommodating, fluctuating or peak loads:

This subclass is indented under subclass 645. Process, including a procedure (1) by which the system may be temporarily made to produce power at a rate above its normal capacity; (2) by which a temporary excess of energy is stored for subsequent release; or (3) by which the operation of the system is varied as the load fluctuates to accommodate it to the load.

SEE OR SEARCH THIS CLASS, SUBCLASS:

659, for a heat operated power system having structure for the temporary storage of energy in the form of heat, steam or compressed gas; and subclasses 660+, for the automatic control of a heat operated power system.

653 Including superheating, desuperheating, or reheating:

This subclass is indented under subclass 645. Process, in which heat is added to or removed from motive fluid after it has been generated or partially expanded to condition it for feed to a motor or motor stage.

654 Including mingling motor exhaust steam with boiler feed water:

This subclass is indented under subclass 645. Process, including a power producing procedure in which the motive vapor exhausting from a motor is mingled with a stream of water being advanced toward the vapor generator.

655 Noncommunicating heat transferring motive fluid system (e.g., cascade, etc.):

This subclass is indented under subclass 643. Apparatus, in which one motor is supplied with motive fluid energized by a second hot motive fluid driving a second motor, the motive fluids of the two motors being held separate at all times.

SEE OR SEARCH THIS CLASS, SUBCLASS:

616+, for an internal combustion engine heating motive fluid motor; and subclass 39.18, for a power plant in which combustion products operate one motor and a different fluid heated by the combustion products operates a second motor.

656 Having ancillary structure for starting:

This subclass is indented under subclass 643. Apparatus, having structure the sole function of which is to start operation of the system.

SEE OR SEARCH THIS CLASS, SUBCLASS:

646, for a heat operated power plant having a particular startup, shutdown, protective or maintenance procedure.

657 Having apparatus cleaning, sealing, lubricating, purging, standby, or protecting feature:

This subclass is indented under subclass 643. Apparatus, having as perfecting features structure by which (1) the apparatus is cleaned, (2) unwanted fluids are discharged from the system (3) the system is lubricated (4) the apparatus is held on standby for ease of restarting; or (5) the apparatus is protected from damage.

SEE OR SEARCH THIS CLASS, SUBCLASS:

645+, for a process of operating a heat energized power plant including a startup, shutdown, cleaning, protective or maintenance procedure.

SEE OR SEARCH CLASS:

122, Liquid Heaters and Vaporizers, subclasses 379+, for a boiler with cleaning structure; and subclasses 504+, for a boiler having safety devices.

184, Lubrication, appropriate subclass for a lubrication system, per se.

236, Automatic Temperature and Humidity Regulation, subclass 21, for a safety cutout for a closed fluid heater.

415, Rotary Kinetic Fluid Motors or Pumps, subclasses 110+, for a turbine having a lubricating, sealing, packing or bearing means with an internal working fluid connection.

658 Damage to heat receiving element prevented by automatic means maintaining minimum flow:

This subclass is indented under subclass 657. Apparatus, in which damage to an element exposed to a high temperature heat source is prevented by condition responsive means that insures a sufficient flow of heat removing fluid through the element.

659 Including heat, steam, or compressed gas storage means:

This subclass is indented under subclass 643. Apparatus, having structure by which motive fluid heat to be supplied to the motive fluid, or compressed gas is temporarily collected and stored for later use.

SEE OR SEARCH THIS CLASS, SUBCLASS:

652, for a heat operated power producing process with provision for the accommodation of fluctuating or peak loads.

660 Having condition responsive control:

This subclass is indented under subclass 643. Apparatus, including a means sensing an external condition or a condition of the system and controlling the system.

SEE OR SEARCH THIS CLASS, SUBCLASS:

658, for apparatus in which damage to a heat receiving element is prevented by automatic means maintaining at least a minimum rate of flow.

661 Of or by heat rejecting means or its bypass:

This subclass is indented under subclass 660. Apparatus, in which the control is by a means (1) sensing the condition of the fluid by which heat is removed from the system, (2) of a means controlling the flow of the fluid or (3) of a by-pass modifying the amount of heat transferred to the fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:

686, for a motor having an exhaust treating means with a condition responsive control of the exhaust structure or the exhaust condition.

662 Involving feed from source means to separate motor stages or utilizing means:

This subclass is indented under subclass 660. Apparatus, including two motors or motor stages and in which motive fluid is fed from the same source or separate sources of energized fluid separately to the two motors or motor stages.

663 Of branched feed to, condition of, or heating means for motive fluid between motor stages:
This subclass is indented under subclass 661. Apparatus, including a means treating fluid discharged from one motor and flowing to another; the control being of a reheater the heat condition of or of the addition of a quantity of fluid to the stream of motive fluid discharged from a first motor flowing toward a second motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:
667, for an automatically controlled boiler feed heater that may be heated by steam extracted between motor stages.

664 Of or by heat source material or element:
This subclass is indented under subclass 660. Apparatus, in which (1) a control element of the heat input is actuated by response to a change of a sensed condition, (2) the condition of a heat source material is controlled or (3) a means sensing a condition of the heat source or heat source material controls the apparatus.

SEE OR SEARCH CLASS:
431, Combustion, subclasses 18+, for the automatic control of combustion apparatus, per se.

665 And of or by boiler liquid level or feed:
This subclass is indented under subclass 664. Apparatus, including means varying or modifying the action of heat supply structure and also means regulating the supply of motive liquid to or quantity of liquid and vaporizing structure.

SEE OR SEARCH CLASS:
122, Liquid Heaters and Vaporizers, subclasses 448.1, and 449, for the automatic regulation of boiler fuel and feed.
236, Automatic Temperature and Humidity Regulation, subclass 14, for the automatic temperature regulation of the condition of a boiler and a combustion chamber heating it.

666 Of bypass of superheater or desuperheater:
This subclass is indented under subclass 660. Apparatus, in which the condition responsive control is of a flow of vapor through a passage by passing a heat exchanger in which the temperature of previously generated vapor is raised or lowered.

SEE OR SEARCH THIS CLASS, SUBCLASS:
653, for a power plant process including superheating, desuperheating or reheating motive fluid.

SEE OR SEARCH CLASS:
122, Liquid Heaters and Vaporizers, subclass 479.1, for the automatic control of a superheater.

667 Of means controlling boiler or its feed:
This subclass is indented under subclass 660. Apparatus, in which the condition or flow of liquid being fed to the boiler or the quantity or condition of the liquid in the boiler is controlled by a condition responsive means.

SEE OR SEARCH THIS CLASS, SUBCLASS:
665, for the automatic control of both the fuel and the liquid feed to the boiler.

SEE OR SEARCH CLASS:
122, Liquid Heaters and Vaporizers, subclass 451.1, for the automatic control of the feed to a boiler.
236, Automatic Temperature and Humidity Regulation, subclasses 20+, for the automatic control of the pressure or temperature of a boiler.

668 Power system physically related to vehicle structure:
This subclass is indented under subclass 643. Apparatus, in which the power plant with means generating hot motive fluid includes means dependent on vehicle motion, a vehicle traction feature or vehicle body structure not classified elsewhere.

SEE OR SEARCH CLASS:
105, Railway Rolling Stock, subclasses 37+, for a steam locomotive.

180, Motor Vehicles, subclasses 36+ for a motor vehicle of a kind which is adapted to pull, rather than to support, a load and which is provided with a motor of the steam type and a boiler therefor; subclasses 291+ for a motor vehicle wherein a specific motor-to-body-frame relationship is established; and subclasses 303+ for a motor vehicle which includes a traction motor of a type driven by expansible gas received from a source external of the motor and wherein the gas is produced by the treatment of a volatile fluid. In general, the nominal combination of a vehicle and a motor therefor is not beyond the scope of this class (60); however, classification in Class 180 is proper when such elements, members, or mechanisms as the frame, the change-speed gearing, the shafting, and connections for transferring power to one or more ground-engaging elements (e.g., wheels), and so forth, are included.

237, Heating Systems, subclass 12.8 for a combined steam heating and power plant for a car.

669 Motor mounted in or on boiler:
This subclass is indented under subclass 643. Apparatus, in which a structure in which motive fluid is generated serves as a support or mount for a motor driven by the motive fluid, e.g., unitary motor-boiler assembly etc.

670 Power system involving change of state:
This subclass is indented under subclass 643. Apparatus, in which vapor is generated from a liquid and utilized as motive fluid to actuate a motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

227, for a reaction motor in which the motive fluid is principally steam; subclass 531, for a motor operated by the vaporization and condensation of a confined mass; and subclass 514, for a motor in which liquid is supplied to and vaporized in an expansible chamber.

671 Motive fluid comprises a material other than steam or water:
This subclass is indented under subclass 670. Apparatus, in which a claim includes a recitation of (1) the material which comprises the fluid which is energized to motivate the motor means; or (2) a material, other than fuel or substance which is burned to give off heat, which is mixed with a motive fluid for energization thereof to motivate a motor means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

649, for a heat operated power producing procedure that includes mixing or separating materials of different chemical composition in a motive fluid flow path.

672 Motor exhaust used in combustion zone:
This subclass is indented under subclass 671. Apparatus, in which the fluid motivating the motor is a reactive material that is fed to a combustion device after its expansion in the motor.

673 One fluid absorbs or reacts with another:
This subclass is indented under subclass 671. Apparatus, in which two distinct fluids come in contact with each other in the apparatus for reaction or absorption.

674 Air and steam supplied to motor:
This subclass is indented under subclass 671. Apparatus, including structure by which air and steam or water are intermingled.

675 Gravity motor actuated by weight of condensed vapor:
This subclass is indented under subclass 670. Apparatus, in which generated vapor is condensed and collected at an elevated location and a work output is obtained from the movement of the condensate collector, downwardly under the influence of gravity.

SEE OR SEARCH THIS CLASS, SUBCLASS:

639+, for a motor actuated by accumulating and dumping liquid or fluent material from a flouring stream of the material.

676 Including plural distinct boilers, heat supplies or external sources of vapor:
This subclass is indented under subclass 670. Apparatus, (1) in which a second vapor generator or an external source of vapor furnishes a supplemental quantity of motive fluid to a power system including a first vapor generator or (2) having more than one distinct means supplying heat to the apparatus.

677 Serially connected motor with intermotor supply or withdrawal of motive fluid:
This subclass is indented under subclass 670. Apparatus, in which the vapor is fed to serially connected motors or stages and a branch stream of vapor is fed to or withdrawn from the interstage flow.

678 Withdrawn fluid heats boiler feed indirectly:
This subclass is indented under subclass 677. Apparatus, in which the vapor withdrawn from between the motor stages is passed in indirect heat exchange with liquid supplied to the vapor generator.

679 Having motive fluid reheater between serially connected motors:
This subclass is indented under subclass 670. Apparatus, comprising a first motor exhausting fluid from a working chamber with means to heat the exhausted fluid indirectly the heated exhaust fluid being then supplied as motive fluid to actuate a second motor or motor stage.

(1) Note. Exhaust fluid is fluid which is discharged from a motor working chamber after having done some work therein.

(2) Note. Mere re-expansion between motors as between turbine stages does not preclude classification in the proper motor class. This subclass requires the combination of a specific energizer (reheater) for the exhausted fluid wherein the energizer is defined in detail or where the energizer bears a significant relationship to the motor or generator. An energizer (reheater) recited by name only as being connected between stages of a turbine would not preclude classification in Class 415 (or Class 91, in the case of an expansible chamber motor).

SEE OR SEARCH THIS CLASS, SUBCLASS:

614, for plants wherein the exhaust from an ICE is heated prior to its being used as motive fluid for a fluid motor.

698+, for diverse motors wherein the exhaust from a motor operated by one principal is the motive fluid for a second motor which is operated by another principal.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclass 152, for multiple expansible chambers where the kinetic energy of the exhaust fluid of one motor chamber is not materially affected (increased) before entry into another of the working chambers.

415, Rotary Kinetic Fluid Motors or Pumps, for turbine comprising: plural rotors where the expanded fluid (exhaust) of one rotor supplies the motive fluid for a subsequent rotor where (1) the rotors may each have a separate output shaft or (2) the rotors may be connected in series all attached to a single output shaft.

680 Motive fluid bypassing upstream motor heats reheater:
This subclass is indented under subclass 679. Apparatus, with fluid passage means branching from a motor supply conduit and conducting hot motive fluid to reheat the motor exhaust.

681 Motor exhaust mixes with combustion products of boiler heater:
This subclass is indented under subclass 670. Apparatus, in which the vapor generator is heated by a burner and the exhaust of the burner is mixed with the exhaust of a motor driven by the vapor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

672, for a power system involving a change of state using a motive fluid that is other than or additional to steam and that is used in the combustion zone, for example, combustible motive fluid.

SEE OR SEARCH CLASS:

110, Furnaces, subclasses 203+, for a solid fuel burner in which exhaust steam is fed to the combustion zone.

682 Single state motive fluid energized by indirect heat transfer:

This subclass is indented under subclass 643. Apparatus, in which a heat energized motive fluid used in a device producing mechanical output does not change state during the operation of the system.

SEE OR SEARCH THIS CLASS, SUBCLASS:

517+, for a motor operated by expansion and contraction of a confined body of fluid (e.g., Stirling cycle); and subclasses 508+, for a motor operated by heating or cooling a fluid while within an expansible chamber.

683 Motor exhaust fed into combustion device:

This subclass is indented under subclass 682. Apparatus, in which the motive fluid after discharge from a motor is discharged into a combustion zone.

SEE OR SEARCH THIS CLASS, SUBCLASS:

672, for a power system involving a change of state in which the motor exhaust is used in the combustion zone.

684 Including interstage reheat means:

This subclass is indented under subclass 682. Apparatus, including serially connected motors or motor stages and in which motive fluid passing between the motors or stages is indirectly heated.

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.17, for a system using combustion products as motive fluid having an interstage cooler or heater.

653, for the condition responsive control of an interstage heater or mixer.

679, for a heat operated power system involving a change of state having a motive fluid reheater between serially connected motors or motor stages.

SEE OR SEARCH CLASS:

415, Rotary Kinetic Fluid Motors or Pumps, subclass 179, for a rotary kinetic fluid motor or pump having a heat exchanger intermediate two sets of blades serving to transfer heat to or from the working fluid as it passes from one set to the next succeeding set. See paragraph (1) of the Search Class reference to Class 60 in the class definition of Class 415, for the line as to this subject matter.

685 MOTOR HAVING EXHAUST FLUID TREATING OR HANDLING MEANS:

This subclass is indented under the class definition. Apparatus of a motor and exhaust system with means affecting the fluid after its exhaust from the motor.

(1) Note. Exhaust fluid is considered to be the fluid that has left the final means that could extract power from the fluid and that has reached a point where its affect cannot affect operation of the power extraction means. For an elaboration of this line see the statement in (4) Note, section B, paragraph (5) of the class definition of Class 91, and paragraph (7) of the Search Class note to Class 60, in the definition of Class 415.

(2) Note. Fluid flowing between serially connected motors or motor stages is not considered to be exhaust fluids. See subclass 684, of this class and the search notes to its definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.5, for the treatment of the exhaust of a motor in which externally generated combustion products are used as motive fluid.

200+, for a power plant, the exhaust of which is the jet of a reaction motor.

272, for an internal combustion engine with means treating or handling exhaust gas.

325+, for a power system including a pressure fluid source and motor in which the motor exhaust is generally pres-

surized by a pump to be redelivered to the motor.

595, for a motor driven by the exhaust of a free piston type of internal combustion engine.

597+, for a motor driven by the waste heat or exhaust energy from an internal combustion engine.

642+, for a power plant energized by externally applied heat in which the motor exhaust is condensed or cooled.

SEE OR SEARCH CLASS:

110, Furnaces, appropriate subclasses for the utilization of motor exhaust steam in a furnace, particularly subclasses 203+, for using exhaust steam to promote combustion in the firebox and subclasses 119+ and 147+ for using exhaust fluid as a means to produce a draft in the smokebox of the furnace.

122, Liquid Heaters and Vaporizers, particularly subclasses 412+, for boiler feed water heated by exhaust fluid.

181, Acoustics, subclass 213 for jet engine type mufflers, per se, and subclass 220 for ground based fluid treatment of jet engine exhaust.

415, Rotary Kinetic Fluid Motors or Pumps, subclasses 182.1+, for rotary kinetic fluid motors having motive fluid exhaust passages provided with means to simply guide, by means of vanes or conduits, the flow of motive fluid immediately after being discharged from the runner and within the area where the fluid could affect the operation of the motor (e.g., by affecting back pressure on the runner).

686 Having condition responsive control of exhaust structure or by exhaust condition:

This subclass is indented under subclass 685. Apparatus having (1) control structure responding to a condition of the exhaust or (2) a condition responsive structure controlling flow or, or a condition of the exhaust.

687 Motor-exhaust assembly with stress relieving or absorbing structure:

This subclass is indented under subclass 685. Apparatus, with means to take up or absorb stresses in the exhaust system which arise due to the difference of expansion and contraction of the components of the exhaust system.

688 Water mingled with exhaust steam:

This subclass is indented under subclass 685. Apparatus, in which fluid exhausted from a steam engine is mingled with external water or separated condensate.

SEE OR SEARCH THIS CLASS, SUBCLASS:

654, for a steam power process in which exhaust steam is mingled with boiler feed water.

SEE OR SEARCH CLASS:

261, Gas and Liquid Contact Apparatus, appropriate subclass for a gas-liquid contact device, per se, for example a barometric or jet type condenser.

689 Exhaust fluid mingled with non-exhaust fluid:

This subclass is indented under subclass 685. Apparatus, in which motor exhaust fluid is mingled with a fluid supplied from a source different from the source of motive fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:

672, and 683, for a heated power system in which the motor exhaust is fed into the combustion zone of the heater of the system.

SEE OR SEARCH CLASS:

110, Furnaces, subclasses 203+, for a solid fuel burner in which exhaust steam from a motor is fed into the combustion zone.

690 Motor and indirect heat exchanger:

This subclass is indented under subclass 685. Apparatus, including means for passing the exhaust fluid through a heat exchanger in which it is cooled indirectly.

SEE OR SEARCH THIS CLASS, SUBCLASS:

320+, for an internal combustion engine having an exhaust system element that is heated, cooled, or used as a heat source.

661, for the automatic control of condenser cooling water.

SEE OR SEARCH CLASS:
165, Heat Exchange, appropriate subclass for a condenser, per se.
237, Heating Systems, subclasses 12.1+, for installations in which all or part of the exhaust steam is used for heating building, vehicles, or other inclosed structures.

691 Boiler feed water heated by exhaust:
This subclass is indented under subclass 690. Apparatus, in which the heat exchange is between motor exhaust steam and water being prepared for introduction into a boiler that feeds steam to the motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:
678, for a boiler motor assembly in which boiler feed water is heated in stages by steam withdrawn between motor sections of serially connected motor sections.

SEE OR SEARCH CLASS:
122, Liquid Heaters and Vaporizers, subclasses 412+, for a boiler feed heater combination.
165, Heat Exchange, appropriate subclass for a heat exchanger, per se.

692 Having condensate pump:
This subclass is indented under subclass 690. Apparatus, in which the heat exchanger is a condenser and has a pump for removing liquid condensate from in the condenser.

693 Plural heat exchangers:
This subclass is indented under subclass 690. Apparatus, including plural physically distinct surface type heat exchangers.

694 Including exhaust flow directing or dividing device:
This subclass is indented under subclass 685. Apparatus, including a manually settable means in a structure receiving a stream of exhaust fluid from a motor and dividing the stream or directing its flow.

SEE OR SEARCH THIS CLASS, SUBCLASS:
324, for a divider, collector, valve means, or boundary layer device controlling exhaust gas flow from an internal combustion engine.

695 Device directs exhaust of air motor into atmosphere:
This subclass is indented under subclass 694. Apparatus, which directs the discharge of a pneumatic motor into the surrounding air.

SEE OR SEARCH THIS CLASS, SUBCLASS:
370, for cyclically operable reciprocating pneumatic motor.
407, for a pneumatic motor with a gas supply or removal device.

696 Device is draft structure of hydraulic motor:
This subclass is indented under subclass 694. Apparatus, forming the flow path carrying the liquid away from a water driven motor.

697 Turbine discharge directed to flow line:
This subclass is indented under subclass 694. Apparatus, including flow directing structure steering fluid discharged from the rotor of a turbine.

SEE OR SEARCH CLASS:
415, Rotary Kinetic Fluid Motors or Pumps, subclasses 208.1+, for a vane or deflector directing the discharge from a rotary kinetic motor that is close enough to the rotor to affect the operation of the motor.

698 SYSTEM HAVING PLURAL MOTORS OR HAVING DIVERSE TYPES OF ENERGY INPUT:
This subclass is indented under the class definition. Apparatus including (1) a device having a mechanical output operable selectively or simultaneously from diverse inputs; (2) a device or assembly including plural motors at least one of which may be separately supplied with motive fluid or may be operated while another is not producing power; or (3) methods of operating such devices.

(1) Note. This group of subclasses takes plural internal combustion engines of the type classifiable, per se, in Class 123.

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.15+, for multiple fluid operated motors at least one of which is driven by externally generated combustion products.

39.19, for a single motor driven by diverse motive fluids that do not mix in the motor, one of the fluids being combustion products.

224+, for interrelated reaction motors.

244+, for a reaction motor driven by motive fluid from alternate diverse generators.

420+, for a condition responsive control in a pressure fluid source plural motor system.

471, for interconnected control elements operating plural distinct motors in a pressure fluid source motor system.

539, for a programmed, self cycled or self pulsed pulsator system having a cam type drive of plural masters actuating plural motors.

581, for plural structurally related master pistons, cylinders or pulsator circuits.

597+, for a fluid motor driven by the waste heat or exhaust energy from an internal combustion engine.

625+, for an internal combustion engine with a fluid motor, for rotating it for starting or convertible to a fluid motor for initiating rotation.

642+, a system including a motive fluid supplier energized by externally applied heat. See, particularly subclasses 655, 663, 676, 677-680, and 684.

SEE OR SEARCH CLASS:

74, Machine Element or Mechanism, subclass 661, for gearing for connecting plural prime movers either individually or unitarily to the same load.

91, Motors: Expansible Chamber Type, subclasses 170+, for plural intercontrolled expansible chamber motors; and subclass 441, for a system of expansible chamber motions having plural working members. See (4) Note of the class definition of Class 91, for a statement of the line.

172, Earth Working, subclasses 48+, for an earthworking machine having plural driven tools.

192, Clutches and Power-Stop Control, subclass .098, for the interrelated control of motors and clutches in a system having plural motors.

290, Prime-Mover Dynamo Plants, subclass 4, for a prime mover dynamo plant having plural prime movers; and subclass 48, for the combination of an internal combustion engine and its electrical starting motor.

303, Fluid-Pressure and Analogous Brake Systems, subclasses 6.01+, for the distribution of pressure fluid to multiple motors, one of which is a brake motor.

318, Electricity: Motive Power Systems, subclasses 34+, for plural diverse or diversely controlled electric motors; and appropriate subclass for a residual system of plural electric motors.

415, Rotary Kinetic Fluid Motors or Pumps, subclasses 60+, for plural runners supported for relative movement or separate shafts in a rotary kinetic fluid motor system; subclass 144, for plural runner stages on a common shaft with a working fluid branch or bypass; and subclasses 198.1+, for plural blade sets rigidly mounted on a common shaft.

416, Fluid Reaction Surfaces, (i.e., Impellers), subclasses 120+, for a system of plural impellers that may drive or be driven by an unconfined fluid.

418, Rotary Expansible Chamber Devices, appropriate subclass for a plurality of rotary expansible chamber motors and see (4) Note of the class definition of Class 91, for a statement of the line between those classes, the same line being maintained between Classes 60 and 418.

475, Planetary Gear Transmission Systems or Components, subclasses 1+, for planetary gearing connecting plural prime movers to a load device.

699 Spring type motor and internal combustion engine motor:

This subclass is indented under subclass 698. Apparatus, including a spring type motor combined with an internal combustion engine.

SEE OR SEARCH CLASS:

185, Motors: Spring, Weight, or Animal Powered, subclasses 2+, for composite or plural motors each of which is classifiable in Class 185. See the notes in the class definition of Class 185, for the line between Classes 60 and 185, as to plural and diverse motors.

700 Motors intercontrolled responsive to angular speed differential of rotatable output shafts:

This subclass is indented under subclass 698. Apparatus, wherein the relative rotational speed or angular position of the output shafts of a plurality of independently operable motors or devices is continually or intermittently sensed, said sensed differential effecting a control to maintain a predetermined operating relationship of the motors.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclass 171, for plural expansible chamber motors synchronized in response to a sensed difference in position.

318, Electricity: Motive Power System, subclasses 68+, for the control of the relative speed of plural electrical motors; and subclass 85, for the synchronizing or phasing control of plural electrical motors.

416, Fluid Reaction Surfaces (i.e., Impellers), subclass 34, for plural distinct impellers having a synchronizing control.

701 Hydraulic or pneumatic intercontrol system:

This subclass is indented under subclass 700. Apparatus, in which the intercontrol system includes hydraulically or pneumatically operated control elements.

702 Electrical intercontrol system:

This subclass is indented under subclass 700. Apparatus, including electrical elements.

SEE OR SEARCH CLASS:

318, Electricity: Motive Power Systems, subclasses 41+, for plural electric motors having electrical synchronizing interconnections; and subclasses 70+, for plural electrical motors with means controlling the relative speed using an electrical type detector.

361, Electricity: Electrical Systems and Devices, subclass 243 for an electrical speed controlled system for synchronizing plural shafts.

703 Control including pacer, oscillator, punch card, template or tape:

This subclass is indented under subclass 698. Apparatus, in which at least one motor is controlled (1) by a punch card, template or tape; or (2) by an externally actuated standard means such as an oscillator or a motor not effected by the operation of the controlled device and that has no external output but merely sets a speed standard.

SEE OR SEARCH THIS CLASS, SUBCLASS:

395, for a pressure fluid source driving a motor relative to an independently driven speed standard or pacer device.

704 Control including clock, retarder or programmer:

This subclass is indented under subclass 698. Apparatus, controlled (1) by a time measuring or period establishing device or (2) by a device providing a sequence of events set to occur at predetermined intervals or terminating a single operation in a fixed position to restart an additional cycle, which cycle is more complex than a mere starting or stopping of a single device.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclasses 35+, for expansible chamber motors having independently operated timer, delay pattern or cyclic control means.

705 Signal, indicator or inspection means:
This subclass is indented under subclass 698. Apparatus, including structure signalling or giving an indication of a condition of operation of the plural motor apparatus or providing for inspection of a part of the apparatus.

706 Having condition responsive control:
This subclass is indented under subclass 698. Apparatus, including structure sensing a condition of the apparatus or an external condition and effecting a control of the plural motors.

707 Of branched flow of motive fluid through serially connected motors:
This subclass is indented under subclass 706. Apparatus, including two expansible chamber motors having flow lines interconnecting them so that under one condition of operation at least some of the fluid passes first through one and then through another motor; the condition responsive control effecting an addition to or removal of motive fluid from the fluid stream of the two motors.

SEE OR SEARCH THIS CLASS, SUBCLASS:
663, for a boiler-motor system having an automatic control of branched feed to, condition of or heating means for motive fluid between serially connected motors or motor stages; and subclass 424, for a system including a pressure fluid source supplying serially connected motors, the system being automatically controlled to establish parallel operation or to bypass a motor means of the series.

708 Of or by motor cooling, ventilation, or brake system:
This subclass is indented under subclass 706. Apparatus, in which the condition sensor effects a control of a cooling ventilating or braking element of the apparatus.

709 Of or by disconnect or load release means to output means or between motors:
This subclass is indented under subclass 706. Apparatus, in which the condition sensor actuates a means connecting or disconnecting one of the plural motors to an output device or to another motor.

710 Intercontrol of internal combustion engines responsive to relative fuel or manifold conditions:
This subclass is indented under subclass 706. Apparatus, in which the condition sensed is the difference between the fuel or manifold conditions of a pair of internal combustion engines, and one of the engines is controlled in response to the sensed difference.

711 First motor load share adjusted relative to the load share of a second motor driving a common load, responsive to a condition of the second motor or of the load:
This subclass is indented under subclass 706. Apparatus, in which the control (1) determines the amount of the common output load carried by each motor responsive to a condition of the load; or (2) the input to one of two motors driving a common load by a means sensing a condition of the other motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:
426, for a pressure fluid source-plural motor system in which the speed of or pressure in one motor controls another.

SEE OR SEARCH CLASS:
318, Electricity: Motive Power Systems, subclasses 98+, for the distribution of load between plural electrical motors. See the search notes in the definition of this subclass for other pertinent subclasses in 318.

712 Engine apparatus or system actuatable selectively or simultaneously by internal combustion of fuel and by expansion of motive fluid:
This subclass is indented under subclass 698. Apparatus, having structure by which the motor apparatus can be energized both by the internal combustion of fuel and by the expansion of pressurized motive fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:
625+, for an internal combustion engine started by a separate motive fluid motor or being driven to start by the admission of motive fluid into the

combustion chamber prior to the admission of fuel.

SEE OR SEARCH CLASS:

123, Internal-Combustion Engines, subclass 22, for a combined hot air and material combustion engine.

713 Plural motors having brake means for motor or output means:

This subclass is indented under subclass 698. Apparatus, with additional adjustable or positionable structure provided to act in opposition to one of the motors to inhibit or prevent motion of the motor or of its output.

714 Plural motors having supply or control of cooling, lubricating, or scavenging fluid:

This subclass is indented under subclass 698. Apparatus, having means handling a fluid that cools, lubricates or flushes an element of the apparatus.

SEE OR SEARCH THIS CLASS, SUBCLASS:

657, for a system in which motive fluid is generated by externally applied heat that has a cleaning, purging or lubricating feature.

715 Plural motors, connected for serial flow of motive fluid:

This subclass is indented under subclass 698. Apparatus, wherein the exhaust for one of the motor means is the motive fluid for a second motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

597, for a fluid motor actuated by the exhaust energy of an internal combustion engine.

663, for the automatic control of branched feed to, condition of or heating means for fluid between motor stages in a system having a steam generator.

677+, for serially connected motors in system including means generating motive fluid by externally applied heat.

716 System of plural motors having a common output structure:

This subclass is indented under subclass 698. Apparatus, having means by which the motors are interconnected to drive one output means.

717 And another output:

This subclass is indented under subclass 716. Apparatus, including a means by which power is delivered by an output member separate from the common output.

718 Having disconnect means between a motor and the output:

This subclass is indented under subclass 716. Apparatus, wherein a motor means is selectively engageable with the output means so that the motor may actuate the output individually or in concert.

SEE OR SEARCH CLASS:

192, Clutches and Power-Stop Control, subclass .098 for nominal or specific motors and adjustable clutch or gears means wherein there is a specific control for the clutch, per se, or an interrelated motor and clutch or gear control means.

719 Interrelated or group control operating means for plural motors or outputs:

This subclass is indented under subclass 698. Apparatus, with manual control means for the apparatus including (1) structure by which the operations of the individual control means for the separate motors or outputs are interlocked or correlated; or (2) separate controllers grouped at a single point for selective operation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

471, for a system including a pressure fluid source and plural ram type motors controlled by an externally operated multiway valve or interconnected control elements.

SEE OR SEARCH CLASS:

192, Clutches and Power-Stop Control, subclass .098 for interrelated clutch and motor controls for a system including multiple motors.

244, Aeronautics and Astronautics, subclass 85 for a pilot operated hydraulic aircraft control system.
303, Fluid-Pressure and Analogous Brake Systems, for a fluid pressure brake system having a plurality of control means.
318, Electricity: Motive Power Systems, subclasses 34+ for plural, diversely controlled electrical motors.

720 Unitary support for plural motors:
This subclass is indented under subclass 698. Apparatus, in which plural motors are mounted on a common supporting structure.

721 MISCELLANEOUS:
This subclass is indented under the class definition. Subject matter not provided for in other subclasses.

722 Combustion products generator:
This subclass is indented under subclass 39.01. Plants having a combustion device for producing products of combustion and associated parts such as valves, outlet nozzles, inlet diffusers, air compressors, air receivers, fuel pumps, fuel vaporizer, fuel injectors, igniting devices, or expansible or other chambers wherein a fuel and an oxidizer are burned in a combustion zone, and wherein the resulting products of combustion are disclosed solely for utilization in a prime mover for furnishing useful external power.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39.23, for combustion products generator in combination with means to vary the air flow.
39.34+, for rotating combustion products generator and turbine.
39.36, for coaxial combustion products generator and turbine.
39.37+, for plural combustion products generators in a ring, coaxial with a turbine shaft.
39.46+, for combustion products generators which are modified to use oxidizer or fuel other than air, oil, or gasoline, and those which use a solid fuel carrying oxidizer.
39.55, for combustion products generator having means to inject water or steam therein.
39.6+, for combustion products generator in combination with a motor of the expansible chamber type.

SEE OR SEARCH CLASS:
48, Gas: Heating and Illuminating, subclass 107 for combined retorts for gasifying oil and means for introducing air or oxygen.
110, Furnaces, appropriate subclasses for furnace structure and accessories for solid fuel.
422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclass 281 for apparatus for generating a gas, which may involve combustion.
431, Combustion, appropriate subclasses for combustion apparatus of general utility.

723 Having catalyst in combustion zone:
This subclass is indented under subclass 722. Device having a zone wherein fuel is burned and having a catalyst in said zone to directly affect the burning reaction.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39.46, for dissociation of a fuel or oxidizer by use of a catalyst prior to a combustion reaction.
299+, for catalytic treatment of the exhaust gases from a reciprocating piston-type internal combustion engine.

SEE OR SEARCH CLASS:
422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, for catalytic apparatus for producing a chemical reaction in a gas for general utility.
431, Combustion, subclass 7 for catalytic combustors of general utility.

724 Plural with intercycling by pressure fluctuations:
This subclass is indented under subclass 722. Device wherein at least two of the devices are of the intermittent combustion type and are related by interconnecting means so that cyclic

events such as fuel or oxidizer inlet, fuel injection scavenging, ignition, or exhaust in one combustion device are influenced directly by pressure changes due to cyclic events in the other combustion device.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39.77+, for combustion products generators of the intermittent combustion type.
247+, for reaction motors utilizing intermittent combustion (e.g., pulse jets).

725 Having noise reduction means:
This subclass is indented under subclass 722. Device having means to reduce or suppress acoustic propagations from or within the combustion device.

(1) Note. Included herein are means to suppress resonance of gases within the combustion device.

SEE OR SEARCH CLASS:
181, Acoustics, appropriate subclass for acoustic treatment means.
431, Combustion, subclass 114 for combustion devices of general utility having sound or pulsation attenuating means.

726 With means to pressurize oxidizer for combustion or other purposes:
This subclass is indented under subclass 722. Device having specific means to place under pressure either (a) the oxidizer to be employed in the combustion process, or (b) an oxidizer to be used as a pressurized fluid for a noncombustion supportive purpose.

(1) Note. Among other means for compressing a fluent material this subclass includes: (a) means to bleed pressurized oxidizer intermediate stages of a compressor for delivery of pressurized oxidizer to a combustion or for cooling a combustion device, or, (b) compressor means, auxiliary to that used to compress the combustion supporting oxidizer, for compressing what may be a combustion oxidizer but which is used solely for another purpose such as for cooling the combustion device.

727 With oxidizer accumulator:
This subclass is indented under subclass 726. Device having means located within the oxidizer flow path between a compressor and the combustion zone of the combustion device for storing a mass of said oxidizer for subsequent use.

728 Having oxidizer cooling means:
This subclass is indented under subclass 726. Device having a means to cool at least a portion of the oxidizer prior to its use in the combustion zone or prior to its use for some other purpose in the combustion device.

(1) Note. This subclass includes means to inject a vaporized coolant, such as water or fuel, into a combustion supporting air flow to effect cooling thereof.

SEE OR SEARCH THIS CLASS, SUBCLASS:
257+, for reaction motors employing means to cool or liquefy air for subsequent use in the formation of a propellant for said motor.

729 Reciprocating positive displacement type:
This subclass is indented under subclass 726. Device wherein the means placing the oxidizer under pressure comprises a contractible chamber formed by the reciprocation of a portion of said chamber relative to another portion of said chamber.

730 With liquid heat exchanger:
This subclass is indented under subclass 722. Device having means to transfer heat to a coolant supplied for such purpose in the liquid state.

(1) Note. The liquid coolant may vaporize while in the process of absorbing heat from the device.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39.18, for plants where the heat absorbing fluid is subsequently utilized to drive a motor after absorbing heat and thereby cooling the device.
39.53+, for plants wherein water is added to the combustion products to cool the

same at some point prior to the discharge thereof from the prime mover which uses said products.

267, for heat exchanger means using liquid to cool reaction motors.

736, for plants having means to use fuel as a liquid coolant and to subsequently use said coolant as fuel in a combustion device.

731 With combustion products accumulator:
This subclass is indented under subclass 722. Device and one or more storage vessel means for receiving all or a portion of the products of combustion from one or more combustion devices for subsequent use by a prime mover.

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.13, for accumulators including means to stop and start the operation of the combustion products generator in response to pressure fluctuations in the accumulator.

39.56+, wherein the water accumulator or boiler serves as a mixing chamber for combustion products and steam.

39.59, for mixing chambers for combustion products and steam.

281, for combinations of internal-combustion engines and exhaust gas accumulators.

632+, for one shot explosion actuated expansible chamber type motors.

732 Having initial fuel-rich combustion zone:
This subclass is indented under subclass 722. Device having a plurality of combustion zones distinguished by the fuel-oxidizer ratio supplied to each zone for combustion therein, and wherein an amount of fuel in excess of that required for stoichiometric combustion is supplied to a first fuel-rich zone for combustion, and to the product of that combustion, and downstream of the first zone, additional fuel or air is added for combustion at one or more locations in what is considered an additional zone or zones whereby the total combustion process of the device is staged.

(1) Note. Excluded from this subclass are those devices provided with a separate fuel-rich combustion zone which serves only as an igniter or initiator such as a pilot flame; see this class (60), subclass 39.82.

SEE OR SEARCH THIS CLASS, SUBCLASS:

739, for manifold means supplying a plurality of separate injectors as least two of which inject fuel into separate combustion zones.

746+, for plural, distinct, spaced injectors for plural distinct combustion zones.

776 through 777, for a process where combustion products are used as a motive fluid having ignition or fuel injection after starting.

SEE OR SEARCH CLASS:

431, Combustion, subclass 10 for means to add an oxidizer to a region of incomplete combustion.

733 Separate fuel injectors for plural zones:
This subclass is indented under subclass 732. Separate fuel injectors for plural zones: Device having fuel injector means for the fuel-rich zone and additional fuel injector means disposed downstream of said fuel-rich zone to supply fuel to the combustion products discharged from the fuel-rich zone.

(1) Note. The additional injector means may supply both oxidizer and fuel.

SEE OR SEARCH THIS CLASS, SUBCLASS:

746, for separate fuel injectors for separate zone having the same fuel-oxidizer mixture.

734 Having fuel supply system:
This subclass is indented under subclass 722. Device having means to supply fuel to the device or to inject fuel into the zone therein where the fuel is combusted.

735 Fuel injected into turbine:
This subclass is indented under subclass 734. Device in combination with a turbine having an impeller element and including means to inject fuel into said element.

(1) Note. Fuel may either be injected by an injector located structurally within the turbine, or fuel may be injected just

upstream of the turbine to flow thereinto. The fuel may or may not combust within the turbine.

SEE OR SEARCH CLASS:

415, Rotary Kinetic Fluid Motors or Pumps, subclass 115 for a turbine having passage means in a vane, shaft, or rotary distributor through which a fluid may be supplied to the turbine; and subclass 116 for means to supply diverse fluids to a turbine.

736 Fuel preheated upstream of injector:

This subclass is indented under subclass 734. Device having means to heat the fuel prior to the point where it exits the injector and enters the combustion zone.

(1) Note. Preheating a mixture of fuel and air downstream of the fuel injector is excluded from this subclass. See subclass 738.

SEE OR SEARCH CLASS:

431, Combustion, subclasses 161+ for combustion devices of general utility wherein fuel for the device is heated by heat generated by the device; and subclasses 207+ for combustion devices of general utility having a flame holder and means to heat fuel supplied to the flame holder.

737 Fuel and air premixed prior to combustion:

This subclass is indented under subclass 734. Device having means whereby fuel and air may be mixed prior to the point where combustion occurs.

(1) Note. A separate means may be provided which permits the air fuel mixing to be completed prior to combustion by prohibiting flame flashback from the combustion zone to the mixing zone.

SEE OR SEARCH CLASS:

239, Fluid Sprinkling, Spraying, and Diffusing, subclasses 419+ for injector means capable of mixing separately supplied fluid at or beyond its outlet.

738 Premix tube within combustion zone:

This subclass is indented under subclass 737. Device wherein at least a portion of the air and fuel are mixed downstream of the injector, and prior to combustion, within a conduit means which is itself within the combustion zone whereby the fluids being mixed may be heated but not caused to combust by the gases in the combustion zone.

739 With fuel supply manifold for separate injectors:

This subclass is indented under subclass 734. Device having conduit means for delivering fuel from a source to a plurality of separate and spaced fuel injectors.

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.37, for gas turbines having a plurality of combustion devices arranged in a ring whose axis is coaxial with the turbine shaft and having manifold means whereby fuel may be supplied to the combustion devices.

261, for fuel manifolds for supplying fuel to a plurality of reaction motor afterburners.

270, for fuel manifolds used in ramjet engines.

742, for unitary injectors having plural fuel flow paths and manifold or flow dividing means supplying said paths from a source.

740 With fuel injector:

This subclass is indented under subclass 734. Combustion devices in combination with means to inject fuel into the combustion device wherein significance is attributed to (a) the injector structure, (b) the relationship of the injector in the combustion device, (c) the modification of the structure of the combustion device to accommodate or to cooperate with the injector, or (d) the modification of the operation of the injector in view of its environment.

SEE OR SEARCH THIS CLASS, SUBCLASS:

776 through 777, for a process where combustion products are used as a motive fluid having ignition or fuel injection after starting.

SEE OR SEARCH CLASS:

239, Fluid Sprinkling, Spraying, and Diffusing, subclasses 86, 87, 88+, 95, 96, 132, 398+, and 583+ for terminal outlet members per se of the type usually provided to inject fuel into a combustion chamber or for other fluid distributors even though disclosed as burners.

431, Combustion, subclasses 159+ for a means injecting fuel into a heating furnace; and subclasses 350+ for a fuel feed device having flame enclosing or stabilizing structure.

741 Fuel control valve integral with injector:

This subclass is indented under subclass 740. Device having a valve means disposed as a part of the injector structure to control the flow of fuel therethrough.

(1) Note. The valve means may be a line condition responsive means such as a check valve.

SEE OR SEARCH CLASS:

239, Fluid Sprinkling, Spraying, and Diffusing, subclasses 407+ for fluid injectors of general utility having valve means therein.

742 Unitary injector having plural fuel flow paths:

This subclass is indented under subclass 740. Device having a plurality of structurally interconnected fuel injectors or discharge means, forming a unitary structure, from which fuel may flow in a plurality of paths to be injected as such into a combustion zone.

(1) Note. The plural injectors may be fed by either (a) separate and distinct fuel sources, or (b) a single fuel source with a fuel divider or manifold means to supply separate streams of fuel to the plurality of injectors.

(2) Note. A unitary injector having a single flow path but having a nozzle provided with a plurality of terminal orifices is not considered subject matter for this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

746, for plural injectors spaced apart or feeding distinct combustion zones.

SEE OR SEARCH CLASS:

239, Fluid Sprinkling, Spraying, and Diffusing, subclass 400 for injectors of general utility combining three or more fluid streams; and subclass 422 for injectors combining three or more fluid streams at or beyond the injector outlet.

743 Surface film injector:

This subclass is indented under subclass 740. Device including a surface means onto which fuel is deposited to become a thin film thereon so that it may be burned, mixed with other fluent material, or vaporized for subsequent burning.

(1) Note. Included in this subclass are means to generate a surface film of fuel that is to be sheared by an air blast for atomization thereof.

744 Rotary fuel injector:

This subclass is indented under subclass 740. Device wherein the injector is provided with a rotating fuel impelling means.

(1) Note. Excluded from this subclass are those injectors having no rotating fuel directing parts even though other means may be provided to rotate the fuel stream. See subclasses 734+.

SEE OR SEARCH CLASS:

431, Combustion, subclass 168 for a rotary fuel dispenser employed in a combustion device of general utility.

745 Slinger type:

This subclass is indented under subclass 744. Device wherein the injector is connected to or forms a part of a rotatable shaft of a work producing motor means, said injector having a fuel dispensing opening spaced radially from the axis of said shaft, so that when the shaft is rotated, fuel is forced out of said opening by centrifugal force.

(1) Note. Fuel may be conducted to the injector through a conduit in the rotatable shaft.

746 Plural distinct injectors:
This subclass is indented under subclass 740. Device wherein a plurality of injector units, each physically spaced from the other, are provided in a combustion device.

(1) Note. Mere duplicate circumferentially spaced combustion device each having a single injector is not considered subject matter for this subclass. Classification there is based upon the structure of one of the devices.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39.5, for plural distinct injectors feeding each of a plurality of combustion devices wherein the devices are separated by a motor means (i.e., a turbine with a combustion products generator upstream and an afterburner downstream).
742, for a plurality of injectors combined in a unitary structure.

747 Injectors in distinct radially spaced parallel flow combustion products generators arranged to combine discharge:
This subclass is indented under subclass 746. Device having at least one injector in each of a plurality of combustion devices, that are at least in part physically separated along a radial line from the center of a grouping, so that their flow paths are parallel and the discharge of each of the combustion devices is combined to form a single path discharge of combustion products.

748 With attendant coaxial air swirler:
This subclass is indented under subclass 740. Device having a means to discharge air so that it swirls in a coaxial relationship with the fuel discharged by the injector.

SEE OR SEARCH CLASS:
239, Fluid Sprinkling, Spraying, and Diffusing, subclasses 399+ for injectors of general utility having means to whirl the discharge.
431, Combustion, subclasses 183+ for combustion devices of general utility having stationary blades coaxial with a fuel dispenser to whirl air.

749 Having bluff flame stabilization means:
This subclass is indented under subclass 734. Device having means positioned to stabilize the flame as it flows in a combustion zone by creating therein a zone of decreased linear flow velocity, said means being (a) aerodynamically designed to cause the formation of eddies, vortices, etc., or (b) aerodynamically smooth with means for selective modification thereof to create a stabilization zone as by the use of fluid injected into the surrounding flow to create flow separation.

SEE OR SEARCH THIS CLASS, SUBCLASS:
261, for flame holders employed in afterburners for jet engines.
270, for flame holders employed in ramjet engines.
752+, for flame stabilization effected solely by the manner in which air is supplied to a burner creating flow patterns therein to stabilize the flame.

SEE OR SEARCH CLASS:
110, Furnaces, subclasses 322+ for baffles and heat retainers for furnaces.

750 Having means to recycle combustion products internally of the combustion zone:
This subclass is indented under subclass 722. Device having means to recirculate the combustion products from a downstream zone or the downstream portion of a single zone back to an upstream zone or the upstream portion of a single zone.

(1) Note. The recirculating means may comprise a jet pump or other means to draw the combustion products back to be reintroduced into an upstream combustion area.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39.52, for recirculation of combustion products from a point downstream of a motor.

SEE OR SEARCH CLASS:
431, Combustion, subclasses 115+ for combustors of general utility employing combustion products return structure.

751 Having diffuser for air inlet:
This subclass is indented under subclass 722. Device having means upstream of the combustion zone adapted to increase the static pressure of the incoming air for combustion by reducing its kinetic energy.

752 Combustor liner:
This subclass is indented under subclass 722. Device having specific means directly engaging and enclosing the flame in the combustion zone.

SEE OR SEARCH CLASS:
431, Combustion, subclasses 350+ for combustion devices of general utility having a flame enclosing liner.

753 Ceramic:
This subclass is indented under subclass 752. Device wherein at least a portion of the flame enclosing means is formed of a nonmetallic mineral.

754 Porous:
This subclass is indented under subclass 752. Device wherein the flame enclosing means is formed at least in part with minute regular or irregular openings for the passage of air.

(1) Note. The porous portion of the flame enclosing means may be made from sintered material, small mesh screen, punched sheet material having a high density of openings per unit area, etc.

755 Having means to direct flow along inner surface of liner:
This subclass is indented under subclass 752. Device having means to direct incoming air so that it has a flow component parallel with a wall of the flame enclosing means.

756 Air directed to flow along inner surface or liner dome:
This subclass is indented under subclass 755. Device wherein the flame enclosing means is provided with means enclosing the upstream end thereof and is provided with means to cause all or a position of the incoming air to flow tangentially with said end enclosing means.

757 In an axial direction:
This subclass is indented under subclass 755. Device wherein the flame enclosing means has an axis which extends fore and aft thereof or in an upstream-downstream direction, and the incoming air is directed along a surface of said enclosing means substantially parallel with said axis.

758 Air introduced into liner counter to flow of combustion products:
This subclass is indented under subclass 752. Device having means to inject air into the flame enclosing means with a flow component at the point of injection in a direction opposite the flow of combustion products therein to promote fluid mixing or flame stabilization.

759 Air scoop extends into air flowing outside liner:
This subclass is indented under subclass 752. Device wherein the exterior of the flame enclosing means is provided with means to capture air flowing exteriorly of and directing it through openings in said enclosing means, said capturing means thereby altering either the speed or direction of the captured air.

760 Air outside liner flows counter to combustion products flow within liner:
Device under 752 wherein the incoming air is caused to flow exteriorly of the flame enclosing means at least in part in a direction counter the direction of flow of the combustion products within the enclosing means.

(1) Note. The combustion devices classified herein are commonly referred to as “reverse flow” or “counter flow” combustors.

761 Having afterburner:
This subclass is indented under subclass 200.1.
Apparatus including an auxiliary combustion chamber, hereinafter "afterburner", having means to inject fuel into the motive fluid consisting of a previously formed combustion product to ignite the fuel and intended to provide extra thrust.

SEE OR SEARCH THIS CLASS, SUBCLASS:
241, for a reaction motor having plural burners in series and a condition responsive thrust varying means.
243, for a reaction motor having condition responsive thrust varying using fuel flow control.
264, for a reaction motor including a fluid treating means for its motive fluid.

762 Having oxidizer bypassed to afterburner feature:
This subclass is indented under subclass 761.
Apparatus including means to channel a substance (e.g., oxygen, etc.) used to generate the motive fluid by supporting burning of fuel to the auxiliary combustion chamber.

763 Movable flame holder:
This subclass is indented under subclass 761.
Apparatus wherein the afterburner has means to shield the ignited fuel within the motive fluid can be moved (e.g., retractable, pivotable, etc.).

764 Fuel flow control:
This subclass is indented under subclass 761.
Apparatus wherein the means to inject fuel regulates movement or rate (e.g., valve, etc.) of a substance used to produce heat or power by burning.

765 Particular flame holder structure:
This subclass is indented under subclass 761.
Apparatus wherein the afterburner has means to shield the ignited fuel within the motive fluid has specific construction.

(1) Note. For this subclass a "flame holder" must be more than nominally recited.

(2) Note. It could describe a structure (e.g., V-shape, etc.).

766 Particular liner or casing structure:
This subclass is indented under subclass 761.
Apparatus wherein the afterburner or component of it has a protective covering specifically constructed to function as an inside or outside surface.

(1) Note. For this subclass a "liner" or "casing" must be more than nominally recited.

(2) Note. It may provide a function (e.g., protection, cooling, expansion, dampening, etc.), have a structure (e.g., fastening, diffusion outlet, etc.) or have a material (e.g., composite material, coating, etc.).

767 Air supplied by ram effect (e.g., ramjet, etc.):
This subclass is indented under subclass 200.1.
Apparatus wherein the thrust produced by the reaction motor compresses atmosphere into the reaction motor where it is heated to produce the motive fluid.

SEE OR SEARCH CLASS:
244, Aeronautics and Astronautics, subclass 53 for an aircraft power plant having an air intake peculiar to aircraft and incorporated with the aircraft structure.

768 Supersonic speed therethrough (e.g., scramjet, etc.):
This subclass is indented under subclass 767.
Apparatus wherein the air flows through the reaction motor and is heated at a velocity above the speed of sound in air.

(1) Note. The speed of sound in air at sea level is 761 mph at 59°F or 1224 km/hr at 15°C.

769 Solid fuel:
This subclass is indented under subclass 767.
Apparatus wherein the air is heated by a material used to produce heat or power by burning having other than a fluid form to produce the motive fluid.

770 Particular exhaust nozzle feature:
This subclass is indented under subclass 200.1. Apparatus wherein the reaction motor produces useful thrust in one direction by ejecting the motive fluid through specific means intended to accelerate or direct the flow of the motive fluid.

(1) Note. For this and indented subclasses a "nozzle" must be more than nominally recited.

(2) Note. It may have a structure (e.g., closure, diffuser, insert, mount, shape, valve, etc.) or a material (e.g., ablative, composite, coating, insulation, etc.).

SEE OR SEARCH CLASS:
138, Pipes and Tubular Conduits, subclasses 40 through 46 for a pipe or pipe fitting that restricts fluid flow.
239, Fluid Sprinkling, Spraying, and Diffusing, subclasses 265.11 through 265.43 for a reaction motor nozzle, especially subclasses 265.19-265.43 for a reaction motor nozzle having means to control amount, shape or direction of a discharge stream.

771 Having variable area:
This subclass is indented under subclass 770. Apparatus includes an exit opening whose size can be adjusted.

772 Process:
This subclass is indented under subclass 39.01. Method for generating the combustion products and then using the products as motive fluid for the motor.

SEE OR SEARCH CLASS:
48, Gas: Heating and Illuminating, subclass 212 for processes of injecting oil and air into a heated retort for gasification then maybe adding air to the gas produced, not provided for elsewhere.
252, Compositions, subclasses 372 through 377 for gaseous compositions or processes of making them.
264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclass 30 for residual processes of furnace lining formation or repair, see Class notes thereunder for the Class lines.
431, Combustion, subclasses 2 through 12 for a residual process of combustion or burner operation of general application.

773 Having power output control:
This subclass is indented under subclass 772. Method including regulating a time rate at which work is produced or delivered by the power plant.

SEE OR SEARCH THIS CLASS, SUBCLASS:
793+, for a power plant that uses combustion products as a motive fluid combined with regulating of power output feature.

774 Multiple expansion:
This subclass is indented under subclass 772. Method wherein the step of using the motive fluid for the motor where the motive fluid has its volume increased and where the motor exhausts the volume increased motive fluid into another motor that again increases the volume of the motive fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:
791+, for a power plant that uses combustion products as a motive fluid for a re-expansion type multiple fluid-operated motors.

775 Introducing water or steam:
This subclass is indented under subclass 772. Method including adding liquid H_2O, or its vaporized form, into a fuel or an oxidizer burned by the combustion product generator to produce the motive fluid or into the motive fluid before it is exhausted by the motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39.53 through 39.59, for a power plant that uses combustion products as a motive fluid having means to introduce water or steam.

SEE OR SEARCH CLASS:

48, Gas: Heating and Illuminating, subclass 215 for processes of injecting oil, steam or air into a highly heated retort where air may be added to gas resulting from the retort.

776 Ignition or fuel injection after starting:

This subclass is indented under subclass 772.
Method wherein the step of generating combustion products initiates burning of combustible material within or sprays combustible material into the combustion products generator following initiation of the combustion process.

SEE OR SEARCH THIS CLASS, SUBCLASS:

786 through 39.142, for a power plant that uses combustion products as a motive fluid combined with a starting device.

39.821 through 39.828, for a power plant that uses combustion products as a motive fluid where a combustion products generator has an ignition device.

732 through 733, for a power plant that uses combustion products as a motive fluid where a combustion products generator has an initial fuel-rich combustion zone.

740 through 748, for a power plant that uses combustion products as a motive fluid where a combustion products generator has a fuel injector.

778, for a power plant that uses combustion products as a motive fluid having a particular starting process.

777 Catalyst:

This subclass is indented under subclass 776.
Method wherein the step of igniting the combustible material is accomplished by a substance that notably affects the rate of a chemical reaction without itself being consumed or essentially altered.

778 Having particular starting:

This subclass is indented under subclass 772.
Method including a specific step of initializing the power plant movement or operation.

(1) Note. For this subclass a "starting process" must be more than nominally recited. It may have a process of fueling (e.g., air-fuel ratio, etc.), igniting (e.g., pyrotechnic charge, etc.) or of energizing (e.g., starter motor, induced flow, etc.).

(2) Note. This subclass includes a step of restarting the power plant when it stops inadvertently (e.g., stall, etc.).

779 Having particular safety:

This subclass is indented under subclass 772.
Method including a specific step of protecting the power plant against failure (e.g., backup system, etc.), breakage (e.g., anti-icing, foreign matter ejection, dampening etc.) or an accident (e.g., shut off, etc.).

780 Having fuel conversion (e.g., reforming, etc.):

This subclass is indented under subclass 772.
Method including a step of chemically altering a combustible material (e.g., coal, bitumen, petroleum, natural gas, etc.) into a product (e.g., hydrogen, methane, etc.) having a higher heating value or lighter than the combustible material, which is burned to generate the combustion products.

781 Solid fuel:

This subclass is indented under subclass 780.
Method wherein the step of fuel conversion the combustible material (e.g., coal, etc.) has a form other than a liquid or gas.

782 Having bleed air to cool or heat motor or component thereof (e.g., active clearance control, etc.):

This subclass is indented under subclass 772.
Method including a step of using compressed atmosphere from a stage of the power plant to raise or lower the power plant or an element of the power plant temperature.

(1) Note. In this subclass active clearance control is the ability to modify and reduce a clearance between a shrouded or unshrouded rotating blade and a casing, liner or shroud during operation of the power plant.

SEE OR SEARCH THIS CLASS, SUBCLASS:

785, for a power plant where combustion products are used as a motive fluid

having air bleed for nominal other than a power plant output feature.

783 Combined with diverse nominal process:
This subclass is indented under subclass 772.
Method including a step (e.g., recovery, providing a product, etc.) in name only that is different from a method of using the power plant.

SEE OR SEARCH THIS CLASS, SUBCLASS:
784 through 785, for a power plant where combustion products are used as a motive fluid for nominal other than a power plant output feature.

784 For nominal other than power plant output feature:
This subclass is indented under subclass 39.01.
Apparatus including means in name only intended to provide power, hereinafter "feature", (e.g., combustion products, compressed air, etc.) for use in means (e.g., steam generation, auxiliary turbine, accessories, chemical recovery, etc.) other than the mechanical motion produced by the motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39.13, for a power plant that uses combustion products as a motive fluid having automatic starting and stopping of its combustion products generator.
39.15+, for a power plant that uses combustion products as a motive fluid having multiple fluid-operated motors.
39.19, for a power plant that uses combustion products as a motive fluid composed of different fluids.
783, for a power plant process of using combustion products as a motive fluid combined with diverse nominal process.
786+, for a power plant that uses combustion products as a motive fluid combined with a starting device.

785 Air bleed:
This subclass is indented under subclass 784.
Apparatus wherein the feature is compressed atmospheric fluid from a stage of the power plant intended for use in a means (e.g., engine start system, environmental control system, canopy de-fog, rain removal system, canopy seal, anti-g suit, external fuel tank pressurization, etc.) other than the mechanical motion produced by the power plant.

SEE OR SEARCH THIS CLASS, SUBCLASS:
782, for a power plant process of using combustion products as a motive fluid having bleed air to cool or heat the power plant or a component thereof (e.g., active clearance control, etc.).

786 Combined with starting feature:
This subclass is indented under subclass 39.01.
Apparatus combined with means to initialize operation of the power plant, or means to facilitate the initial operation of the power plant by conditioning or modifying the normal operating cycle of the power plant.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39.13, for a power plant that uses combustion products as a motive fluid having automatic starting and stopping of its combustion products generator.
39.33, for a power plant that uses combustion products as a motive fluid that is convertible or combined.
39.821 through 39.828, for a power plant that uses combustion products as a motive fluid having an ignition device.

SEE OR SEARCH CLASS:
123, Internal Combustion Engines, subclasses 179.1 through 184.1 for a starting device for an internal combustion engine.

787 Separate device or motive fluid source:
This subclass is indented under subclass 786.
Apparatus wherein the starting feature is distinct and (1) an element, component, tool, equipment or mechanism used to start the power plant, or (2) a source of liquid or gas, other than a main source of liquid or gas used to keep the power plant in normal operation, used to start the power plant.

788 Starter motor mechanically coupled to power plant:
This subclass is indented under subclass 787.
Apparatus wherein the starting feature is a machine that converts energy into mechanical

motion and uses a physical connection to transfer this motion to initiate the operation of the motor.

789 Solid propellant charge initiates starting (e.g., cartridge starter, etc.):
This subclass is indented under subclass 787.
Apparatus wherein the starting feature is a quantity of fuel and oxidizer in other than gas or liquid form ignited to create a motive fluid used to initiate the operation of the power plant.

790 Having condition responsive fuel control:
This subclass is indented under subclass 786.
Apparatus including means to sense a state or change in state of the power plant to effect a change in regulation of a substance used to produce heat or power by burning to start the power plant.

791 Re-expansion:
This subclass is indented under subclass 39.15.
Apparatus wherein the motive fluid passes through and is expanded by each of two or more distinct motors fluidly connected in series to perform useful work.

SEE OR SEARCH CLASS:
91, Motors: Expansible Chamber Type, subclasses 8 through 10 for a semi-compound type having fluid supply through diverse paths to a single expansible chamber or subclasses 152-164 for multiple expansion type chambers.
418, Rotary Expansible Chamber Devices, subclasses 5 through 13 for multi-stage rotary expansible chamber devices.

792 Multi-spool turbocompressor:
This subclass is indented under subclass 791.
Apparatus wherein the two or more motors drive at least two or more separate pumps fluidly connected in series to raise gas or air pressure in stages.

793 Combined with regulation of power output feature:
This subclass is indented under subclass 39.01.
Apparatus combined with means (e.g., speed of motor, combustion products temperature or quantity, duration of events during an intermittent cycle, etc.) to govern capacity to perform useful work produced by the power plant.

(1) Note. To be classified in this subclass the patent should claim a control means more specifically than merely reciting a "valve," "valved pipe," "controlling means," "throttle valve," or similar broad terms. This exclusion note applies only to this subclass, and not to the indented subclasses.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39.13, for a power plant that uses combustion products as a motive fluid having automatic starting and stopping of its combustion products generator.
773, for a power plant that uses combustion products as a motive fluid having power output control.

SEE OR SEARCH CLASS:
110, Furnaces, subclass 101 for a fuel feeder to a furnace.
123, Internal Combustion Engines, subclasses 319 through 405 for a speed regulator to an internal combustion engine.

794 Oxidizer:
This subclass is indented under subclass 39.24.
Apparatus wherein the sensing means controls a substance (e.g., oxygen, etc.) used to support burning of fuel to regulate the power plant output.

SEE OR SEARCH THIS CLASS, SUBCLASS:
39.23, for a power plant that uses combustion products as a motive fluid having means to vary oxidizer flow that is other than condition responsive.

795 Bleed:
This subclass is indented under subclass 794.
Apparatus wherein the oxidizer is channeled away before reaching the combustion products generator.

796 Having mounting or supporting structure:
This subclass is indented under subclass 39.01.
Apparatus including means constructed to attach, fix or hold the power plant to another

physcial entitly, hereinafter "mounting or supporting structure" (e.g., base, foundation, vehicle, aircraft, etc.) or parts of the power plant to each other.

SEE OR SEARCH CLASS:

74, Machine Element or Mechanism, subclass 16 for a power table or stand portable assembly designed to drive one or more auxiliary attachments.

244, Aeronautics and Astronautics, subclass 54 for a mount connecting an aircraft power plant to an aircraft structure.

248, Supports, subclasses 637 through 681 for a machinery support.

440, Marine Propulsion, subclasses 53 through 65 having means effecting or facilitating movement of a screw propeller or a segment of the screw propeller (e.g., tilting or steering, etc.), or subclasses 79-82 for a screw propeller connected to a vessel or having a specific relationship with other propellers.

797 For motor:

This subclass is indented under subclass 796.
Apparatus wherein the mounting or supporting structure is for a machine that converts the motive fluid into mechanical motion.

798 Having ease of assembly or disassembly feature:

This subclass is indented under subclass 796.
Apparatus including means to facilitate putting together or taking apart parts of the power plant.

799 Having expansible connection:

This subclass is indented under subclass 39.01.
Apparatus including means joining two or more parts, and permitting an increase in size of a part of the power plant.

(1) Note. Expansion is usually caused by a change in temperature or may cause sliding or angular movement.

(2) Note. The connection may be a seal or transition piece that allows growth.

SEE OR SEARCH CLASS:

285, Pipe Joints or Couplings, subclass 187 for a temperature responsive joint or coupling to maintain a good seal, subclasses 223-237 for a flexible joint for rigid members, subclasses 261-271 for a ball and socket joint, or subclass 302 for a variable length telescopic joint having relative motion.

403, Joints and Connections, subclasses 34 through 39 having distinct fluid or article handling or directing feature in which the means and the fluid are not essential to the joint, subclasses 52-166 for articulated members, or subclasses 220-229 having flexibly connected rigid members.

800 Combustor or fuel system:

This subclass is indented under subclass 799.
Apparatus wherein the expansible connection joins the means to generate combustion products or one of a group of interacting parts that function to deliver a substance used to produce heat or power by burning to another part.

801 Convertible or combined with feature other than combustion products generator or motor:

This subclass is indented under subclass 39.01.
Apparatus including means (1) to modify the power plant to operate on a different motive fluid or different cycle, or change the function of the motor; or (2) includes means other than a motive fluid generator or the machine that converts the motive fluid into mechanical motion together with means having a different proximate function, effect or product (i.e., subject matter of another class), or a perfecting means.

(1) Note. The convertible or combined (e.g., accessories, etc.) in this and indented subclasses are not provided for in a previous subclass.

(2) Note. Combustion products generator or motor includes a fuel, steam or water supplying means, a compressor or accumulator, a cooling structure, or an exhaust treatment device.

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.64, for a power plant that uses combustion products as a motive fluid having an alternate cycle.

424, for a motor powered by a pressurized source of fluid, other than products of combustion, serially connected motors controlled to establish parallel operation or to bypass a motor means of the series.

596, for an internal combustion type free piston device having a pressure fluid starting means.

625 through 631, for an internal combustion engine having structure to rotate or start it by pressure fluid.

786 through 39.142, for a power plant that uses combustion products as a motive fluid combined with a starting device.

SEE OR SEARCH CLASS:

91, Motors: Expansible Chamber Type, subclass 11 for expansible chambers having fluid supply through diverse paths changeable from multiple expansion to parallel flow operation.

802 Motor driven accessory:

This subclass is indented under subclass 801.

Apparatus wherein the means is powered (e.g., bleed air, belts, gears, vacuum, etc.) by the machine that converts the motive fluid into mechanical motion either to perform an additional function or to enhance performance of the power plant.

803 Motor condition sensing feature:

This subclass is indented under subclass 801.

Apparatus wherein the means detects and identifies a state or change in state of the machine that converts the motive fluid into mechanical motion.

804 Coaxial combustion products generator and turbine:

This subclass is indented under subclass 39.01.

Apparatus including motive fluid generating means having an axis in common with a rotational axis of a bladed rotor used by a machine to convert the motive fluid acting upon blades of the rotor into rotary mechanical motion.

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.34 through 39.35, for a power plant that uses combustion products as a motive fluid having rotating combustion products generator and turbine.

200.1 through 771, for a reaction motor type power plant having a motive fluid generator and a reaction nozzle.

805 Having turbine:

This subclass is indented under subclass 722.

Apparatus including a machine where the products of combustion drive a bladed rotor that convert the products of combustion into rotary mechanical motion.

SEE OR SEARCH THIS CLASS, SUBCLASS:

39.34 through 39.35, for a power plant that uses combustion products as a motive fluid having rotating combustion products generator and turbine.

39.37 through 39.4, for a power plant that uses combustion products as a motive fluid having plural combustion products generators in a ring coaxial with a turbine.

39.42, for a power plant that uses combustion products as a motive fluid having a reversible turbine.

39.43, for a power plant that uses combustion products as a motive fluid having a dual function turbine.

39.44, for a power plant that uses combustion products as a motive fluid having a closed pocket turbine.

804, for a power plant that uses combustion products as a motive fluid having a coaxial combustion products generator and turbine.

SEE OR SEARCH CLASS:

415, Rotary Kinetic Fluid Motors or Pumps, for appropriate subclasses for gas operated turbines, per se.

806 And cooling:

This subclass is indented under subclass 805.

Apparatus and means to reduce the temperature of the combustion products or a component of the power plant.

CROSS-REFERENCE ART COLLECTIONS

900 EXCESS AIR TO INTERNAL COMBUSTION ENGINE TO ASSIST EXHAUST TREATMENT:
This subclass is indented under the class definition. A cross-reference collection based on a manner of operating an engine to control pollution by adjustably setting the air feed to the engine. Much of the art is from Class 123, Internal-Combustion Engines; subclasses 568.11+, charge forming devices having exhaust gas used with the combustible mixture. See also Class 60 for the control of the air, fuel, or ignition of an engine, responsive to the condition of an exhaust treating reactor.

901 EXHAUST TREATMENT SPECIAL TO ROTARY INTERNAL COMBUSTION ENGINE:
This subclass is indented under the class definition. Cross-reference collection disclosing a treatment or handling of exhaust from a rotary internal combustion engine.

902 ROTARY REACTOR SEPARATOR, OR TREATER OF EXHAUST OF AN INTERNAL COMBUSTION ENGINE:
This subclass is indented under the class definition. Cross-reference collection disclosing a rotary device in the exhaust gas.

903 CLOSURE OPERATORS:
This subclass is indented under the class definition. Systems that are disclosed as operating doors, windows, gates etc.

904 PROPELLER OR AIRPLANE SYSTEM:
This subclass is indented under the class definition. Systems that are disclosed as controlling the pitch of a propeller or as operating an element of an airplane.

905 WINDING AND REELING:
This subclass is indented under the class definition. Systems disclosed as operating a reel or winding a rope or strand.

906 ENGINE SPEED RESPONSIVE THROTTLE CONTROL SYSTEM:
This subclass is indented under the class definition. Systems disclosed as receiving a signal indicative of the speed of an engine and controlling the throttle of the engine.

907 WORKING MEMBER POSITIONED AGAINST COUNTERFORCE BY CONSTANTLY APPLIED MOTIVE FLUID:
This subclass is indented under the class definition. System in which a constantly maintained, though variable, pressure positions a member against bias or maintains substantially constant pull or thrust.

908 WASHING MACHINE SYSTEM:
This subclass is indented under the class definition. Systems disclosed as operating a clothes washing machine.

909 REACTION MOTOR OR COMPONENT COMPOSED OF SPECIFIC MATERIAL:
This subclass is indented under the class definition. Cross-reference collection of art disclosing reaction motors or components thereof which are composed of specific materials.

910 FREE PISTON:
This subclass is indented under the class definition. Cross-reference collection of art disclosing free piston arrangements in power plants.

911 FLUID MOTOR SYSTEM INCORPORATING ELECTRICAL SYSTEM:
This subclass is indented under the class definition. Cross-reference collection of art disclosing fluid motor systems provided with or incorporating an electrical system.

912 COOLING MEANS:
This subclass is indented under the class definition. Cross-reference collection of art disclosing power plants provided with special cooling devices or structures.

913 COLLECTION OF REGGIO PATENTS:
This subclass is indented under the class definition. Cross-reference collection of art drawn to those patents granted to Reggio and related to turbo or super-charging devices.

914 EXPLOSIVE:
This subclass is indented under the class definition. Cross-reference collection of art disclosing power plants utilizing explosives.

915 COLLECTION OF GODDARD PATENTS:
This subclass is indented under the class definition. Cross-reference collection of art drawn to patents granted to Robert Goddard and related to early developments in liquid fuel rocketry.

916 UNITARY CONSTRUCTION:
This subclass is indented under the class definition. Cross-reference collection of art disclosing power plants or their components constructed a single member or structure.

917 SOLID FUEL RAMJET USING PULVERIZED FUEL:
This subclass is indented under the class definition. Cross-reference collection of art disclosing power plants for producing a useful thrust in one direction in an opposite direction comprising a means for or step of producing said motive fluid and a means for or step of ejecting said motive fluid in which the means for producing motive fluid includes a combustion or heating chamber and air is supplied to said chamber due only to the forward motion of the apparatus and further wherein the fuel to produce the motive fluid is pulverized fuel.

FOREIGN ART COLLECTIONS

The definitions below correspond to the abolished subclasses from which these collections were formed. See the Foreign Art Collection schedule of this class for spe correspondences. [Note: The titles and definitions for indented art collections include all the details of the one(s) that are hierarchically superior.]

FOR 100 Including afterburner:
Foreign art collection for apparatus having means to oxidize fuel in an atmosphere of motive fluid comprising previ formed combustion products.

FOR 101 Air supplied by ram effect:
Foreign art collection for apparatus in which the means for producing motive fluid includes a combustion or heating chamber and air is supplied to said chamber due only to the forward motion of the appara.

FOR 102 Motive fluid outlet means:
Foreign art collection for apparatus having a specifically claimed open by means of which motive fluid is ejected from the apparatus.

(1) Note. Included in this definition are reaction motor ejection means having an opening which may be varied in cross sectional area.

FOR 103 Processes:
Foreign art collection for producing motive fluids composed of products of combustion or for operating plants utilizing such motive fluids.

FOR 104 Regulation of power output:
Foreign art collection involving the variation of the quan or temperature of the motive fluid composed of products of combustion, or the available energy of a plant utilizing such motive fluid.

FOR 105 Multiple expansion:
Foreign art collection involving the generation of motive fluid composed of products of combustion used in, or the use of such motive fluid in, plants having multiple expansion motors.

FOR 106 Addition of steam and/or water:
Foreign art collection involving the addition of steam and/ or water to the ingredients utilized to generate the motive fluid, or to the motive fluid, prior to its discharge from the motor.

FOR 107 Ignition and/or fuel injection:
Foreign art collection involving the initiation of the com of the fuel charge and/or the injection of the fuel within a combustion products gener.

FOR 108 With nonmotor output:
Foreign art collection for Plants in combination with means whereby the device, in addition to providing useful power for external use, also serves as a source of heat or pressure fluid, such as steam, combustion products, or compressed air, for use in another art device.

FOR 109 With starting device:
Foreign art collection for Plants in combination with means to initially place the plant in operation, or to condition the plant or to modify the normal operating cycle, in order to facilitate the initial operation thereof.

FOR 110 Separate starting device or motive fluid source:
Foreign art collection for Plants having either (1) a motor dis from a plant wherein the motor is used to place the plant in operation, or (2) a separate source of working fluid distinct from a main source of working fluid normally used to drive the plant wherein this separate source of fluid is used to place the plant in operation.

FOR 111 Re-expansion:
Foreign art collection for Plants in which the motive fluid passes through two or more motors in series.

FOR 112 With regulation of power output:
Foreign art collection for Plants in combination with means to vary the rate of power output, as by varying the speed of the power output motor, or by controlling the temperature and/or quantity of the motive fluid, or by varying the duration of the events, during each cycle, of an intermittent combus type generator.

(1) Note. In order to be classified in this subclass the patent should claim the con means more specifically than merely as a "valve", "valved pipe", "controlling means", "throttle valve", or similar broad terms. This exclusion note applies only to this subclass, and not to the indented subclasses.

FOR 113 Oxidizer:
Foreign art collection for combinations wherein the means to vary the rate of power output regulates the quantity of oxidizer comprising an ingredient to produce the motive fluid.

FOR 114 With mounting or supporting structure:
Foreign art collection for devices wherein means are provided for fixing or holding said device relative to some frame of reference.

(1) Note. Means for securing parts or ele of the device to each other are not considered supporting or mounting means for classification in this subclass. A bed plate, per se, is not considered to be a support under this definition.

FOR 115 With expansible connections:
Foreign art collection for devices wherein means are provided to permit relative movement between parts to compen for expansion and contraction.

FOR 116 Convertible and combined:
Foreign art collection for plants including means whereby the plant may be selectively or automatically modified to operate on a different motive fluid or different cycle, or the function of the motor may be changed. Also, plants under subclass 39.01 in combination with features other than combus products generators and motors, and not provided for in the preceding subclasses.

(1) Note. Combustion products generators and motors include means to supply fuel, steam and/or water, compressors, accumulators, cooling structure, and exhaust treatment devices.

FOR 117 Coaxial combustion products generator and combined:
Foreign art collection for plants comprising a turbine and a single com products generator, the axis of the com products generator being coaxial with the turbine shaft.

FOR 118 With turbine:
Foreign art collection for devices, comprising a generator of combustion products and a turbine receiving and driven by such products.

END