

CLASS 91, MOTORS: EXPANSIBLE CHAMBER TYPE

SECTION I - CLASS DEFINITION

This class is limited to motors for converting the energy of a pressure fluid into mechanical work in which a charge of simple pressure fluid is admitted to an expansible chamber, the expansion of said chamber converting into work only the original energy of the charge, the charge after expansion of said chamber being exhausted to some place other than whence it came, and in which no energy is extracted from the charge except by expansion of the chamber, said motors when of the reciprocating or oscillating type including control of the fluid.

- (1) Note. Claims Not Controlling in Patents Prior to 1936. Patents issued prior to 1936 have not necessarily been classified by claims so that the placement of these patents does not necessarily indicate lines of classification. However, most of the patents regardless of their age have been placed in accordance with their claimed subject matter.

PLACEMENT OF PATENTS

A. Involving Combination and Subcombination Subclasses:

In many instances the schedule of this class provides for a combination which requires a given subcombination, and elsewhere below provides for the subcombination.

The following rule has been followed as to the placement of the original patent, and as to cross-referencing, and should be followed in the future.

Where the combination subclass requires the same subcombination as is provided for in the subcombination subclass, i.e., subcombination defined with the same specificity in both subclasses, a patent disclosing the combination is placed as an original in, or under, the combination subclass regardless of whether the claims are directed to the combination or subcombination and is not cross-referenced to the subcombination subclass. A patent disclosing only the subcombination and claiming same is placed as an original in the subcombination subclass and is not cross-referenced to the combination subclass.

This rule is applicable only in instances where there is but a single subcombination subclass, i.e., no indented subclasses, but

the combination subclass may be further subdivided into indented subclasses.

The prime feature of this situation is that the subcombination must, by definition, be of equal specificity in the two subclasses. A search for the subcombination, at least in the case where it is adapted to be used in the combination, of necessity involves all of the patents in the combination subclass. Under this system of placing the patents a complete search of the combination can be made in the combination subclass, and of the subcombination in both subclasses without the addition to the search files of the otherwise necessary cross-reference copies.

The subclasses involved in this combination-subcombination relationship have been indicated in the schedule by numbers in parenthesis, as explained in a paragraph after the class title.

Exemplary of this situation in the indented subclasses (223-229) provide for a distributor (valve) in the piston of a cyclically operable motor combination while subclass 422 requires only a valved piston subcombination. As between these subclasses any patent having a disclosed cyclically operable motor is placed as an original in subclass 222 or one of the indented subclasses regardless of whether the means which makes the motor cyclically operable is claimed and is not cross-referenced in subclass 422. A complete search for the subject matter provided for in subclass 422 of necessity involves all of the patents in subclasses 222-229.

B. Involving Ancillary or Auxiliary Expansible Chamber Motor:

In many instances the claimed motor which provides the basis of classification for a patent in Class 91 is provided with another expansible chamber motor which merely performs an ancillary or auxiliary function for the main motor. Illustrative of such functions are motor valve or lock, or lubricator actuation. In such cases the structure or operation of the ancillary motor does not constitute a basis for original classification of the patent in the Class 91 schedule unless the patent includes a claim to the auxiliary motor, per se. However, the patent may be cross-referenced on the basis of the auxiliary motor. For example, see subclasses 6-

33 and 282-283. Subclasses 6-33 provide for fluid supply through diverse paths to a single expandable chamber. In this case the chamber must be a chamber of the motor which causes the patent to be classified in Class 91. Subclasses 282-283 provide for the same type of supply to a motor chamber, but in this case the motor is an auxiliary motor in that it actuates the distributor of another motor. This type of control of a distributor motor does not cause classification of the patent as an original in subclasses 6-33, but cross-reference to subclasses 6-33 is appropriate.

SECTION II - LINES WITH OTHER CLASSES AND WITHIN THIS CLASS

Combinations With Load Devices.

Inasmuch as the basic purpose of a motor is to operate a load the inclusion of the load in the claim by name only or in general terms will not exclude a patent from this class. An exception to this general rule exists where the load on the motor is a valve. The combination of an expandable chamber motor and a valve as the load driven thereby, even if the valve is claimed by name only, is excluded from this class and will be found in Class 137, Fluid Handling, or Class 251, Valves and Valve Actuation. A second exception exists where the claimed nominal load on the motor is an expandable chamber means solely disclosed as the master of a pulsator. This combination is classifiable in Class 60, subclasses 533-594.

This line also applies where the load is a tool; that is, a named tool driven by the motor will not exclude a patent from this class if no tool details are recited. However, if a support for the work being acted upon by the tool is claimed, classification in the appropriate tool class results even though both the tool and the support are claimed by name only. Also see the Search Class 173 note in section III below for the line with regard to a nominally claimed tool driven by an expandable chamber motor combined with other features such as work cleansing or tool feeding.

No attempt has been made to review the classification of all patents found in classes relating to loads adapted to be driven by a motor. Thus, it is to be noted that the original classification of all patents is not consistent with the above statement as to nominally claimed loads and this particularly applies as to classes not recently

reclassified. In those instances in which a body of art is known to exist in a given class, in which the load on the motor is claimed only nominally, and especially where the classification of that class provides for a fluid motor actuator for the device, currently issuing patents will not be classified as originals in Class 91 even though the load is only nominally claimed.

The means which transmits power from the working member of the motor to the load to be driven, e.g., linkage, gearing, etc., is not considered to be the load for the motor. See the Search Class 74 note in the class definition of Class 91 for a further discussion of this subject.

RELATIONSHIP TO CLASS 92

Class 92 is directed to expandable chamber devices, per se, and is related to Class 91 as a subcombination thereof. Class 92 is limited to expandable chamber devices in which the working member has an oscillating or reciprocating motion to expand and contract the expandable chamber. Thus, Class 92 cannot take the subcombination of any Class 91 motor in which the working member is of the rotating type as defined in subclass 58 of Class 91.

With respect to expandable chamber motors in which the working member has a reciprocating or oscillating motion to expand and contract the expandable chamber, Class 92 will take those patents in which no control of the motive fluid by a valving action is claimed. Thus, any claimed valving of motive fluid of an expandable chamber motor in sufficient to preclude classification is Class 92 even though the valving claimed may not be all of the valving necessary to cause the motor to operate in the intended manner. However, if a claim is for an expandable chamber motor driving a specifically claimed Class 92 device, then classification is in Class 92 regardless of the details of the expandable chamber motor recited.

See Class 92, subclass 3. For the classification of various subcombination features of Class 92 devices elsewhere classified see the class definition and appropriate notes in Class 92.

With regard to claim interpretation to determine whether valving is claimed to cause classification in Class 91, or is not claimed thus permitting classification in Class 92 the following criteria have been followed:

1. Claims which include a limitation such as “means for supplying fluid to the motor” or “means supplying fluid to the motor” are construed as requiring no more than the conduits or ports which supply the fluid and would, therefore, not be interpreted as including valving for Class 91.

2. Claims which include a limitation similar to that in (1) above, but with a further limitation which indicates a change in supply of working fluid such as--alternately, periodically, intermittently, pulsing, fluctuating, reversing flow, etc.--are construed as necessarily including more than a mere conduit or port and are excluded from Class 92. These patents would thus be classified on their claimed disclosure of what performs the noted change in the supply. Thus, a patent claiming “means (for) alternately supplying motive fluid to the motor” would be classified in Class 91 if said means is disclosed as a valve.

3. A port in an expansible chamber wall which is disclosed as controlled by the working member as, for example, an exhaust port which is overrun by a piston, together with the working member constitutes valving for Class 91. If such a port is claimed classification is in Class 91 regardless of whether the claim sets forth that the working member controls the port.

RELATIONSHIP TO CLASS 60

The general line between Class 91 and Class 60 is that if subject matter relating to power production comprising more than an expansible chamber motor or more than a plurality of such motors is claimed, classification is in Class 60 if otherwise appropriate.

More specifically the line may be categorized as follows:

A. Plural or combined type motors

(1) The combination of a motor classifiable, per se, in Class 91 with a motor of another type (including a pulsator) i.e., one which, per se, would be classified in another motor class, is classified in Class 60. See Class 60 subclasses 698-720.

However, the combination of a Class 91 type motor with a second motor which performs an ancillary function only of the Class 91 type motor, e.g., valve operating motor, etc. and provides no power for external use is not excluded from Class 91

even if the second motor is of another type (e.g., electric motor).

(2) The combination of a plurality of Class 91 type motors or a Class 91 type motor having a plurality of working members, e.g., pistons, etc., is classified in Class 91. See the Search Class 60 note in subclass 170 of Class 91 for a further statement of this line.

B. Motive fluid source, modification or exhaust treatment

(1) Pumps.

The inclusion in a claim of a pump broadly which provides motive fluid for utilization by the Class 91 motor does not preclude classification in Class 91.

The following examples of terminology have been considered to be nominal inclusion of a pump and if so claimed would not preclude classification in Class 91: (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 sump, pump and motor.

The following examples have been considered to be significant inclusion of a pump, and if so claimed would preclude classification in Class 91 and 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 the preceding paragraph); (b) a motor driven pump in which the motor is characterized as to type, e.g., turbine, electric motor, internal combustion engine, etc. (however, see (e) in the 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 sump, 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.

See particularly Class 60 subclasses 325-494.

(2) Accumulators.

A motor having an expansible chamber in constant communication with an accumulator for pressurized motive fluid is not precluded from Class 91 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.

Class 60 takes an accumulator combined with a Class 91 motor in which a control valve means is interposed between the accumulator and expansible chamber unless the accumulator is claimed so broadly as to amount to a mere conduit. See particularly Class 60, subclasses 325-494.

(3) Internal Generation.

Class 60 takes those expansible chamber motors in which the motive fluid within an expansible chamber is heated or cooled, as, for example, by a fluid in heat exchange relation with the interior of the chamber. Such a fluid may be the same motive fluid used in the chamber either before or after it passes through the chamber. See Class 60, subclass 508.

(4) Heating, Superheating or External Generation.

An expansible chamber motor having nominally claimed means to heat or superheat the motive fluid before introduction into the expansible chamber is not precluded from Class 91. For example, Class 91 takes a "boiler" combined with an expansible chamber motor while a "fire tube boiler" combined with a Class 91 motor would be classified in Class 60. See, for example, Class 60, subclasses 643-684.

Class 91 does not take the combination of an expansible chamber motor with an explosive generation of motive fluid even if nominally claimed. See, for example, Class 60, subclasses 632-638.

(5) Exhaust Treatment or Handling.

Class 60 takes combinations involving treatment of motive fluid after it leaves an expansible chamber where means is claimed to change some characteristic of the fluid. A condenser is an example of such a means, but the inclusion of a condenser in a claim by name only is not sufficient to preclude a patent from Class 91.

Class 60 also takes combinations involving handling of exhaust fluid from a fluid motor. This fluid is considered to be

exhaust fluid for Class 60 after it leaves the last claimed valve means which could affect operation of the Class 91 motor. Handling is considered to necessarily include more than a mere pipe or chamber to conduct the exhaust fluid away. A valve for controlling a Class 91 motor, located in the exhaust line from the motor, designed to direct exhaust fluid to one or more of a number of exhaust passages is not exhaust fluid handling for Class 60. However, an exhaust fluid conductor having a number of ports therein merely for the purpose of dividing the exhaust stream is more than a mere chamber or pipe and is classified in Class 60. Claimed limitations to an elbow, support or other fitting which constitutes a mere part of the exhaust pipe will be ignored, but any significant relation of the pipe and motor will result in classification in the appropriate exhaust treatment subclass of Class 60. A particular physical relation or mechanical interconnection between a chamber or reservoir for receiving exhaust fluid from the motor and the motor has been considered exhaust handling for Class 60.

C. Pulsators

Class 60 takes pulsator systems in which a generally constant mass of confined motive fluid passes between pump and motor expansible chambers and returns to the pump by the same route or conduit. Class 60 also provides for such pulsator systems where additional fluid is added to the system whether the fluid is make-up fluid to replace leakage or pressurized motive fluid to operate the motor, unless the pressurized motive fluid is valved by a movable valve element which is mechanically connected to the pump working member so that movement of the working member will cause movement of the valve element. The latter combination is classified in Class 91. See the Search Class 60 note in subclass 6 of Class 91 for a further statement of this line. It is to be noted that some pulsator systems which involve a generally constant mass of confined motive fluid include a valve such as a throttle between the pump and motor. The claiming of the motor and valve only in such a disclosed system is excluded from Class 91 in that the fluid does not exhaust to some place other than whence it came.

Search Class 60 subclasses 533-594 for pulsators and pulsator systems.

RELATIONSHIP TO CLASS 418

Class 418, Rotary Expansible Chamber Devices, takes rotary expansible chamber motors even though the disclosure and claims may be restricted to motor use. In some ways Class 418 may be considered to be less comprehensive than Class 91, and rotary expansible chamber type motors in certain combinations enumerated below will be classified in Class 91 rather than Class 418. Unless specifically excluded below a patent to a rotary expansible chamber type motor as defined in the class definition of Class 418 will be classified as an original in Class 418 as opposed to Class 91.

(1) Valving

(a) Cyclic or Position Responsive: Class 418 will take rotary expansible motors combined with valves for the motive fluid which have a repetitive pattern or cycle of operation which is related to the rotation of the motor. These may be termed cyclic or position responsive valving and include the opening and closing of inlet or exhaust ports by the movement of this type valving so as to provide, for example, early cutoff of supply is also included in Class 418. The inclusion, however, of means to cutoff operation of the motor after a partial, full or predetermined number revolutions is excluded from Class 418 and would cause classification in this class (91). See for example, subclass 2.

(b) In-line: An in-line valve is defined as one situated in the normal line of motive fluid flow which acts in some way to control the flow in the line, but not by diverting the fluid to a second or subsidiary flow line, e.g., waste, etc. Class 418 will take all in-line valves combined with a rotary expansible chamber motor which are controlled by some means other than a condition of the motive fluid, e.g., manual throttle, etc., and will also take those which are actuated directly by the application of the motive fluid thereto, i.e., direct response valves. Those devices including in-line valves which are controlled by a motive fluid condition, e.g., pressure, flow, etc., and in which said valves are not of the direct response type are excluded from Class 418

and will be classified in Class 91 if otherwise appropriate.

(c) Branched Flow or By-pass:

(1) Separate Valve Means: Those rotary expansible chamber devices which include a separate valve means (as opposed to a movable chamber part as discussed in paragraph (2) immediately below) to divert or by-pass all or a portion of the motive fluid from its normal or first course of flow to a second or waste path are excluded from Class 418 regardless of whether the valve is manually or otherwise controlled unless the diverted fluid is used merely for a motor perfecting function such as lubricating, cooling, vane bias, etc.

(2) Movable Chamber Part: Many rotary expansible chamber motors have expansible chamber parts which are in running contact with other chamber parts and which move from a "normal" or contacting position to a noncontacting position and in so moving allow passage or by-pass of motive fluid thereby. Examples of such parts are vanes, abutments, end plates, etc., and such parts are usually biased into contacting position by means such as a spring, pressure fluid conducted from the expansible chamber or the like. Such devices are not excluded from Class 418 even though the yielding of the part may be considered to be performing a by-pass function. However, if motive fluid is conducted to the part for such a biasing function, e.g., behind end plate, etc., and there is a controlled application of fluid to or release of the fluid from the bias area for the disclosed purpose of by-passing said fluid or conducting it to another point of disposal such devices are excluded from Class 418 and are classified in Class 91 if otherwise appropriate.

(3) With Diverse Motor: The combination of a rotary expansible chamber motor with another motor of a different type, e.g., reciprocating, etc., is excluded from Class 418. Unless the diverse motor is a mere auxiliary of the rotary expansible chamber motor, as for example, a valve actuating motor. See Class 91, subclass 61 for a combined rotary expansible chamber motor and a reciprocating motor. See Class 60, Power Plants, subclasses 698-720, for other diverse motors one of which may be of the rotary expansible chamber type.

The Search Class notes below also include statements of the line with other classes.

SECTION III - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

- 60, Power Plants, see (4) Note above for the relationship of Class 91 and Class 60.
- 73, Measuring and Testing, subclasses 232 through 271 for expansible chamber type volume or rate of flow meters. Class 73 includes expansible chamber meters combined with registering mechanism and meters incapable of general use as an expansible chamber motor. A meter is considered to be incapable of such general use if there is not disclosed means to take power therefrom for external use such as to a registering mechanism. Therefore, Class 91 takes an expansible chamber device disclosed as a meter having means to take power therefrom such as for an unclaimed registering mechanism.
- 74, Machine Element or Mechanism, appropriate subclasses for machine elements and mechanisms, per se, and in combination with a nominally claimed expansible chamber motor. In general gearing or linkage included as part of the power output means from an expansible chamber motor is considered to be basic subject matter of the motor and would not preclude classification in Class 91. Also see (2) Note, in subclass 55 of Class 91. For statement of the line between Class 74 and Class 92, see section III of the class definition Class 92.
- 92, Expansible Chamber Devices, see (3) Note above for the relationship of Class 91 and Class 92.
- 123, Internal-Combustion Engines, The line between Class 91 and Class 123 is one of disclosure. Thus, any patent which has at least one embodiment of the invention which is disclosed as an internal combustion engine, and which has a claim specific to such embodiment, and in which the claim includes control of the motive fluid, is classified in Class 123 even though the motive fluid control is not necessarily limited to internal combustion operation.
- 137, Fluid Handling, subclasses 82 through 86, for pressure modulating relays or followers for expansible chamber motors. The positive inclusion in a claim of the expansible chamber motor which is controlled by the pressure modulating relay or follower precludes classification in Class 137 and causes classification in Class 91. See, for example, subclasses 3, 47-51 and 52 of Class 91. See subclasses 87.01-87.06, 455-543.23 and 561-616.7 for self proportioning or correlating systems, line condition change responsive valves and multiple or multi-way valves for expansible chamber motors, respectively. The positive inclusion in a claim of the motor which is being controlled by the valve means precludes classification in Class 137. The inclusion in a claim of a cylinder in combination with a valve will not exclude a patent from Class 137 on the basis that a cylinder is the equivalent of a flow path being controlled by the valve. However, where a cylinder is claimed as having passages leading to or ports present in opposite ends thereof (as in a double acting motor) the patent is excluded from Class 137. Also see (2) Note in section I above.
- 172, Earth Working, appropriate subclasses, and especially subclasses 2 through 12, 464-466 and 491 for expansible chamber motor operated or adjusted implements and see the reference to Class 91 in the Search Class section of Class 172 for a statement of the line.
- 173, Tool Driving or Impacting, appropriate subclasses for an expansible chamber fluid motor in a claimed combination peculiar to tool driving, such as a tool drive means combined with a tool impacting, work cleaning, tool advancing or manipulating handle feature. See the class definition of Class 173 for a complete description of the subject matter provided for therein. Also see the reference to Class 91 in section IV of the class definition of Class 173.
- 180, Motor Vehicles, subclasses 53.1 through 53.8 for vehicles with power take-off means from the vehicle motor to a nominally claimed load.
- 187, Elevator, Industrial Lift Truck or Stationary Lift for Vehicle, especially subclass 215 for an expansible chamber fluid motor and its control in claimed combination with a more than named stationary lift for raising a vehicle in its entirety between spaced vertical positions, and subclasses 272-275 for an expansible chamber fluid motor and its control in claimed combination with a more than named load-underlying support surface, e.g., external load support guide structure which is not necessary to the fluid motor internal drive, particular load-

- underlying support structure, elevator counter-balances, etc.
- 251, Valves and Valve Actuation, appropriate subclasses for valves and valve actuators for expansible chamber motors. The positive inclusion in a claim of the motor which is being controlled by the valve precludes classification in Class 251. The inclusion in a claim of a cylinder in combination with a valve will not exclude a patent from Class 251 on the basis that a cylinder is the equivalent of a flow path being controlled by the valve. Also see (2) Note in section I above.
- 415, Rotary Kinetic Fluid Motors or Pumps, appropriate subclasses for a rotary motor operated by a confined or directed fluid but not inclusive of "expansible chamber" type classifiable in Class 418, Rotary Expansible Chamber Devices.
- 417, Pumps, appropriate subclasses for expansible chamber pumps. Many expansible chamber devices, are capable of use either as a pump or a motor without modification, the only difference being whether pressure fluid is introduced, and mechanical power produced (motor) or mechanical power is introduced and pressure fluid produced (pump). The following criteria will determine original classification if a patent: (a) Where the disclosure is that the device can be used as a pump or motor, classification in Class 91, will result if the device is claimed as a motor or alternatively as pump or motor, or generically as an expansible chamber device, for example. If such a device is claimed as a pump classification will be in Class 417. (b) Where the device is solely disclosed as a pump, classification in Class 417 will result whether claimed generically or specifically. (c) Where the device is solely disclosed as a motor, classification in Class 91 will result whether claimed generically or specifically. (d) Where the device is disclosed and claimed generically, classification in Class 91 will result. (e) For an exception to this general line see subclasses 269 through 273 of Class 417 and (1) Note in subclass 269 for the line between the art classified thereunder and the art in Class 91, subclasses 472-507.
- 475, Planetary Gear Transmission Systems or Components, for planetary gear transmissions, per se. The same line exists between Class 91 and Class 475 as exists between Class 91 and Class 74.

- 477, Interrelated Power Delivery Controls, Including Engine Control, for interrelated control between an engine and a transmission, clutch, or brake. Class 477 was formed from patents in Classes 74 and 192 and so the same line exists between Classes 91 and 477 as exists between Class 91 and Classes 74 and 192. subclasses 375+ for expansible chamber motor driven pumps. The claiming of the pump by name only is not sufficient to exclude a patent from Class 91, the pump or piston and cylinder being considered a nominal load or the equivalent of a crosshead and guide for the motor.

SECTION IV - GLOSSARY

See (3) Note of subclass 418 of Class 91 for definitions of terms applicable to subclasses 418-470 only.

CYLINDER

A rigid external member which permanently surrounds the piston, the latter constituting a relatively moving wall for the expansible chamber, the other walls of which are formed by the cylinder, and the cylinder ordinarily including the abutment or reaction surface against which the motive fluid acts or the piston forming the abutment for the cylinder when the cylinder is movable and the piston fixed. However, the abutment or reaction surface for the piston need not necessarily be formed by the cylinder, but may be formed by a second relatively movable opposed piston within the cylinder. If the piston withdraws from the cylinder merely to control the motive fluid, the piston is still considered to be permanently surrounded by the cylinder.

DISTRIBUTOR

Means which comprises or includes a part which is movable relative to the working member of a cyclically operable motor to control a motive fluid port or passage in such a manner as to cyclically control inlet and/or exhaust flow of motive fluid to or from the motor. The distributor need not entirely cut off the motive fluid flow, but may cyclically control the amount of flow (i.e., throttling).

MOTIVE FLUID

The fluid (expansible or inexpandible) which is introduced into or withdrawn from a working chamber of the motor to cause the working member to move. The term "motive fluid" applies to the fluid from the point of ori-

gin to the point of disposal. Fluid which is withdrawn from the motive fluid supply to perform some other motor function, such as motor valve operation, is still considered to be motive fluid even though said fluid never enters the working chamber of the motor. Atmospheric air which acts upon the working member of a vacuum motor is not considered to be motive fluid unless the atmospheric air is controlled in some manner, as by valving. In a vacuum motor the fluid which is evacuated from the working chamber is considered to be exhaust motive fluid and the atmospheric air, if controlled, is considered to be inlet motive fluid.

NON-WORKING CHAMBER

A chamber of the motor which expands and contracts incident to movement of the working member, and which is neither expanded nor contracted to do work by fluid supplied to or evacuated from said chamber.

WORKING CHAMBER

A chamber into which motive fluid is introduced or from which motive fluid is withdrawn (vacuum) to cause the working member to move to perform work, the chamber expanding or contracting incident to the movement of the working member. A chamber of a vacuum motor to which atmospheric air has free ingress and egress without any control thereof is not a working chamber. However, a chamber of a vacuum motor in which atmospheric air acts and some control is exercised over the atmospheric air is a working chamber.

WORKING MEMBER

A movable wall of the expansible chamber to which motive fluid is applied or to which atmospheric air is applied in the case of vacuum motor, said wall moving as a result of the application of the motive fluid and in so moving doing work for utilization by means other than the motor or some part thereof. In a reciprocating motor this term is generic to both a moving piston and a moving cylinder. The working member is considered to include the movable wall to which motive fluid is applied as well as all parts which are rigid therewith, e.g., piston rod, etc. However, a pair of separate movable walls disposed in separate working chambers (i.e., chambers which are not in fluid communication during at least some part of the operation of the motor), even though rigidly connected together, are considered to be plural working members if the application of motive fluid thereto urges both walls in the same direction. A working member has a single working surface which surface may have two or more relatively movable faces

so long as adjacent faces are always an extension of each other, e.g., flexible diaphragm or bellows, etc.

SUBCLASSES

1 WITH SIGNAL, INDICATOR OR INSPECTION MEANS:

This subclass is indented under the class definition. Apparatus having (1) signals, indicators, registers, recorders, or gauges for indicating a condition or the position of a motor part such as a piston, control member, valve, etc., such devices consisting of relatively movable, changeable or audible information giving parts, or (2) transparent viewing means whereby the motor 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 position, etc.) classification under this definition does not result unless some cooperating indicia are included.

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, subclasses 232 through 271 for expansible chamber type volume or rate of flow meters and see section III of the class definition of this class for a general statement of the line between this class and Class 73.
- 92, Expansible Chamber Devices, subclass 5 for signals indicators or inspection windows for expansible chamber devices.
- 340, Communications: Electrical, subclasses 500 through 693.12 for electrical automatic condition responsive indicating systems.

2 CUTOFF OR CONTROL AFTER PREDETERMINED NUMBER OF CYCLES OR REVOLUTIONS:

This subclass is indented under the class definition. Apparatus in which the motor has a working member which operates through a

given cycle, i.e., from a given position through a revolution or reciprocation back to the starting position so as to be in condition to repeat the cycle, and having means for stopping or modifying the operation of the motor responsive to working member travel through a definite preselected number of cycles greater than one.

- (1) Note. This definition does not include those motors which operate for a predetermined period of time and then are stopped or controlled in some way even though for a given speed it could be determined how many cycles or revolutions would be made in a given period of time.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 35 through 40, for expansible chamber motors having means to start, stop or change the mode of operation thereof after passage of a predetermined time. See (1) Note above.
- 355 through 356, for motors having control means to cut off the motor after the working member has made one complete cycle of operation.

3 JET CONTROL TYPE:

This subclass is indented under the class definition. Apparatus including means for providing a jet stream of motive fluid and a receiving orifice to receive all or a portion of the jet stream, motive fluid being conducted from the orifice to a working chamber of the motor to cause operation thereof, movement of the motor being controlled by varying the proportion of the jet stream which enters the orifice.

SEE OR SEARCH CLASS:

- 137, Fluid Handling, subclass 83 for jet control type pressure modulating relays or followers, per se.

4 HYDRO-PNEUMATIC:

This subclass is indented under the class definition. Apparatus in which the motor is provided with a quantity of trapped liquid which is applicable to the working member to move same, means to apply pneumatic pressure directly to said trapped liquid to actuate said working

member and valve means for controlling the pneumatic fluid.

- (1) Note. Pneumatic fluid under this definition is considered to be any fluid in the gaseous state.

SEE OR SEARCH CLASS:

- 60, Power Plants, subclasses 547.1 through 547.3 for hydraulic pulsators, i.e. a motor piston and pump piston with a trapped quantity of fluid there-between, and means to apply pneumatic pressure to the pump piston to actuate the motor piston.
- 92, Expansible Chamber Devices, subclass 81 for expansible chamber devices in which the working member forms a reservoir for noncompressible working fluid and subclass 142 for expansible chamber devices having a reservoir for noncompressible working fluid.

5 WORKING MEMBER MOVED BY STORED MOTIVE FLUID CHARGE:

This subclass is indented under the class definition. Apparatus in which the working member of the motor is operated by a charge of expansible motive fluid which has been completely isolated in a storage chamber separate from the expansible chamber; i.e., the storage chamber at a given time is cut off from both the source of supply and the expansible chamber.

- (1) Note. The storage chamber generally holds only a sufficient quantity of motive fluid for one stroke of the working member and is recharged before each succeeding stroke.
- (2) Note. The charge of motive fluid from the storage chamber may constitute the only motive fluid for impelling the working member or may be supplemented with additional motive fluid.
- (3) Note. The storage chamber may not be another expansible chamber of the motor or another motor.

6 FLUID SUPPLY THROUGH DIVERSE PATHS TO SINGLE EXPANSIBLE CHAMBER:

This subclass is indented under the class definition. Apparatus in which a working chamber of the motor is provided with inlet motive fluid which is supplied from different sources at different times or flows through supply paths that are different at the will of the operator or under different operating conditions so as to supply force to act on the same face of the working member at different times.

- (1) Note. The supply paths are considered to be different under this definition if the motive fluid flows through one path at one time and flows through the same path and additionally through another path at another time.
- (2) Note. Different positions of the motor working member are considered to be different operating conditions under this definition.
- (3) Note. Inlet motive fluid under this definition is considered to be any fluid supplied to the expansible chamber during expansion thereof for the purpose of driving the working member. Also, motive fluid which is admitted to a contracting chamber to cushion the working member prior to admission of motive fluid to expand the chamber is also considered to be inlet motive fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 282 through 283, for cyclically operable expansible chamber motors having a fluid actuated distributor with fluid supplied to the distributor motor through diverse flow paths.
- 436, for expansible chamber motors in which inlet fluid to an expanding working chamber is selectively supplemented by fluid pressurized in the contracting chamber.
- 441, for expansible chamber motors in which a valve is provided to permit ambient fluid to be drawn into a working chamber thereof as, for example, when the load is moving the working

member to expand the chamber faster than inlet fluid can be supplied.

- 464, for double acting expansible chamber motors having means to simultaneously open opposed working chambers to inlet motive fluid.

SEE OR SEARCH CLASS:

- 60, Power Plants, subclasses 563 through 564 for pulsator systems in which the normally constant mass of motive fluid confined between pump and motor chambers of a pulsator system is increased by the addition of pressurized motive fluid from a valve-controlled motive fluid supply means so that the motor is supplied with motive fluid from diverse flow paths. Inclusion of any details of the pulsator pump, for example, reciting the piston or even reciting broadly the type of pump, e.g., "pulsator pump," is sufficient to cause classification in Class 60 although patents merely reciting a "pump" will be classified in Class 91, subclasses 6-33 even where the pump is disclosed as being a pulsator type. It is to be noted that a pair of pistons of the same size in the same uniform diameter cylinder with a confined body of fluid therebetween is not a pulsator system, but is considered to be a mere transmission or two piece piston and does not preclude classification of a patent in Class 91. The combination of two pistons in the same cylinder with an additional, controlled supply of motive fluid to the space therebetween, is construed as a means to vary the size of the piston and thus limit the stroke or alternatively, as a Class 91 type working chamber which, after expansion, is filled with locked up fluid which may constitute a fluid link transmission to transmit the output of another working member. See, for example, subclasses 167-168 of Class 91. Also see section C of (4) Note of the class definition of Class 91; and subclasses 17 and 51 for specific pumps which form diverse paths and sources of pressurized fluid for a Class 91 motor. See (4) Note under the class definition of

Class 91 defining the degree of specificity of the pump which results in classification of Class 60.

6.5 Three or more cylinders arranged in parallel, radial or conical relationship with rotary transmission axis:

This subclass is indented under subclass 6. Apparatus comprising three or more cylinders each cylinder being provided with relatively reciprocating piston (includes diaphragm) to thereby form a plurality of working chambers, the cylinders or a transmission element in common operative engagement with said cylinders or pistons being adapted to rotate about a fixed axis; said cylinders being physically arranged in a manner such that their longitudinal axis either (1) intersect at a common point or (2) extend parallel to said axis of rotation, and in which motive fluid is supplied to at least one of said cylinders through diverse flow paths.

- (1) Note. Plural cylinder motors of the above defined type in which each cylinder receives motive fluid through different supply paths for the sole purpose of causing more than one expansion and contraction cycle of the working chambers during each complete revolution of 360° of the cylinders of rotary transmission are not intended to form subject matter under this definition and are therefor excluded hereunder.
- (2) Note. See note in Class 417, Pumps, subclass 269 for a statement of the line between this class and Class 417 regarding plural cylinder devices of the above defined type.

7 Selective cyclic and noncyclic operation or parking:

This subclass is indented under subclass 6. Apparatus in which the motor is capable of reciprocatory motion through a cycle by a forward stroke and a return stroke to the starting point and wherein the motor (1) may be operated continuously repeating said cycle without manual intervention with motive fluid being supplied to a working chamber thereof through one supply path or (2) may at the will of the operator, be operated through a full or partial forward or return stroke utilizing a different

motive fluid supply path to said working chamber.

- (1) Note. The non-cyclic operation may be, for example, for the purpose of operating the motor as a servo motor or for placing the working member in a fixed stopped position or for starting the working member when on dead center.

SEE OR SEARCH THIS CLASS, SUBCLASS:

282 through 283, for motors which may be made to operate cyclically or non-cyclically by supplying fluid through diverse flow paths to a motor which operates a distributor therefor.

8 Semi-compound type:

This subclass is indented under subclass 6. Apparatus wherein the motor is provided with at least two expansible working chambers, a prior one of the chambers receiving expansible motive fluid and having a passage for exhausting the fluid into a subsequent chamber for expansion therein; and wherein a further fluid passage is provided which may be used to additionally supply motive fluid to the subsequent chamber simultaneously with the exhaust fluid from the prior chamber.

SEE OR SEARCH THIS CLASS, SUBCLASS:

11, for expansible chamber motors which operate by multiple expansion, i.e., the motive fluid is supplied to a first working chamber and then discharged to a second working chamber for expansion therein and which may be modified so that inlet motive fluid is supplied directly to the second chamber and the first chamber is exhausted to some place other than the second chamber.

9 Changeable by shiftable distributor:

This subclass is indented under subclass 8. Apparatus having a valve for distributing motive fluid to and between the working chambers and wherein a movement of the valve from the normal limits of travel during multiple expansion operation opens an additional fluid passage allowing motive fluid to be introduced directly into the subsequent chamber.

- 10 With condition responsive change-over valve:**
This subclass is indented under subclass 8. Apparatus having a valve means for changing the motor to or from the semicomound type, the valve means responding to some condition of operation of the motor or the motive fluid.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
28, for an expansible chamber motor in which a second fluid flow path to the motor is opened in response to a pressure or flow condition of the motor.
- 11 Changeable from multiple expansion to simple operation:**
This subclass is indented under subclass 6. Apparatus comprising two or more expansible working chambers having, in one condition of operation, interconnecting passages whereby a prior one of the chambers receives motive fluid and then exhausts the motive fluid into the subsequent chamber for expansion therein; and wherein additional passage means is provided, in another condition of operation, for introducing motive fluid from the source to the subsequent chamber, the subsequent chamber then receiving no fluid from the first chamber.
- (1) Note. This definition does not include motors in which motive fluid is supplied to a first expansible chamber and then directed to a second expansible chamber while the first is still in communication with the supply so as to in effect provide direct communication between the second chamber and the supply.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
8 through 10, for expansible chamber motors of the multiple expansion type wherein motive fluid may optionally be supplied directly to a subsequent working chamber in addition to fluid supplied thereto from a prior working chamber.
- 12 Cyclically operable motor with port reversing:**
This subclass is indented under subclass 6. Apparatus comprising a cyclically operable motor and motive fluid distributing valve means operated incident to the operation of the motor for causing the cyclic operation and means for reversing the motive fluid flow to and from the motor for a given position of the motor.
- (1) Note. The means for reversing the motive fluid flow causes the motive fluid to flow to a given chamber through different paths for the two conditions of operation.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
30, for expansible chamber motors of other than the cyclically operable type having serially arranged reversing valves.
218, (2) Note for the definition of a cyclically operable motor.
- 13 By Shifting distributor seat:**
This subclass is indented under subclass 12. Apparatus in which fluid connections to the motor for a given position of the motor are reversed by adjusting the distributor seat, i.e., the part of the distributor which is fixed during normal cyclic operation of the motor.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
218, (2) Note for the definition of distributor.
- 14 By shifting distributor:**
This subclass is indented under subclass 12. Apparatus comprising separately actuatable means to additionally operate the distributor of the motor so as to reverse the fluid connections to the motor for a given position of the motor.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
13, for cyclically operable expansible chamber motors in which the parts are reversed by shifting the distributor seat.

- 218, (2) Note for the definition of distributor.
- 15 Selector valve between distributor and motor:**
 This subclass is indented under subclass 12. Apparatus comprising further valve means arranged in series with the distributing valve means and operable to reverse the fluid connections between the distributing valve means and the motor for a given position of the distributing valve means, the further valve means being located between the distributing valve means and the motor.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
 30, for expansible chamber motors of other than the cyclically operable type having serially arranged reversing valves.
- 16 Drifting or coasting on lower pressure:**
 This subclass is indented under subclass 6. Apparatus in which the working chamber is supplied with relatively high pressure fluid to drive the working member and is supplied with a relatively lower pressure fluid when the high pressure fluid is cut off and the motor is coasting, i.e., being driven by the load, to prevent vacuum build-up in the working chamber.
- (1) Note. This is an art group in which the momentum of the load, e.g., locomotive, etc., drives the motor working member after the motive fluid has been cut off with lower fluid pressure being supplied when the high pressure supply is cut off. While the lower pressure fluid may not actually drive the working member because of the momentum of the load, it must be supplied in such a manner as to provide a driving force to the working member in the absence of the load. Thus, a simultaneous application of lower pressure fluid to opposed working chambers is not included under this definition.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
 437 through 439, for expansible chamber motors having a by-pass between opposed working chambers which is controlled independently of the inlet and exhaust control valve means. The by-pass in many instances is to prevent pressure or vacuum build up in a motor which is coasting.
- 441, for expansible chamber motors in which a valve is provided to permit ambient fluid to be drawn into a working chamber thereof as, for example, when the motor is coasting.
- 464, for double acting expansible chamber motors having means to simultaneously open opposed working chambers to either inlet or exhaust.
- 17 With speed responsive cutoff of drifting fluid:**
 This subclass is indented under subclass 16. Apparatus in which the lower pressure fluid is cut off from the motor in response to the speed of operation of the motor falling below a given amount.
- (1) Note. This definition does not include drifting valves which are controlled by a pressure condition of the motor which pressure condition may incidentally be indicative of the speed of the motor.
- 18 Pressure control of drifting fluid:**
 This subclass is indented under subclass 16. Apparatus in which the lower pressure fluid is controlled by the pressure condition in the higher pressure line or in a motor working chamber.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
 28 through 29, for expansible chamber motors in which motive fluid is supplied to a working chamber through different flow paths, the flow in the second path being activated by a pressure or flow condition in the first path.
- 33, for expansible chamber motors in which motive fluid is supplied to a working chamber through different flow paths, the activation of one path acting to disable a second flow path by the pressure of fluid acting in said one path as, for example, by a shuttle valve.

19 Diverse paths used to control extent of working member travel:

This subclass is indented under subclass 6. Apparatus in which the supply of motive fluid to a working chamber of the motor through one path is effective to cause the working member to move to a given position or within a given limited range and then stop and the supply to said working chamber through a second path is effective to move the working member to a different position or through a different limited range and then stop.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

357, for expansible chamber motor in which the stop position of the working member is controlled by selectively venting any of a number of exhaust ports.

20 Position responsive:

This subclass is indented under subclass 6. Apparatus in which at least one of the flow paths of the motive fluid supply is controlled as a result of the motor working member or load attaining a given position or is incapable of being controlled until the working member or load has attained a given position.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

5, for expansible chamber motors having position responsive fluid supply through diverse flow paths to a single working chamber wherein the supply in one path includes a trapped motive fluid charge.

21 Rotating working member or chamber:

This subclass is indented under subclass 20. Apparatus comprising a rotating working member or chamber.

(1) Note. For class definition glossary for Class 418, Rotary Expansible Chamber Devices.

22 Preliminary inlet to contracting chamber (e.g., cushioning, etc.):

This subclass is indented under subclass 20. Apparatus in which the motor is of the reciprocating type wherein when the motor working

member is moving in one direction and approaching the end of the stroke an initial charge of motive fluid is admitted to the contracting chamber in response to the working member attaining a given position, usually to cushion the movement of the working member, and then an additional charge of motive fluid is supplied through a different supply path to cause the working member to move in the opposite direction on the return stroke.

23 By bypassing from expanding chamber (399):

This subclass is indented under subclass 22. Apparatus in which the motor is of the double acting type, the initial charge of motive fluid being supplied to the contracting chamber from the expanding chamber.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

399, for expansible chamber motors in which motive fluid is by passed from an expanding chamber to an opposed otherwise closed contracting chamber so as, for example, to cushion movement of the working member.

24 Additional inlet path opened in response to position:

This subclass is indented under subclass 20. Apparatus in which a working chamber is supplied with motive fluid through a first supply path and in response to the working member attaining a given position further motive fluid is supplied to said chamber through a second path with the first path remaining open.

25 Working member or part carried thereby uncovers inlet port:

This subclass is indented under subclass 24. Apparatus in which the second supply path includes a supply port in the working chamber which is closed by the working member or a relatively movable part carried on the working member, the working member or said relatively movable part acting to open said supply port in response to movement of the working member.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

21, for rotary expansible chamber motors having an additional inlet path opened

in response to the position of the rotary working member.

26 First path has check valve or selectively adjustable throttle:

This subclass is indented under subclass 25. Apparatus in which said first supply path is provided with (1) a self acting valve which opens in response to motive fluid flow to permit substantially unrestricted flow into the working chamber, but is self closing to prevent exhaust flow from the working chamber, or (2) a valve which may be manually operated to vary the flow capacity of said first supply path.

27 Plural simultaneous paths, one cutoff in response to position:

This subclass is indented under subclass 20. Apparatus in which motive fluid is concurrently supplied to a working chamber through a plurality of flow paths, one of said paths being closed in response to the working member attaining a given position while the other supply path remains open.

28 Second path activated in response to pressure or flow in first path:

This subclass is indented under subclass 6. Apparatus in which motive fluid is supplied to the working chamber through one path and in response to a flow or pressure condition in said flow path a second inlet flow path to said working chamber is opened.

- (1) Note. The working chamber is considered to be part of the flow path. Thus, sensing of pressure in the working chamber to activate the second inlet flow path is included under this definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

18, for cyclically operable expansible chamber motors in which low pressure fluid is supplied to the working chamber when the high pressure fluid is cut off and the motor is coasting or drifting, e.g., locomotive, etc., the low pressure fluid being controlled in response to the pressure in the high pressure line.

33, for expansible chamber motors having diverse motive fluid supply paths to a single expansible chamber in which

the pressure or flow of motive fluid in one path is effective to cut off or deactivate a second supply path.

436, for expansible chamber motors in which inlet motive fluid to an expanding chamber is supplemented by fluid pressurized in an opposed contacting chamber.

29 By pressure rise in first path:

This subclass is indented under subclass 28. Apparatus in which the second inlet flow path to the working chamber is opened in response to an increase in pressure of the motive fluid in the first inlet flow path.

30 Serially arranged reversing valves:

This subclass is indented under subclass 6. Apparatus comprising a double acting reciprocating motor having opposed working chambers, motive fluid inlet and exhaust lines and a pair of valves serially arranged between the inlet and exhaust lines on the one hand and the opposed working chambers on the other hand, each of said valves being controllable to connect the motive fluid inlet to one of said chambers while the other chamber is connected to exhaust or vice versa.

SEE OR SEARCH THIS CLASS, SUBCLASS:

12 through 15, for a cyclically operable expansible chamber motor and means for reversing the connections of the distributing valve and motor and especially subclass 15 where said means comprises a reversing or selector valve located between the distributing valve and motor.

31 One path includes restriction:

This subclass is indented under subclass 6. Apparatus in which one of the flow paths to the working chamber has throttling means therein to restrict the flow of motive fluid to the working chamber.

32 Activation of one path disables second path:

This subclass is indented under subclass 6. Apparatus wherein when motive fluid is supplied to a working chamber through one supply path another motive fluid supply path to said chamber is inactivated and does not supply

motive fluid to the chamber when said one supply path is active.

- (1) Note. Under this definition the two supply paths must be separate, i.e., one supply path may not include two simultaneous flow lines and the other comprise one of said lines as set forth in (1) Note of subclass 6.

33 **Pressure operated:**

This subclass is indented under subclass 32. Apparatus in which motive fluid from said one supply path acts on valve means in the second supply path to cut off said second path to the working chamber.

SEE OR SEARCH THIS CLASS, SUBCLASS:

18, for cyclically operable expansible chamber motors in which low pressure fluid is supplied to the working chamber when the high pressure fluid is cut off and the motor is coasting or drifting, e.g., locomotive, etc., the pressure in the high pressure line acting to disable the low pressure line when the high pressure line is activated.

34 **SINGLE ACTING, CHANGEABLE TO OR FROM DOUBLE ACTING:**

This subclass is indented under the class definition. Apparatus in which a motor having a reciprocating working member is provided with means by which the reciprocating member is moved through a complete cycle by application of motive fluid alternately to opposed working faces thereof and alternately is moved through a complete cycle with motive fluid being applied to only one working face thereof during a portion of the cycle.

35 **INDEPENDENTLY OPERATED TIMER, DELAY, PATTERN OR CYCLIC CONTROL:**

This subclass is indented under the class definition. Apparatus including means separate from the motor to (1) cause or permit the 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 (2) cause the motor to operate through a given reciprocating cycle of operation repetitiously; the operation

of said means being independent of and not controlled by the operation of the motor or a pressure or flow condition of the motive fluid supplied to or exhausted from the motor and not requiring the intervention of a human operator.

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

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

SEE OR SEARCH THIS CLASS, SUBCLASS:

152 through 164, for expansible chamber motors of the multiple expansion type.

170 through 195, for expansible chamber motors having multiple working members one of which acts as or controls the valve means for the other.

218 through 354, and especially 219, 282-283, 284-285, and 289 for cyclically operable expansible chamber motors including means to delay the shift of a distributor after initiation of the shift by the working member.

364, for expansible chamber motors having feedback control and means to delay operation of the valve means in response to the feedback signal from the motor working member.

393, for expansible chamber motors having position initiated timing or delay means for controlling motive fluid.

36 **Of independently movable working members:**

This subclass is indented under subclass 35. Apparatus including a plurality of working members, each being capable of movement independent of the other, and each being provided with independently operable timing, delay, pattern or cyclic control.

37 Pattern or template control:

This subclass is indented under subclass 35. Apparatus in which there is provided an information carrying device such as a perforated tape, cam or the like, said device being driven or moved independently relative to and not controlled by the motor and means operated by said device for causing the motor to operate in accordance with the information carried thereby.

- (1) Note. This definition is limited to those devices in which the information carrying device is driven independently of the motor and would continue to feed control signals to the motor even in the event that the motor is not following, e.g., motor jammed, etc., as distinct from a fixed pattern or the like wherein a follower element is driven by the motor and follows the pattern only because it is driven by the motor. However, this definition includes holding the information carrying device stationary and independently driving a tracer or pick up device over it.

SEE OR SEARCH CLASS:

- 251, Valves and Valve Actuation, subclass 3 for a pattern or tracer controlled actuator for a valve which may be disclosed as controlling an expansible chamber motor.

38 Fluid actuated valve with volume chamber delay means:

This subclass is indented under subclass 35. Apparatus in which there is a fluid actuated valve which is operated after a predetermined time or delay to control the motor, the timing or delay means comprising a chamber of predetermined volume to which the valve actuating fluid flows at a limited rate and which must be filled by said fluid before the fluid actuates said valve to control the motor.

39 Independent distributor actuation for cyclic control:

This subclass is indented under subclass 35. Apparatus in which the motor has a cycle of operation in which the working member moves in one direction, reverses its direction of movement and returns to the original position, so as

to be in condition to repeat the operation, and in which a distributor is provided to control the flow of motive fluid to cause the motor to operate through said cycle, said distributor being driven independently of said motor and not in consequence of motion or operation of the motor to cause the motor to operate continuously repeating said cycle.

- (1) Note. For the definition of distributor see
(2) Note of subclass 218 of this class.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 2, for expansible chamber motors having means to stop or change the mode of operation of same after a predetermined number of cycles or revolutions.
- 218 through 354, for cyclically operable expansible chamber motors in which the motive fluid is controlled as a consequence of motor working member movement or cyclic change of pressure in a working chamber. For the definition of distributor see (2) Note of subclass 218 of this class.
- 429, for expansible chamber motors having independent means to drive a distributor valve to provide pulses of fluid to opposite sides of a working member to maintain the working member in a "ready" or static friction-free state.

40 Fluid actuated distributor motor:

This subclass is indented under subclass 39. Apparatus in which the distributor is driven by a fluid motor other than and not controlled by the motor which is controlled by the distributor.

- (1) Note. The motor which drives the distributor may not produce power for external use.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 170 through 195, for expansible chamber motors having a plurality of working members in which one working member is controlled by the position of another working member.

41 WITH CORRELATED CONTROL OF MOTIVE FLUID AND LOCKING MEANS:

This subclass is indented under the class definition. Apparatus which includes releasable means for holding a working member against movement, in at least one direction, and in which means for controlling said holding means to provide holding and/or release of the working member is so related to means for controlling the flow of motive to or from the motor that operation of the means for controlling the flow of motive fluid to produce starting or stopping of the working member will result in operation of the holding means to produce holding or release of the working member, or, operation of the means for controlling the holding means to produce holding or release of the working member will result in operation of the fluid flow control means to produce starting or stopping of fluid flow to or from the motor.

- (1) Note. Motive fluid, so controlled as to be confined or entrapped and which thereby prevents movement of the working member, is not to be considered as locking means under this definition.
- (2) Note. Locking means for the working member which is operated only as a consequence of movement of the working member, even though such movement is produced in response to control of motive fluid applied to the working member, is not to be considered as related to the motive fluid control means in such a way as to be included under this definition.
- (3) Note. It is immaterial whether the locking means is applied to the working member, a transmission member or the load, provided that operation of the locking means to holding position, in some position of the working member, will hold the working member against movement in at least one direction. If the locking means is applied to hold a transmission member or the load only at the limit of movement of the working member in one direction and does not also hold the working member against movement in the opposite direction it is

not to be considered as holding the working member, and is therefore not included under this definition, even though the locking means is correlated with the motive fluid control means.

SEE OR SEARCH CLASS:

- 92, Expansible Chamber Devices, subclass 8 for means to control flow of non-working arresting fluid for the working member of an expansible chamber device, subclasses 15-28 for controllable means to prevent movement of the working member of an expansible chamber device and then subclass 19 for means engageable between the working member of an expansible chamber device and a relatively movable part to prevent retraction of the working member.
- 477, Interrelated Power Delivery Controls, Including Engine Control, appropriate subclasses for the combination of an expansible chamber motor driving a rotary (not oscillating) output shaft and a brake or lock applied to the shaft, there being a joint control for the motor and for the brake or lock.

42 By electrical control means:

This subclass is indented under subclass 41. Apparatus in which the control means for the motive fluid and the control means for the holding means are interconnected by electrical circuit means in such a way as to provide the correlated operation of the two control means.

43 Working member position control of motive fluid and locking means:

This subclass is indented under subclass 41. Apparatus in which the means for controlling the flow of motive fluid and the working member holding means are operated in response to the motor working member, or the load driven by the working member, attaining a given position.

44 Sequential operation of locking means and motive fluid control:

This subclass is indented under subclass 41. Apparatus in which the control means for the motive fluid and for the locking means are so related that either the locking means or the

motive fluid control means is necessarily operated prior to operation of the other.

45 Common or interconnected valve means control motive fluid and fluid for locking means:

This subclass is indented under subclass 41. Apparatus in which holding and/or release of the working member is accomplished by control of flow of a nonworking fluid or by control of fluid flow to a fluid actuated holding means, and in which the flow of actuating fluid for the holding means, or the flow of nonworking fluid is controlled by the same valve, or by a valve which is mechanically interconnected with a valve, which controls the flow of motive fluid.

- (1) Note. The common or interconnected valve means may control the motive fluid and/or fluid to provide holding of the working member, directly, or may control actuating fluid for operating fluid actuated valve means which control the motive fluid and/or fluid to provide holding.

46 WITH INTERRELATED CONTROL OF MOTIVE FLUID AND LUBRICANT:

This subclass is indented under the class definition. Apparatus including a means provided for the function of supplying lubricant to relatively moving parts of the motor, e.g., piston, transmission elements, etc., said lubricating means requiring the actuation of a movable motive fluid control or distribution means.

- (1) Note. Merely turning on a motive fluid supply valve, or actuating a distributor to supply motive fluid to the motor will inherently supply lubricant since motive fluid ordinarily carries out a lubricating function, and as such is excluded from this subclass, even if a separate means to entrain another material in motive fluid solely for lubrication is provided, unless said motive fluid supply or distribution means separately controls the supply of separate lubricant material, or plural actuation of said supply or distribution means is required to properly carry out the lubricating function.

SEE OR SEARCH CLASS:

- 92, Expansible Chamber Devices, subclasses 153 through 160 for lubrication means for expansible chamber devices.

47 CONSTANTLY APPLIED MOTIVE FLUID WITH CONTROLLED VENTING:

This subclass is indented under the class definition. Apparatus in which a motor working chamber and working member are in continuous communication with a supply of motive fluid under all conditions of operation of the motor, the movement of the motor working member being controlled by the operation of the motor, the movement of the motor working member being controlled by the operation of an outlet to selectively or adjustably connect said working chamber to a region of continually lower pressure to allow escape of motive fluid, the pressure in said region being constant, e.g., atmospheric, etc.

- (1) Note. This definition includes motors in which the supply line is vented upstream of the motor chamber so long as the motor chamber is in constant communication with the pressure source.
- (2) Note. The supply of motive fluid under this definition may be atmospheric air in which case the region of lower pressure would be a vacuum.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 307, for cyclically operated expansible chamber motors having a distributor motor with constantly applied actuating fluid and controlled venting.
- 415 through 417, for expansible chamber differential motors in which motive fluid is applied to one working face of a motor to cause motion in one direction and then by-passed to an opposed larger area working face to cause reverse motion while the motive fluid is still being applied to said one face.

48 Plural separately controlled vents:

This subclass is indented under subclass 47. Apparatus in which the working chamber is provided with a plurality of outlets or vent pas-

sages there being control means for each of the vent passages which act independently or at different times or under different conditions.

- 49 Fluid vented through working member:**
This subclass is indented under subclass 47. Apparatus in which the working member is provided with a passage therein and the outlet or vented fluid passes therethrough.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 222 through 229, for cyclically operable expansible chamber motors in which motive fluid is exhausted through a valved piston and in which the inlet motive fluid is also controlled.
- 376 through 378, for expansible chamber motors including feedback control in which motive fluid is exhausted through a valved working member and in which the inlet motive fluid is controlled.
- 401, for expansible chamber motors in which an expanding working chamber is vented through the working member in response to working member position and in which the inlet motive fluid is also controlled.
- 422, for expansible chamber motors in which motive fluid is exhausted through a valved piston and in which the inlet motive fluid is also controlled.

- 50 Cyclically operable:**
This subclass is indented under subclass 47. Apparatus in which the motor is of the cyclically operable type.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 218, for the definition of a cyclically operable motor.

- 51 Motive fluid constantly applied to and vented from opposed chambers:**
This subclass is indented under subclass 47. Apparatus in which the motor is provided with opposed working chambers and a working member having opposed working faces, the motive fluid being continuously supplied to said opposed chambers and opposed working member faces the working member being mov-

able in opposite direction by alternately venting said working chambers.

- 52 CONSTANTLY OPEN THROTTLED EXHAUST WITH CONTROLLED MOTIVE FLUID SUPPLY:**

This subclass is indented under the class definition. Apparatus in which a motor working chamber and working member are in continuous communication with a low pressure region by means of a restricted outlet under all conditions of operation of the motor, the movement of the motor working member being controlled by the operation of means to selectively or adjustably connect the working chamber to a source of motive fluid supply.

- (1) Note. Motor movement is obtained by supplying motive fluid in greater quantities than the restricted, open outlet has capacity to pass.
- (2) Note. The restriction of the outlet may be adjustable at the will of the operator, but those devices in which the outlet is variably restricted in response to a condition of operation of the motor are excluded.
- (3) Note. The low pressure region may be a source of vacuum and the controlled motive fluid supply be atmospheric air.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 296, for cyclically operable motors having a motor operated distributor in which the working chamber of the distributor has a constantly open throttled exhaust and a controlled motive fluid supply.

- 53 ENGINE ROTATING OR STARTING TYPE:**

This subclass is indented under the class definition. Apparatus for turning or starting the rotary shaft of an engine and having a clutch or gearing connection with the engine which is disengaged from or which permits the engine shaft to rotate while the starting motor is inoperative.

- (1) Note. The inclusion in the claim of the engine by name only or only that part of the engine which cooperates with the

starting or rotating motor will not act to exclude a patent from this definition.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

55, for expandible chamber motors combined with a clutch or disengageable gearing which may be selectively operated.

SEE OR SEARCH CLASS:

60, Power Plants, subclasses 625 through 631 for an internal combustion engine with structure for rotating or starting it by pressure fluid.

74, Machine Element or Mechanism, subclasses 6 through 9 for mechanical movement or gearing engageable with a machine for starting the machine and in which conventional means applies power to the mechanical movements or gearing.

123, Internal-Combustion Engines, subclasses 179.1 through 184.1 for internal combustion engine starting devices.

477, Interrelated Power Delivery Controls, Including Engine Control, appropriate subclasses for the combination of a motor and a clutch in which the motor control operates the clutch control; appropriate subclasses for the combination of a motor and clutch having separate controls which are interrelated.

54 CONVERTIBLE; OR CHANGEABLE BY DISASSEMBLY OR ASSEMBLY:

This subclass is indented under the class definition. Apparatus, (1) adapted to be rearranged to perform different functions; or (2) adapted to be altered so as to operate in a different way or change its function or enhance its operation in some way by (a) disassembling the apparatus in some portion and then reassembling the apparatus with the same or different portion, (b) disassembling some portion from the apparatus, or (c) assembling some portion of the apparatus.

(1) Note. The change in the apparatus must be more than merely placing a part in one of a series of holes such as piston controlled vent ports or in general mak-

ing a change which amounts to only an adjustment such as, for example, adjusting the valve actuating linkage for a motor operated valve.

(2) Note. A part which is disassembled and reversed to present a new wearing surface is included under this definition.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

34, for expandible chamber motors of the single acting type changeable to or from the double acting type.

SEE OR SEARCH CLASS:

60, Power Plants, subclasses 625 through 631 for an internal combustion engine that may be rotated by the admission of pressure fluid and subclass 698 for a system of convertible or combined motors.

92, Expandible Chamber Devices, subclass 59 for expandible chamber devices which are convertible or changeable by assembly or disassembly facilitating means for expandible chamber devices.

123, Internal-Combustion Engines, subclass 22 for engines operable as either internal combustion or air engines.

417, Pumps, subclass 237 for devices having means for changing a pumping mechanism so that it may function as a motor and vice versa.

55 COMBINED:

This subclass is indented under the class definition. Apparatus 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 motor.

(1) Note. In view of Class 92 and the intimate relationship thereof with this class many subject matters which ordinarily would be considered to be combined when claimed in combination with the basic subject matter of this Class 91 are not considered to be combined herein and are excluded under this definition. The following basis has been used to determine whether certain subject matter is to be considered as combined under

this definition. If Class 92 specifically provides a basis of classification for the subject matter under consideration combined with the subject matter of Class 92 then said subject matter combined with basic subject matter of this Class 91 will be excluded from this definition. The miscellaneous combined subclass of Class 92 (92-145) is not considered to specifically provide a basis of classification for any combined device. For example, subject matter of this class combined with a fluid purifying means as provided for in 92/78 or with a nonsealing cleaning means as provided for in 92/87 would be excluded from this definition.

- (2) Note. Inasmuch as a motor must transmit its power to the load to be driven thereby there is ordinarily some power transmitting mechanism between the motor working member and load. This power transmitting mechanism is ordinarily termed the "transmission" and may include a single rigid element such as a piston rod or may include a number of relatively movable elements such as a lever or linkage system. Any element of the transmission which necessarily partakes of a given motion or pattern of motion dependent upon the motion of the motor working member is considered to be basic subject matter of the motor and is excluded from this definition. However, when the transmission includes some part which does not necessarily 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 basic subject matter for this class and causes classification under this definition. The mere inclusion in the transmission of a lost motion or resilient connection will not cause classification under this definition.
- (3) Note. Apparatus found in this subclass includes for example, motors having a selectively engageable clutch or gear in a transmission from the motor to a load and motors having means to prevent formation of ice or to break up ice in the exhaust passage from the motor.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 53, for expansible chamber motors for starting or rotating an engine and having a disengageable clutch or gearing connection therewith.
- 391, for expansible chamber motors with a manual actuator which may be clutched to the working member to move the load in the absence of operation of the motor.

59 TORQUE RESPONSIVE MOTIVE FLUID CONTROL:

This subclass is indented under the class definition. Apparatus in which a variation of rotational load imposed upon the rotating shaft of the motor controls the flow of motive fluid to or from the motor.

SEE OR SEARCH CLASS:

- 74, Machine Element or Mechanism, subclass 731.1 for gearing with fluid drive having speed and/or torque responsive ratio change and see the search notes thereunder.
- 418, Rotary Expansible Chamber Devices, subclasses 40 through 44, for rotary expansible chamber motors in which the motive fluid is controlled by the speed of the motor.
- 475, Planetary Gear Transmission Systems or Components, subclasses 31 through 148, for fluid drive or control of planetary gearing.
- 477, Interrelated Power Delivery Controls, Including Engine Control, appropriate subclasses for interrelated motor and clutch controls having automatic torque responsive control and see the search notes thereunder.

61 ROTARY AND RECIPROCATING WORKING MEMBERS:

This subclass is indented under the class definition. Apparatus in which there is provided a plurality of working chambers, each having a working member moving therein, at least one other working member having to-and-fro motion whereby the working members expand and contract the respective working chambers.

SEE OR SEARCH CLASS:

- 60, Power Plants, subclasses 698 through 720 for a system of combined or convertible motors.
- 173, Tool Driving or Impacting, subclass 105 for impact delivering devices having a separate motor to rotate a driven element.

151 SERIALLY FORMED EXPANDING WORKING CHAMBERS (E.G., ENDLESS, ETC.):

This subclass is indented under the class definition. Apparatus in which one or more working members act to form a progression of completely isolated expanding working chambers by a unidirectional movement.

- (1) Note. Motors comprising a series of working members or a single working member carried on an endless flexible member and travelling unidirectionally are found here.

SEE OR SEARCH CLASS:

- 415, Rotary Kinetic Fluid Motors or Pumps, subclass 5 for fluid motors of the endless type operated by a directed or confined fluid flow and see section III of this class definition for a general statement of the line between this Class 91 and Class 415.
- 416, Fluid Reaction Surfaces (i.e., Impellers), subclasses 7 through 8 for one or more working members supported or an endless flexible carrier and reacting with an undirected or unconfined medium fluid flow.

152 MULTIPLE EXPANSION:

This subclass is indented under the class definition. Apparatus utilizing an expansible motive fluid and having a plurality of working chambers at least one of which receives its motive fluid in whole or in part from another of the working chambers for expansion or further expansion of the motive fluid therein to perform work.

- (1) Note. This definition does not include motors in which motive fluid is supplied to a first expansible chamber and then directed to a second expansible chamber

while the first is still in communication with the supply so as to in effect provide direct communication between the second chamber and the supply.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 8 through 10, for multiple expansion motors having means for simultaneously supplying live motive fluid to a subsequent chamber while the prior chamber is exhausting to the subsequent chamber.

SEE OR SEARCH CLASS:

- 417, Pumps, subclasses 244 through 268, for pumps having successive pumping stages.
- 418, Rotary Expansible Chamber Devices, subclass 5, for multiple expansion motors wherein one of the working chambers includes a rotary working member.

153 Duplex:

This subclass is indented under subclass 152. Apparatus comprising a motive fluid distributing valve for each of the working chambers, the fluid distributing valve of one working chamber being operated by the working member of another working chamber.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 191 through 195, for expansible chamber having a plurality of relatively movable working members wherein the position of each working member cyclically controls another.

154 Cut-off or reversing:

This subclass is indented under subclass 153. Apparatus comprising means for adjusting one or more of the fluid distributing valves for affecting the period of admission of motive fluid to the working chamber or for varying fluid flow to the working chambers so that the direction of movement of the power transmitting means is reversed.

155 With fluid actuated distributor:

This subclass is indented under subclass 152. Apparatus wherein at least one of the working chambers has a motive fluid distributing valve

- which is actuated in whole or in part by variations in pressure of a fluid applied to the valve or valve actuator.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
281 through 320, for expansible chamber motors having a fluid actuated distributor motor, the motive fluid to the distributor motor being controlled by the position of the working member.
- 156 Concentric working chambers:**
This subclass is indented under subclass 152. Apparatus wherein one of the working chambers surrounds another working chamber, said chambers having a common axis.
- 157 Relative valving adjustment between high and low pressure working chambers:**
This subclass is indented under subclass 152. Apparatus in which each of the working chambers is provided with valve means for distributing motive fluid thereto, and including means for selectively moving at least one of the valve means relative to the other, the movement being in addition to the normal fluid distributing movement.
- 158 Adjustment for valving for plural chambers:**
This subclass is indented under subclass 157. Apparatus wherein the valve means for a plurality of working chambers are selectively movable, each being movable independently of the other or being so interrelated that a movement of one results in a movement of the other.
- 159 Expansion between relatively movable working members:**
This subclass is indented under subclass 152. Apparatus comprising a plurality of working members which are movable relative to one another, the fluid acting on one of the working members and then being expanded to act on another working member.
- 160 Double acting high and low pressure working members:**
This subclass is indented under subclass 159. Apparatus in which the relatively movable working members each have opposed rigidly connected working faces to which motive fluid is alternately applied, exhaust fluid from the working faces of one of the working members being expanded to the working faces of another working member.
- 161 Fluid acts on each working member in single direction:**
This subclass is indented under subclass 159. Apparatus wherein the working face or faces on each working member are so disposed that the motive fluid reacts with each working member in a single direction only.
- (1) Note. The motive fluid does not necessarily act in the same direction on all the relatively movable working members, but acts in one direction only on each individual working member.
- 162 High and low pressure faces on each working member:**
This subclass is indented under subclass 161. Apparatus wherein each working member has at least two integrally connected working faces disposed in the same direction, one of the faces receiving motive fluid from a high pressure source and another face simultaneously receiving motive fluid by cross expansion from another relatively movable working member.
- 163 Fluid expanded through working member:**
This subclass is indented under subclass 152. Apparatus having a high pressure chamber and a low pressure chamber, a working member in the high pressure chamber having a fluid passage therein, the motive fluid from the high pressure chamber being expanded through the passage into the low pressure chamber.
- 164 Dual, rigidly connected high and low pressure faces:**
This subclass is indented under subclass 152. Apparatus having at least two high pressure working chambers and at least two low pressure working chambers, a working member face in each of said working chambers, the working faces being integrally connected so as to move in unison and, on each stroke of the motor, motive fluid from a high pressure source acting in one of said high pressure chambers while fluid is simultaneously expanded from another of said high pressure chambers into one of the low pressure chambers.

165 APPLICATION OF MOTIVE FLUID AT DIFFERENT PRESSURES TO OPPOSED WORKING MEMBER FACES:

This subclass is indented under the class definition. Apparatus in which the motor is provided with opposed working member faces, motive fluid being applied to said faces at the same or different times, the motive fluid which is applied to one working member face being above atmospheric pressure and the motive fluid which is applied to the second face also being above atmospheric pressure, but being at a different pressure than that applied to the first face.

- (1) Note. The opposed working faces may be on different, interconnected, relatively movable working members or may be integrally connected together. Opposed working faces are defined as faces which when motive fluid is applied thereto tend to make the working member move in opposite directions when the faces are integrally connected. When the working faces are relatively movable the application of motive fluid to the opposed working faces tends to move the power output member in opposite directions.
- (2) Note. This definition does not include those devices in which a different pressure is obtained in the opposed chambers merely because a flow of the motive fluid occurs as, for example, where a pressure drop occurs due to flow past a restriction but which would disappear when flow ceases.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 6 through 33, and especially 28-29 for expansible chamber motors in which motive fluid at different pressures is applied to the same working chamber at different times.
- 152 through 164, for expansible chamber motors of the multiple expansion type.
- 415 through 417, for expansible chamber motors in which motive fluid at the same pressure is simultaneously

applied to opposed working member faces.

166 Double acting motor reversed by pressure variation of motive fluid:

This subclass is indented under subclass 165. Apparatus in which the motor is of the double acting type wherein valve means controls the flow of motive fluid to the opposed working member faces in a manner such that the working member will move in one direction when the pressure of the motive fluid being supplied to operate the motor is at a first predetermined magnitude and will move in the opposite direction when the motive fluid supply pressure varies from said predetermined magnitude.

- (1) Note. The predetermined magnitude of pressure may include a range of pressure, as for example, the working member may be in one position until the supply pressure drops below 90 psi. and will then move to a second position until the supply pressure increases to 100 psi. at which time the working member returns to its first position.

167 EXTENSION OF UNIT HAVING SEPARATELY CONTROLLED WORKING CHAMBERS EQUALS SUM OF INDIVIDUAL CHAMBER EXTENSIONS:

This subclass is indented under the class definition. Apparatus having plural working chambers with individually actuated control means supplying motive fluid to each chamber, and in which the chambers are physically connected in such fashion that the output motion of one chamber can bodily shift another chamber in the same general direction in which said other chamber is expansible so that the individual output motions are cumulative and equal the sum of the individual chamber extensions.

- (1) Note. The chambers may expand simultaneously or in any order, either at the will of an operator or in response to a condition of a working chamber or its working fluid. One chamber may either move the second chamber before the latter has expanded by abutment of moving walls of each chamber or it may move without affecting the second chamber to merely form an abutment for a subsequent expansion of said second chamber.

- (2) Note. Situations involving the separate control of plural chambers include (1) a common supply valve for plural chambers and an additional valve in the supply line to one chamber to control this one chamber relative to another and (2) a separate, controllable valve for each chamber.

- (3) Note. The direction in which the cumulative expansion occurs may be generally linear or it may be about an axis so that angular motions may be added.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 217, for expandible chamber motors having inner and outer cylinders which are relatively shifted axially to control valve ports for the inner cylinder.

SEE OR SEARCH CLASS:

- 173, Tool Driving or Impacting, subclasses 152 through 161 for tools which may be reciprocated by an expandible chamber motor and in which the tool and motor are advanced by another expandible chamber motor.

168 Control of motive fluid for one working member in response to position of second:

This subclass is indented under subclass 167. Apparatus in which the supply of motive fluid to one working chamber is controlled in response to the working member in another working chamber attaining a given position in its chamber.

- (1) Note. The position at which control occurs may be immediately after one working member is slightly moved, i.e., where a valved passage through a working member in one working chamber is held open or closed in response to the proximity of the working member to its starting position but upon slight movement of the working member is either (1) opened to port working fluid to another working chamber or (2) closed to lock up working fluid in another working chamber.

169 SINGLE CHAMBER FORMED BY MUTUALLY RELATIVELY MOVABLE CYLINDER, SLEEVE AND PISTON:

This subclass is indented under the class definition. Apparatus having a structural unit consisting of a single working chamber whose surfaces include an external cylinder member, and internal cylindrical sleeve member slidable therein and a third member slidable in or on one of said members in such fashion that each of the members is movable relative to the others.

- (1) Note. This subclass is intended to be the generic location of the structural unit defined above regardless of whether one or more of the members are (load engaging) working members or whether it is not clear from the disclosure which members are working members.
- (2) Note. The intermediate cylindrical member may have an end wall or annular flange between itself and the external cylinder provided that said end wall is apertured to provide a continuous and uncontrolled flow of motive fluid there-through.
- (3) Note. The inner and outer cylinders may be axially spaced from each other provided that the outer cylinder is radially spaced a greater distance from a common axis than the inner cylinder.
- (4) Note. An inner sleeve which may or may not be part of an inner cylinder, which shifts longitudinally within an outer cylinder for the purpose of controlling valve ports between the cylinder and the sleeve has been excluded where no significant work is performed by the outer cylinder over and above that performed during the shifting of the inner sleeve to actuate said valve ports.
- (5) Note. Each of said members sealingly engages at least one of the other members.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 167 through 168, for similar structures in which an end wall on a sleeve intermediate a cylinder and piston divides the organization into two chambers with separate control means for each which control means may include a valve in said end wall.
- 217, 276 and 423, for expansible chamber motors having inner and outer sleeves or cylinders which are relatively shifted axially to control valve ports for the inner cylinder or sleeve.

SEE OR SEARCH CLASS:

- 92, Expansible Chamber Devices, subclasses 51 through 53 for patents showing similar structures where valving is not claimed.

170 RELATIVELY MOVABLE WORKING MEMBERS WITH ONE HAVING MOTIVE FLUID CONTROLLED BY, MOVABLY INTERCONNECTED WITH OR MOVED BY ANOTHER:

This subclass is indented under the class definition. Apparatus having plural working members which are capable of relative movement and in which there is either (1) control of motive fluid for one working member in response to the position of another; (2) an interconnection between the members to cause relative motion or (3) an interconnection between said members (such as a "lost motion" or separable abutment connection) which causes one member to move the other member under some disclosed operating condition but which permits relative motion of the members.

- (1) Note. See the class definition for the definition of the term working member. A plurality of working member faces are not considered to be relatively movable merely because each is made up of constituent areas which are relatively movable. For example, a pair of diaphragms fixed to a single rigid output rod are not considered to have relative movement when flexed, but a pair of diaphragms connected to separate shafts which have relative movement when the dia-

phragms are flexed are considered to be relatively movable.

- (2) Note. The working members must produce power for external use. A piston or the like which operates only a valve of the motor or a motor latch, etc. is not considered to be a working member under this definition. See, for example, subclasses 304-314. However, one working member may transmit its power output through another.
- (3) Note. The control of working fluid for one working member by another may be such that: (a) one member controls another only; (b) each of several members controls another or (c) the connected output of all of the working members actuates means to control some or all of them.
- (4) Note. Included under this definition are patents claiming a first working chamber having a working member which extends into a second working chamber to engage or abut a second working member therein to move the latter. However, if the first working member is disclosed as merely displacing fluid in the second chamber and thus moves the second working member without engaging it, the patent has been construed as a pulsator and classified in an appropriate subclass of Class 60.
- (5) Note. For classification as an original under this definition a patent must claim either features (1), (2), or (3) of the definition.
- (6) Note. Means to actuate a valve may be part of the motive fluid control in part 1 of this definition but a means to merely prevent or permit actuation of the valve by some other agency has not been considered motive fluid control.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 472 through 507, for motors having three or more cylinders arranged in parallel, radial, or conical relationship with a rotary transmission axis.

508 through 536 for more residual relations between plural working members including (1) those continuously connected to move as a unit (2) those which have unrelated or independent outputs and wherein one is not controlled in response to position of another (3) those in which one member is controlled in response to some condition or criteria of the other than its position and (4) control of supply of working fluid to plural working chambers regardless of the relation between their outputs and including plural working members which are relatively moved by transmissions which are disclosed but not claimed.

SEE OR SEARCH CLASS:

60, Power Plants, subclass 426 for a system of plural motors combined with a pressure fluid source in which the speed of, pressure in or position of one output motor or motor section controls another.

92, Expansible Chamber Devices, subclasses 61 through 76 for expansible chamber devices having relatively movable working members.

185, Motors: Spring, Weight, or Animal Powered, subclasses 2 through 14 for combined motors of that class.

416, Fluid Reaction Surfaces (i.e., Impellers), subclasses 120 through 130 for plural impellers reacting with an undirected or unconfined medium fluid flow.

171 Synchronizing in response to sensed difference in positions:

This subclass is indented under subclass 170. Apparatus having separate means to control the working fluid to two working members and additional means to sense the difference in distances traveled by the working members from a starting point and to affect the first means in a manner to decrease the difference in said distances.

(1) Note. Means to sense angular displacements between rotating plural shafts driven by separate working members have been excluded and have been clas-

sified in subclass 412 as speed sensing devices.

(2) Note. Included are patents claiming structures wherein one working member is controlled to follow-up another.

SEE OR SEARCH THIS CLASS, SUBCLASS:

509, 511, 515-518, and 528, for means e.g., a differential, etc., to control a working member in response to a sensed difference in angular positions of two shafts, one of which is rotated continuously by said working member.

172 One working member oppositely biased by another:

This subclass is indented under subclass 170. Apparatus having a working member urged in one direction by motive fluid acting thereon and urged in an opposing direction by a second working member having motive fluid simultaneously supplied thereto and which is movable relative thereto; e.g., by engagement through separable abutment surfaces or by connection by a transmission or linkage means or indirectly through a body of interposed fluid, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:

508 through 536, for patents showing similar organizations where the working members are connected to move as a unit so as to preclude relative motion.

173 One working member forms movable chamber for another:

This subclass is indented under subclass 170. Apparatus comprising a working chamber carried by and movable with a first working member, and a second working member movable within the working chamber carried by the first working member.

SEE OR SEARCH THIS CLASS, SUBCLASS:

167 through 168, for a motor having a unit having separately controlled working chambers, the extension of which is equal to the individual chamber extensions.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclass 240, for expansible chamber volume or rate of flow meters having a transversely reciprocating piston and cylinder.

174 With connection to relatively movable output member disposed between spaced unitary end faces:

This subclass is indented under subclass 170. Apparatus in which at least one of the working members has spaced integral opposed working faces or an additional working member rigidly secured thereto, and engaging a relatively movable load or transmission member at a point between the opposed faces or at a point between the rigidly connected working members.

SEE OR SEARCH THIS CLASS, SUBCLASS:

493, for motors having three or more radially arranged cylinders and having at least one pair of rigidly connected pistons reciprocating in rigidly connected cylinders, there being provided a transmission or reaction element interposed between said rigid pistons.

176 Moving cylinders:

This subclass is indented under subclass 170. Apparatus having either (1) movably mounted cylinders which form relatively movable working members or (2) relatively movable working members which are disposed in movably mounted cylinders.

SEE OR SEARCH THIS CLASS, SUBCLASS:

173, for cylinders which are working members and which form working chambers movable therewith within which other working members are movable.

197, for relatively movable pistons disposed within rigidly connected, rotating cylinders, said cylinders being connected to the load in such fashion that said pistons are not working members.

472 through 507, for motors having three or more cylinders arranged in parallel, radial, or conical relationship with a

rotary transmission axis and especially subclass 479 wherein the motive fluid for each cylinder is separately controlled by movement of the cylinder or liner.

480, for rotatably mounted cylinders which are spaced from and parallel to an axis about which they rotate.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclass 241 for meters wherein the cylinders are supported for rocking movement.

92, Expansible Chamber Devices, subclass 66 for relatively movable working members disposed in moving cylinders.

177 Oscillating working members:

This subclass is indented under subclass 170. Apparatus in which at least two relatively movable working members move back and forth about one or more axes to describe arcs of not more than 360°.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclass 252 for meters having oscillating pistons.

92, Expansible Chamber Devices, subclass 67 for expansible chamber devices having plural oscillating working members.

178 Single valve unit controlling plural working chambers:

This subclass is indented under subclass 170. Apparatus comprising a unitary valve member which is within a single housing and movable relatively thereto to separately control separate passages communicating with different working chambers or with fluid operated valves controlling said chambers.

179 Oscillating valve:

This subclass is indented under subclass 178. Apparatus in which the valve member and housing are mounted for relative rotary motion which is limited to not more than 360°.

SEE OR SEARCH THIS CLASS, SUBCLASS:

176, for oscillating distributor valves having at least one port on an oscillating cylinder.

211, through 214, for oscillating valves formed in oscillating cylinders.

180 Rotary valve:

This subclass is indented under subclass 178. Apparatus having a means to impart a continuous relative rotation of the valve member and housing.

SEE OR SEARCH THIS CLASS, SUBCLASS:

484 through 485, for motors having three or more cylinders arranged in parallel, radial, or conical relationship with a rotary transmission axis in which relatively movable parts of the motive fluid control valve therefor (usually of the rotary type) as fluidly biased into seating engagement.

487, for motors having three or more cylinders arranged in parallel, radial, or conical relationship with a rotary transmission axis in which motive fluid is directed to or from the motive fluid control valve interface, said control valve usually being of the rotary type.

498, for motors having three or more radially arranged cylinders and a centrally arranged relatively rotatable valve member.

503, for motors having three or more parallel cylinders and a rotary spool type motive fluid control valve.

181 Interconnected working members in communicating chamber portions:

This subclass is indented under subclass 170. Apparatus having a plurality of working members disposed in the same chamber and urged in opposite directions by the working fluid in the chamber, the working members being connected to a force transmitting means or mechanism which constrains them to move relative to each other.

(1) Note. Continuously intercommunicating working chambers have been considered as the same chamber for purposes of this subclass.

SEE OR SEARCH CLASS:

92, Expansible Chamber Devices, subclasses 69 through 70 for expansible chamber devices having interconnected oppositely movable working members in a common working chamber.

182 Means connecting working members actuates common part controlling motive fluid for the members:

This subclass is indented under subclass 170. Apparatus having a single member driven by the transmission or the like which connects the plural working members for relative motion, said member actuating separate control valves for the working fluid supplied to each working member.

SEE OR SEARCH THIS CLASS, SUBCLASS:

476 through 481, for motors having three or more cylinders arranged in parallel, radial, or conical relationship with a rotary transmission axis and in which there is provided separate motive fluid control means for each working chamber.

183 With means interconnecting working members to cause relative motion:

This subclass is indented under subclass 170. Apparatus having a member, linkage, or transmission connected to each of the working members and arranged to impart relative movement to one working member when the other is moved or to constrain each of the working members to move relatively in some predetermined relation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

194, for expansible chamber motors disclosing plural, relatively movable working members connected to a rotary shaft by an unclaimed transmission and in which the valving for each working member is actuated by another working member.

472 through 507, for motors having three or more cylinders arranged in parallel, radial, or conical relationship with a rotary transmission axis and particu-

larly subclass 496 for positive bidirectional drive to the reciprocating members within radially arranged cylinders and subclass 507 for positive bidirectional drive of the reciprocating members within parallel cylinders.

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, subclasses 245 through 246 for meters having parallel working members which drive a common shaft extending transverse to the axis of said working members.
- 92, Expansible Chamber Devices, subclasses 61 through 76 and especially subclasses 68-74 and 76 for expansible chamber devices having relatively movable, interconnected working members.

184 Working member covers port to control motive fluid:

This subclass is indented under subclass 183. Apparatus in which the flow of motive fluid to or from a working chamber is interrupted by a surface of the working member overlapping an orifice in the working chamber wall.

185 Motive fluid control by pitman swing or intermittent contact with working member:

This subclass is indented under subclass 183. Apparatus having valve means to control the motive fluid flow to or from a working chamber, said valve means being actuated by either (1) means connected to the valve means and disposed in the path of a working member for intermittent contact therewith or (2) by pivotal motion of a member pivoted to a working member at one end and connected to a transmission at its other end.

- (1) Note. The valve means may be formed in a member pivoted to the working member so that ports therein are intermittently aligned with ports in the working member.

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, subclasses 250 through 251 for meters having a distributing valve mechanism actu-

ated by the piston, piston rod, or part rigidly attached thereto.

186 Connection includes toothed gearing or rocking lever:

This subclass is indented under subclass 183. Apparatus in which the member, linkage, or transmission which connects plural working members for relative movement is formed, at least in part, by either (1) gearing having intermeshing teeth or cogs such as a rack and pinion or (2) by an elongated member which is pivoted to oscillate about a transverse axis and is engaged at points spaced from said axis by means connecting it to the working members.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 508 through 536, for (a) differential gearing and (b) for floating links connected both to plural working members and to a load or transmission to move the latter cumulatively but which to not cause one working member to move another.

SEE OR SEARCH CLASS:

- 418, Rotary Expansible Chamber Devices, subclasses 191 through 206.9, for rotary working members which interengage in a gear-like manner.

187 Means varies cyclic relation between working member and control valve therefor:

This subclass is indented under subclass 183. Apparatus having means actuated by a working member to control the motive fluid for said working member, said means being adjustable to vary the position of the working member at which control occurs.

- (1) Note. The adjustment may vary all cyclic events simultaneously or the relative timing of plural, fluid control events may be changed.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 330 through 334, and see the note in that subclass for additional fields of search for expansible chamber motors having a means to adjust the positional relationship of its working member and the means to control working fluid for

that working member so as to vary the position of the working member at which control occurs.

478, for motors having three or more cylinders arranged in parallel, radial, or conical relationship with a rotary transmission axis and in which there is provided separate motive fluid control for each working chamber and means for varying the cyclic relation between at least one of said reciprocating members and its associated control valve.

482 through 483, for motors having three or more cylinders arranged in parallel, radial, or conical relationship with a rotary transmission axis and means for varying the cyclic relation between at least one of said reciprocating members and its associated control valve.

188 Motive fluid control actuator includes cam or crank rigid with means connecting working members:

This subclass is indented under subclass 183. Apparatus in which the valve means to control flow of motive fluid to or from a working member is actuated by a cam, an eccentric or a part moving in a circular path and either (1) forming a portion of the means to connect plural working members for relative motion or (2) connected to said connecting means to move therewith as a unit.

189 Position of one working member controls motive fluid for another:

This subclass is indented under subclass 170. Apparatus in which motive fluid for one of said working members is controlled in response to another working member attaining a given position.

- (1) Note. Included under this definition are patents claiming control of motive fluid for a first working member by fluid displaced by a second working member, usually from a nonworking chamber and as a function of the position of the latter member.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

35 through 40, for expansible chamber motors in which a fluid operated device controlling a working member is at least part of an independent motor which is in no way influenced by the working member controlled thereby and which has no output other than that required for control of the working member.

44, for expansible chamber motors having sequential operation of fluid operated locking means and a control of motive fluid for a working member.

190 Changeable to plural self-controlled working members:

This subclass is indented under subclass 189. Apparatus having plural working members at least one of which actuates control valve means for another working member and in which means are provided to disassociate said control valve means from said one working member and connect it for operation by the working member which it controls to thereby provide plural self-controlled working members.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

54, for expansible chamber motors which are convertible from one type of valve operation to another by disassembly or reassembly in which parts are removed or added or reconnected rather than adjusted for this purpose.

191 Each cyclically controls another (e.g., duplex, etc.):

This subclass is indented under subclass 189. Apparatus in which each working member actuates a valve means controlling another working member in successive fashion to provide cyclic operation, e.g., "duplex" motor, etc.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

153 through 154, for expansible chamber motors in which a second working chamber is expanded by motive fluid exhausting from a first working chamber while said first working chamber

is isolated from the working fluid supply.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclass 243 for meters having plural piston type working members and cylinders wherein the movement of each piston actuates the valving for another, and subclass 264 for similar meters wherein the working members are of the diaphragm or collapsible wall type.

192 With three or more working members:

This subclass is indented under subclass 191. Apparatus having at least three working members, at least two of which are controlled by valve means actuated by a different working member than the working member controlled thereby.

193 Fluid operated valve controlled by relatively movable working member:

This subclass is indented under subclass 191. Apparatus having a valve controlling motive fluid flow to or from at least one of plural working members, fluid operated means to move the valve, and means to control the supply of fluid to said valve moving means in response to the position of another relatively movable working member.

194 Rotating output shaft type (e.g., locomotive or reversing means, etc.):

This subclass is indented under subclass 191. Apparatus having a disclosure of a means to convert the motion of the working members to a rotary output.

- (1) Note. The patents in this subclass disclose, but do not claim transmission features, e.g. the wheels, crankpins and axle of a locomotive, etc. which, if claimed, would cause the patent to be classified in subclasses 183-188 but the valving is peculiar to a rotary output and yet is often not associated with the transmission.

195 With self-control:

This subclass is indented under subclass 191. Apparatus having valve means controlling only a first working member, means to actuate the

valve means by said first working member and additional means to actuate said valve means by a different working member.

- (1) Note. A typical example is a type of "duplex" motor where each piston actuates the valving for another piston to synchronize the pistons but with additional cut off valves each actuated by the piston controlled thereby.
- (2) Note. The valve means may consist of a single valve operated by both the working member controlled thereby and by a second working member.

SEE OR SEARCH THIS CLASS, SUBCLASS:

193, for fluid operated distributor valves controlled jointly by plural working members.

194, for plural motors of the type provided for in this subclass (195) but which have a disclosed rotary output.

196 MOVING CYLINDER:

This subclass is indented under the class definition. Apparatus in which, incident to the operation of the motor, the cylinder has an absolute movement.

- (1) Note. Those motors in which it involves an obvious matter of choice and/or reversal of parts whether the piston is stationary and the cylinder movable or vice versa will not be classified under this definition even if the claims identify the cylinder as the movable element provided that the claims do not set forth a specific power transmission between the cylinder and driven member or load.
- (2) Note. An open ended cylindrical member which has sliding and/or rotary movement with respect to the piston merely for valving purposes is not included under this definition. However, if the cylindrical member carries or has formed as a part thereof the end wall of the expansible chamber (i.e., the abutment) it is considered to be a cylinder and is included under this definition even if the sole disclosed purpose of the

sliding and/or rotary movement is for valving.

- (3) Note. A cylinder which moves merely because it is a part of a motor which moves as an entity, as by being mounted on a movable device, e.g., check, etc. is not included under this definition because of said mounting.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 169, for expansible chamber motors wherein the chamber is formed by a movable cylinder, sleeve and piston.
 173, for expansible chamber motors having a moving cylinder formed by a working member, the moving cylinder having another working member movable therein.
 176, for relatively movable working members in which the cylinder is a moving cylinder.

SEE OR SEARCH CLASS:

- 92, Expansible Chamber Devices, subclasses 54 through 58 for cylinders mounted for rotation where no valving is claimed, subclasses 117-119 for cylinders mounted for movement incident to expansion and contraction of the working chamber, and subclasses 51-53 for a working chamber having mutually relatively movable tubular member, member slidable therein and an outer cylinder therefor.
 418, Rotary Expansible Chamber Devices, subclasses 160 through 177 for expansible chamber motors of the rotary type in which the rotating working member is a rotating cylinder.

- 197 Plural rigidly connected rotary cylinders:**
 This subclass is indented under subclass 196. Apparatus comprising a plurality of working chambers formed by rigidly connected cylinders mounted for continuous rotation in a single direction about a fixed or movable axis.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 183 through 188, for patents on expansible chamber motors some of which

have plural rigidly connected stationary cylinders not acting as working members.

- 472 through 507, for motors having three or more cylinders arranged in parallel, radial, or conical relationship with a rotary transmission axis.

206 With integral exterior working face:

This subclass is indented under subclass 196. Apparatus in which a unitary cylinder has a first internal working face actuated by motive fluid to urge the cylinder in one direction of movement and has a second working face extending outwardly or formed exteriorly thereof, said second face being a piston, the faces forming portions of separate working chambers and being urged by motive fluid in the same or different directions simultaneously or at different times.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 167 through 168, for expansible chamber motors having separately controlled plural chambers extensible as a unit wherein one of the chambers may be formed by a moving cylinder.

207 Both faces urged in single direction:

This subclass is indented under subclass 206. Apparatus in which the first and second working faces are so disposed on the cylinder that when motive fluid is applied thereto both surfaces urge the cylinder in the same direction.

208 Fluid to exterior face controlled by motive fluid pressure:

This subclass is indented under subclass 207. Apparatus comprising means for applying motive fluid to the first working face, and means responsive to a change of the pressure of the motive fluid being applied thereto to cause motive fluid to be applied to the second working face.

209 Fluid to exterior face controlled by cylinder position:

This subclass is indented under subclass 207. Apparatus comprising means for applying motive fluid to the first working face, and means responsive to the cylinder attaining a given position to cause motive fluid to be applied to the second working face.

210 Oscillating cylinder:

This subclass is indented under subclass 179. Apparatus in which the cylinder swings back and forth in an arcuate path of not more than 360° about a fixed pivot, incident to operation of the motor.

- (1) Note. A fixed pivot as herein used is meant a pivot that has no mechanical motion imparted thereto during the oscillation of the cylinder, such as reciprocating, rotating, etc. A pivot that may be shifted and then remain stationary during oscillation of the cylinder is considered as being fixed.

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, subclass 241, for expansible chamber volume or rate of flow meters having an oscillating cylinder.
- 92, Expansible Chamber Devices, subclasses 117 through 119 for expansible chamber devices having pivoted or oscillating cylinders.

211 Cooperating valve ports in cylinder and fixed member:

This subclass is indented under subclass 210. Apparatus comprising a stationary member on which the cylinder moves during oscillation, the stationary member having ports therein through which motive fluid is conveyed, and the cylinder having ports aligning with the ports in the stationary member to valve the motive fluid.

212 Ported end bearing:

This subclass is indented under subclass 211. Apparatus in which the cylinder oscillates about an axis transverse to the longitudinal axis of the cylinder the ported stationary member being located at one end of the cylinder and forming means on which the cylinder rocks or slides.

213 Ported trunnion:

This subclass is indented under subclass 211. Apparatus in which the cylinder has at least one laterally extending trunnion forming a member by which the cylinder is pivoted, a bearing member supporting the trunnion, and fluid ports in the trunnion cooperating with

fluid ports in the bearing member to valve the motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 212, for oscillating expansible chamber motors having cooperating valve ports formed in the cylinder and a ported end bearing about which the cylinder oscillates.

214 Ported arcuate slide face on which cylinder moves:

This subclass is indented under subclass 211. Apparatus in which the stationary member has an arcuate surface, an arcuate surface on the cylinder engaging therewith, fluid ports in the surfaces, the oscillation of the cylinder causing relative sliding motion between the two surfaces to align the ports and valve the motive fluid.

215 Cylinder carried valve operated by fixed actuator:

This subclass is indented under subclass 210. Apparatus comprising a valve that oscillates with the cylinder and in addition has sliding movement relative thereto, a stationary member to which the valve is connected, the sliding movement of the valve being caused by the oscillation of the cylinder relative to the stationary member.

216 Cylinder and piston have relative reciprocation on fixed axis:

This subclass is indented under subclass 196. Apparatus in which the cylinder has a piston therein, the cylinder having absolute movement back and forth in a fixed straight line.

- (1) Note. This definition does not include motors in which the relative movement between the piston and cylinder includes any motion other than rectilinear reciprocation unless the additional relative movement is merely for the purpose of valving.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 167 through 168, for expansible chamber motors having separately controlled plural chambers extensible as a unit

wherein one of the chambers may be formed by a moving cylinder.

217 Reciprocating piston and cylinder:
This subclass is indented under subclass 216. Apparatus in which the piston partakes of absolute back and forth movement in a fixed straight line.

218 CYCLICALLY OPERABLE:
This subclass is indented under the class definition. Apparatus in which the motor has a cycle of operation in which the working member moves in one direction, reverses its direction of movement and returns to the original position, so as to be in condition to repeat the operation, and in which a distributor or other means, operated as a consequence of motor working member movement or cyclic change of pressure in a working chamber, is provided to control the flow of motive fluid so as to cause the motor, when started, to continuously repeat the cycle of operation.

(1) Note. A motor, in which the described operation is cyclic, will be classified under this definition if (1) cyclic operation necessarily results from the structural relationship of the claimed motor elements, e.g., valveless motor, etc., (2) an element of the fluid or mechanical connection between the working member and a cyclically operated distributing means is claimed, or (3) features, considered peculiar to cyclically operable motors, are claimed, specifically, in the See or Search This Class, Subclass notes below that refer to this (1) Note.

(2) Note. In a cyclically operable motor, the term distributor is defined as a means which comprises or includes a part which is movable relative to the working member of the cyclically operable motor to control a motive fluid port or passage in such a manner as to cyclically control inlet and/or exhaust flow of motive fluid to or from the motor. The distributor need not entirely cut off the motive fluid flow, but may cyclically control the amount of flow, i.e., throttling.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 2, for expansible chamber motors including means to stop or control the motor after a predetermined number of cycles or revolutions.
- 7, for expansible chamber motors which are caused to operate cyclically by supplying fluid to a working chamber thereof through one path and caused to operate selectively through a partial or full stroke by supplying fluid to said working chamber through a different path.
- 8 through 10, for cyclically operable expansible chamber motors of the semi-compound type.
- 12 through 15, for cyclically operable expansible chamber motors having means to reverse the inlet and exhaust porting to cause reverse operation thereof.
- 16 through 18, for cyclically operable expansible chamber motors which operate on low pressure fluid when drifting or coasting.
- 39 through 40, for expansible chamber motors having independent means to drive the distributor to cause the motor to continuously reciprocate.
- 50, for cyclically operable expansible chamber motors in which motive fluid is constantly applied to a working chamber and controllably vented therefrom.
- 152 through 164, for cyclically operable expansible chamber motors of the multiple expansion type.
- 191 through 195, for expansible chamber motors having relatively movable working members in which each cyclically controls another, e.g., duplex, etc.
- 236, for exhaust through a plurality of controlled exhaust flow paths (as per the (1) Note above).
- 237, for adjustable timing control (as per the (1) Note above).
- 245, for clearance control (as per the (1) Note above).
- 246, for fluid flow control by correlated throttle valve and distributor (as per the (1) Note above).

- 264, for separate control of starting and stopping of fluid flow in inlet or exhaust flow path by plural control elements (as per the (1) Note above).
- 267, for exhaust control by lost motion drive of exhaust valve by inlet valve to provide delayed opening and/or closing of exhaust flow path with respect to inlet valve movement (as per the (1) Note above).
- 219 With dwell:**
This subclass is indented under subclass 218. Apparatus having (1) means to bring the working member of the motor to a complete stop by controlling the motive fluid or to sense that the working member has stopped, (2) means to maintain said member stopped for a given period of time and (3) means to again cause the working member to move by controlling the motive fluid after expiration of said period of time.
- 220 With condition responsive stop means:**
This subclass is indented under subclass 218. Apparatus including means to halt operation of the motor said means being responsive to a condition of operation of the motor or of the motive fluid.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
2, for motors having means to cut off or control the motor after a predetermined number of cycles of the working member.
- 221 Speed:**
This subclass is indented under subclass 220. Apparatus in which the condition sensed to stop the motor is the speed of operation of the motor or the failure of a driving connection between the motor and a speed regulating governor.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
435, for expansible chamber motors having a valve controlled in response to the speed of the motor and see the subclasses there noted for other speed controlled expansible chamber motors.
- SEE OR SEARCH CLASS:
73, Measuring and Testing, subclass 508 for speed responsive governors having governor drive failure responsive means.
- 222 Distributor in piston (422):**
This subclass is indented under subclass 218. Apparatus in which a passage is provided entirely within the piston or piston rod for inlet or exhaust of motive fluid and a distributor movable relative to both the piston and cylinder is carried by the piston or piston rod and controls said passage.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
49, for expansible chamber motors having constantly applied motive fluid with controlled venting, in which the fluid is vented through the working member.
312, for cyclically operable motors having working member controlled motive fluid for a distributor motor, in which the distributor motor may include a valve piston.
422, for noncyclically operable motors having a valved piston.
- SEE OR SEARCH CLASS:
73, Measuring and Testing, subclass 248 for expansible chamber type volume or rate of flow meters having a valved piston.
- 223 Oscillating piston (e.g., vane, etc.):**
This subclass is indented under subclass 222. Apparatus in which the piston moves back and forth about an axis to describe an arc of not more than 360°.
- (1) Note. The term "piston", as employed in the definition of this subclass, includes a vane swinging within a working chamber.
- 224 Distributor establishes communication between opposite faces of piston:**
This subclass is indented under subclass 222. Apparatus in which the distributor controls a passage in the piston which is adapted to con-

vey fluid through a working face of the piston to a face which is axially opposed.

225 Piston traverses pilot port to control distributor motor motive fluid:

This subclass is indented under subclass 222. Apparatus in which the distributor in the piston is operated by a fluid motor, and a port is provided in the working chamber side wall to convey inlet or exhaust for the distributor motor, the position of the piston controlling said port so as to control supply or exhaust for the distributor motor.

226 Communication into piston through peripheral port:

This subclass is indented under subclass 222. Apparatus in which the inlet or exhaust of motive fluid is through a port in the side wall of the working chamber which communicates with the distributor controlled passage which opens through the side of the piston.

227 Port controlled by piston position:

This subclass is indented under subclass 226. Apparatus in which communication between the port in the working chamber and the passage in the piston is established and broken by relative reciprocation of the two members.

SEE OR SEARCH THIS CLASS, SUBCLASS:

225, for a cyclically operable motor having a fluid operated distributor in the piston, said distributor being controlled by traversal of a pilot port in the cylinder wall.

228 Piston carries separate inlet and exhaust valves:

This subclass is indented under subclass 222. Apparatus in which the piston is provided with relatively movable valves which control inlet and exhaust passages to and from a working chamber.

229 Distributor operated by abutment with cylinder head:

This subclass is indented under subclass 222. Apparatus in which the distributor is cyclically moved by a part thereof contacting the cylinder head in the working chamber.

SEE OR SEARCH THIS CLASS, SUBCLASS:

228, for cyclically operable motors having separate distributors for inlet and exhaust in the piston, one of said distributors usually being moved by contacting the cylinder head in the working chamber.

230 Codirectional separately supplied working members:

This subclass is indented under subclass 218. Apparatus in which plural working members acting in the same direction are provided with a separately controlled supply of motive fluid, said working members being (1) relatively movable or (2) connected to move together as a unit under all conditions of operation and which have different faces forming moving walls of different working chambers which are not in fluid communication during at least some part of a cycle of operation of the apparatus.

(1) Note. Motors in which one working chamber is constantly supplied and the second working chamber receives a controlled intermittent supply from the first working chamber are included under this definition.

231 One working member supply is distributor controlled:

This subclass is indented under subclass 230. Apparatus in which one of the plural working members acting in the same direction is controlled by a distributor.

232 Valveless distribution:

This subclass is indented under subclass 218. Apparatus in which closing and opening of fluid flow paths for cyclically admitting and exhausting motive fluid to and from an expandible chamber of the motor are accomplished by movement of the motor working member to and from positions in which it obstructs fluid flow through said flow paths, said flow paths not being further controlled by a cyclically operated valve.

SEE OR SEARCH THIS CLASS, SUBCLASS:

230 through 231, for a cyclically operable motor having codirectional, separately supplied working members, the control of one working member usually being by valveless distribution.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclass 242 for volume or rate of flow meters of the expandible chamber type having valveless distribution of metered fluid.

233 Distribution by reciprocating working member moving about an axis:

This subclass is indented under subclass 232. Apparatus in which the motor is of the reciprocating type and means are provided to rotate or oscillate the working member about its own axis incident to reciprocation, the opening and closing of fluid flow paths being accomplished as a result of movement of the working member about its axis.

234 Working member formed to provide internal fluid flow passage:

This subclass is indented under subclass 232. Apparatus in which a fluid flow path for cyclically admitting or exhausting motive fluid to or from an expandible chamber of the motor includes a fluid flow passage formed, at least in part, by a passage entirely within the motor working member.

SEE OR SEARCH THIS CLASS, SUBCLASS:

233, for valveless cyclically operable expandible chamber motors of the reciprocating type, in which the working member is formed to provide a fluid flow passage and the working member is rotated or oscillated about its own axis to move said passage into and out of communication with another fluid flow passage to open and close a fluid flow path.

235 Working chamber receives controlled motive fluid supply from opposed chamber having constant supply (321) (417):

This subclass is indented under subclass 218. Apparatus in which the motor is provided with a first working chamber which is constantly supplied with motive fluid, and a second working chamber acting in a direction opposite to the first working chamber, said second working chamber being supplied with distributor controlled motive fluid which is taken from the first working chamber.

SEE OR SEARCH THIS CLASS, SUBCLASS:

224, for a cyclically operable motor having a distributor in a piston, in which the distributor establishes communication between opposed faces of the piston.

321, for other cyclically operable motors in which motive fluid is constantly applied to one working member face.

417, for noncyclically operable motors of the differential type in which motive fluid is constantly applied to one working member face.

236 Multiple exhaust passages (e.g., compression control, etc.):

This subclass is indented under subclass 218. Apparatus in which there are provided a plurality of controlled, i.e., valved or working member position controlled, exhaust flow paths from a working chamber, i.e., exhausting, one of said flow paths constituting a second exhaust passage which provides for exhaust flow or continuation of exhaust flow after another of said flow paths has been closed, or provides a flow path, separate and distinct from another of said flow paths, for the removal of condensate from the expandible chamber in synchronism with movement of the working member of the motor.

(1) Note. Plural exhaust passages which are simultaneously opened and closed and merely provide the equivalent operation of a single larger port are not considered to fall within this definition, even though they may incidentally remove condensate; however, plural passages, one of which is specifically provided and

arranged to remove condensate, even though opened and closed simultaneously with another exhaust passage, are included.

- (2) Note. For purposes of this definition, the term "second exhaust passage" is intended to designate that passage which provides exhaust flow after another exhaust flow path is closed, or which provides for condensate removal, irrespective of the relative sizes of the plurality of flow paths.
- (3) Note. Fluid which is conducted from the working chamber for a valve operating or other function ancillary to the operation of the motor, such as sealing, is not considered to be exhaust motive fluid under this definition.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 290 through 302, for cyclically operable expansible chamber motors in which the working member traverses a pilot port in the working chamber side wall to provide actuating fluid for a distributor motor.
- 449 through 452, for expansible chamber motors, other than those which are cyclically operable, having separately controlled waste passages for a single chamber.

237 Exhaust valve has separate valve controlled second exhaust passage therein:

This subclass is indented under subclass 236. Apparatus comprising a valve member which moves to cyclically control a first exhaust passage, said movable valve member having a second exhaust passage therein, and relatively movable means to open and close said second exhaust passage during different phases of the cycle of operation of the motor or under different conditions of operation of the motor.

238 Pressure controlled second passage:

This subclass is indented under subclass 237. Apparatus in which the relatively movable means which controls the second exhaust passage is moved to cause such control by pressure of fluid within the expansible chamber.

239 Distributor for inlet or first exhaust controls second exhaust passage:

This subclass is indented under subclass 236. Apparatus in which a distributor is moved to cyclically control inlet of fluid to an expansible chamber, or to control exhaust of fluid from the expansible chamber through a first exhaust passage, and said distributor, or means rigidly attached thereto, directly controls the second exhaust passage.

- (1) Note. The second exhaust passage may be a passage which also acts as an admission passage for the expansible chamber.

240 Fluid pressure actuated valve for second exhaust passage:

This subclass is indented under subclass 236. Apparatus in which the second exhaust passage is provided with a valve which is moved to open or close said passage by fluid pressure acting on the valve or on its actuator.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 239, for cyclically operable expansible chamber motors having multiple exhaust passages, in which the second exhaust passage is controlled by a fluid pressure actuated valve member, or a part rigidly attached thereto, which controls inlet of fluid or controls exhaust of fluid through a first exhaust passage.

241 Compression actuated discharge to motive fluid supply:

This subclass is indented under subclass 240. Apparatus in which the second exhaust passage is connected to the motive fluid supply, and the valve which controls said second passage is biased to closed position by fluid supply pressure; said valve being opened by compression pressure within the working chamber which exceeds the supply pressure, to permit motive fluid to pass from the expansible chamber to the fluid supply.

242 Exhaust pressure controlled:

This subclass is indented under subclass 240. Apparatus in which the valve is moved by pressure within or from the contracting chamber.

- (1) Note. The exhaust pressure may act on the valve or its actuator to operate the valve, or may act on means which varies, limits or prevents operation of the valve by other valve operating means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 241, for a cyclically operable motor having a second exhaust passage controlled by a valve which is operated by compression actuated discharge to motive fluid supply.

243 Working member controlled exhaust port with valved second exhaust passage:

This subclass is indented under subclass 236. Apparatus in which exhaust of motive fluid through an exhaust flow path is controlled by the motor working member uncovering an exhaust port, and exhaust of motive fluid through a second exhaust flow path is controlled by a valve operating in synchronism with motor operation.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 239, for cyclically operable expansible chamber motors having a working member controlled exhaust port with a valved second exhaust passage, in which the second passage is controlled by a valve member, or a part rigidly attached thereto, which controls inlet of fluid or controls exhaust of fluid through a first exhaust passage.

244 Controlled by separate relatively movable valves:

This subclass is indented under subclass 236. Apparatus in which a plurality of exhaust flow paths are each controlled by a different valve, said valves being movable to cyclically control fluid flow through the different flow paths, and also being relatively movable.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 237 through 238, for cyclically operable expansible chamber motors having multiple exhaust passages controlled by separate relatively movable valves,

in which the relatively movable valves comprise a movable exhaust valve having a relatively movable valve controlling a second exhaust passage therein.

- 240 through 242, for cyclically operable expansible chamber motors having multiple exhaust passages controlled by separate relatively movable valves, in which the valve for a second exhaust passage is fluid pressure actuated.

- 242, for cyclically operable expansible chamber motors having multiple exhaust passages controlled by separate relatively movable valves, in which the valve for a second exhaust passage is controlled by exhaust pressure.

245 Clearance control:

This subclass is indented under subclass 218. Apparatus which includes means by which the volume of the working chamber, when the working member has reached the end of its stroke in the direction which contracts said chamber may be varied without altering the length of stroke of the working member.

SEE OR SEARCH CLASS:

- 92, Expansible Chamber Devices, subclass 60.5, for expansible chamber devices having selective clearance control.
- 123, Internal-Combustion Engines, subclass 48 for internal combustion engines having clearance control means.
- 417, Pumps, subclasses 274 through 277, for pumps having condition responsive clearance control.

246 Correlated throttle valve and distributor:

This subclass is indented under subclass 218. Apparatus in which a throttle valve and distributor are in series in a fluid flow path, the throttle valve controlling fluid flow to or from the motor, and in which the operating means for the throttle valve and distributor are so related that (1) the throttle valve is moved to vary the flow and the distributor is adjusted to vary the cycle of motive fluid distribution with respect to the working member movement cycle, in response to the same motor condition, e.g.,

speed, etc., or to the same operation of a common control means, or (2) either the throttle valve, or distributor, is adjusted to vary the flow of motive fluid, or the cycle of motive fluid distribution with respect to the working member movement cycle, respectively, in response to the change of a condition, e.g., pressure, etc., resulting from the adjustment of the distributor or throttle valve respectively.

- (1) Note. The inherent variation in the speed of operation of a motive fluid actuated distributor resulting from a pressure change in the motive fluid due to throttle valve adjustment is not considered as a variation in the cycle of motive fluid distribution with respect to the working member movement cycle under this definition.

247 Timing control by relative adjustment of plural movable fluid control elements:

This subclass is indented under subclass 218. Apparatus in which an expansible chamber is provided with a distributor having (1) a plurality of fluid control elements each of which move to cyclically control the flow of motive fluid and which, in addition to such control movement, are relatively adjustable so as to vary the time of occurrence of a fluid control event with respect to the movement cycle of the motor working member, and with respect to the occurrence of another fluid control event, or (2) a relatively fixed, but adjustable, fluid control element which cooperates with a moving fluid control element to cyclically produce one or more but not all of the fluid control events, and is adjusted so as to vary the time of occurrence of a fluid control event produced by the cooperation of the relatively fixed and moving fluid control elements, with respect to the movement cycle of the motor working member and with respect to the occurrence of another fluid control event.

- (1) Note. A fluid control event is the occurrence of starting or stopping the flow of motive fluid to or from a working chamber of the motor. Inlet of motive fluid is started by the occurrence of the "admission" event and is stopped by the occurrence of the "cut off" event. Exhaust of motive fluid is started by the occurrence of the "release" event and is stopped by

the occurrence of the "compression" event.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 187, for expansible chamber motors having adjustable means to change the timing of control events for plural relatively movable working members.
- 246, for cyclically operable expansible chamber motors having means to adjust the distributor for varying the cyclic control of motive fluid, the operation of said means being correlated with movement of a throttle valve.

248 Electrical adjustment:

This subclass is indented under subclass 247. Apparatus in which electrically operated means are provided to move or control the movement of a fluid control element, and adjustable electrical control means are provided to vary the operation of the electrically operated means so as to vary the timing of a fluid control event.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 42, for expansible chamber motors having correlated control of motive fluid and working member locking means in which the correlated control is accomplished by electrical control means.
- 275, for cyclically operable expansible chamber motors having electrically actuated distributors, other than those which involve adjustable timing control of fluid control events as defined under subclass 247.
- 459, for expansible chamber motors, other than those which are cyclically operable, which include electrically operated valves.

249 With relative adjustment of plural adjustable fluid control elements:

This subclass is indented under subclass 247. Apparatus in which there are provided plural fluid control elements which are separately adjustable relative to the movement cycle of the motor so as to control the time of occurrence of one of a plurality of adjustable events with respect to the time of occurrence of another of a plurality of adjustable events.

250 Adjustable inlet and exhaust events:
This subclass is indented under subclass 249. Apparatus in which the adjusting means provides for adjusting the time of occurrence of the starting or stopping of fluid flow to the working chamber and the starting or stopping of fluid flow from the working chamber.

251 With adjustable release and compression events:
This subclass is indented under subclass 250. Apparatus in which the adjusting means provides for adjustment of the time of occurrence of the starting and stopping of fluid flow to the motor working chamber, and the starting and stopping of fluid flow from the motor working chamber with respect to the motor working member movement cycle.

252 Cut off adjustable relative to admission:
This subclass is indented under subclass 247. Apparatus in which the adjusting means provides for adjusting a fluid control element with respect to another fluid control element so as to vary the time of stopping of fluid flow to the motor working chamber, with respect to the working member movement cycle and with respect to the starting of flow to the motor working chamber.

253 Inlet controlled by relatively cyclically moved elements:
This subclass is indented under subclass 252. Apparatus in which cyclic starting and stopping of motive fluid flow to the working chamber is controlled by valve means having a plurality of relatively cyclically moved fluid flow control elements, and in which means are provided to adjust a fluid flow control element which controls the stopping of fluid flow so as to vary the time of occurrence of the cut off event with respect to the working member movement cycle and with respect to the occurrence of the admission event.

SEE OR SEARCH THIS CLASS, SUBCLASS:

264, for cyclically operable expansible chamber motors in which starting and stopping of fluid flow to a motor working chamber are separately controlled by plural control elements, other than those which are adjustable

to vary the timing of fluid control events as defined under subclass 247.

254 Biased cut off with adjustable trip:
This subclass is indented under subclass 253. Apparatus in which the means to adjust the control element for stopping fluid flow include means to move or hold said element from its fluid flow stopping position against a biasing force tending to move it to said fluid flow stopping position and adjustable means to release said moving or holding means to allow said biasing force to move said element to its fluid flow stopping position so as to vary the time of occurrence of the cut-off event.

SEE OR SEARCH THIS CLASS, SUBCLASS:

260 through 261, for cyclically operable expansible chamber motors having adjustable trip means for a biased inlet valve means, other than the cut off element of a plural control element inlet valve, for varying the time of occurrence of the cut-off event.

331, for cyclically operable expansible chamber motors having independently operable means to adjust the connection between a working member and a distributing valve, other than those which adjust the timing of fluid control events as defined under subclass 247, in which the connection includes trip means.

344 through 347, for cyclically operable expansible chamber motors in which a biased means moves a distributor after a predetermined travel, other than those which involve adjustable timing of fluid control events as defined under subclass 247.

255 Adjustable fluid control for fluid actuated cut off:
This subclass is indented under subclass 253. Apparatus in which the means to adjust the control element for stopping motive fluid flow includes means cyclically moved by an actuating fluid to move the control element to or from its flow stopping position and adjustable means to control the actuating fluid flow so as to vary the time of occurrence of the cut-off event.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:
- 263, for cyclically operable expandible chamber motors having adjustable fluid control for an inlet valve, other than the cut off element of a plural control element inlet valve, for varying the time of occurrence of the cut off event.
- 281 through 320, for cyclically operable expandible chamber motors having working member controlled motive fluid supply for operating a distributor motor, other than those which adjust timing of fluid control events as defined under subclass 247.
- 256 Cut off adjustable relative to reciprocating admission element:**
This subclass is indented under subclass 253. Apparatus in which the means to adjust the control element for stopping fluid flow includes means to move, or to vary the movement of the control element with respect to a reciprocating admission control element so as to vary the time of occurrence of the cut-off event.
- 257 Oscillating admission element:**
This subclass is indented under subclass 256. Apparatus in which the admission control element moves back and forth about an axis.
- 258 Arcuate adjustment of cut off:**
This subclass is indented under subclass 256. Apparatus in which the means to adjust the control element for stopping fluid flow includes means to move or vary the movement of said control element in a arcuate path.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
- 257, for expandible chamber motors having a plural control element inlet valve means in which an admission control element oscillates about an axis and the cut off control element is accurately adjustable.
- 259 Cut off adjustable codirectional with admission element movement:**
This subclass is indented under subclass 256. Apparatus in which the means to adjust the control element for stopping fluid flow includes means to move or vary the movement of said control element in a direction parallel to or in alignment with the linear direction of movement of an admission control element.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
- 257, for expandible chamber motors having a plural control element inlet valve means in which an admission control element oscillates about an axis and the cut off control element is adjustable about the same axis.
- 260 Biased inlet valve with adjustable tripping means:**
This subclass is indented under subclass 252. Apparatus in which a releasable drive means, or a releasable latch, is provided to cyclically open or hold open, respectively, the inlet valve against a biasing force tending to move said valve to a closed position, and in which adjustable means are provided to release said drive means or said latch to allow the biasing force to close said valve, so as to vary the time of closing of the inlet valve means with respect to the motor movement cycle.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
- 254, for cyclically operable expandible chamber motors having adjustable trip means for a biased cut-off element of a plural control element inlet valve for varying the time of occurrence of the cut-off event.
- 331, for cyclically operable expandible chamber motors having independently operable means to adjust the connection between working member and a distributing valve, other than those which adjust the timing of fluid control events as defined under subclass 247, in which the connection includes trip means.
- 344 through 347, for cyclically operable expandible chamber motors in which a biased means moves a distributor after

a predetermined travel, other than those which involve adjustable timing of fluid control events as defined under subclass 247.

261 Inlet valve movable about an axis:

This subclass is indented under subclass 260. Apparatus in which the inlet valve is moved about an axis by said driving means and said biasing force to open and close the inlet fluid flow path.

262 Adjustable cam or cam follower actuated inlet valve:

This subclass is indented under subclass 252. Apparatus in which the inlet valve is cyclically moved, to control the flow of motive fluid to the working chamber, by cam means, and means are provided to adjust the cam means, or a valve driving member moved by the cam means, so as to vary the time of closing of the inlet valve.

- (1) Note. For purposes of this definition, a shaft mounted eccentric and its strap and rod, are not considered to be a cam and cam follower.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

330 through 334, for cyclically operable expansible chamber motors with means to adjust the connection between the working member and the distributing valve, other than those which adjust timing of fluid control events as defined under subclass 247, and especially subclasses 331-334 for such adjustable connections which include a cam.

263 Adjustable fluid control for fluid actuated inlet valve:

This subclass is indented under subclass 252. Apparatus in which the inlet valve is cyclically moved to control the flow of motive fluid to the working chamber by working member controlled actuating fluid, and means are provided to adjust the control of the inlet valve actuating fluid so as to vary the time of closing of the inlet valve.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

247 through 263, for cyclically operable expansible chamber motors having independent inlet and exhaust valves each movable about an axis in which there is provided means to adjust relatively adjustable fluid control elements to vary the timing of fluid control events, especially subclasses 252-263 for such motors which include adjustable plural control element inlet valves to vary the timing of the cut off element, and subclass 261 for such motors which include a biased inlet valve movable about an axis and provided with adjustable trip means to vary the timing of the fluid control event.

255, for cyclically operable expansible chamber motors having adjustable fluid control for a fluid actuated cut off element of a plural fluid control element inlet valve, so as to vary the time of occurrence of the cut off event.

266, for cyclically operable expansible chamber motors employing oscillating working members and which may include valves which move about an axis.

281 through 320, for cyclically operable expansible chamber motors having working member controlled motive fluid supply for operating a distributor motor, other than those which adjust timing of fluid control events as defined under subclass 247.

352, and see the subclasses there noted for other distributors movable about an axis.

264 Relatively movable serial distributors:

This subclass is indented under subclass 218. Apparatus including at least two distributors through which the motive fluid must pass serially in the course of flowing either to the working chamber or exhausting from the working chamber, each distributor having a cyclically moved flow controlling element so arranged that the control of motive fluid by the distributors is effected by the movement of one distrib-

utor relative to the movable element of another distributor.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

247 through 263, for cyclically operable expansible chamber motors having plural fluid control elements for separately starting and stopping of fluid flow to or from the working chamber in which means are provided for adjusting a fluid control element with respect to another fluid control element to vary the time of occurrence of fluid control events, and especially subclasses 253-259 for such motors which have plural fluid control element inlet valve means with means to adjust the control element which stops fluid flow so as to vary the timing of the cut-off event.

444, for expansible chamber motors of other than the cyclically operable type having relatively movable serial valves.

265 Relatively movable inlet and exhaust valves:
This subclass is indented under subclass 218. Apparatus in which the distributor comprises movable inlet and exhaust valve means for controlling motive fluid flow to and from an expansible chamber, said valve means cyclically moving relative to one another as a consequence of operation of the motor.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

222 through 229, for cyclically operable expansible chamber motors having independent inlet and exhaust valves, one of which is provided to control a motive fluid passage entirely within the piston or piston rod, and especially subclass 228 for such motors in which the piston carries separate inlet and exhaust valves.

236 through 244, for cyclically operable expansible chamber motors having multiple exhaust passages for an expansible chamber, one of which exhausts, or continues to exhaust after another is closed.

247 through 263, for cyclically operable expansible chamber motors having

movable relatively adjustable plural fluid control elements with means to adjust said elements so as to vary the timing of fluid control events.

325, for cyclically operable expansible chamber motors having a movable inlet or exhaust valve and a working member controlled exhaust or inlet port, respectively.

330 through 334, for cyclically operable expansible chamber motors with independently operable means to move or adjust movement of the distributor.

454 through 457, for expansible chamber motors, other than those which are cyclically operable, having relatively movable inlet and exhaust valves for a single chamber.

266 Oscillating working member:

This subclass is indented under subclass 265. Apparatus in which the working member moves back and forth about an axis to describe an arc of not more than 360°.

267 Lost motion drive from inlet to exhaust valve:

This subclass is indented under subclass 265. Apparatus in which the inlet and exhaust valve means move in a back and forth motion to cyclically open and close, respectively, the inlet and exhaust flow paths, the exhaust valve means being moved by the inlet valve means during a portion of the movement of the inlet valve means, and having a lost motion connection therewith, to provide a delay in the opening and/or closing of the exhaust flow path with respect to closing and/or opening movement of the inlet valve means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

457, for expansible chamber motors, other than cyclically operable, having relatively movable inlet and exhaust valves for a single chamber, which valves are movable by a single actuating means.

268 Exhaust valve closed or held closed by inlet fluid (442):

This subclass is indented under subclass 265. Apparatus in which cyclic admission of motive fluid is provided by operation of the inlet valve

means and exhaust is provided by opening of an exhaust valve which is cyclically moved to or held in its closed position by pressure or flow of the motive fluid cyclically admitted by the inlet valve means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

442, for expansible chamber motors, other than cyclically operable, having a self opening exhaust valve held closed by inlet pressure.

269 Biased valve with trip:

This subclass is indented under subclass 265. Apparatus in which a releasable drive means is provided to cyclically open the inlet and/or exhaust valve means against a resisting force, and means are provided to release said drive means to allow said force to close the valve means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

247 through 263, for cyclically operable expansible chamber motors having movable relatively adjustable plural fluid control elements with means to adjust said elements so as to vary the timing of fluid control events, and especially subclasses 254 and 260-261 for such motors in which the cut off is adjustable by means of biased valve means with adjustable trip means.

338, for other cyclically operable motors having trip type biased distributors.

270 Inlet and exhaust valve movable about an axis:

This subclass is indented under subclass 265. Apparatus in which the inlet and exhaust valve means are each movable about an axis to cyclically control inlet and exhaust flow of motive fluid to and from a motor working chamber.

271 Reciprocating inlet and exhaust valves:

This subclass is indented under subclass 265. Apparatus in which the inlet and exhaust valve means each moves in a back and forth motion to cyclically control inlet and exhaust of motive fluid to and from a motor working chamber.

272 Codirectional with working member movement:

This subclass is indented under subclass 271. Apparatus in which the path of reciprocating movement of both the inlet and exhaust valve means is in alignment with or parallel to the path of movement of the motor working member.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

228, for a cyclically operable motor having a piston which carries relatively movable valves for inlet and exhaust, said valves usually moving relative to the piston codirectional to the movement of the piston.

273 Axially seating valves:

This subclass is indented under subclass 272. Apparatus in which the inlet and exhaust valve means are of the type in which a valve member moves perpendicularly to or from its seat to close or open the fluid flow path.

274 With independent throttle adjustment for one side of double-acting motor:

This subclass is indented under subclass 218. Apparatus in which the motor is operated by motive fluid pressure applied to opposing faces of a working member, and in which means are provided to controllably vary the fluid handling capacity of either an inlet or exhaust passage to or from one of the working faces, without affecting the fluid handling capacity of the corresponding passage to or from the opposite working face.

275 Electrically or magnetically actuated or adjusted distributor (459):

This subclass is indented under subclass 218. Apparatus in which the distributor or distributor actuating means includes an element which is operated by an electric current or a magnetic field.

(1) Note. Electrical or magnetic adjustment of the distributor is included under this definition, even though the cyclic operation may be by other than electrical or magnetic means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 248, for cyclically operable motors having electrical adjustment of timing control by relative adjustment of plural movable fluid control elements.
- 459, for motors of other than the cyclically operable type having electrically operated valves.

276 Distributor forms traversed movable portion of working chamber wall (423):

This subclass is indented under subclass 218. Apparatus in which the distributor comprises a movable fluid control element which is arranged so as to completely encompass the working member in a plane transverse to the reciprocatory path of said working member, the working member reciprocating relative to the fluid control element, and the fluid control element forming a portion of the working chamber wall.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 173, for expansible chamber motors wherein a working member forms a movable chamber for another and also forms a movable distributor therefor.
- 423, for a motive fluid valve which forms a movable chamber wall portion traversed by a working member.

SEE OR SEARCH CLASS:

- 417, Pumps, subclass 509 for expansible chamber pumps in which the pump fluid is controlled by a valve means which is formed by a movable portion of the pump chamber wall traversed by the pumping member.

277 Adjustable working member reversal position (e.g., stroke control, etc.):

This subclass is indented under subclass 218. Apparatus in which the distributor or distributor actuating means includes selectively operable means to adjustably cause the working member to reverse at two different extents of movement in one direction.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 247 through 263, for adjustable timing control for fluid control events.
- 284 through 285, for a cyclically operable motor having independent means to adjust a distributor supply or exhaust passage, such means not necessarily changing the length of stroke of the output motor working member.
- 330 through 334, for independently operable means to move or adjust movement of a distributor.

278 Selective diverse supply or exhaust paths for distributor motor:

This subclass is indented under subclass 277. Apparatus in which diverse flow paths are provided for supply or exhaust to or from a distributor motor working chamber, and the selectively operable means determines the path of flow to adjustably control the point of reversal of the output motor working member.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 283, for a cyclically operable motor having independently operable means to control fluid supply through diverse paths to a distributor motor chamber, such control not necessarily changing the length of stroke of the output motor working member.

279 Adjustable lost motion connection:

This subclass is indented under subclass 277. Apparatus in which the selectively operable means comprises a lost motion connection between the working member and the distributor, the amount of lost motion being adjustable.

280 Pulsator-actuated distributor (460):

This subclass is indented under subclass 218. Apparatus in which the distributor is cyclically actuated by a substantially constant mass of fluid forming a fluid link between a valve actuating surface and an actuated surface.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 460, for pulsator actuated valves for motors of the noncyclically operable type.

281 Working member controlled motive fluid for distributor motor:

This subclass is indented under subclass 218. Apparatus in which the working member position controls or varies the supply or exhaust of motive fluid for a motor which cyclically moves the distributor.

- (1) Note. Since this definition deals with at least two fluid operated motors, the output motor and a motor operating the means controlling the distribution of motive fluid to the output motor, the titles and definitions of the indented subclass elements of the output motor will be specified as output motor elements or merely motor elements while the term "distributor" will precede the motor elements operating the means controlling the distribution of motive fluid to the output motor.
- (2) Note. A motor is included under this definition as controlling distributor motive fluid in response to position even though the distributor is reversed solely by a change in pressure in the working chamber as a result, for example, of the working member compressing fluid in the working chamber, or due to a build-up of motive fluid at the end of the stroke of the working member. Such position of reversal will normally remain constant with a consistent load and uniform motive fluid supply, but the position may change if the load or supply varies.
- (3) Note. The motor which moves the distributor under this definition may be merely an integral face of the distributor which is subjected to fluid pressure to shift the distributor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 155, for a multiple expansion expansible chamber fluid motor having a fluid actuated distributor.
- 189 through 195, for relatively movable working members in which one controls another.
- 191 through 195, for an expansible chamber fluid motor having plural working

members in which the position of each cyclically controls another, and particularly subclass 193 for a fluid actuated valve controlled by a relatively movable working member.

- 278, for selectively usable distributor reversal passages for a fluid operated distributor.

282 Fluid supply through diverse paths to distributor motor chamber:

This subclass is indented under subclass 281. Apparatus in which the distributor motor working chamber is provided with inlet motive fluid which is supplied from different sources at different times or flows through supply paths that are different at the will of the operator or under different operating conditions so as to supply force to act on the same face of the working member at different times.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 6 through 33, for fluid supply through diverse flow paths to a single expansible chamber of an expansible chamber fluid motor.

283 Path controlled by independently operable means:

This subclass is indented under subclass 282. Apparatus in which a manually operable means is provided to separately control one of the sources or paths.

284 Independent means to adjust distributor motor supply or exhaust passage:

This subclass is indented under subclass 281. Apparatus in which a manually operable means is provided to selectively vary the flow carrying capacity of a passage which supplies fluid to or exhausts fluid from a fluid operated distributor motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 225, for a cyclically operable motor having a distributor in the piston, and in which the piston traverses a pilot port to control distributor motor motive fluid.
- 263, for a cyclically operable motor having timing control by relative adjustment of plural movable fluid control ele-

ments in which cutoff is adjustable relative to admission, and involving adjustable fluid control for fluid actuated inlet valve.

285 Separately adjusts one chamber of double-acting distributor motor:

This subclass is indented under subclass 284. Apparatus in which the means varies the supply or exhaust passage for one chamber of a double acting distributor motor without affecting the supply or exhaust for the opposed chamber.

SEE OR SEARCH THIS CLASS, SUBCLASS:

274, for a cyclically operable expansible chamber fluid motor having an independent throttle adjustment for one side of a double acting motor.

286 Distributor or distributor motor mechanically moved cyclically to control actuating fluid for distributor motor:

This subclass is indented under subclass 281. Apparatus in which a mechanical linkage or transmission connected to or engaged by the output motor working member moves the distributor motor working member, such movement controlling a port supplying fluid to or exhausting fluid from the distributor motor working chamber to cause an additional fluid powered movement of the distributor motor working member.

287 Movement of relatively movable pilot mechanically moves distributor:

This subclass is indented under subclass 286. Apparatus in which the movement of the distributor motor working member which is caused mechanically moves a relatively movable valve means which controls the distributor motor supply or exhaust port.

(1) Note. The relatively movable means may comprise a distributor which also controls supply or exhaust for the output motor.

288 Distributor motor mechanically moved about axis:

This subclass is indented under subclass 286. Apparatus in which the mechanically caused movement of the distributor is about an axis,

followed by a fluid actuated movement which may or may not be the same type as the mechanically caused movement.

(1) Note. The fluid actuated movement is usually parallel to the axis of rotation of the rotary movement.

289 Adjustable means to retard or lock distributor motor:

This subclass is indented under subclass 281. Apparatus in which a manually operable means is provided to (1) adjust a means such as a brake or dash pot to control rate of movement of the distributor working member or (2) hold the distributor motor in a predetermined position.

290 Working member traverses pilot port in working chamber side wall:

This subclass is indented under subclass 281. Apparatus in which a passage is provided to convey motive fluid to or convey exhaust fluid from a distributor motor working chamber, said passage receiving motive fluid from the output motor working chamber or receiving exhaust fluid from the distributor motor working chamber and being connected to a port in the output motor working chamber wall which is controlled by the reciprocatory motion of the output motor working member.

(1) Note. The "distributor motor" under this definition may be a motor operating a pilot valve for the motor which operates the distributor.

291 Port controls separate motor for intermediate pilot valve:

This subclass is indented under subclass 290. Apparatus in which the port in the output motor working chamber controls a pilot valve motor which further controls the motor operating the distributor for the output motor.

292 Distributor controls passage from port:

This subclass is indented under subclass 291. Apparatus in which the distributor or distributor working member further controls the passage leading from the output motor working chamber to the pilot valve motor.

- 293 With passage from port controlled by pilot valve:**
This subclass is indented under subclass 290. Apparatus in which a cyclically operated valve controls the passage from the output motor working chamber to the distributor motor working chamber.
- 294 Pilot valve operated by separately controlled fluid motor:**
This subclass is indented under subclass 293. Apparatus in which the cyclically operated valve is operated by a fluid motor the fluid supply or exhaust of which is controlled separately from the distributor motor supply.
- (1) Note. The pilot valve motor supply or exhaust is usually controlled by the distributor motor working member.
- 295 Plural ports control relatively movable distributor motors:**
This subclass is indented under subclass 290. Apparatus in which the output motor working member controls separate ports in the working chamber wall, said ports conveying fluid in such a manner as to cause relative movement of plural distributor motors.
- 296 Constantly open exhaust from distributor working chamber:**
This subclass is indented under subclass 290. Apparatus in which the distributor motor working chamber is constantly connected to exhaust, said exhaust being throttled with relation to controlled supply through the working member controlled port to cause distributor cyclic operation.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
52, for expansible chamber fluid motors having constantly open throttled exhaust with controlled motive fluid supply.
- 297 With passage for pilot fluid in working member:**
This subclass is indented under subclass 290. Apparatus in which the output motor working member is provided with a passage to convey fluid to or from the distributor motor working chamber.
- (1) Note. The passage in the working member is not necessarily entirely within the working member but may be formed by cooperation with the working chamber wall.
- (2) Note. The passage in the working member need not necessarily communicate with the pilot port in the output motor working chamber side wall.
- 298 Working member passage supplies distributor motive fluid:**
This subclass is indented under subclass 297. Apparatus in which the passage in the output motor working member supplies inlet motive fluid to the distributor working chamber.
- 299 With distributor reversal by fluid compressed by working member:**
This subclass is indented under subclass 290. Apparatus in which the distributor motor working member is moved in one direction by fluid compressed in the output motor working chamber by the movement of the output motor working member.
- 300 With distributor reversal by constantly supplied motive fluid:**
This subclass is indented under subclass 290. Apparatus in which the distributor motor working member is moved in one direction by motive fluid which is continuously applied to the distributor motor working member.
- 301 With control of distributor motor supply or exhaust port by distributor working member:**
This subclass is indented under subclass 290. Apparatus in which the distributor motor working member controls a port in the distributor motor working chamber which conveys fluid to or from the distributor motor working chamber.
- (1) Note. The distributor motor working member controlled port need not actually convey fluid to move said working member, but may merely convey fluid for the purpose of retaining the working member in a reversed position.

- 302 Pilot port relieved into working chamber having working member controlled exhaust port:**
This subclass is indented under subclass 290. Apparatus in which the pilot port conducts exhaust fluid from the distributor motor working chamber into the output motor working chamber, said output motor working chamber being exhausted through a port in the wall thereof which is controlled by the position of the output motor working member.
- 303 Working member adapted to directly mechanically reverse distributor:**
This subclass is indented under subclass 281. Apparatus in which the distributor is adapted to be moved cyclically solely by mechanical connection with the output motor working member (1) in one direction of movement for each complete cycle of operation or (2) as a safety measure to insure the continuous operation of the motor, even if the fluid operated distributor motor fails to properly function.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
286 through 288, for a cyclically operable motor having a distributor or distributor motor mechanically moved cyclically to control actuating fluid for the distributor motor.
- 304 Pilot valve controlled distributor motor (461):**
This subclass is indented under subclass 281. Apparatus in which a fluid passage is controlled by a relatively movable valve in response to movement of the output motor working member to a predetermined position to cyclically connect the distributor motor working chamber to exhaust or motive fluid supply.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
290 through 302, for a cyclically operable motor in which the working member traverses a pilot port in the working chamber side wall to control motive fluid supply for a distributor motor, and particularly subclasses 291-292 for a motor in which the pilot port controls a separate motor for an intermediate pilot valve and subclasses 293-294 for a motor in which the passage from the port is controlled by a pilot valve.
461, for pilot valves for motors of the non-cyclically operable type.
- 305 Plural pilot valves:**
This subclass is indented under subclass 304. Apparatus in which the distributor motor is controlled by plural, relatively movable pilot valves, either in series or parallel.
- 306 Independent:**
This subclass is indented under subclass 305. Apparatus in which each pilot valve controls the distributor motor independent of the movement of any other pilot valve.
- (1) Note. Under this definition, pilot valves are considered to be independent if one pilot valve controls the distributor motor working member to move in one direction and another pilot valve controls the distributor motor working member to move in the opposite direction.
- 307 Pilot valve relieves constantly supplied distributor motor fluid:**
This subclass is indented under subclass 304. Apparatus in which the pilot valve controls the exhaust of motive fluid from the distributor motor working chamber, said chamber being constantly supplied with motive fluid under all conditions of operation.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
51 for motors having a working chamber which is constantly supplied with motive fluid and having a controlled vent or exhaust passage from said chamber.
- 308 Fluid-operated pilot valve:**
This subclass is indented under subclass 304. Apparatus in which the pilot valve is moved by a fluid operated motor controlled by position of the output motor working member or pressure in the output motor working chamber.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:
- 291 through 292, for cyclically operable motors having working member controlled motive fluid for a distributor motor in which the working member traverses a pilot port in the working chamber side wall, and in which said port controls a separate motor for an intermediate pilot valve.
- 294, for cyclically operable motors having working member controlled motive fluid for a distributor motor in which the working member traverses a pilot port in the working chamber side wall, and in which said port is further controlled by a pilot valve moved by a separately controlled fluid motor.
- 305 through 306, for a cyclically operable motor having a working member controlled motive fluid supply for a distributor motor, and including plural pilot valves, one or more of which may be fluid actuated.
- 309 With distributor motor reversal by constantly applied fluid pressure:**
This subclass is indented under subclass 304. Apparatus in which the distributor motor working member is moved in one direction by continuously applied fluid pressure and in the opposing direction by fluid under control of the pilot valve.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
- 300, for a cyclically operable motor in which the distributor is moved in one direction by constantly supplied motive fluid, and in the opposite direction by fluid supplied through a working member controlled port in the working chamber side wall.
- 310 Pilot valve moves about an axis:**
This subclass is indented under subclass 304. Apparatus in which the pilot valve is cyclically moved about an axis.
- 311 Pilot valve moves laterally relative to working member reciprocatory path:**
This subclass is indented under subclass 304. Apparatus in which the pilot valve is given a cyclic movement which is not substantially parallel to the reciprocatory path of movement of the output motor working member.
- 312 Distributor motor working member is valve seat for pilot valve:**
This subclass is indented under subclass 304. Apparatus in which a distributor motor motive fluid supply or exhaust port is provided in the distributor motor working member and said port is controlled by relative movement between said working member and the pilot valve.
- 313 Pilot valve actuator extends into working chamber:**
This subclass is indented under subclass 304. Apparatus in which means transmitting cyclic motion from the output motor working member to the pilot valve includes an element which moves relative to the working member and extends into the working chamber.
- 314 Working member reverses pilot through part movable relative to both:**
This subclass is indented under subclass 304. Apparatus in which means transmitting cyclic motion from the output motor working member to the pilot valve includes an element moved relative to both the working member and pilot valve at least once during each cycle of operation.
- 315 Distributor moves about an axis:**
This subclass is indented under subclass 281. Apparatus in which the distributor is cyclically moved about an axis.
- 316 Distributor moves laterally relative to working member reciprocatory path:**
This subclass is indented under subclass 281. Apparatus in which the distributor is given a cyclic movement which is not substantially parallel to the reciprocatory path of movement of the output motor working member.

317 Working member compresses fluid to reverse distributor:

This subclass is indented under subclass 281. Apparatus in which the distributor motor working member is moved by fluid compressed in the output motor working chamber by the movement of the output motor working member.

SEE OR SEARCH THIS CLASS, SUBCLASS:

299, for cyclically operable motors having a distributor motor controlled by fluid from an output motor working member controlled port in a working chamber side wall, and including operation of the distributor motor by fluid compressed by the output motor working member in the output motor working chamber.

318 Motive fluid build-up at end of working stroke reverses distributor:

This subclass is indented under subclass 281. Apparatus in which the reaching of the terminus of a stroke of the output motor working member results in increase of pressure in the working chamber due to continued supply of motive fluid without working member movement, the increase of pressure in the working chamber causing the distributor motor to shift the distributor to reverse the direction of movement of the output motor working member.

319 Working member traverses pilot passage to control distributor motor:

This subclass is indented under subclass 281. Apparatus in which fluid communication through a motive fluid supply or exhaust passage for a fluid actuated distributor motor is cyclically connected and disconnected by the output motor working member which acts directly as a valve for said passage.

SEE OR SEARCH THIS CLASS, SUBCLASS:

225, for a cyclically operable motor having a distributor in the piston, and in which the piston traverses a pilot port to control distributor motor motive fluid.

290 through 302, for working member traversal of a pilot port in the working

chamber side wall to cyclically control a fluid actuated distributor motor by supplying distributing motor actuating fluid from or exhausting distributing motor actuating fluid to a working chamber of the output motor, and particularly subclasses 297-298 for such structure combined with a passage for pilot fluid in the working member.

320 Port in piston between opposed working faces:

This subclass is indented under subclass 319. Apparatus in which the working member comprises a piston having opposed working faces and a passage on or in the piston between the opposed working faces, the distributor motor fluid being conveyed to or from the distributor motor working chamber by said passage.

321 Motive fluid constantly applied to one working member face (235) (417):

This subclass is indented under subclass 218. Apparatus in which motive fluid is continuously supplied to one chamber to act constantly on a working member of a motor during recurring cycles thereof.

SEE OR SEARCH THIS CLASS, SUBCLASS:

224, for cyclically operable motors having a distributor in the piston, and in which the distributor establishes communication between opposed faces, one face of which is usually constantly supplied.

235, for a cyclically operable motor having opposed working faces, and in which one working chamber receives a controlled motive fluid supply from an opposed chamber having a constant supply. NOTE "PLACEMENT OF PATENTS" IN THE CLASS DEFINITION AND THE PARAGRAPH FOLLOWING THE TITLE IN THE SCHEDULE OF THIS CLASS.

417, for noncyclically operable motors having motive fluid constantly applied to one working member face.

322 With independently operable means to lock distributor:

This subclass is indented under subclass 218. Apparatus including means operable independent of working member movement to positively hold the distributor in set position relative to the ports in the valve seat with which the distributor normally cooperates to control the motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

41 through 45, for correlated control of motive fluid and lock means for an expansible chamber fluid motor.

289, for working member controlled motive fluid supply for a distributor motor combined with means to lock the motor.

323 Relatively movable distributors for opposed working chambers:

This subclass is indented under subclass 218. Apparatus in which the motor comprises opposed working chambers and separate distributors for the working chambers, said distributors being free of one another to cyclically relatively move during operation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

265, for relatively movable inlet and exhaust valves for a single expansible chamber.

324 Distributor moves about an axis:

This subclass is indented under subclass 323. Apparatus in which at least one of the distributors is cyclically moved about an axis.

SEE OR SEARCH THIS CLASS, SUBCLASS:

352, and see the subclasses there noted for other distributors which move about an axis.

325 Working member controlled inlet or exhaust port (e.g., semi-valveless, etc.):

This subclass is indented under subclass 218. Apparatus in which inlet or exhaust of motive fluid is controlled by the motor working member uncovering a motive fluid inlet or exhaust

port which is not further controlled by a cyclically operated valve.

SEE OR SEARCH THIS CLASS, SUBCLASS:

184, for a motor having relatively movable working members with one movable interconnected with another to cause relative motion in which a working member covers a port to control motive fluid.

232 through 234, for a motor in which both the inlet and exhaust are controlled solely by the piston overrunning or uncovering inlet and exhaust ports.

302, for a cyclically operable motor having working member controlled motive fluid supply for a distributor motor in which the working member traverses a pilot passage in the working chamber side wall, the pilot port being relieved into a chamber having a working member controlled exhaust port.

326 Distributor moves transverse and parallel to same line:

This subclass is indented under subclass 218. Apparatus in which the distributor is moved in a first direction, e.g., about an axis, etc., and also in another direction which is not substantially parallel to the first direction.

(1) Note. For classification under this definition, one direction of movement is cyclic and the other may or may not be cyclic, e.g., may be for the purpose of a throttling adjustment which is not necessarily cyclically changed, etc.

327 Distributor moves about axis parallel to working member reciprocatory path:

This subclass is indented under subclass 218. Apparatus in which the distributor is moved about an axis which extends substantially parallel to the axis of reciprocation of the motor working member.

SEE OR SEARCH THIS CLASS, SUBCLASS:

352, and see the subclasses there noted for other distributors which move about an axis.

- 328 Distributor peripherally engages (1) working chamber wall, or (2) cylinder between opposed working faces:**
 This subclass is indented under subclass 218. Apparatus in which the distributor and the motor piston have approximately the same cross-sectional configuration so as to cooperate with common cylindrical walls of the motor cylinder, the distributor being located either in a working chamber or in a space formed between opposed working member faces.
- 329 Distributor located in cylinder between spaced working faces:**
 This subclass is indented under subclass 218. Apparatus in which the distributor is located within the periphery of a cylinder defined by spaced working member faces, and within the space between the faces.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
 222 through 229, for a cyclically operable motor having a distributor in the piston.
- 330 With independently operable means to move or means to adjust movement of distributor:**
 This subclass is indented under subclass 218. Apparatus in which means are provided to (1) move a distributor independently of motor operation or (2) adjust movement of a distributor relative to the movement of the working member either independently of or in response to a condition of motor operation.
- (1) Note. This definition includes any means to cause or permit the adjustment of the distributor such as a relatively adjustable joint or connection.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
 39 through 40, for independent distributor actuation for cyclic control.
 187, for relatively movable working member with means interconnecting working members to cause relative motion in which means is provided to vary cyclic relation of distributor to working member.
 247 through 263, for timing control for a cyclically operable motor by relative
- adjustment of plural movable fluid control elements.
 277 through 279, for adjustable working member reversal position for a cyclically operable motor.
 282 through 283, for fluid supply through diverse paths to cyclically operable working member controlled distributor motor chamber, which paths may be independently controllable.
 284 through 285, for independent means to adjust the distributor motor supply or exhaust passage of a working member controlled distributor of a cyclically operable motor.
 289, for adjustable means to retard or lock a cyclically operable, working member controlled distributor motor.
 478, for motors having three or more cylinders arranged in parallel, radial, or conical relationship with a rotary transmission axis and in which there is provided separate motive fluid control for each working chamber and means for varying the cyclic members and its associated control valve.
 482 through 483, for motors having three or more cylinders arranged in parallel, radial, or conical relationship with a rotary transmission axis and means for varying the cyclic relation between at least one of said reciprocating members and its associated control valve.
- 331 Means adjusts motion transmission from working member to distributor:**
 This subclass is indented under subclass 330. Apparatus in which a mechanical means connects the working member to the distributor, and the mechanical means is manipulated or adjusted to move or control movement of the distributor.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
 187, for relatively movable working members with means interconnecting working members to cause relative motion in which means is provided to vary cyclic relation of distributor to working member.
 277, for a cyclically operable motor having means to adjust the working member

reversal position, and which generally involves an adjustment of the motion transmission from the working member to the distributor.

478, for motors having three or more cylinders arranged in parallel, radial, or conical relationship with a rotary transmission axis and in which there is provided separate motive fluid control for each working chamber and means for varying the cyclic relation between at least one of said reciprocating members and its associated control valve.

482 through 483, for motors having three or more cylinders arranged in parallel, radial, or conical relationship with a rotary transmission axis and means for varying the cyclic relation between at least one of said reciprocating members and its associated control valve.

SEE OR SEARCH CLASS:

74, Machine Element or Mechanism, subclasses 828 through 839 for an alternating motion driven device with means operable during operation to adjust length of and/or displace stroke, and including many such devices which are described as operating expansible chamber motor valves.

332 Adjusting means comprises motor:

This subclass is indented under subclass 331. Apparatus in which the mechanical means is manipulated or adjusted by a motor.

333 Speed controlled:

This subclass is indented under subclass 331. Apparatus in which the manipulating or adjusting means is operated in response to a means, e.g., governor, etc., sensing a speed condition of the motor.

334 To reverse direction of rotation of interposed shaft:

This subclass is indented under subclass 331. Apparatus in which the manipulation or adjustment of the mechanical means results in causing a shaft forming part of the mechanical means (generally the output shaft of the motor) to change direction of continuous unidirectional rotation.

335 With throttle valve or distributor throttle adjustment:

This subclass is indented under subclass 218. Apparatus including (1) a valve positioned in the motor inlet or exhaust line which is operable independently of motor operation to selectively vary the fluid handling capacity thereof or (2) a distributor which is selectively adjustable either by being composed of plural relatively adjustable parts or cooperating in a different manner with a controlled port to vary the fluid handling capacity of the distributor for one complete cycle of motor operation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

247 through 263, for a cyclically operable motor having adjustable timing control for fluid control events.

265 through 273, for a cyclically operable motor having relatively adjustable inlet and exhaust valves.

274, for a cyclically operable motor having an independent throttle adjustment for one side of double acting motor.

326, for a cyclically operable motor having a distributor which moves transverse and parallel to the same line, one of the movements of which may comprise a distributor throttle adjustment.

330, for a cyclically operable motor having independently operable means to move or adjust movement of distributor.

336 Speed controlled:

This subclass is indented under subclass 335. Apparatus in which a means sensing a speed condition of the motor comprises a means to directly operate the (1) valve to vary inlet or exhaust or (2) means to adjust the distributor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

221, for a cyclically operable motor having speed condition responsive stop means.

333, for a cyclically operable motor having speed responsive control means to adjust the motion transmission from the working member to the distributor.

- members in organizations of the type provided therein.
- 337 With means independent of distributor reversing parts to cyclically hold distributor:**
This subclass is indented under subclass 218. Apparatus including a means which does not cause cyclic distributor movement but functions to positively hold or hold a distributor part against movement until a predetermined force tending to cause movement is attained, said means being released at least once for each cycle of the motor to permit distributor movement.
- 338 Positive hold (e.g., tripped type, etc.):**
This subclass is indented under subclass 337. Apparatus in which the holding means is adapted to positively hold the distributor regardless of the degree of force applied by the distributor, it being necessary to remove the holding means by a means movable relative to the distributor before distributor reversal may occur.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
254, for cyclically operable motors having plural movable fluid control elements to provide timing cutoff adjustment relative to admission in which the fluid control elements include a biased cutoff with an adjustable trip.
269, for cyclically operable motors having relatively movable inlet and exhaust valves at least one of which is biased with a trip means.
- SEE OR SEARCH CLASS:
73, Measuring and Testing, subclass 251 for expansible chamber type volume or rate of flow meters having trip type valve gear.
- 339 Oscillating working member:**
This subclass is indented under subclass 218. Apparatus in which the working member moves back and forth about an axis to describe an arc of not more than 360 degrees.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
177, 223 and 266, for expansible chamber motors having oscillating working
- 340 Distributor reversed by rotated part:**
This subclass is indented under subclass 339. Apparatus having a part continuously rotated in a single direction by a working member and a distributor actuated by said part to control the flow of motive fluid for said working member.
- 341 Distributor actuator extends into working chamber:**
This subclass is indented under subclass 218. Apparatus in which means transmitting cyclic motion from the working member to the distributor includes an element which moves relative to the working member and extends into the working chamber.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
276, for cyclically operable motors in which the distributor forms a traversed, movable portion of the working chamber side wall, the distributor being usually reversed by contact with the working member.
313, for cyclically operable motors having a working member controlled motive fluid supply for a distributor motor in which a pilot valve actuator extends into the working chamber.
348 through 349, for motors in which the working member includes spaced working surfaces, and in which the distributor actuating means includes a member contacting the working member and movable relative thereto and positioned between said spaced working surfaces.
- 342 Axially slidable through working face:**
This subclass is indented under subclass 341. Apparatus in which the means extending into the working chamber cyclically relatively

moves through an opening in a working face of the working member which comprises a piston.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

229, for a cyclically operable motor having a distributor in the piston which is actuated by abutment with the cylinder head.

343 Moves laterally relative to working member reciprocatory path:

This subclass is indented under subclass 341. Apparatus in which the means extending into the working chamber is given a cyclic movement which is not substantially parallel to the reciprocatory path of movement of the working member.

344 Biasing means moves distributor after pre-determined travel (i.e., snap action):

This subclass is indented under subclass 218. Apparatus in which a means adapted to store kinetic energy, such as a weight or spring, is moved a distance as a consequence of working member movement to store such energy, followed by the release of such energy to reverse, or complete the reversal of the distributor regardless of whether the working member continues to move or not.

(1) Note. A motor, in which a distributor reversing element is initially restrained to store kinetic energy solely by motive fluid which the distributor controls, is classified under this definition only if the motive fluid causes such restraint by acting upon an element which is movable relative to the distributor. Motors having reversing elements which store kinetic energy as a result of an unbalanced action of motive fluid upon the distributor are classified on other features.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

286 through 288, for working member controlled motive fluid for distributor motor in which the distributor motor is mechanically moved cyclically to control actuating fluid supply.

345 Distributor moves about axis:

This subclass is indented under subclass 344. Apparatus in which the distributor is cyclically moved about an axis.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

339, for cyclically operable expandible chamber motors having oscillating working members and which include distributors whose motion about an axis is influenced by a bias means which varies as a function of the distributor position.

352, and see the subclasses there noted for other distributors which move about an axis.

346 Spring biased:

This subclass is indented under subclass 344. Apparatus in which the kinetic energy storing means comprises a spring.

(1) Note. Fluid operated biasing means are considered as springs for the purposes of this definition only when biased by a fluid which is independent of the motive fluid supply for the expandible chamber motor.

347 Coil spring moves laterally relative to coil axis:

This subclass is indented under subclass 346. Apparatus in which the spring comprises a helical element form of plural spaced coils which are biased parallel to the coil axis, and at least one complete coil of the helix is moved laterally relative to said axis during each cycle.

348 Distributor actuator between space piston faces:

This subclass is indented under subclass 218. Apparatus in which the working member is a piston having spaced working surfaces and the distributor actuating means includes a member contacting the working member, movable relative thereto, and positioned between said working surfaces.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

313 for a cyclically operable motor having working member controlled motive

- fluid supply for a distributor motor in which a pilot valve actuator extends into a working chamber.
- 328, for a cyclically operable motor having a distributor which peripherally engages the working chamber wall or cylinder between opposed working faces.
- 329, for a cyclically operable motor having a distributor located in a cylinder between spaced working faces.
- 341 through 343, for a cyclically operable motor having a distributor actuator extending into a working chamber.
- 349 Distributor moves about axis:**
This subclass is indented under subclass 348. Apparatus in which the distributor is cyclically moved about an axis.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
352, and see the search there noted for other distributors which move about an axis.
- 350 Working member reverses distributor through part movable relative to both:**
This subclass is indented under subclass 218. Apparatus in which means transmitting cyclic motion from the working member to the distributor includes an element moved relative to both the working member and distributor during each cycle of operation.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
330 through 334, for independently operable means to move or adjust movement of distributor and particularly subclasses 331-334 for such means which adjusts a connection between a working member and a distributor.
- 351 Meshing rotary gear:**
This subclass is indented under subclass 350. Apparatus in which the means transmitting cyclic motion includes a circular or arcuate element provided with peripheral teeth and which is unidirectionally moved about an axis, to cooperate with teeth on another element.
- 352 Distributor moves about axis:**
This subclass is indented under subclass 350. Apparatus in which the distributor is cyclically moved about an axis.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
270, for cyclically operable motors having relatively movable or adjustable inlet and exhaust valves in which both valves are moved about an axis.
315, for cyclically operable motors having working member controlled motive fluid supply for distributor motor in which the distributor moves about an axis.
324, for cyclically operable double acting motors having relatively movable distributors for opposed working chambers, at least one of the distributors being movable about an axis.
327, for cyclically operable motors having a distributor which moves about an axis parallel to the working member reciprocatory path.
339, for cyclically operable expandible chamber motors having oscillating working members and which include distributors which move about an axis.
345, for cyclically operable motors having biased means to move a distributor after predetermined travel in which the distributor moves about an axis.
349, for cyclically operable motors in which the piston area between spaced working member faces contacts a relatively movable part to reverse the distributor, in which the distributor moves about an axis.
- 353 Distributor moves laterally relative to working member reciprocatory path:**
This subclass is indented under subclass 350. Apparatus in which the distributor is given a cyclic movement which is not substantially parallel to the reciprocatory path of movement of the working member.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
310, for a cyclically operable motor having a working member controlled pilot

- valve for a distributor motor in which the pilot moves laterally relative to the working member reciprocatory path.
- 316, for a cyclically operable motor having a working member controlled distributor motor which moves laterally relative to the working member reciprocatory path.
- 343, for a cyclically operable motor having a distributor actuator extending into the working chamber, and in which the actuator moves laterally relative to the reciprocatory path of the working member.
- 354 Rotated part:**
This subclass is indented under subclass 350. Apparatus in which the relatively moved element is moved unidirectionally about an axis.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 188, for relatively movable working members with means interconnecting working members to cause relative motion in which a control actuator includes a cam or crank rigid with means connecting the working members.
- 334, for a cyclically operable motor having a means to adjust the motion transmission from a working member to a distributor in which the means reverses the direction of rotation of an interposed shaft.
- 340, for a cyclically operable motor having an oscillating working member in which the distributor is reversed by a rotated part.
- 351, for a meshing rotary gear element included in the connecting train between a working member and distributor.
- 352, and see the subclasses there noted for distributors which move about an axis.
- 355 CUTOFF AFTER SINGLE COMPLETE CYCLE:**
This subclass is indented under the class definition. Apparatus in which the working member of the motor 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:
- 2, for control means which stops or modifies the action of a motor after a predetermined number of cycles of the working member greater than one.
- 218 through 354, for motors in which the working members operates through more than one cycle. Patents disclosing motors having control means which when operated, but immediately released, will cause one cycle of movement of the working member and which are also capable of operating in a cyclic manner as long as the control means is operated have been placed in subclasses 218-354 even though the cyclic mode of operation has not been specifically described therein.
- 356 Reversal responsive to motive fluid pressure change:**
This subclass is indented under subclass 355. Apparatus in which the working member of the motor is reversed to operate through the return stroke by means responsive to an increase or decrease in the pressure of the motive fluid.
- (1) Note. The change in pressure of the motive fluid may be caused by the working member moving to a predetermined position, as by engaging the end of the cylinder or a stop, or by a change in the load on the working member having no relationship to the position of the working member or the distance it has traveled before the pressure change occurs.
- 357 SELECTIVELY USABLE OR POSITIONABLE WORKING MEMBER CONTROLLED VENT IN CHAMBER WALL (402):**
This subclass is indented under the class definition. Apparatus in which a nonmovable portion of the working chamber wall is provided with (1) an outlet opening intermediate the limits of movement of the working member and

means for selectively opening and closing said outlet opening or (2) an outlet opening the position of which is adjustable in the direction of working member travel; said outlet opening acting as a vent for the expanding chamber or an exhaust for the contracting chamber which is cut off when overrun by the working member.

- (1) Note. In connection with part (1) of this definition, the outlet opening only acts as a vent when it is selectively opened. In many cases, there is provided a plurality of longitudinally spaced controllable vents to cause the working member to stop at any one of a plurality of selected positions.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

402, for motors in which the working member overruns an exhaust port to vent the expanding chamber.

358 WORKING MEMBER POSITION FEEDBACK TO MOTIVE FLUID CONTROL:

This subclass is indented under the class definition. Apparatus comprising valve means for controlling the flow of motive fluid, signal input means operated manually or by some separate control instrumentality for operating said valve means to cause operation of the motor, the motor providing a feedback signal in response to the position of the working member thereof, said feedback signal acting to control or modify the operation of said valve means.

- (1) Note. This definition does not include a feedback signal responsive to motor chamber fluid pressure build-up or fall off, even if such a pressure change is a result of the motor reaching an extreme of its travel; see subclass 433 and the search there noted for such devices.
- (2) Note. The term "signal input means" is intended to cover broadly any device for operating the valve means and may be no more than a manually operated handle directly connected thereto.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

392 through 410, and the search there noted for expansible chamber motors having working member responsive motive fluid controls.

359 Regenerative or positive feedback type:

This subclass is indented under subclass 358. Apparatus comprising feedback signal means which acts on the valve means to cause the working member to increase or continue its movement in the same direction in which it was started by the signal input means.

360 With safety means operable upon input signal loss:

This subclass is indented under subclass 358. Apparatus in which the system is of the type where upon loss or termination of the input signal the working member would normally move to one extreme of its range of travel, and means are provided which are effective upon loss or termination of said input signal to cause the working member to assume a position intermediate the ends of its range of travel or to prevent movement thereof to an extreme of its range.

361 Electrical input and feedback signal means (459):

This subclass is indented under subclass 358. Apparatus in which the input signal is electrical and the signal created in response to the position of the working member operates electrically to modify or control the operation of the valve means.

- (1) Note. The signal created in response to the position of the working member may control or modify the operation of the valve means by electrically altering the input signal.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

459, for expansible chamber motors with electrically operated motive fluid control valves not involving an electrical feedback.

- 362 Means provides incremental movements (e.g., stepper type, etc.):**
This subclass is indented under subclass 361. Apparatus comprising a plurality of switch or contact means in the electrical input and feedback circuits corresponding to a plurality of specific increments of the range of movement of the motor working member in one direction such that on making or breaking certain ones of the switches or contacts a definite range of movement or a specific position of the working member will result.
- 363 Follower type:**
This subclass is indented under subclass 361. Apparatus in which the input and feedback means is of the type in which the motor will move a given amount corresponding to a given magnitude of input signal and the feedback signal means will reset the valve means to stop the motor after said corresponding amount of movement has been obtained.
- 364 With means to vary feedback signal in response to rate of working member movement:**
This subclass is indented under subclass 358. Apparatus including means responsive to (1) the rate of movement or (2) the rate of change of movement of the working member to alter the feedback signal while the working member is in motion such that the feedback signal at any particular instant does not represent the true position of the working member at that instant but a position at some future or past time related to its rate of movement at that particular instant.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
35 through 40, for expansible chamber motors including an independently operated timing or delay means the operation of which is not initiated by the motor.
435, for expansible chamber motor control valves controlled by the rate of movement of the working member and not involving a position feedback.
- 365 With main valve position feedback to pilot valve:**
This subclass is indented under subclass 358. Apparatus in which the valve means is actuated by a fluid pressure operated motor and a secondary or pilot valve is operable to control the flow of pressure fluid to the valve actuating motor, the input signal being applied to the secondary or pilot valve and additional position feedback means being provided from the valve actuating motor to the pilot valve.
- 366 Speed governor controlled input signal (458):**
This subclass is indented under subclass 358. Apparatus in which the input signal for the valve means is produced by a means which is driven from a rotating shaft and the signal varies in accordance with the speed at which the rotating shaft is driven.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
435, and the subclasses there noted for other expansible chamber motors controlled by speed governors.
- 367 Plural input signal means for single motor valve (453):**
This subclass is indented under subclass 358. Apparatus in which there are a plurality of separate means for generating an input signal operatively associated with a single valve means such that the separate signal generating means may actuate the valve means either separately or simultaneously.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
453, for expansible chamber motors having plural actuators for a single valve and not including position responsive feedback means.
- 368 Follower type:**
This subclass is indented under subclass 358. Apparatus in which the valve means comprises relatively movable parts whose range of movement to cause actuation of the working member is limited to a fractional portion of the total input signal which may be applied and to the total range of movement of the working member and in which the signal input means and the

working member are so related to the valve means that working member movement will result only when the input signal means moves and will continue only as long as the signal input means continues to move; movement of the working member ceasing when movement of the input signal means ceases.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

363, for working member position feedback controls of the follower type in which both the input and feedback signal means are electrical.

369.1 With relatively movable working and output members reacting on input member:

This subclass is indented under subclass 368. Apparatus in which there is an output member for transmitting movement of the working member to a load, the working member being movable relative to the output member, and in which means are provided to cause the relative movement between the working members and the output member to affect the input signal means.

(1) Note. A device having a flexible wall working member must have a means other than the wall itself to permit relative movement of the working member and the output member.

369.2 Rubber block reaction means:

This subclass is indented under subclass 369.1. Apparatus in which the means causing relative movement between the working member and the output member comprises an elastomeric element positioned in a chamber to transmit movement from the output member to the valve means.

369.3 And transverse valve key:

This subclass is indented under subclass 369.2. Apparatus in which the valve means moves in one direction from rest position to cause movement of the working member, there being provided an element, e.g., key-like element, etc., which engages the valve means or a member connected to the valve means for limiting movement of the valve means in the opposite direction beyond the rest position.

369.4 Lever reaction means:

This subclass is indented under subclass 369.1. Apparatus in which the means causing relative movement between the working member and the output member comprises at least one lever to transmit movement from the output member or the working member to the valve means.

370 With motor chamber pressure reaction on valve:

This subclass is indented under subclass 368. Apparatus in which the valve means is provided with a means responsive to fluid pressure, which means is so related to the valve means and a working chamber of the motor that it exerts a force on the valve means due to pressure existing in the motor chamber.

(1) Note. The means responsive to fluid pressure may be a surface on one of the valve parts but, for classification under this definition, the part must be specifically described as having the function of a fluid pressure responsive means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

369.1, through 369.4, for motors in which the motor chamber pressure reaction is transmitted to the input member by relative movement between the working member and the load output member.

371 With valve means limiting reaction pressure:

This subclass is indented under subclass 370. Apparatus in which an additional valve means is provided for controlling the application of fluid to the means responsive to fluid pressure, said additional valve means also being responsive to fluid pressure of a predetermined magnitude (1) to limit the pressure of the fluid applied to the means responsive to fluid pressure or (2) to change the proportion of the fluid pressure in the working chamber applied to the means responsive to fluid pressure when the working chamber pressure rises above the predetermined magnitude.

372 Spring-loaded valve:

This subclass is indented under subclass 370. Apparatus in which the valve means has a mechanical spring acting on a movable valve part in such a manner that a given minimum force must be exerted on the valve part to cause its movement.

373 With lost motion between input and reaction member:

This subclass is indented under subclass 372. Apparatus in which movable parts of the input signal means and the means responsive to fluid pressure are operatively connected to transmit forces to each other during a portion of their operation and to move relative to each other without transmitting force during another portion of their operation.

- (1) Note. Devices in which the signal and reaction parts move relative to each other because the reaction force is transmitted through relatively movable sequentially operable inlet and exhaust valves are excluded from this subclass unless there is additional means to permit lost motion between the parts.

374 Plural movable valve parts:

This subclass is indented under subclass 368. Apparatus in which the valve means has a plurality of (movable) parts movable to perform a valving function, which are moved relative to one another to control the flow of motive fluid, one of said valve parts being moved by the input signal means to cause movement of the working member and another of said movable parts being operated in response to movement of the working member to stop the working member.

375 Valve part moves about an axis:

This subclass is indented under subclass 374. Apparatus in which at least one of the movable valve parts oscillates or rotates about an axis relative to another valve part to perform a valving function.

376 One movable part unitary with working member:

This subclass is indented under subclass 374. Apparatus in which one of the movable valve parts is rigid with the working member so as to

move as a unit therewith without any relative motion.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 375, for a plural movable valve parts type feedback control in which one of the valve parts is unitary with a working member which rotates or oscillates about an axis.

377 Lost motion linkage connecting valve, load and working member:

This subclass is indented under subclass 376. Apparatus in which the movable valve part, the working member and a load receiving member are connected by a linkage to provide a lost motion connection so that there is a limited amount of motion between the parts to cause operation of the valve before the working member actuates the load.

378 Axially movable spool-type valve:

This subclass is indented under subclass 376. Apparatus in which the movable valve parts comprise a ported sleeve and a spool mounted within the sleeve, said sleeve and spool being both movable along the axis thereof to control the flow of motive fluid.

379 Disproportional rate of response:

This subclass is indented under subclass 368. Apparatus in which the motor moves different increments in different parts of its range of movement for the same increment of signal input.

380 Screw and follower (e.g., nut, etc.):

This subclass is indented under subclass 368. Apparatus including relatively rotatable screw and follower, e.g., nut, etc., elements, the follower engaging the thread of the screw, and the elements being also bodily displaceable as a unit (either axially or rotatably); the input signal means, the valve means and the working member being operatively connected to the elements such that the signal input means will cause operation of the valve means to initiate movement of the working member by moving a first one of the elements either by bodily displacement or rotation relative to the second element while the working member remains stationary; the operation of the valve means causing movement of the working member

which will cause the second element to move by the other type of movement than that caused by the input signal means to cause operation of the valve means to stop movement of the working member while the input signal means remains stationary.

- (1) Note. The screw element of the above definition is intended to be limited to an element having a helical track of more than 360° and is by this characteristic distinguished from a cam device as provided for in subclass 382.

381 Differential gearing:

This subclass is indented under subclass 368. Apparatus including a train of at least three intermeshing toothed gears, one connected to the signal input means, another connected to the valve means and a third connected to the working member to provide the feedback signal, operation of the signal input connected gear causing operation of the valve means connected gear while the working member connected gear is stationary, and operation of the working member causing operation of the valve connected gear while the signal input connected gear is stationary.

382 Cam and follower:

This subclass is indented under subclass 368. Apparatus including cam and cam follower elements which are movable relative to each other to cause a camming action and also to cause relative movement without a camming action, i.e., a noncamming movement, the input signal means, the valve means and the working member being operatively connected to the elements such that the input signal means will cause operation of the valve means to initiate movement of the working member by moving a first one of the elements relative to the second by either a camming movement or a noncamming movement while the working member remains stationary; the operation of the valve means causing movement of the working member which will cause the second element to move relative to the first element by a movement of the other type than that caused by the input signal means to cause operation of the valve means to stop movement of the working member while the input signal means remains stationary.

- (1) Note. Devices in which a straight lever is operatively connected to the input signal means, the valve means and the working member and one or more of such connections is of the pin and slot type to permit lost motion to accommodate for the difference in motion of parts, e.g., rectilinear motion of a valve stem and pivotal motion of the lever, etc., are not considered to be a cam and follower follow-up for this subclass and will generally be found in subclass 384.

- (2) Note. See (1) Note under subclass 380 for an explanation of the distinction between this subclass and subclass 380.

383 Cable:

This subclass is indented under subclass 368. Apparatus including a flexible means such as cable rope, chain, etc., connected to the signal input means, the valve means and the working member such that the signal input means will cause movement of the flexible means to operate the valve means to cause movement of the working member; the flexible means being moved by the working member to operate the valve means to stop movement of the working member.

384 Floating link:

This subclass is indented under subclass 368. Apparatus including a control link having three axially spaced connecting points, one of said connecting points being connected to the valve means, the second to the input signal means and the third to the working member so that movement of said input signal means will move said valve means through said link and movement of the working member will reposition the valve through said link.

385 Bias-type input and feedback signal means:

This subclass is indented under subclass 358. Apparatus in which the signal provided by the input signal means is a variable force acting on the valve means and the working member position signal is generated by means which provides a variable force acting on the valve means in opposition to the input signal force and which force is greater the greater the deviation of the working member from a given position.

386 Feedback bias means adjustable:
This subclass is indented under subclass 385. Apparatus in which the means for generating the working member position signal is adjustable to change the amount of force exerted against the valve means for a given position of the working member.

387 Spring-type feedback bias means:
This subclass is indented under subclass 385. Apparatus in which the working member position signal is generated by a resilient material which is variably stressed by the position of the working member.

388 Fluid operated:
This subclass is indented under subclass 358. Apparatus in which means responsive to fluid pressure is connected to operate or modify the operation of the valve means by fluid pressure variations created in response to the position of the working member.

- (1) Note. The fluid pressure for operating the valve means in response to the position of the working member may be motive fluid from the motor or fluid from a separate supply.
- (2) Note. A valve means which is operated by fluid pressure variations which are created in the motive fluid merely by the working member engaging the end of the chamber in which it is working or by a mere variation in the load are excluded; see subclass 433 and the search there noted for such devices.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 403, for expansible chamber motors having a fluid actuated valve in which the valve actuating fluid is controlled in response to the working member position and which does not involve a feedback means.
- 460, and 461, for expansible chamber motors having a pulsator operated valve or a pilot valve, respectively.

389 Adjustable:
This subclass is indented under subclass 358. Apparatus in which the signal is provided in response to the working member reaching a given position, the position of the working member at which the signal is provided being selectively changeable.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 277, for cyclic operable motors in which the working member reversal position is adjustable.
- 386, for a working member position feedback control having a bias type input signal and an adjustable feedback bias means.

390 POSITION MAINTAINING TYPE:
This subclass is indented under the class definition. Apparatus comprising means responsive to the movement or the tendency to move of the working member to control the motive fluid so as to restore the working member to its original position or to provide a force counteracting the force tending to move the working member.

- (1) Note. This definition does not include means responsive to motor chamber pressure build up or fall off, even if such pressure change is a result of a tendency of the working member to move from a given position; see subclass 433 and the search there noted for such devices.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 358 through 389, for working member position feedback controls having a valve means which is actuated by an input signal to initiate operation of the motor and the working member creates a signal which acts on the same valve means to modify the operation of the motor. Practically all of these devices will also operate to maintain the working member in position when there is no input signal.

391 WITH ALTERNATIVE MANUAL ACTUATION OF LOAD:

This subclass is indented under the class definition. Apparatus having means for moving the load normally driven by the working member by a human operator in the absence of operation of the motor.

- (1) Note. When the load is moved manually, the motor working member may also move due to the application of the manual force.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 368 through 384, for follower-type working member position feedback controls which generally provide for movement of the load when motive fluid is not available to operate the motor by engagement of the valve parts on extreme travel of such parts and without other means to facilitate manual actuation. Patents in which such means is provided have been cross referenced to this subclass (391).

392 WORKING MEMBER POSITION RESPONSIVE MOTIVE FLUID CONTROL:

This subclass is indented under the class definition. Apparatus in which the flow of motive fluid to or from a working chamber or within a working chamber is modified so as to alter the motor operation in response to the working member of the motor attaining a given position in the working chamber.

- (1) Note. Motors in which a control is effected by a motive fluid pressure change due merely to the working member reaching the end of the stroke or engaging a stop or the like are not considered to be position responsive under this definition.
- (2) Note. This definition includes those motors in which the motive fluid is controlled in response to means which senses or measures the quantity or volume of fluid (as opposed to rate of flow or pressure) which flows to or from a

chamber which expands or contracts proportionally to the motor movement. The chamber may be a working or non-working chamber.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 20 through 27, for expansible chamber motors in which motive fluid is supplied to a single working chamber through different supply paths at different times, at least one of said supply paths being controlled in response to the position of the motor working member.
- 168, for expansible chamber motors in which the motor has separately controlled working chambers, the extension of the unit equalling the sum of the individual chamber extensions and in which the position of one working member controls the motive fluid for another working member.
- 170 through 195, and especially subclasses 189-195 for expansible chamber motors having plural relatively movable working members in which the motive fluid for one working member is controlled in response to the position of another working member.
- 218 through 354, for expansible chamber motors having a reciprocating cycle of operation and means operating in response to the position of the working member to control the motive fluid to cause the motor to operate continuously repeating the cycle.
- 357, for expansible chamber motors having selectively usable or positionable working member controlled vent in the working chamber wall.
- 358 through 389, for expansible chamber motors having valve means which is operated by an input signal to cause operation of the motor and in which said valve means is further controlled in response to the working member of the motor attaining a given position.
- 419, for expansible chamber motors in which a motive fluid valve is controlled in response to the position or orientation of the entire motor.

- 425, for expansible chamber motors in which in response to position of the working member means are actuated to hold a valve in a given position.
- SEE OR SEARCH CLASS:
- 418, Rotary Expansible Chamber Devices, subclass 270 for rotary expansible chamber motors in which the motive fluid is controlled in response to the position of the rotary working member of the motor.
- 393 Position initiated timing or delay means:**
This subclass is indented under subclass 392. Apparatus in which in response to the position of the working member means are actuated which cause a predetermined delay or time to elapse prior to control of the motive fluid.
- (1) Note. The operation of the timing or delay means is initiated in response to the position of the motor working member, but thereafter the amount of time delay which occurs before the motive fluid is controlled is not dependent upon the operation of the motor.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 35 through 40, for expansible chamber motors having timing, delay, pattern or cyclic control means which are operated independently of the motor, i.e., not initiated by the motor.
- 218 through 354, and especially subclasses 219, 282-283, 284-285, and 289, for cyclically operable expansible chamber motors including means to delay the shift of a distributor after initiation of the shift by the working member.
- 364, for expansible chamber motors having feedback control and means to delay operation of the valve means in response to the feedback signal from the motor working member.
- 394 Working member carries part within working chamber which controls port in chamber end wall:**
This subclass is indented under subclass 392. Apparatus in which the working member of the motor has attached thereto or formed as a part thereof a part which directly cooperates with an inlet or exhaust opening in the working chamber end wall to control motive fluid flow through said opening in response to position of said working member, said part being disposed within the working chamber in at least one position of the motor.
- 395 Part movable with respect to working member:**
This subclass is indented under subclass 394. Apparatus in which the part attached to the working member moves relative to the working member incident to the control of said end wall opening.
- 396 Part forms throttle member:**
This subclass is indented under subclass 394. Apparatus in which the part carried by the working member is smaller than said opening so as not to completely close the opening or is of tapering or irregular shape so as to progressively or irregularly close or open said opening on continued movement of said part.
- 397 Alternate control of inlet and exhaust for same chamber at opposite ends of stroke:**
This subclass is indented under subclass 392. Apparatus in which the working member has reciprocating motion and wherein at substantially the limit of the stroke in one direction the motive fluid being admitted to a working chamber is controlled in response to working member position and at substantially the limit of the stroke in the opposite direction the motive fluid being exhausted from the same working chamber is controlled in response to working member position.
- 398 Simultaneous control of inlet and exhaust of same chamber:**
This subclass is indented under subclass 392. Apparatus in which both a flow path for motive fluid entering and a flow path for motive fluid exhausting from a single working chamber are substantially concurrently controlled in response to working member position.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 397, for expansible chamber motors in which the inlet and exhaust of motive fluid for a single working chamber are alternately controlled in response to

working member position at opposite ends of the stroke thereof.

399 Bypassing between expanding chamber and closed or throttled contracting chamber (e.g., cushioning, etc.) (23):

This subclass is indented under subclass 392. Apparatus wherein the motor is provided with opposed expansible chambers, i.e., one of which contracts as the other expands and vice versa, and in which in response to motor position a passage interconnecting the two chambers is opened and at that time the contracting chamber is otherwise closed or the outlet therefrom is otherwise restricted.

- (1) Note. The purpose of the by-pass is ordinarily for cushioning by the passage of motive fluid from the expanding chamber to the closed contracting chamber to act on the opposed working member face.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 23, for expansible chamber motors in which motive fluid is supplied to a contracting working chamber by bypassing from an opposed expanding working chamber in response to working member position and additional motive fluid is supplied from a different source. NOTE "PLACEMENT OF PATENTS" IN THE CLASS DEFINITION AND THE PARAGRAPH FOLLOWING THE TITLE IN THE SCHEDULE OF THIS CLASS.
- 235, for cyclically operable, expansible chamber motors in which motive fluid is constantly applied to one working chamber and is by-passed therefrom to an opposed working chamber in response to position of the working member.
- 416, for differential, expansible chamber motors in which motive fluid is supplied to one working chamber by bypassing from an opposed working chamber.

400 Venting expanding chamber:

This subclass is indented under subclass 392. Apparatus in which in response to motor position a working chamber of the motor which is increasing in size is opened to exhaust so as to vent motive fluid therefrom.

- (1) Note. The motive fluid need not be vented directly from the working chamber, but may be vented from the inlet line upstream from the chamber if the fluid in the chamber is capable of escaping from the vent.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 47 through 51, for expansible chamber motors in which motive fluid is constantly applied to a working chamber thereof, motor movement being controlled by operating a vent valve for said working chamber.
- 399, for expansible chamber motors in which a by-pass between an expanding chamber and an opposed contracting chamber is opened in response to position, the contracting chamber being otherwise closed or the outlet thereof being restricted.

401 Through working member:

This subclass is indented under subclass 400. Apparatus in which the motive fluid is vented through a passage in the working member.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 49, for expansible chamber motors in which motive fluid is constantly applied to a working chamber thereof, motor movement being controlled by operating a vent valve for said working chamber, the vented fluid passing through a passage in the working member of the motor.

402 Working member overrides exhaust port (357):

This subclass is indented under subclass 400. Apparatus in which the working member travels past an exhaust port to permit the motive fluid in the expanding chamber to exhaust therethrough.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

325, for cyclically operable expansible chamber motors in which the working member overruns a port to allow the expanding working chamber to exhaust.

357, for expansible chamber motors in which the working member overruns an exhaust port to vent the expanding chamber, the exhaust port being selectively positionable in the direction of working member travel or having means to selectively open and close same. NOTE "PLACEMENT OF PATENTS" IN THE CLASS DEFINITION AND THE PARAGRAPH FOLLOWING THE TITLE IN THE SCHEDULE OF THIS CLASS.

403 Position controls actuating fluid for valve:

This subclass is indented under subclass 392. Apparatus comprising a control valve which is actuated by fluid, said fluid being controlled by the position of the motor working member.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

281 through 320, for cyclically operable expansible chamber motors in which the distributing valve is actuated by a fluid motor the motive fluid supply of which is controlled in response to position of the expansible chamber motor working member.

388, for expansible chamber motors having valve means which is controlled by an input signal and is also operated by fluid pressure which is controlled in response to position of the motor working member.

404 Exhaust control:

This subclass is indented under subclass 392. Apparatus comprising control of the motive fluid as it leaves the working chamber of the motor in response to working member position.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

394 through 396, for expansible chamber motors in which the working member carries a part within the working

chamber which, in response to working member position, cooperates with a port in the working chamber end wall to control exhaust flow there-through.

397, for expansible chamber motors in which the inlet and exhaust of motive fluid to a single working chamber are alternately controlled in response to the working member reaching the end of its stroke in opposite directions.

398, for expansible chamber motors in which both the inlet and exhaust of motive fluid for a single working chamber are controlled simultaneously in response to working member position.

405 Throttling (e.g., cushioning, etc.):

This subclass is indented under subclass 404. Apparatus in which the exhaust is only partially closed in response to working member position or is progressively closed or throttled due to movement of the working member.

(1) Note. Many valves have an incidental throttling action when activated. A patent will not be classified under this definition on the basis of such incidental throttle action. However, a valve or porting which is specifically designed or modified to provide a throttling action is included under this definition.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

396, for expansible chamber motors in which the working member carries a part which cooperates with an exhaust port formed in the working chamber end wall and acts to throttle said port in response to working member movement.

406 Exhaust valve with bleed passage therein:

This subclass is indented under subclass 405. Apparatus in which the exhaust is controlled by a separate valve, the movable part of said valve having a relatively small passage therein to permit limited exhaust from the working chamber after said movable part has been moved to closed position in response to working member position.

407 By successively controlling or controlling less than all of plural exhaust passages:

This subclass is indented under subclass 405. Apparatus in which there is provided a plurality of exhaust flow paths from the working chamber and (1) said flow paths being closed in series in response to movement of the motor working member, or (2) at least one of said exhaust flow paths is not controlled in response to working member position.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

24 through 26, for expansible chamber motors in which inlet motive fluid is supplied to an expanding chamber through one supply path and in response to working member position an additional supply path is opened. Ordinarily in this type motor, the supply paths are also exhaust paths when the chamber is contracting and one exhaust path is cut off in response to working member position while another remains open.

236 through 244, for cyclically operable expansible chamber motors having multiple exhaust passages, one of which exhausts or continues to exhaust after another has been cut off.

408 Working member covers exhaust port (409):

This subclass is indented under subclass 407. Apparatus in which the working member covers an exhaust port located in a wall of the working chamber.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

409, for other motors in which the working member covers an exhaust port in the contracting chamber.

409 Working member covers exhaust port in contracting chamber (408):

This subclass is indented under subclass 404. Apparatus in which the expansible chamber exhausts through a port which is so located as to be covered by the working member during contraction of the expansible chamber to prevent further exhaust therethrough.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

408, for expansible chamber motors in which the working member covers an exhaust port in a contracting working chamber, there being additional exhaust means which remain open after the working member covers said port. NOTE "PLACEMENT OF PATENTS" IN THE CLASS DEFINITION AND THE PARAGRAPH FOLLOWING THE TITLE IN THE SCHEDULE OF THIS CLASS.

410 Working member controls relatively movable inlet valve:

This subclass is indented under subclass 392. Apparatus wherein a valve which has a controlling part movable with respect to the working member is controlled in response to working member position to control the inlet of motive fluid to an expanding working chamber.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

398, for expansible chamber motors in which both the inlet and exhaust of motive fluid to a working chamber are simultaneously controlled in response to working member position.

415 DIFFERENTIAL:

This subclass is indented under the class definition. Apparatus in which the motor is provided with opposed working member faces, motive fluid being applied to or evacuated from one of said faces to cause the working member to move in one direction and being applied simultaneously to or evacuated simultaneously from both of said faces to cause the working member to move in the opposite direction or to slow the movement in said one direction.

(1) Note. The opposed working member faces are usually of different areas. However, they may be of the same area with or without an additional impelling force such as a spring applied in one direction.

(2) Note. Opposed working member faces are defined as faces which when motive fluid is applied thereto tend to move the

working member or load in opposite directions.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 22 through 23, for expansible chamber motors with preliminary admission of motive fluid to a contracting working chamber to cushion movement of the working member and further admission of motive fluid through a different supply path to said working chamber to cause the working member to move in the opposite direction to expand the chamber.
- 51, for double acting expansible chamber motors having motive fluid constantly applied to opposed working member faces and selectively vented therefrom to cause the motor to move in either direction.
- 152, for expansible chamber motors of the multiple expansion type.
- 165, for expansible chamber motors in which motive fluid at different pressures may be simultaneously applied to opposed working member faces.
- 172, for expansible chamber motors having opposed, relatively movable working members with motive fluid being simultaneously applied thereto.
- 464, for double acting expansible chamber motors in which motive fluid is supplied to opposed working member faces when the motor is in idle or stationary condition.

- 416 Opposing pressure applied by bypassing:**
This subclass is indented under subclass 415. Apparatus in which the motive fluid which acts in one of the expansible chambers is supplied directly thereto from the other expansible chamber.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 23, for double acting expansible chamber motors in which motive fluid is supplied to the contracting chamber from the expanding chamber to cushion movement of the working member and additional motive fluid is supplied to said contracting chamber through a different path.

224, for cyclically operable expansible chamber motors of the differential type in which opposed working chambers are placed in communication through a valved piston.

235, for cyclically operable motors in which one working chamber receives controlled motive fluid supply from an opposed chamber having constant supply.

399, for expansible chamber motors in which in response to position of the working member motive fluid is bypassed from an expanding working chamber to a closed contracting chamber.

417 Motive fluid constantly applied to one working member face (235) (321):

This subclass is indented under subclass 415. Apparatus in which motive fluid is applied to one working face of the motor under all conditions of operation of the motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 235, and 321, for cyclically operable motors of the differential type in which motive fluid is constantly applied to one working member face. NOTE "PLACEMENT OF PATENTS" IN THE CLASS DEFINITION AND THE PARAGRAPH FOLLOWING THE TITLE IN THE SCHEDULE OF THIS CLASS.

418 WITH MOTIVE FLUID VALVE:

This subclass is indented under the class definition. Apparatus including valve means to control the flow of motive fluid to or from the motor or while in the motor so as to provide a control of the motor.

- (1) Note. The valve means may be, for example, a distributing valve, throttle valve, pressure relief or check valve or a pressure reducing valve. A mere fixed orifice which provides a throttling action is not considered to be a valve, but a controllable throttle is considered to be a valve even though it may not be capable of being completely cut off.

(2) Note. Patents disclosing a cyclically operable motor in which the claims are directed to any of the motor operated valve actuating means are classified in subclasses 218-354.

(3) Note. The following definitions of terms are applicable to this and indented subclasses (418-470).

(a) Inlet and Exhaust Valve - A valve for connecting three lines; a pressure line, a motor line and an exhaust line; the valve being settable in any of three positions, namely, with the pressure line connected to the motor line, with the motor line connected to the exhaust line and with the motor line cut off. The valve may comprise a single unitary member or relatively movable separate valving elements.

(b) Stop Valve - A valve in any line which is capable of being closed to stop the flow in both directions in that line. A stop valve may also be a throttling valve so long as it is capable of being completely closed.

(c) Check Valve - A direction responsive valve which when placed in line is designed to prevent any flow in one direction and allow substantially free, unimpeded flow in the opposite direction.

419 Responsive to (1) motive fluid temperature or state, or (2) motor position or orientation: This subclass is indented under subclass 418. Apparatus in which the valve means is controlled in response to (1) changes in the temperature or the physical state of the motive fluid supplied to or exhausted from the motor or (2) changes in the position of the motor relative to a support or relative to a predetermined spatial reference, such as a line, plane or direction.

420 Contracting chamber exhaust valve controlled by expanding chamber pressure or flow:

This subclass is indented under subclass 418. Apparatus in which the motor has a first chamber which is expanded by pressure motive fluid acting therein and a second chamber which is contracted and from which motive fluid is exhausted due to the expansion of the first chamber, the exhaust from the contracting chamber being controlled by valve means which is operated by the pressure of motive fluid in or the flow of motive fluid to said expanding chamber.

(1) Note. This subclass includes patents which disclose rotary expansible chamber motors but are not claimed as such.

(2) Note. This subclass does not include patents in which the expanding and contracting chambers are disclosed as associated with plural relatively movable working members since such patents are provided for above in subclasses 170-195 and 508-536.

SEE OR SEARCH THIS CLASS, SUBCLASS:

268, for cyclically operable expansible chamber motors in which the exhaust valve for one chamber is closed or held closed by inlet pressure in an opposing chamber.

421 Expanding chamber inlet controlled by contracting chamber pressure or flow:

This subclass is indented under subclass 418. Apparatus in which the motor is provided with a first chamber which is expanded by pressure motive fluid acting therein and a second chamber which is contracted and from which motive fluid is exhausted due to the expansion of said first chamber, the flow of motive fluid into the expanding chamber being controlled by valve means which is responsive to the motive fluid pressure in or flow from said contracting chamber.

(1) Note. See Notes (1) and (2) under subclass 420 which also apply to this subclass.

422 Valved piston (222):

This subclass is indented under subclass 418. Apparatus in which the movable valve means is in or carried by a piston or piston rod of the motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 49, for expansible chamber motors in which motive fluid constantly applied to the working chamber is vented through the piston or rod.
- 163, for multiple expansion expansible chamber motors in which the motive fluid is expanded through the piston from the high pressure chamber into the low pressure chamber.
- 222 through 229, for cyclically operable expansible chamber motors in which the motive fluid is supplied or exhausted through a valved piston or rod. NOTE "PLACEMENT OF PATENTS" IN THE CLASS DEFINITION AND THE PARAGRAPH FOLLOWING THE TITLE IN THE SCHEDULE OF THIS CLASS.
- 234, for cyclically operable valveless expansible chamber motors in which the piston has a passage for the flow of motive fluid formed therein.
- 376 through 378, for expansible chamber motors having follower type feed back control valve means positioned in the piston or rod.
- 401, for expansible chamber motors having a valved passage in the piston or piston rod which is controlled in response to working member position.

423 Valve part forms traversed movable portion of working chamber wall (276):

This subclass is indented under subclass 418. Apparatus in which a part of the working chamber wall which is traversed by the working member is movable and forms or carries a part forming a portion of the motive fluid valve means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 276, for cyclically operable expansible chamber motors in which the valve means is formed by a movable portion

of the working chamber wall traversed by the working member. NOTE "PLACEMENT OF PATENTS" IN THE CLASS DEFINITION AND THE PARAGRAPH FOLLOWING THE TITLE IN THE SCHEDULE OF THIS CLASS.

SEE OR SEARCH CLASS:

- 417, Pumps, subclass 509 for expansible chamber pumps in which the pump fluid is controlled by a valve means which is formed by a movable portion of the pump chamber wall traversed by the pumping member.

424 Two hand control:

This subclass is indented under subclass 418. Apparatus in which operation of the valve means requires the use of both hands of a human operator.

425 With motor-controlled holding means for valve:

This subclass is indented under subclass 424. Apparatus including means responsive to an operating condition of the motor for permitting the motor to continue to operate upon release of either or both hands of the operator.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 301, and 337, for cyclically operable expansible chamber motors in which fluid is supplied to a chamber subsequent to movement of the distributor to reversed position to hold the distributor in such position.
- 392 through 410, for expansible chamber motor valve means which responds to working member position.
- 426, for expansible chamber motor valves having subsequently applied fluid means to hold the valve in the position to which it had previously been shifted.

426 With fluid pressure holding means for valve:

This subclass is indented under subclass 418. Apparatus including means to actuate the valve means to a given position and separate means to hold the valve means in said position by the application of fluid pressure to the separate means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

301, and 337, for cyclically operable expansible chamber motors in which fluid is supplied to a chamber subsequent to movement of the distributor to reversed position to hold the distributor in such position.

392 through 410, for expansible chamber motor valve means which responds to working member position.

425, for expansible chamber motors having two hand control valve means with motor controlled fluid holding means for said valve means.

427 Plural manual control stations:

This subclass is indented under subclass 418. Apparatus comprising a plurality of spaced control stations from which the motor may be alternatively controlled by a human operator.

- (1) Note. The spaced control stations may comprise separate control valves for the motor or may comprise separate operators for a single control valve.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

6 through 33, for motors in which motive fluid is supplied to an expansible chamber through different supply paths and which may involve separate control stations.

428 Manual control carried on or operated from load or output element:

This subclass is indented under subclass 418. Apparatus in which the valve means is manually operable by means carried on and movable with the working member or load or which is positioned to be operable by a human operator carried on and movable with the working member or load.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

376 through 378, for working member position feedback controls having a valve part which is unitary with the working member.

429 Dither valve:

This subclass is indented under subclass 418. Apparatus in which the valve means is so actuated as to provide motive fluid to the motor in a series of pressure impulses rather than in a steady continuous flow.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

39 through 40, for expansible chamber motors having independent means to actuate a distributor to cause cyclic, reciprocating operation of the motor. Mere pulsing of fluid alternately to opposed working chambers of a motor to maintain the working member in a "ready" or static friction-free state is not considered to be cyclic operation for subclasses 39-40.

430, for expansible chamber motors with valve means which has parts which are continuously relatively moved for a nonvalving function, usually to prevent sticking of the valve means.

430 Valve parts continuously relatively moved for nonvalving function:

This subclass is indented under subclass 418. Apparatus in which the valve means has parts which are relatively movable for a nonvalving function and means are provided to cause the parts to be moved continuously.

- (1) Note. The valve parts are usually moved for the purpose of reducing static friction in the valve so that the parts may be easily moved by other means to perform a valving function.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

429, for expansible chamber motors with a dither valve which controls the motive fluid to supply a series of impulses rather than a steady flow to the motor.

431 Continuous motive fluid flow through chamber in motor idle condition:

This subclass is indented under subclass 418. Apparatus in which the valve means is so constructed as to provide for a circulating flow of motive fluid into and out of the motor working

chamber while the motor working member is stationary.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 47 through 51, for expansible chamber motors having constantly applied motive fluid with controlled venting.
- 52, for expansible chamber motors having a constantly open throttled exhaust with controlled motive fluid supply.

432 Inlet check valve with means for disconnectable supply line (468):

This subclass is indented under subclass 418. Apparatus in which the valve means comprises a check valve which is operable to permit motive fluid to flow into the working chamber, the check valve having connecting means combined therewith to provide for the reception of a readily disconnectable or removable motive fluid supply line to the motor through said check valve.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 468, and see the subclasses there noted for other motors with self-acting valves.

433 Both inlet and exhaust controlled by motive fluid pressure in supply line or chamber:

This subclass is indented under subclass 418. Apparatus in which the valve means controls both the inlet and the exhaust to initiate flow of motive fluid to and from a single working chamber of the motor and the valve means is operated in response to variations in the pressure in either the pressure line supplying motive fluid to the motor or the working chamber or the motor itself to control both the inlet and exhaust of motive fluid.

- (1) Note. The valve means controlling the inlet and the exhaust in response to variations in the pressure is an inlet and exhaust valve.
- (2) Note. The motive fluid which operates the valve means must also be subject to the control of the valve means.
- (3) Note. The variations in pressure in the supply line or working chamber may be caused by any condition including a

manually operable means such as a throttle valve in the pressure line or by changes in the load on the motor so long as the inlet and exhaust are both valved by a means which itself operates by variations in pressure applied thereto.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 166, for double acting motor having valve means for reversing the direction of operation of the motor in response to motive fluid pressure variations.
- 356, for reciprocating motors which operate through a complete cycle and then stop, the reversal of the motor being controlled in response to motive fluid pressure change.
- 420, for a double acting motor in which the contracting chamber exhaust valve is controlled by the pressure in or flow to the expanding chamber.
- 421, for a double acting motor in which the expanding chamber inlet is controlled by the pressure in or flow from the contracting chamber.
- 461, for pilot valves which are operated by motive fluid which is controlled separately from that supplied directly to the motor.

434 With manual valve actuating means responsive to motive fluid pressure (e.g., "feel", etc.):

This subclass is indented under subclass 433. Apparatus in which the valve means is provided with manual actuating means, the variations in pressure being applied to said manual actuating means to provide a reaction or "feel" to the operator.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 370 through 373, for expansible chamber motors having follower type valve means with motor chamber pressure reaction on the valve.

435 Controlled by rate of movement of working member:

This subclass is indented under subclass 418. Apparatus in which the valve means is controlled in response to the speed of movement of the working member.

- (1) Note. Rate of motive fluid flow to or from a working chamber has not been considered to be indicative of the speed of movement of the working member. Thus, this definition does not include valve means which are controlled in response to the rate of flow to or from a working chamber.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 17, for cyclically operable expandible chamber motors having means to supply low pressure fluid to the motor when the main supply is cut off and the motor is coasting or drifting and speed responsive means for cutting off the low pressure fluid when the motor speed decreases to a given value or the motor stops.
- 221, for cyclically operable expandible chamber motors with stop means responsive to speed.
- 333, for cyclically operable expandible chamber motors having independently operable means to control the distributor in response to the speed of the motor.
- 336, for cyclically operable motors having speed controlled throttle valve means.
- 364, for expandible chamber motors of the feedback type having means to vary the feedback signal in response to rate of working member movement.
- 366, for expandible chamber motors of the feedback type having a speed governor controlled input signal.
- 458, for expandible chamber motors having speed governor operated valve means.
- 468, and see the search there noted for expandible chamber motors having self acting valves and see (1) Note above.

SEE OR SEARCH CLASS:

- 418, Rotary Expandible Chamber Devices, subclasses 40 through 44 for rotary expandible chamber motors which are controlled in response to the speed of rotation of the working member.

436 Inlet fluid supplemented by controlled fluid pressurized in opposed contracting chamber:

This subclass is indented under subclass 418. Apparatus in which the motor is provided with opposed chambers such that the introduction of pressure motive fluid into one chamber will cause expansion thereof, movement of the working member, and contraction of the opposed chamber to exert a pressure on fluid contained therein, the valve means being operable to permit fluid which has been put under pressure in the contracting chamber to be admitted to the expanding chamber during at least a portion of the period pressure motive fluid is also being admitted to the expanding chamber.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 6 through 33, for expandible chamber motors having inlet motive fluid supplied through diverse flow passages to a single working chamber at different times.

437 Independent control of bypass between opposed working chambers:

This subclass is indented under subclass 418. Apparatus in which the motor comprises a pair of working chambers for driving a single working member in opposite directions by the application of controlled pressure motive fluid to expand one chamber and to contract and expel exhaust motive fluid from the other chamber and in which the valve means controls a fluid line connecting the chambers to permit motive fluid to pass from one chamber to the other, said valve means operating separately from the control of the pressure motive fluid.

- (1) Note. The operation of the by-pass valve means, to be separate from the pressure motive fluid control, must operate in a manner inconsistent with the normal motor operation such that a double acting motor with a unitary spool valve having short lands which may interconnect opposed motor chambers at one valve position is excluded and will be found in subclass 464.

- (2) Note. A double acting motor in which a valve controlled by-pass line is also constantly open to exhaust is considered to be a common exhaust and is excluded from this definition.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 16 through 18, for expansible chamber motors with motive fluid supplied through diverse flow paths to a single expansible chamber in which the motor drifts or coasts on a lower motive fluid pressure.

438 Held closed by motive fluid pressure:
This subclass is indented under subclass 437. Apparatus in which the valve means controlling the by-pass is held in position to close the by-pass by the pressure of motive fluid applied to the motor.

439 Bypass through supply line:
This subclass is indented under subclass 438. Apparatus in which the pressure motive fluid applied to the motor is controlled by a valve means having an inlet line common to the opposed chambers for the pressure motive fluid and in which the by-pass line is formed in part by said inlet line so that fluid may flow from one chamber to the other through the inlet line independently of the position of the pressure motive fluid control valve means.

440 For exhausting contracting working chamber to expanding opposed nonworking:
This subclass is indented under subclass 418. Apparatus in which the motor includes a non-working chamber and the valve means acts to exhaust motive fluid from the contracting working chamber to the nonworking chamber which is expanded due to the movement of the working member contracting the working chamber.

441 With ambient fluid inlet valve to expanding working chamber:
This subclass is indented under subclass 418. Apparatus in which the motor is provided with an additional valve means which opens to admit ambient fluid into an expanding chamber when the pressure in the chamber falls below the pressure of the ambient fluid source.

- (1) Note. Ambient fluid is fluid which is not under pressure and does not cause the working member to move when it is being admitted to the expanding chamber; however, pressure motive fluid may be applied to the chamber when the ambient fluid source is cut off from the expanding chamber so that the ambient fluid trapped in the expanding chamber becomes pressurized and assists in moving the working member.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 16 through 18, for expansible chamber motors with motive fluid supplied through diverse flow paths to a single expansible chamber in which the motor drifts or coasts on a lower motive fluid pressure.

442 Self-opening exhaust valve held closed by inlet pressure (268):
This subclass is indented under subclass 418. Apparatus in which an expansible chamber is provided with a valve to discharge motive fluid therefrom, said valve being held closed by the pressure of inlet motive fluid applied to said chamber and said valve opening automatically to permit discharge when the inlet pressure is removed.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 268, for cyclically operable expansible chamber motors having relatively movable inlet and exhaust valves in which the exhaust valve is held closed by inlet pressure. NOTE "PLACEMENT OF PATENTS" IN THE CLASS DEFINITION AND THE PARAGRAPH FOLLOWING THE TITLE IN THE SCHEDULE OF THIS CLASS.

443 To provide unequal inlet and exhaust flow rates to single working chamber:
This subclass is indented under subclass 418. Apparatus in which the valve means controls the inlet and exhaust flow of motive fluid to and from the same working chamber to cause the magnitude of the inlet flow and exhaust flow to be unequal.

- (1) Note. The valve means must be more than a mere manually operable throttle in a common inlet and exhaust line and includes, for example, additional passages in the valve means or plural motive fluid lines.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 6 through 33, for expansible chamber motors having a single working chamber having fluid supplied thereto by diverse flow paths.

444 Relatively movable serial valves:

This subclass is indented under subclass 418. Apparatus in which the valve means comprises at least two valves through which the fluid must pass serially in the course of flowing either to the working chamber or exhausting from the working chamber, each valve having a movable fluid flow controlling element so arranged that the control of the motive fluid by the valves is effected by the movement of the movable element of one valve relative to the movable element of another valve.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 12, and 15, for cyclically operable expansible chamber motors with serially arranged reversing valves arranged between the supply and exhaust and opposed expansible chambers of the motor.
- 30, for expansible chamber motors with serially arranged reversing valves arranged between the supply and exhaust and opposed expansible chambers of the motor.
- 246, for cyclically operable expansible chamber motors having a throttle valve correlated with the distributor.
- 247, for cyclically operable expansible chamber motors having additional valve means for adjusting the timing of the fluid control events.
- 264, for cyclically operable expansible chamber motors having serially arranged distributors which are relatively movable.
- 274, for cyclically operable expansible chamber motors having additional

valve means to controllably vary the fluid handling capacity of the inlet or exhaust passage.

- 335 through 336, for cyclically operable expansible chamber motors which include a throttle valve in the flow path to the distributor.

445 Stop valve between working chamber and inlet and exhaust valve:

This subclass is indented under subclass 444. Apparatus in which one of the serial valves is an inlet and exhaust valve and another is a stop valve, the stop valve being disposed in the motor line between the inlet and exhaust valve and the working chamber.

446 Including motive fluid pressure or flow responsive valve (468):

This subclass is indented under subclass 444. Apparatus in which one of the serial valves acts in response to pressure or flow in the line in which said one valve is placed.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 468, and see the subclasses there noted for other motors with self acting valves.

447 Between working chamber and inlet and exhaust valve:

This subclass is indented under subclass 446. Apparatus in which another of the serial valves is an inlet and exhaust valve and the pressure or flow responsive valve is disposed in the motor line between the inlet and exhaust valve and the working chamber.

448 In supply path:

This subclass is indented under subclass 444. Apparatus in which the serially arranged valves are located in the fluid line supplying motive fluid to the motor.

449 Plural separately controlled waste passages for single working chamber:

This subclass is indented under subclass 418. Apparatus in which the same working chamber of the motor is provided with at least two waste passages through which motive fluid may be diverted or exhausted from the chamber and the valve means is operable to control these passages separately of one another.

- (1) Note. A waste passage under this definition includes an exhaust line or a line branching from an inlet line which is controlled merely to prevent motive fluid from reaching the chamber by being opened, while the inlet line is open to the chamber. A passage for motive fluid which is directed from the chamber to some motor control means, e.g., valve actuator, feel or holding means, etc., or for some function ancillary to the motor operation, e.g., sealing, etc., is excluded.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 48, for expansible chamber motors in which motive fluid is constantly applied to a working chamber thereof and having a plurality of separately controlled vent or waste passages to control the operation of the motor.
- 236 through 244, for cyclically operable expansible chamber motors having multiple exhaust passages.
- 407 through 408, for expansible chamber motors having a plurality of exhaust passages which are successively controlled in response to working member position.

450 One passage controlled by inlet and exhaust valve:

This subclass is indented under subclass 449. Apparatus in which the valve means controlling one of the passages is an inlet and exhaust valve.

451 Another passage controlled by motive fluid pressure or flow responsive valve (468):

This subclass is indented under subclass 450. Apparatus in which the valve means controlling a second passage is a self acting valve operated in response to the motive fluid pressure or rate of flow in the chamber or motive fluid lines.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 240 through 242, for cyclically operable expansible chamber motors having multiple exhaust passages with one passage controlled by a fluid pressure actuated valve.

- 452, for other motors having plural separately controlled waste passages for a single chamber, at least one of which is controlled by a motive fluid pressure or flow responsive valve.

- 468, and see the subclasses there noted for other motors with self acting valves.

452 One passage controlled by motive fluid pressure or flow-responsive valve (468):

This subclass is indented under subclass 449. Apparatus in which the valve means controlling one of the passages is a self acting valve operated in response to the motive fluid pressure or rate of flow in the chamber or motive fluid lines.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 240 through 242, for cyclically operable motors having a fluid actuated valve controlling one of a plurality of exhaust passages.
- 451, for plural separately controlled waste passages for the same chamber where one passage is controlled by a motive fluid pressure or flow responsive valve and another passage is controlled by an inlet and exhaust valve.
- 468, and see the subclasses there noted for other motors with self acting valves.

453 Plural actuators for single valve means (367):

This subclass is indented under subclass 418. Apparatus in which a single valve means is provided with two or more separate means to cause operation of the valve means.

- (1) Note. When the valving comprises separate relatively movable inlet and exhaust valves for one working chamber, each valve is considered a single valve means within this definition so that a single actuator only on each valve is not included.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 367, for motors having position responsive feedback control and plural input signal means for a single valve. NOTE "PLACEMENT OF PATENTS" IN THE CLASS DEFINITION AND

THE PARAGRAPH FOLLOWING THE TITLE IN THE SCHEDULE OF THIS CLASS.

- 425, and the subclasses noted thereunder for expansible chamber motors having valve means having plural actuating means, one of which is responsive to the position of the working member controlled by the valve means.
- 454 Relatively movable inlet and exhaust valves for single working chamber:**
This subclass is indented under subclass 418. Apparatus in which the valve means comprises two valves, each having a movable flow controlling part, one of the valves controlling the pressure line to a working chamber and the other controlling the exhaust line from the same chamber, at least one of the valves controlling its respective line by movement of its movable valve part relative to the movable valve part of the other valve.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
265 through 273, and the subclasses there noted for cyclically operable expansible chamber motors having relatively movable inlet and exhaust valves.
- 455 One valve forms unitary part of valve controlling opposed working chamber:**
This subclass is indented under subclass 454. Apparatus in which said two valves control the inlet and exhaust of one working chamber of a double acting motor and the movable flow controlling part of one of the valves moves as a unit with another movable flow controlling part of a valve which controls the flow of motive fluid to or from the other working chamber of the double acting motor.
- 456 One valve moves about an axis:**
This subclass is indented under subclass 454. Apparatus in which the movable flow controlling part of at least one of said two valves oscillates or rotates about a fixed axis to perform its valving function.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
270, for cyclically operable expansible chamber motors having relatively
- movable inlet and exhaust valves movable about an axis.
- 457 Single actuating means moves both valves:**
This subclass is indented under subclass 454. Apparatus in which a single movable actuating member or element is operatively associated with said two valves so that the movable flow controlling parts of both valves are capable of being moved by the member or element.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
376, for working member position feedback controls of the follower type having plural movable valve parts one of which is unitary with the working member and which are generally of the type having relatively movable inlet and exhaust valves operated by a single actuator.
- 458 Speed governor operated (366):**
This subclass is indented under subclass 418. Apparatus in which the valve means is actuated by a means which is driven from a rotating shaft and the actuation of the valve means varies in accordance with the speed at which the rotating shaft is driven.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
366, for expansible chamber motors having working member position feedback to the motive fluid control valve means in which the input control signal is derived from a speed governor. NOTE "PLACEMENT OF PATENTS" IN OF THE CLASS DEFINITION AND THE PARAGRAPH FOLLOWING THE TITLE IN THE SCHEDULE OF THIS CLASS.
- 435, for expansible chamber motor valve means controlled by the rate of movement of the working member and see the subclasses noted thereunder for other speed controlled valve means.
- 459 Electrically operated (275) (361):**
This subclass is indented under subclass 418. Apparatus in which the valve means includes a movable part which is caused to move by a means operated by an electrical current to effect control of the motive fluid.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 42, for expansible chamber motors with locking means having correlated control of the motive fluid in which the correlated control is accomplished by electrical means.
- 248, for cyclically operable expansible chamber motors with electrically operated means for adjustably controlling the timing of a fluid control event.
- 275, for cyclically operable expansible chamber motors having electrically operated valve means. NOTE "PLACEMENT OF PATENTS" IN THE CLASS DEFINITION AND THE PARAGRAPH FOLLOWING THE TITLE IN THE SCHEDULE OF THIS CLASS.
- 361 through 363, for expansible chamber motors with working member feedback control in which the valve means is actuated electrically. NOTE "PLACEMENT OF PATENTS" IN THE CLASS DEFINITION AND THE PARAGRAPH FOLLOWING THE TITLE IN THE SCHEDULE OF THIS CLASS.

460 Pulsator actuator for valve (280):

This subclass is indented under subclass 418. Apparatus in which the valve means is operated by a substantially constant mass of fluid forming a fluid link between a valve actuating surface and an actuated surface.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 280, for cyclically operable expansible chamber motors having a pulsator actuated distributor. NOTE "PLACEMENT OF PATENTS" IN THE CLASS DEFINITION AND THE PARAGRAPH FOLLOWING THE TITLE IN THE SCHEDULE OF THIS CLASS.

461 Pilot valve (304):

This subclass is indented under subclass 418. Apparatus in which the valve means comprises a main or primary valve which is movable by fluid under pressure to control the flow of

motive fluid to or from the motor and a secondary or pilot valve operable to control the application of pressure fluid to the main valve, or a fluid actuator therefor, so as to control movement of said main valve, said fluid under pressure being separate or separated from the motive fluid controlled by the main or primary valve and not entering the working chamber.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 304 through 314, for cyclically operable expansible chamber motors having a pilot valve controlled distributor. NOTE "PLACEMENT OF PATENTS" IN THE CLASS DEFINITION AND THE PARAGRAPH FOLLOWING THE TITLE IN THE SCHEDULE OF THIS CLASS.

462 For double-acting motor:

This subclass is indented under subclass 418. Apparatus in which the motor has a working member positioned to move in opposite directions in opposed working chambers by alternate supply of motive fluid to one side of the piston and the alternate exhaust from the other.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 166, for double acting expansible chamber motors with valve means to reverse the direction of movement in response to variations in the motive fluid supply line pressure or flow.
- 420, for double acting expansible chamber motors with an exhaust valve for the contracting chamber which is controlled by the motive fluid pressure applied to the expanding chamber.
- 421, for double acting expansible chamber motors with valve means controlling the expanding chamber inlet in response to the contracting chamber motive fluid pressure or flow.
- 437 through 439, for double acting expansible chamber motors with an independently controlled by-pass between opposed working chambers.
- 455, for double acting expansible chamber motors having relatively movable inlet and exhaust valves for one chamber in which one of the valves also

forms a unitary valve part for the opposed chamber.

through the common pressure inlet line to the motor.

463 With means to provide unequal flow rates to or from opposed working chambers:

This subclass is indented under subclass 462. Apparatus in which the flow capacity of the motive fluid flow line to one working chamber is different from the flow capacity of the motive fluid flow line to an opposed working chamber, or the flow capacity of the motive fluid flow line from one working chamber is different from the flow capacity of the motive fluid flow line from an opposed working chambers.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

274, for cyclically operable double acting expansible chamber motors having a throttle adjustment for one side of the motor.

443, for expansible chamber motors with valve means for providing unequal inlet and exhaust flow rates to a single working chamber.

464 Means to simultaneously open working chambers to inlet or exhaust:

This subclass is indented under subclass 462. Apparatus in which valve means are provided for concurrently opening the opposed working chambers of the double acting motor to either inlet or exhaust.

(1) Note. Mere independently operated valves for opposed working chambers without some operating means to assure that the opposed chambers are simultaneously opened when desired are not included under this definition.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

3, for double acting expansible chamber motors with receiving orifices for the opposed working chamber to receive all or a portion of a jet stream to cause movement of the working member.

439, for double acting expansible chamber motors with an independently controlled by-pass between opposed working chambers which by-passes

465 Relatively movable unitary inlet and exhaust valves for opposed working chambers:

This subclass is indented under subclass 462. Apparatus in which the valve means comprises two unitary inlet and exhaust valves, each controlling the flow of motive fluid to and from its respective opposed working chamber, the control of motive fluid for each working chamber being effected by the relative movement of the unitary movable elements of the valves.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

323, for cyclically operable expansible chamber motors having relatively movable unitary inlet and exhaust valves for opposed working chambers.

466 Unitary inlet and exhaust valve means for opposed working chambers:

This subclass is indented under subclass 462. Apparatus in which the inlet and exhaust for the opposed chambers is controlled by a single unitary movable valve means having no relatively movable parts for the valving function.

(1) Note. Two spaced unitary inlet and exhaust valves in which the unitary movable elements are connected together by a rigid means to make them move as a unit are included under this definition.

467 Valve means moves about an axis:

This subclass is indented under subclass 466. Apparatus in which the valve means oscillates or rotates about a fixed axis to perform the valving function.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

315, 327, 345, 349, and 352, for cyclically operable expansible chamber motors having a distributor which moves about an axis.

468 Self-acting valve (432) (446) (451) (452):

This subclass is indented under subclass 418. Apparatus in which the valve means comprises a valve in a line which operates in response to

motive fluid pressure, rate of flow, or direction of flow in the line.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 155, for expansible chamber motors of the multiple expansion type with fluid actuated valve means.
- 166, for double acting expansible chamber motors having valve means to reverse the direction of movement in response to variations in the motive fluid inlet line pressure or flow.
- 281 through 320, for cyclically operable expansible chamber motors having motive fluid pressure or flow responsive valve means.
- 420, for expansible chamber motors in which a contacting chamber exhaust valve is controlled by expanding chamber pressure or flow.
- 421, for expansible chamber motors in which an expanding chamber inlet valve is controlled by contacting chamber pressure or flow.
- 432, for expansible chamber motors having a check valve in the inlet the check valve having means providing a disconnectable motive fluid supply line.
- 433 through 434, for expansible chamber motors with valve means controlling both the inlet and exhaust to a single chamber in response to the motive fluid pressure in the supply line or chamber.
- 438 through 439, for expansible chamber motors having a by-pass between opposed working chambers held closed by motive fluid pressure.
- 441, for expansible chamber motors having valve means which opens to ambient when the pressure in the expanding chamber falls below the pressure of the ambient fluid source.
- 442, for expansive chamber motors with a self opening exhaust valve held closed by inlet pressure.
- 446 through 447, for expansible chamber motors with relatively movable serial valves one of which is a motive fluid pressure or flow responsive valve. NOTE "PLACEMENT OF PATENTS" IN THE CLASS DEFINITION AND THE PARAGRAPH

FOLLOWING THE TITLE IN THE SCHEDULE OF THIS CLASS.

- 452, for expansible chamber motors with plural separately controlled waste passages for a single chamber in which one of the passages is controlled by a motive fluid pressure or flow responsive valve and subclass 451 for similar motors in which another of the passages is controlled by an inlet and exhaust valve.

469 Unitary inlet and exhaust valve for single working chamber:

This subclass is indented under subclass 418. Apparatus in which the valve means comprises a unitary inlet and exhaust valve for controlling the motive fluid flow for a single working chamber having no relatively movable parts for the valving function.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 323, for cyclically operable expansible chamber motors having relatively movable unitary inlet and exhaust valves for opposed working chambers.
- 465, for double acting expansible chamber motors having relatively movable unitary inlet and exhaust valves for controlling the opposed chambers thereof.

470 Valve moves about an axis:

This subclass is indented under subclass 469. Apparatus in which the inlet and exhaust valve oscillates or rotates about a fixed axis to perform the valving function.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 467, for double acting expansible chamber motors having unitary inlet and exhaust valve means movable about an axis and see the subclasses there noted for cyclically operable motors with distributors which move about an axis.

471 MISCELLANEOUS (E.G., METHODS, ETC.):

This subclass is indented under the class definition. Subject matter not otherwise provided for.

- (1) Note. For example, in this subclass are classified patents containing method claims under the class definition. If a patent contains only method claims, it is classified in this subclass as an original. If it contains apparatus claims as well as method claims, the original is classified in the appropriate apparatus subclass of this class and cross-referenced to this subclass.

472 THREE OR MORE CYLINDERS ARRANGED IN PARALLEL RADIAL OR CONICAL RELATIONSHIP WITH ROTARY TRANSMISSION AXIS:

This subclass is indented under the class definition. Apparatus comprising three or more cylinders each cylinder being provided with a relatively reciprocating piston (includes diaphragm) to thereby form a plurality of working chambers, the cylinders or a transmission element in common operative engagement with said cylinders or pistons being adapted to rotate about a fixed axis; said cylinders being physically arranged in a manner such that their longitudinal axes either (1) intersect at a common point or (2) extend parallel to said axis of rotation.

- (1) Note. See note in Class 417, Pumps, subclass 269 for a statement of the line between this class and Class 417 regarding plural cylinder devices of the above stated type.
- (2) Note. Since all devices having three or more cylinders arranged in the above defined relationship are intended to be included under this definition regardless of whether the disclosure or claims are directed to a pump or a motor, provided the device is in fact capable of operation as a motor, such terminology as “motive fluid”, “working member” and “working chamber”, as used in this definition or those indented hereunder, should be construed as equally applicable to pumping

apparatus and synonymous with the terms, “pumped fluid”, “pumping member” and “pumping chamber”, respectively.

- (3) Note. The recital in the claims of a plurality of cylinders is sufficient to cause classification under this definition if the claimed device has a disclosure of three or more cylinders arranged in the above defined relationship. However, the specific designation in the claims of only one or a pair of three or more disclosed cylinders precludes classification under this definition and would be classified elsewhere in the class, e.g., subclass 243, etc., if of the moving cylinder type.
- (4) Note. To fall within the scope of this definition the motor must be of the type which includes at least three cylinders and none of said three may be formed integral with the relatively reciprocating piston of another.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 6.5, for motors having three or more cylinders arranged in parallel, radial, or conical relationship with a rotary transmission axis and in which motive fluid is supplied to at least one of said cylinders through diverse flow paths.

SEE OR SEARCH CLASS:

- 74, Machine Element or Mechanism, appropriate subclasses, for mechanical motion converting devices having no motive fluid valving or porting claimed and see especially subclass 22 for apparatus for converting rotary motion to reciprocating and rotary motion and subclass 55 for apparatus employing a cam and slide for converting rotary motion to or from reciprocating or oscillating motion.
- 92, Expansible Chamber Devices, appropriate subclasses, for expansible chamber devices having plural parallel, radial, or conically arranged cylinders in which there is no valving of motive fluid claimed. The mere recital of a ported element or housing which cooperates with or surrounds the cyl-

inders is sufficient to exclude classification in Class 92 if, by disclosure, the element or housing cooperates with the cylinders to perform a valving function. See especially the following subclasses: 12.1-13.8, for displacement control of plural cylinders arranged in parallel, radial, or conical relationship with a rotary transmission axis; 56-58, for plural rotating cylinders; 68-74, for relatively movable working members interconnected with a common rotatable shaft; and 146-152, for plural unitarily mounted cylinders.

417, Pumps, subclasses 269 through 273, for pumps having three or more cylinders arranged in parallel, radial, or conical relationship with a rotary transmission axis.

473 Condition responsive control of drive transmission:

This subclass is indented under subclass 472. Apparatus in which there is provided (1) drive means for converting the relative reciprocatory motion between said plural cylinders and pistons into rotary motion of a driven member, (2) control means for controlling the drive means in some manner and (3) a separate sensing means which is responsive to the occurrence of a condition of either the motor or motive fluid to effect operation of the control means for altering the operation of the drive means.

SEE OR SEARCH CLASS:

417, Pumps, subclasses 218 through 222.2 for pumps having a drive transmission including an adjustable cam or linkage which is controlled responsive to a condition.

474 Separate fluid supply or discharge paths:

This subclass is indented under subclass 472. Apparatus in which at least one of said plural working chambers either (1) discharges motive fluid to an external destination separate from that to which another of said expansible chambers discharges fluid or (2) receives motive fluid from an external source separate from that from which another of said expansible chambers receives fluid.

475 Having yieldable drive transmission:

This subclass is indented under subclass 472. Apparatus in which there is provided a reaction member in common operative engagement with said plural piston or cylinders for converting the relative reciprocatory motion between the pistons and cylinders to or from continuous rotary motion of a drive element, there being provided resilient means for biasing said reaction member to a position causing said motion conversion, said reaction member being directly responsive to fluid pressure within the plural expansible chambers for movement in opposition to the resilient bias thereon for varying the extent of relative reciprocation between said piston and cylinders.

SEE OR SEARCH THIS CLASS, SUBCLASS:

473, for control of the drive means by means which includes a separate sensing means, i.e., not directly responsive to pressure in the working chamber, which responds to a condition, e.g., input or output pressure, etc., of the device.

476 Separate motive fluid control for each working chamber:

This subclass is indented under subclass 472. Apparatus in which there is provided individual valve means for each for said working chambers to cyclically control the flow of motive fluid to or from the chamber, each of said valve means being movable relative to another and each controlling the motive fluid for a single chamber without effecting motive fluid control for any other chamber.

(1) Note. The valve means may comprise a separate valve movable with respect to both the piston and cylinder, i.e., distributor, or may comprise, for example, a part in the cylinder wall controlled by the piston, e.g., "valveless" or "semi-valveless", etc.

477 Each piston acts as valve for different working chamber:

This subclass is indented under subclass 476. Apparatus in which the cylinders contain pistons which reciprocate relative thereto to form the working chambers, each piston acting as a

- valve to control the flow of motive fluid to or from a working chamber other than the working chamber of which that piston forms a part.
- (1) Note. The piston may act as a pilot to control actuating fluid for a valve of another chamber.
- 478 Means varies cyclic relation between reciprocating member and control valve therefor:**
This subclass is indented under subclass 476. Apparatus in which there is provided means for enabling the selective adjustment of the time of occurrence of admission or discharge of motive fluid to or from at least one of said plural working chambers relative to the reciprocatory movement cycle of the relatively reciprocating piston and cylinder forming said chamber.
- 479 Control by moving cylinder or liner:**
This subclass is indented under subclass 476. Apparatus in which, incident to the operation of the device, the cylinders also have absolute individual movement, e.g., rocking, etc., the individual movement of the cylinders controlling porting to control the flow of motive fluid to or from the working chambers.
- (1) Note. Under this definition the term cylinder includes merely a liner which has individual motion to control the motive fluid without movement of the cylinder head.
- 480 Mechanically actuated valves:**
This subclass is indented under subclass 476. Apparatus in which the individual valve means comprises a valve movable with respect to both the cylinder and relatively reciprocating piston therein, said valve being cyclically shifted by mechanical means incident to the operation of the device.
- 481 Radial cylinders:**
This subclass is indented under subclass 480. Apparatus in which the longitudinal axes of said plural cylinders intersect at a common point from which they radiate and are contained within a common plane perpendicular to said axis of rotation.
- 482 Means varies cyclic relation between reciprocating member and control valve therefor:**
This subclass is indented under subclass 472. Apparatus having valve means for controlling the admission or discharge of motive fluid to or from said plural working chambers, there being provided means for enabling the selective adjustment of the time of occurrence of admission or discharge of fluid to or from at least one of said plural working chambers relative to the reciprocating movement cycle of the relatively reciprocating piston and cylinder forming said chamber.
- (1) Note. The mere varying of the length of stroke or displacement of the device in the absence of a disclosure of valve timing control is excluded under this definition.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
6.5, for three or more radial or parallel cylinders having means for supplying motive fluid thereto vial diverse flow paths.
478, for means for adjusting the time of occurrence of admission and discharge of motive fluid in devices having a separate valve for each expansible chamber.
- 483 By adjustment of transmission or reaction element:**
This subclass is indented under subclass 482. Apparatus having a transmission or reaction element, e.g., swash-plate, crankshaft, etc., which is mechanically connected (includes abutment-type connection) to the cylinders or relatively reciprocating pistons and which is adapted to be selectively moved and held in different positions for the purpose of changing the time of occurrence of admission or discharge of fluid to or from at least one of said working chambers.
- 484 Control valve seating surface contact maintained by fluid pressure bias:**
This subclass is indented under subclass 472. Apparatus in which there is provided a valve having a pair of relatively slidable abutting face portions, relative sliding movement of said face portions serving to control admission

- or discharge of fluid to or from said working chambers, and valve face portions being biased into relative seating engagement by fluid actuated means which is either (1) located externally of said plural working chambers or (2) if located within a working chamber being mounted for movement relative to both the piston and cylinder forming said working chamber.
- 485 Disc valve:**
This subclass is indented under subclass 484. Apparatus in which said pair of relatively slidable valve face portions are substantially flat and abut in a common plane, one of said face portions being mounted for movement relative to the other.
- 486 Motive fluid bypass to or from assembly:**
This subclass is indented under subclass 472. Apparatus including means to conduct a portion of the motive fluid to or from a part of the motor assembly to assist said part in performing its intended function, e.g., lubricating, sealing, thrust balancing, etc.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
484, for means for exerting a fluid pressure bias on the motor distributing valve, in many cases the fluid pressure so utilized being motive fluid.
- 487 Separate passage directs motive fluid to or from valve interface:**
This subclass is indented under subclass 486. Apparatus in which there is provided valve means comprising plural relatively movable elements having interengaging face portions for controlling admission or discharge of motive fluid to or from said plural working chambers, at least one of said valve elements being provided with passage means for conducting motive fluid to or from the interface formed by said interengaging face portions, said passage means at no time serving to effect control of admission or discharge of motive fluid to or from said working chambers.
- 488 Fluid conducting passage disposed within piston:**
This subclass is indented under subclass 486. Apparatus in which motive fluid is conducted to or from the motor assembly by means of a fluid conducting passage which is physically located within one of said plural pistons.
- 489 Valved:**
This subclass is indented under subclass 486. Apparatus in which there is provided valve means in addition to that controlling motive fluid admission or discharge to or from said plural working chambers for controlling the flow of motive fluid to or from said motor assembly.
- 490 Motive fluid supply or discharge through piston:**
This subclass is indented under subclass 472. Apparatus in which there is provided passage means formed within at least one of said plural pistons and extending therethrough for the purpose of providing communication between the expansible chamber associated with said piston and a source of motive fluid supply or discharge.
- 491 Radially disposed cylinders:**
This subclass is indented under subclass 472. Apparatus in which the longitudinal axes of said plural cylinders intersect at a common point from which they radiate and are contained within a common plane perpendicular to said axis of rotation.
- (1) Note. In some instances, the longitudinal axes of the cylinders move relative to the axis of rotation and devices of this type are intended to be included hereunder if the individual cylinder axes pass through the common point in at least one position of their movement.
- SEE OR SEARCH CLASS:
73, Measuring and Testing, subclass 247, for meters having two or more radially arranged cylinders.
74, Machine Element or Mechanism, appropriate subclasses, for mechanical motion fluid valving or porting claimed and see especially subclass 22 for apparatus for converting rotary motion to reciprocating and rotary motion, subclass 51, for apparatus employing a crank and multiple pitmans for converting rotary motion to or from reciprocating or oscillating motion and subclass 55, for apparatus

- employing a cam slide for converting rotary motion to or from reciprocating or oscillating motion.
- 92, Expansible Chamber Devices, appropriate subclasses, for expansible chamber devices having plural radial cylinders in which there is no valving of motive fluid claimed and see especially subclass 58, for plural rotating cylinders in which the axes at a common point, subclasses 72-74, for relatively movable working members interconnected with a common rotatable shaft and in which the shaft axis is intersected by the axis of the working members and subclass 148, for three or more unitarily mounted, radially arranged cylinders.
- 417, Pumps, subclass 273, for pumps having three or more cylinders arranged in radial relationship with a rotary transmission axis.
- 492 Plural banks:**
This subclass is indented under subclass 491. Apparatus comprising more than one group of plural radiating cylinders and in which either (1) the longitudinal cylinder axes of one group of plural cylinders are contained longitudinal axes of another group or (2) the rotation axis of one group is spaced from the rotation axis of another.
- 493 Rigidly connected pistons reciprocate within rigidly connected cylinders:**
This subclass is indented under subclass 491. Apparatus having plural rigidly interconnected cylinders, the piston associated with one of said rigid cylinders being interconnected for unitary movement with the piston associated with another of said rigid cylinders.
- 494 Cylinders and pistons form or coact with respective common elements having limited relative rotary movement:**
This subclass is indented under subclass 491. Apparatus in which said plural cylinders form or are connected to or coact with a first common element and said plural pistons form or are connected to or coact with a second common element in a manner such that relative rotary motion between said first and second common elements is positively constrained to less than 360°.
- (1) Note. To come within the scope of this definition, a plurality of cylinders or pistons must be connected to their respective common members in a manner which would positively prevent full relative rotary motion, e.g., 360° or more, etc., between the common members. Therefore, a simple abutment connection between a plurality of pistons and a common eccentrically mounted ring is excluded under this definition, even though the ring itself may be journaled for rotation and intended to rotate with the pistons due to frictional engagement therewith during the normal mode of operation.
- 495 Cylinders or pistons pinned to common element:**
This subclass is indented under subclass 494. Apparatus in which either the plural cylinders or pistons are connected to their respective common element by means including a pivoted connection, and move about said pivoted connection incident to the limited relative rotation of said elements.
- 496 Positive bidirectional drive or reciprocating members:**
This subclass is indented under subclass 491. Apparatus in which the plural cylinders or pistons coact with drive transmission means, e.g., crank shaft, gear, grooved cam track, etc., for converting relative reciprocatory movement of said cylinders and pistons to or from rotary motion of said cylinders or transmission means, said cylinders or pistons co-acting with said drive transmission means in a manner such that positive mechanical force transmission is provided therebetween during both directions, i.e., to-and-fro, of reciprocatory movement of said cylinders or pistons.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
493, for radially disposed bidirectionally driven reciprocating members in which plural rigidly connected pistons reciprocate in plural rigidly connected cylinders.
494 through 495, for radially disposed bidirectionally driven reciprocating members in which the cylinders or

pistons form or coact with respective common elements having limited relative rotary movement.

497

Stroke control:

This subclass is indented under subclass 491. Apparatus in which there is provided means to selectively vary the length of the reciprocating stroke between said cylinders and their respective relatively reciprocating pistons.

SEE OR SEARCH CLASS:

- 92, Expansible Chamber Devices, subclass 12.1, for displacement control of plural cylinders arranged in radial relationship with a rotary transmission axis in which there is no valving of motive fluid claimed.
- 417, Pumps, subclass 221, for condition responsive adjustments of a radial pump operating cam.

498

Cooperating valve ports in cylinder and relatively movable central member:

This subclass is indented under subclass 491. Apparatus in which there is provided a centrally located substantially cylindrically or conically shaped member having an axis from which the plural longitudinal cylinder axes radiate, said central member being provided with at least one motive fluid conveying passage terminating on the peripheral surface thereof, the central member and said plural cylinders being mounted for relative rotary movement and individual port means in continuous communication with each of said plural cylinders and cyclically communicable with the terminal portion of said motive fluid conveying passage as a result of said relative rotary movement.

499

Cylinders parallel to rotation axis:

This subclass is indented under subclass 472. Apparatus in which the longitudinal axes of said plural cylinders are parallel to and spaced from said axis of rotation.

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, subclass 244, for meters having plural parallel cylinders and a wobble plate or cam associated therewith.

74,

Machine Element or Mechanism, appropriate subclasses, for mechanical motion converting apparatus having no motive fluid valving or porting claimed and see especially subclass 22, for apparatus for converting rotary motion to reciprocating and rotary motion and subclass 55, for apparatus employing a cam and slide for converting rotary motion to or from reciprocating or oscillating motion.

92,

Expansible Chamber Devices, appropriate subclasses, for expansible chamber devices having plural radial cylinders in which there is no valving of motive fluid claimed and see especially subclass 57, for plural rotating cylinders in which the axes of the cylinders are parallel to the axes of rotation, subclass 70, for relatively movable working members forming opposite walls of a common chamber and interconnected with and parallel to a common rotatable shaft, subclass 71, for relatively movable working members interconnected with and parallel to a common rotatable shaft.

417,

Pumps, subclass 269, for pumps having three or more cylinders arranged in parallel relationship with a rotary transmission axis.

500

Plural angularly disposed cylinder banks:

This subclass is indented under subclass 499. Apparatus in which said plural parallel cylinders are angularly disposed relative to a second set of plural cylinders having parallel longitudinal axes.

501

Cylinders contain plural oppositely movable pistons:

This subclass is indented under subclass 499. Apparatus in which each of said plural cylinders define a single working chamber containing plural piston forming opposite walls thereof, said pistons being movable toward and away from each other during contraction and expansion of the working chamber.

SEE OR SEARCH CLASS:

- 92, Expansible Chamber Devices, subclass 70, for expansible chamber devices having relatively movable working members forming opposite

walls of a common chamber and interconnected with and parallel to a common rotatable shaft.

502 Including plural axially spaced working chambers (e.g., double-acting working members, etc.):

This subclass is indented under subclass 499. Apparatus in which at least one of said plural parallel cylinders is either (1) axially longitudinally spaced relative to another or (2) provided with a piston which divides same into a pair of spaced opposed expansible working chambers.

503 Rotary spool valve:

This subclass is indented under subclass 499. Apparatus in which there is provided a valve comprising a pair of cylindrical parts one rotating with respect to and operating within the other, the axis of rotation of the valve part coinciding with said fixed axis, the relative rotary movement between the valve parts serving to cyclically control admission or discharge of motive fluid to or from the plural expansible chambers.

504 Stroke control:

This subclass is indented under subclass 499. Apparatus in which there is provided means to selectively vary the length of the reciprocating stroke between said cylinders and their respective relatively reciprocating pistons.

SEE OR SEARCH CLASS:

92, Expansible Chamber Devices, subclass 12.2 for displacement control of plural cylinders arranged in parallel relationship with a rotary transmission axis in which there is no valving of motive fluid claimed.

417, Pumps, subclasses 222.1 through 222.2, for condition responsive adjustment of an axial pump operating cam.

505 By varying reaction plate inclination relative to cylinder axes:

This subclass is indented under subclass 504. Apparatus in which the plural cylinders or pistons coact with a common drive transmission element, e.g., swashplate, etc., for converting relative reciprocatory movement of said cylinders and pistons to or from rotary motion of said cylinders or said transmission element,

said transmission element, being selectively angularly adjustable relative to said parallel cylinder axes for varying the reciprocatory stroke length between said cylinders and pistons.

SEE OR SEARCH CLASS:

417, Pumps, subclasses 222.1 through 222.2, for condition responsive adjustment of an axial pump operating cam wherein a cam may be tilted relative to the drive shaft axis.

506 Motor operated:

This subclass is indented under subclass 505. Apparatus in which the transmission element is angularly adjusted by means of a motor.

SEE OR SEARCH CLASS:

417, Pumps, subclasses 222.1 through 222.2, for condition responsive motor operated adjustment of an axial pump operating cam wherein a cam may be tilted relative to the drive shaft axis.

507 Positive bidirectional drive of reciprocating members:

This subclass is indented under subclass 499. Apparatus in which the plural cylinders or pistons coact with drive transmission means, e.g., swashplate, interconnecting linkage, etc., for converting relative reciprocatory movement of said cylinders and pistons to or from rotary motion of said cylinders or transmission means, said cylinders or pistons co-acting with said drive transmission means in a manner such that positive mechanical force transmission is provided therebetween during both directions, i.e., to-and-fro, of reciprocatory movement of said cylinders or pistons.

SEE OR SEARCH THIS CLASS, SUBCLASS:

502, for plural, parallel, double acting working members which of necessity require positive bidirectional force transmission.

508 PLURAL RELATIVELY MOVABLE OR RIGIDLY INTERCONNECTED WORKING MEMBERS:

This subclass is indented under the class definition. Apparatus having plural working members which are either (a) relatively movable, or

(b) connected to move together as a unit under all conditions of operation and which have different faces forming moving walls of different working chambers which regardless of the positions of the different faces are not in fluid communication during at least some part of the operation of said apparatus, said faces being urged in the same direction either simultaneously or sequentially by working fluid in said chambers.

(1) Note. Under this definition, a means to actuate a valve may be part of the motive fluid control means for the plural working members, but a means to merely prevent or permit actuation of the valve by some other agency has not been considered motive fluid control.

(2) Note. Under this definition, plural expansible chamber type motors disclosed as being of the rotary type are specifically excluded unless otherwise not meeting the valving requirements of Class 418 (see (5) Note on page 91 - 4 of class definitions for relationship to Class 418).

(3) Note. Under this definition, patents disclosing a working member having different single-acting working faces forming moving walls of different working chambers for the sole purpose of causing reciprocation of the working member in opposite directions are not considered to be drawn to plural working members.

SEE OR SEARCH THIS CLASS, SUBCLASS:

6 through 33, for an expansible chamber motor having different faces forming moving walls of different working chambers which are not in fluid communication during at least some part of the operation of said apparatus, communication between the working chambers being responsive to the position of the different faces.

170 through 195, for expansible chamber motors having a plurality of relatively movable working members in which one is controlled by, movably interconnected with, or moved by another.

206 through 209, for expansible chamber motors wherein the cylinder forms a working member and has two separate integral fluid actuated surfaces, one being formed exteriorly of the other.

SEE OR SEARCH CLASS:

92, Expansible Chamber Devices, subclasses 61 through 76 for expansible chamber devices having relatively movable working members; and subclasses 146-152 for plural unitarily mounted cylinders or a frame therefor.

509 Having (1) stand-by or (2) redundant means enabling load to be driven upon failure of primarily load moving means:

This subclass is indented under subclass 508. Apparatus including a (1) stand-by means becoming operative, or (2) one member of a redundant means remaining operative upon the inability of at least one working member to drive the load, (1) the stand-by means enabling the one working member to once again drive its load, or (2) the stand-by means comprising an auxiliary working member for taking over the function of the one working member.

(1) Note. A working member may become unable to drive the load as the result of a malfunction of its control valve or other associated parts or adjuncts which are necessary to the operation of the said working member.

SEE OR SEARCH THIS CLASS, SUBCLASS:

517, for means controlling the operation of one motor, in response to the pressure in another motor.

519, for apparatus including a controllable first working member and a second working member connected to move with the first working member, and manual means or working member position responsive means for controlling motive fluid to the second working member so that it will aid in the movement of the load of the first working member in the same direction of movement thereof.

SEE OR SEARCH CLASS:

60, Power Plants, subclasses 420 through 427 for a system having distinct or separately operable outputs and condition responsive means controlling the systems such as selecting from plural pressure sources. See in the definition of Class 60, subclass 325 under "Motive Fluid Source" for a definition of a motive fluid source in terms of Class 60.

510 Stand-by means utilizes an auxiliary motive fluid source for another working member to same load:

This subclass is indented under subclass 509. Apparatus wherein the stand-by means comprises means to activate or utilize an auxiliary source of motive fluid for causing a working member, other than the disabled one, to drive the load which was previously driven by the disabled working member, i.e., redundant system.

- (1) Note. See Section II- Lines with Other Classes and within This Class, section B(1) and B(2) in this Class (91) definitions for a statement of what constitutes a properly claimed motive fluid source for classification in this class.
- (2) Note. Included in this subclass are those devices having plural motors driving the same load and each motor having its own source of motive fluid, whereby upon failure of one of the motors, the other motor drives the load using either (a) its source of motive fluid, or (b) its source of motive fluid in addition to that motive fluid previously supplied to the failed motor.

511 Condition responsive means for modifying working member operation:

This subclass is indented under subclass 508. Apparatus having a means for controlling the operation of at least one of the working members in response to a sensed condition external of the motor in which the one working member operates.

- (1) Note. Under this subclass the means could include a condition responsive

valve in the inlet line from the source to the motor or in the exhaust line downstream from the motor, the condition responsive valve being more than a relief valve connected between the source and the reservoir.

- (2) Note. Under this subclass the means could include a means for sensing insufficiency of inlet pressure to at least one working member which means enables compensation for this insufficiency.
- (3) Note. Excluded from this subclass are patents having a standby auxiliary pressure source for a working member, which source is activated upon sensing complete failure of its primary source. See subclasses 509-510 for such devices.
- (4) Note. For the purposes of this and indented subclasses, at least, "motor" is defined as an expansible chamber comprising a space defined by stationary wall member(s) and a movable wall member or the working member which outputs to move a load. Although a motive fluid control valve must be claimed in a patent to be classified herein, as required by the class definition, said valve is not an element in the definition of "motor" for the purpose of this and indented subclasses.
- (5) Note. Means "controlling" or "modifying" as used herein includes means by which a working member is caused to start to move, to stop from moving, or to change speed, force, or direction of motion.

SEE OR SEARCH THIS CLASS, SUBCLASS:

170 through 195, for means controlling one working member in response to the sensed position of another relatively movable working member. However, control of one working member in response to the sensed angular displacements between rotating plural shafts driven by separate working members are placed in this subclass.

- 519, for nonrelatively movable interconnected working members controlled in response to the position thereof.
- 512 Condition is that of a load driven by a working member other than working member having its operation modified:**
This subclass is indented under subclass 511. Apparatus wherein the external condition is the condition of the load driven by one of the working members.
- (1) Note. If a force transmitting means driven by the working member is rigidly attached thereto the means is then considered to be a part of the working member. However, if the force transmitting means is movable relative to the working member, said means is then considered to be part of the load.
- (2) Note. Placed in this subclass are apparatus having plural working members wherein the position of the load of one working member results in the control of the motive fluid for another working member when the working members are not relatively movable.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
170+, for relatively movable working members wherein the motive fluid for one working member is controlled as the result of an attained position of another working member.
- 513 Condition is position of fluid control member of motor other than motor whose operation is modified:**
This subclass is indented under subclass 511. Apparatus wherein the external condition sensed is the position of the motive fluid control member of a motor other than the one having its operation modified.
- 514 Pressure responsive valve divides motive fluid between motors:**
This subclass is indented under subclass 511. Apparatus including a single fluid pressure or flow responsive valve for dividing or controlling the inlet fluid between and controlling a plurality of motors.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
517, for a valve which controls the motive fluid to one motor only and is actuated in response to the motive fluid to or exhaust from another motor.
- 515 For synchronization of motors:**
This subclass is indented under subclass 514. Apparatus wherein the fluid pressure or flow responsive valve comprises (a) means for equalizing fluid pressure or flow to the plurality of motors, or (b) means for synchronizing the operation of the plurality of motors.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
171, for means controlling plural working members for synchronization thereof by sensing the difference in the distance the members have traveled.
532, for noncondition responsive means for insuring equal motive fluid supply to plural motors.
- 516 To give one motor priority to motive fluid over another:**
This subclass is indented under subclass 514. Apparatus wherein the fluid pressure or flow responsive valve comprises means for giving supply priority to one of the motors, such that in the absence of sufficient pressure or flow, supply to the one motor will be take precedence over supply to the other motor.
- 517 Condition sensed is working member speed or working fluid pressure of another motor (i.e., fluid pressure or flow to or from expandible chamber of the other motor):**
This subclass is indented under subclass 511. Apparatus wherein the external condition is the condition of a motor other than the one having its operation modified, e.g., speed, fluid pressure, amount of flow or lack thereof to or from the other motor, etc.
- (1) Note. Specifically excluded from this subclass are patents wherein the condition of the other motor is the position of its working member. Patents to plural relatively movable working member wherein the position of one working member is responsible for the control of

another are found in subclasses 170-195
But see subclass 519 for nonrelatively
movable interconnected working mem-
bers controlled in response to the posi-
tion thereof.

- (2) Note. The condition of a motor may be sensed at any point between the motor and its control valve.

SEE OR SEARCH THIS CLASS, SUB-
CLASS:

509, for standby working member means which is activated when another working member means becomes inoperative.

512, for working members whose operation is modified in response to its load; and for working members whose operation is modified in response to the load of another motor. See also subclass 512 for a statement as to what is considered to be a load.

513, for a motor which is controlled in response to the sensed position of a motive fluid control valve for another motor.

518 Motive fluid control valve responsive to pressure in supply line to or exhaust line from motor which it modifies:

This subclass is indented under subclass 511. Apparatus wherein the means comprises a motive fluid control valve responsive to a change in the sensed condition in the motive fluid inlet line to the motor or in the motive fluid exhaust line from the motor to change the operation of said motor.

519 With means for selectively changing the speed or force exerted on load by the selective application of motive fluid in a single direction to one or more working members:

This subclass is indented under subclass 508. Apparatus having means for selectively changing the load output speed or force by selectively applying motive fluid to different working members interconnected to actuate the load or by selectively applying different working fluid pressures in a single direction to one working member of a plurality of working members driving the load.

SEE OR SEARCH THIS CLASS, SUB-
CLASS:

415 through 417, for a working member having its movement controlled as a function of motive fluid pressure acting on its opposed pressure surfaces.

533, for plural rigidly connected working members controlled by a single motive fluid control valve.

520 Motors connected in series:

This subclass is indented under subclass 508. Apparatus including a conduit means for connecting the contracting chamber of one motor with the expanding chamber of another motor (serial connection).

(1) Note. A mere connection through the reservoir is not considered a conduit means for this subclass.

(2) Note. Both the one motor and the other motor must have a fluid pressure input and a mechanical output, e.g., motor, etc. or a mechanical input and a fluid pressure output, e.g., pump, etc.

SEE OR SEARCH CLASS:

60, Power Plants, subclasses 533 through 594 for an expansible chamber device which has a fluid pressure input and a fluid pressure output, e.g., pulsator, etc., with no mechanical output but which pressurizes the motive fluid for an expansible chamber motor.

521 Separate valve means actuatable by a common nonmanual actuator or separately actuatable means with common manual actuator:

This subclass is indented under subclass 508. Apparatus having (a) separate valve means for plural working members and a single nonmanual means for actuating each of the valve means separately, or (b) separately actuatable valve means for plural working members with a common manual actuator.

(1) Note. The single means which actuates the separate valves may have several different means to move it, e.g., plural handles, plural solenoids, etc. Conversely,

the single element which actuates separate valves may be a single handle or switch which controls individual operations for each valve.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 508, for plural valves with manual means to simultaneously operate them in identical fashion without means to adjust the movement of one valve relative to another.
- 530, for separately controlled valves for each working member.
- 533, for plural rigidly connected working members controlled by a single valve.
- 536, for relatively movable working members controlled by a single motive fluid control valve. A single motive fluid control valve is one having a single movable member, such as a rotatable or slidable valve core or sleeve, which may have a plurality of variously arranged fluid passages which may be caused to be aligned with passages in an associated stationary member to control one or more motor means upon various movements of said movable member.

522 With means to independently actuate valve means:

This subclass is indented under subclass 521. Apparatus wherein, in addition to the single actuating means, included is a means permitting independent operation of the separate valve means.

523 Simultaneously actuated separate valve means:

This subclass is indented under subclass 521. Apparatus wherein the separate valve means may be activated simultaneously.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 536, for device having relatively movable working members controlled by a single valve means.

524 Successive actuation of separate valve means:

This subclass is indented under subclass 521. Apparatus wherein the separate valve means are activated successively.

525 With means to control the working fluid to one working member for movement relative to another without controlling the working fluid to the other working member by said means:

This subclass is indented under subclass 508. Apparatus having means to individually control one working member to cause relative motion between said one working member and another without altering the operation of the other working member.

- (1) Note. Each working member may have its own control valve or there may be valve means controlling more than one working member simultaneously and an additional valve controlling either inlet or exhaust for only one working member.
- (2) Note. The means is more than a mere check valve in the inlet line to one of the motors.
- (3) Note. Plural motors controlled by valves of the single selector type are included here if the valve, when actuated, controls one motor to the exclusion of another motor.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 536, for plural relatively movable working members controlled by a single selector type valve wherein the working members are controlled simultaneously upon actuation of said valve.

526 With multiway valve in series with control means:

This subclass is indented under subclass 525. Apparatus and having a multiway valve disposed in series with the means to individually control one working member whereby the relative motion between working members may be produced.

- 527 Valve controlled by remote means (e.g., radio, electromagnetic, etc.):**
This subclass is indented under subclass 525. Apparatus wherein the control means is controlled by a remotely controlled device.
- (1) Note. "Remote control" as used in this subclass includes means in addition to a pilot valve such as a radio controlled means controlling the fluid for operating the fluid pressure operated valve.
- (2) Note. Other remote control devices include electromagnetic means, light sensitive means, sound or temperature sensitive means, dedicated pump-motor systems (pulsator), etc.
- 528 Control means is fluid pressure operated valve:**
This subclass is indented under subclass 525. Apparatus wherein the means comprises a valve which is actuated by a means responsive to the application of a pressurized fluid.
- 529 Fluid pressure operated valve controlled by a pilot valve:**
This subclass is indented under subclass 528. Apparatus having a pilot valve for controlling the fluid operated valve.
- 530 Control means includes separate control valves for each working member:**
This subclass is indented under subclass 525. Apparatus wherein the means to individually control one working member relative to another comprises a separate control valve for each working member.
- 531 With additional control valve in series with at least one separate control valve in supply line to one of motors:**
This subclass is indented under subclass 530. Apparatus and further including a second valve between the source and one of the motors, the second valve being disposed in serial relationship with respect to at least one of the control valves.
- 532 With means for proportioning motive fluid supply to plural motors:**
This subclass is indented under subclass 508. Apparatus having means, e.g., a flow divider valve, etc., for insuring predetermined proportional motive fluid supply to plural motors.
- (1) Note. The means has to be more than a mere conduit interconnecting the chambers of two motors at all times; however, conduits particularly designed and claimed to proportion the motive fluid among plural motors is included in this subclass.
- (2) Note. A plurality of valves each dedicated to control the motive fluid to a fluid motor is not considered to be means to proportion motive fluid under this definition.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
515, for a condition responsive means for equalizing supply to plural motors.
- 533 Single valve for plural rigidly connected working members:**
This subclass is indented under subclass 508. Apparatus having a single valve controlling motive fluid to plural motors, the motor working members being rigidly connected.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
519, for plural working members which may be rigidly connected and having means to selectively apply motive fluid to one or more of said working members to change the output speed or force acting on the load.
- 534 Single valve for relatively movable working members driving common load:**
This subclass is indented under subclass 508. Apparatus having a single valve controlling motive fluid to plural motors, the motor working members being relatively movable and connected to a common output.

535 Relatively movable working members of unequal cross-sectional areas:

This subclass is indented under subclass 508. Apparatus wherein at least two of the working members are relatively movable and have cross-sectional areas which are unequal.

536 Single valve for relatively movable working members:

This subclass is indented under subclass 508. Apparatus wherein at least two of the working members are relatively movable and have their movements controlled by a common valve arrangement.

END