

CLASS 44, FUEL AND RELATED COMPOSITIONS

SECTION I - CLASS DEFINITION

This class includes most patents for:

A liquid or solid composition designed primarily to react chemically, usually with oxygen in air, to produce heat in controllable amounts, included are most compositions designed to produce both heat and a deoxygenating effect in metallurgical and similar processes, designated to be dispersed in air for explosive combustion in an engine and/or designed to produce illumination light along with heat upon combustion.

A process for making such composition by adding substances, by removing components (using chemical or physico-chemical procedures) by shaping or reshaping or arranging fuel elements or object in a particular relation to each other, except where provided for in another class.

Apparatus specialized for use in an above process and not provided for in a single other class.

An additive which imparts desire aesthetic, handling or burning properties to a fuel, or a composition useful only for scratching a match or removing soot from a combustion-related apparatus.

Certain combinations of fuel with an igniting composition, an incombustible carrier for the fuel, a wrapper of bundling material or an additive as described above.

A solid product of a Class 201 thermolytic distillation process not elsewhere classifiable.

A process for treating coal not elsewhere classifiable.

SECTION II - NOTES TO THE CLASS DEFINITION

- (1) Note. In this class a process for making a fuel product is classified with the product, except where specifically provided for elsewhere.

SECTION III - LINES WITH OTHER CLASSES AND WITHIN THIS CLASS

When the expression "organic compound" is used in this

class, it means a compound which fulfills the requirements of the Class 260 class definition, i.e., the molecule is characterized by two carbons bonded together, one atom of carbon bonded to at least one atom of hydrogen or halogen, or one atom of carbon bonded to at least one atom of nitrogen by a single or double bond. Certain compounds are exceptions to this rule, i.e., HCN, CN-CN, HNCO, HNCS, cyanogen halides, cyanamide, fulminic acid and metal carbides.

The rules for determining Class placement of the Original Reference (OR) for claimed chemical compositions are set forth in the Class Definition of Class 252 in the section LINES WITH OTHER CLASSES AND WITHIN THIS CLASS, subsection COMPOSITION CLASS SUPERIORITY, which includes a hierarchical ORDER OF SUPERIORITY FOR COMPOSITION CLASSES.

SECTION IV - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

- 34, Drying and Gas or Vapor Contact With Solids, appropriate subclasses for a process limited to a drying step for the removal of moisture or other liquid impurity from a solid fuel.
- 48, Gas: Heating and Illumination, appropriate subclasses especially subclasses 197+ for a fuel composition which is a mixture of gases and a process for making such a composition from solid and/or liquid material, e.g., coal, oil, water, etc., especially subclasses 209, 210 and 211 for a process for producing a gas as a desired product from wood, coal and/ or oil, weather or not a liquid and/ or solid fuel is produced as a by-product or an additional desired product.
- 60, Power Plants, subclass 200.1 for a reaction motor which may contain a claimed fuel.
- 75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, appropriate subclasses for a method which produces a free metal from a metal compound, whether or not a fuel composition is also produced.
- 102, Ammunition and Explosives, appropriate subclasses for incendiary bombs and projectiles, and appropriate subclasses for an ammunition or explosive charge or device having a fuse for ignition mass or surface.

- 106, Compositions: Coating or Plastic, appropriate subclasses for a coating or plastic composition not useful primarily as a fuel, including a composition which may be used as a binder for fuel particles for a coating for fuel.
- 110, Furnaces, appropriate subclasses for industrial apparatus for burning a solid fuel, which apparatus does not claim the fuel itself, or a process for burning or igniting solid fuel, including a process wherein fuels are blended or mixed or an additive is applied to a fuel within a solid-fuel burner or apparatus ancillary thereto, such as provided for in that class (110).
- 118, Coating Apparatus, appropriate subclasses for a device useful only for applying a coating material to a substrate, e.g., a solid fuel.
- 126, Stoves and Furnaces, appropriate subclasses for a domestic apparatus and process along the same lines as Class 110, above.
- 131, Tobacco, subclass 329 and 349+ for tobacco-containing products intended to be burned.
- 137, Fluid Handling, appropriate subclasses for a method or apparatus for transporting or allowing the transporting or allowing the transport of, a liquid or gaseous material, e.g., a fuel.
- 144, Woodworking, subclasses 50+ for match making.
- 149, Explosive and Thermic Compositions or Charges, appropriate subclasses for thermite-type compositions, and those which include sufficient oxidizer (such as a chlorate or a nitrate) as a component thereof to provide at least the major portion necessary for its combustion. Solid rocket-propellant fuels are classified in Class 149. Fuels which undergo combustion in air are classified in this class (44). See (2) Note and (3) Note in the class definition of Class 149.
- 162, Paper Making and Fiber Liberation, for a process or apparatus for the purification or recovery of cellulose or other fibrous material for use other than as fuel.
- 196, Mineral Oils: Apparatus, appropriate subclasses for dewaxing, solvent extraction, refining, vaporizing, etc., apparatus.
- 201, Distillation: Processes, Thermolytic, appropriate subclasses for a process of carbonizing coal, oil shale, wood or other solid carbonaceous material not otherwise provided for, wherein a recoverable vapor or gas product is produced, whether or not a usable fuel composition is also produced. The solid product of a Class 201 thermolytic distillation process, not elsewhere classifiable, is classified in this class (44).
- 202, Distillation: Apparatus, appropriate subclasses for apparatus for carbonizing solid carbonaceous material.
- 204, Chemistry: Electrical and Wave Energy, appropriate subclasses for a chemically reactive treatment of a fuel or related composition by direct exposure to electrical or wave energy where such treatment is performed either as a single step process or as the last step of a multi-step process.
- 205, Electrolysis: Processes, Compositions Used Therein, and Methods of Preparing the Compositions, for electrolytic production or treatment of a fuel or related composition where such production or treatment is performed either as a single step process or as the last step of a multi-step process.
- 206, Special Receptacle or Package, subclasses 85+ for a tobacco package with an igniter for the content, subclasses 96+ for a match packet, container assemblage of diverse components (i.e., a kit), one or more components of which may contain a fuel composition.
- 208, Mineral Oils: Processes and Products, subclasses 15+ for a liquid fuel which is entirely mineral oil-derived, and appropriate other subclasses for a process for producing such fuel from a solid or liquid mineral material. Also, a process for producing coke from mainly mineral oil material is classified in class 208.
- 209, Classifying, Separating, and Assorting Solids, appropriate subclasses, for a nonchemical method of removing an impurity from a solid fuel composition, e.g., by magnetism, sleving, flotation, etc.
- 241, Solid Material Comminution or Disintegration, appropriate subclasses for a process or apparatus for comminuting or breaking up solid fuel substances, alone or combined with a procedure for separating solids.
- 252, Compositions, appropriate subclasses for a composition not classifiable elsewhere, especially subclass 70 for composition which may release heat due to a readily-reversible chemical reaction, subclass 373 for a gas composition which may have fuel value but which is intended for use as a chemical reactant and subclasses 502+ for an electrically conductive or emissive composition, e.g., an electrode, etc., containing elemental carbon. See also (1) Note, above.

- 264, Plastic and Nonmetallic Articles Shaping or Treating: Processes, appropriate subclasses for plastic-shaping methods, e.g., subclass 5 for shaping or treating explosive or propellant compositions, etc.
- 314, Electric Lamp and Discharge Devices: Consumable Electrodes, subclass 60 for a consumable electrode.
- 422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, for an apparatus in general in which a chemical reaction takes place.
- 423, Chemistry of Inorganic Compounds, appropriate subclasses for an inorganic compound or element in a relatively pure state or a process for making such a material, especially subclasses 445+ for a method of producing pure elemental carbon, including a shaped form thereof, and subclasses 511+ for the recovery of elemental sulfur, for example, from mineral materials such as coal.
- 424, Drug, Bio-Affecting and Body Treating Compositions, subclasses 40+ for a composition which is burnable to produce an odorizing or deodorizing effect upon the atmosphere to other material, e.g., incense, etc.
- 426, Food or Edible Material: Processes, Compositions, and Products, subclasses 314+ for the application of a gaseous combustion product to a food or beverage.
- 431, Combustion, appropriate subclasses for a residual combustion or combustion-starting method or device, especially subclass 289 for a candle device and subclass 288 for a candle or taper, per se, subclass 6 for a procedure for starting a fire, subclasses 72+ for the automatic control of an igniter and burner feed control, subclasses 258+ for a burner not specialized to the use of solid fuel having an electrical igniter, (and see the search notes to this subclass for a statement of the classification of electrical igniters) and subclass 267 for a residual frictional, chemical or percussive-type igniter, and see the search notes to this subclass for a statement of the classification of other igniters of this type. See the Search Class references in the class definitions of Class 431 to other classes in which such methods or devices may be found. See particularly the reference to class 44 for a statement of the distribution of the art between Classes 44 and 431.
- 502, Catalyst, Solid Sorbent or Support Therefor: Product or Process of Making, subclasses 416+ for a composition containing free carbon

intended for use as an adsorbent or a method for making such composition.

- 585, Chemistry of Hydrocarbon Compounds, subclasses 1+, especially subclass 14, for a fuel composition which is mixture of only hydrocarbons, and appropriate subclasses, especially subclass 302, for methods of making such compositions involving the synthesis of at least one hydrocarbon component.

SECTION V - GLOSSARY

The organic chemical structure terminology used in this class is consistent with that used in the Glossary for the Class 532 - Organic Compounds-Part of the Class 532-570 Series (Published May 22, 1984 in Addendum No. 1 - Order No. 946), except as otherwise noted.

BRIQUET

Defined as a fuel object, of a size suitable to be manipulated by a human hand, made, by consolidating, usually including pressing and shaping, smaller-sizes, loose, broken, comminuted or other divided carbonaceous powder, particles, chunks, lumps, fibers, sheets, etc.

HYDROCARBON

Used in this class, it means an organic compound which consists exclusively of carbon and hydrogen.

SUBCLASSES

250 FLAMELESS OR GLOWLESS:

This subclass is indented under the class definition. Compositions intended, when its elements are brought into contact with each other and/or with a suitable irreversible outside agent, to set up such chemical reaction as to generate heat without light.

- (1) Note. Processes for preparing such compositions by mixing ingredients are included herein.
- (2) Note. Processes for producing heat by merely mixing the ingredients of such composition or by merely exposing the composition to an activating agent are included herein.
- (3) Note. Compositions included herein are often packaged, transported, and handled

in such a way that less than all of the ingredients are in admixture before the start of the exothermic reaction; they are classified herein, however, as if all of the ingredients are contained in a single mixture.

SEE OR SEARCH THIS CLASS, SUBCLASS:

902, for a collection of patents which illustrate the combination of a fuel of this subclass with an article to be heated, e.g., a hair curler, a package of food, a laminating press, etc.

SEE OR SEARCH CLASS:

75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, subclasses 252+ for a mass of loose metal particles.

126, Stoves and Furnaces, subclasses 263.01+ for a fuel composition in a container in which it is used, when the proximate function of the claimed device is merely the production of heat.

132, Toilet, subclass 220 for a hair device having a heat generating composition.

149, Explosive and Thermic Compositions or Charges, for fuels combined with an oxidizer for nonair combustion to produce explosive force, propellant gases, and/or intense or glowing heat, whether or not accompanied by flames or sparks, especially subclasses 37+ and 108.2 for such compositions containing free metal. Where the composition claimed in a patent is similar to those of Class 149 but the disclosure leaves doubt as to whether classification in this class (44) or Class 149 is proper, the doubt is resolved as follows: (1) Where a significant amount of water is required for the exothermic reaction to take place, the patent is classified here (class 44, subclasses 250+). (2) Where the exothermic reaction takes place while in contact with a living thing, it is classified here. (3) Where neither of these conditions is disclosed, classification is in Class 149.

156, Adhesive Bonding and Miscellaneous Chemical Manufacture, subclasses 583.1+ for a device containing a fuel, for pressing against a tube or hose to adhere a patch thereto by, for example, vulcanization.

228, Metal Fusion Bonding, subclass 198 for a process of that class in which a filler metal is supplied by an in situ chemical reaction. Such reaction is usually an exothermic, thermic-type reaction.

252, Compositions, subclass 70 for, among others, a composition which gives off heat in a readily reversible chemical reaction, heat being applied to the composition to reverse the reaction, and subclass 188.1 for a composition comprised of chemically interactive ingredients, which does not produce a significant amount of usable heat in the reaction.

426, Food or Edible Material: Processes, Compositions, and Products, subclasses 113+ for a package of food combined with means to heat the food.

251 Activatable by or containing water:

This subclass is indented under subclass 250. Subject matter in which the composition requires the presence of water (free or combined as water of crystallization) in order to produce its exothermic effect.

SEE OR SEARCH CLASS:

252, Compositions, subclass 157 for gas-generating compositions, which may be exothermic, intended solely for cleaning, for example, drains, and a process for cleaning which merely uses a composition suitable for this subclass.

252 Free metal-containing:

This subclass is indented under subclass 251. Subject matter which contains a metal in elemental form, usually in finely divided condition.

253 With organic or second elemental material:

This subclass is indented under subclass 252. Subject matter containing a second metal in uncombined form (which may be alloyed with

the first elemental metal), a nonmetal in uncombined form, or an organic compound.

- (1) Note. See Glossary in the class definition for the definition of "organic compound".

265 SOLIDIFIED LIQUID (E.G., GEL, ETC.):
This subclass is indented under the class definition. Compositions wherein a normally liquid fuel is supplied in a solidified form.

- (1) Note. The normally liquid fuel is often in the form of a gel.

SEE OR SEARCH THIS CLASS, SUBCLASS:

280+, for dispersions of solid carbonaceous fuels, such as coal, charcoal, peat, etc., in a liquid.

551+, for consolidated solid fuels which employ a binder that may be liquid.

SEE OR SEARCH CLASS:

516, Colloid Systems and Wetting Agents; Subcombinations Thereof; Processes of Making, Stabilizing, Breaking, or Inhibiting, subclasses 98+ for colloid systems of continuous or semicontinuous solid phase with discontinuous liquid phase (gels, pastes, flocs, coagulates) or agents for such systems or making or stabilizing such systems or agents, when generically claimed or when there is no hierarchically superior provision in the USPC for the specifically claimed art.

266 Liquid alkanol base:
This subclass is indented under subclass 265. Compositions wherein an alkanol, or a mixture of alkanols, constitutes at least 50 percent of the normally liquid fuel.

- (1) Note. An alkanol is a compound wherein a single -OH group replaces a hydrogen on an alkane.

SEE OR SEARCH CLASS:

516, Colloid Systems and Wetting Agents; Subcombinations Thereof; Processes of Making, Stabilizing, Breaking, or Inhibiting, subclasses 98+ for colloid systems of continuous or semicontin-

uous solid phase with discontinuous liquid phase (gels, pastes, flocs, coagulates) or agents for such systems or making or stabilizing such systems or agents, when generically claimed or when there is no hierarchically superior provision in the USPC for the specifically claimed art.

267 With carbohydrate (e.g., cellulose compound, cotton, etc.):

This subclass is indented under subclass 266. Compositions wherein a carbohydrate is a component of the solidified liquid fuel composition.

- (1) Note. The carbohydrate is usually, but not always, present as a binder.
- (2) Note. See Class 536, the main class definition, for the meaning of the term carbohydrate.

SEE OR SEARCH CLASS:

516, Colloid Systems and Wetting Agents; Subcombinations Thereof; Processes of Making, Stabilizing, Breaking, or Inhibiting, subclasses 98+ for colloid systems of continuous or semicontinuous solid phase with discontinuous liquid phase (gels, pastes, flocs, coagulates) or agents for such systems or making or stabilizing such systems or agents, when generically claimed or when there is no hierarchically superior provision in the USPC for the specifically claimed art.

268 Liquid hydrocarbon base (e.g., gasoline, etc.):

This subclass is indented under subclass 265. Compositions wherein a hydrocarbon, or a mixture of hydrocarbons, constitutes at least 50 percent of the normally liquid fuel.

- (1) Note. Examples of such normally liquid fuels provided for herein are gasoline, kerosene, and naphtha.
- (2) Note. See (5) Note of the class definition for the definition of the term hydrocarbon.

SEE OR SEARCH CLASS:

516, Colloid Systems and Wetting Agents; Subcombinations Thereof; Processes of Making, Stabilizing, Breaking, or Inhibiting, subclasses 98+ for colloid systems of continuous or semicontinuous solid phase with discontinuous liquid phase (gels, pastes, flocs, coagulates) or agents for such systems or making or stabilizing such systems or agents, when generically claimed or when there is no hierarchically superior provision in the USPC for the specifically claimed art.

269 With plant derivative of unknown composition (except rosin or rosin derivatives) or carbohydrate:

This subclass is indented under subclass 268. Compositions wherein a plant derivative, excluding rosin or a rosin derivative, of unknown composition or a carbohydrate is a component of the solidified liquid fuel composition.

- (1) Note. Each of the components specified is usually, but not always, present as a binder.
- (2) Note. See Class 536, the main class definition, for the meaning of the term carbohydrate.

SEE OR SEARCH THIS CLASS, SUBCLASS:

272, for solidified liquid fuel compositions which contain rosin or a rosin derivative as a component.

SEE OR SEARCH CLASS:

516, Colloid Systems and Wetting Agents; Subcombinations Thereof; Processes of Making, Stabilizing, Breaking, or Inhibiting, subclasses 98+ for colloid systems of continuous or semicontinuous solid phase with discontinuous liquid phase (gels, pastes, flocs, coagulates) or agents for such systems or making or stabilizing such systems or agents, when generically claimed or when there is no hierarchically superior provision in the USPC for the specifically claimed art.

270 With organic nitrogen compound:

This subclass is indented under subclass 268. Compositions wherein an organic nitrogen compound is a component of the solidified liquid fuel composition.

- (1) Note. The organic nitrogen compound is usually, but not always, present as a binder.
- (2) Note. An organic nitrogen compound is one which has nitrogen attached directly or indirectly, by nonionic bonding, to carbon of an organic compound.
- (3) Note. See (4) Note of the class definition for the definition of "organic compound".

SEE OR SEARCH CLASS:

516, Colloid Systems and Wetting Agents; Subcombinations Thereof; Processes of Making, Stabilizing, Breaking, or Inhibiting, subclasses 98+ for colloid systems of continuous or semicontinuous solid phase with discontinuous liquid phase (gels, pastes, flocs, coagulates) or agents for such systems or making or stabilizing such systems or agents, when generically claimed or when there is no hierarchically superior provision in the USPC for the specifically claimed art.

271 With organic polymer polymerized through olefinic or acetylenic bond (e.g., methacrylate polymers, polypropylene, etc.):

This subclass is indented under subclass 268. Compositions wherein an organic polymer compound, which has been formed by the polymerization of an olefinic or acetylenic bond in a monomer, is a component of the solidified liquid fuel composition.

- (1) Note. The organic polymer is usually, but not always, present as a binder.
- (2) Note. See Glossary in the class definition for the definition of "organic compound".

SEE OR SEARCH CLASS:

516, Colloid Systems and Wetting Agents; Subcombinations Thereof; Processes of Making, Stabilizing, Breaking, or Inhibiting, subclasses 98+ for colloid systems of continuous or semicontinuous solid phase with discontinuous liquid phase (gels, pastes, flocs, coagulates) or agents for such systems or making or stabilizing such systems or agents, when generically claimed or when there is no hierarchically superior provision in the USPC for the specifically claimed art.

272 With organic -C(=X)X- compound, wherein the X's are the same or diverse chalcogens (e.g., aluminum carboxylates, rosin salts, etc.):

This subclass is indented under subclass 268. Compositions wherein the solidified liquid fuel composition contains as a component an organic-C(=X)X- compound, wherein the X's are the same or diverse chalcogens (i.e., oxygen, sulfur, selenium, or tellurium).

- (1) Note. The organic -C(=X)X- compound is usually, but not always, present as a binder.
- (2) Note. An organic -C(=X)X- compound is one in which the carbon of the -C(=X)X- group is, or is attached directly or indirectly by nonionic bonding to, the carbon of an organic compound.
- (3) Note. See (4) Note of the class definition for the definition of "organic compound".
- (4) Note. Rosin, the principal substituent of which is abietic acid, is also known as colophony.

SEE OR SEARCH CLASS:

516, Colloid Systems and Wetting Agents; Subcombinations Thereof; Processes of Making, Stabilizing, Breaking, or Inhibiting, subclasses 98+ for colloid systems of continuous or semicontinuous solid phase with discontinuous liquid phase (gels, pastes, flocs, coagulates) or agents for such systems or

making or stabilizing such systems or agents, when generically claimed or when there is no hierarchically superior provision in the USPC for the specifically claimed art.

275 CANDLE COMPOSITION:

This subclass is indented under the class definition. Compositions adapted and designed for use in making candles.

SEE OR SEARCH CLASS:

- 425, Plastic Article or Earthenware Shaping or Treating: Apparatus, subclass 803 for a collection of patents drawn to candle-shaping apparatus.
- 431, Combustion, subclasses 289+ for a device additional to the wick and fuel, forming a part of a candle or taper or peculiarly adapted for use with a candle or taper, and subclass 288 for a candle or taper.

280 SOLID CARBONACEOUS FUEL DISPERSED IN A LIQUID MEDIUM (E.G., DISPERSED COAL, COKE, CARBON POWDER, PEAT, ETC.):

This subclass is indented under the class definition. Compositions wherein a liquid medium acts as dispersant for a solid carbonaceous fuel.

- (1) Note. Asphalt and asphaltenes are considered to be mineral oil substances, even if solid. Class 208, particularly subclasses 15+, provides for fuel compositions which are mixtures having mineral oil components only.
- (2) Note. Examples of compositions provided for herein are aqueous coal slurries to which has been added a surfactant.
- (3) Note. Included in the solid carbonaceous fuels encompassed are coal, charcoal, lignite, wood, coke, peat, carbon black, carbon powder, shale, solid asphalt, solid asphaltene, and solid bitumen.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 311, for fuel compositions which contain pitch, sludge, or tar.

SEE OR SEARCH CLASS:

516, Colloid Systems and Wetting Agents; Subcombinations Thereof; Processes of Making, Stabilizing, Breaking, or Inhibiting, subclasses 31+ for colloid systems of colloid-sized solid or semi-solid phase dispersed in primarily organic continuous liquid phase, subclasses 38+ for colloid systems of colloid-sized bituminous, coal, or Carbon phase dispersed in aqueous continuous liquid phase, subclasses 77+ for colloid systems of colloid-sized solid phase dispersed in aqueous continuous liquid phase; subclass 901 for colloid system of substantially pure element Carbon; or agents for such systems or making or stabilizing such systems or agents; in each instance, when generically claimed or when there is no hierarchically superior provision in the USPC for the specifically claimed art.

281 The liquid medium is, or contains, hydrocarbon:

This subclass is indented under subclass 280. Compositions wherein liquid hydrocarbon constitutes all, or part of, the liquid medium.

- (1) Note. Examples of compositions provided for herein are gasoline-coal-water slurries having additives such as surfactants or stabilizers.
- (2) Note. See (5) Note in the class definition for the definition of hydrocarbon.

SEE OR SEARCH CLASS:

516, Colloid Systems and Wetting Agents; Subcombinations Thereof; Processes of Making, Stabilizing, Breaking, or Inhibiting, subclasses 31+ for colloid systems of colloid-sized solid or semi-solid phase dispersed in primarily organic continuous liquid phase, subclasses 38+ for colloid systems of colloid-sized bituminous, coal, or Carbon phase dispersed in aqueous continuous liquid phase, subclasses 77+ for colloid systems of colloid-sized solid phase dispersed in aqueous continuous liquid phase; subclass 901 for col-

loid system of substantially pure element Carbon; or agents for such systems or making or stabilizing such systems or agents; in each instance, when generically claimed or when there is no hierarchically superior provision in the USPC for the specifically claimed art.

282 Liquid hydrocarbon, or liquid hydrocarbon and water, are the only components:

This subclass is indented under subclass 281. Compositions wherein the composition consists of solid carbonaceous fuel and liquid hydrocarbon or solid carbonaceous fuel, liquid hydrocarbon, and water.

- (1) Note. See (5) Note in the class definition for the definition of hydrocarbon.

SEE OR SEARCH CLASS:

516, Colloid Systems and Wetting Agents; Subcombinations Thereof; Processes of Making, Stabilizing, Breaking, or Inhibiting, subclasses 31+ for colloid systems of colloid-sized solid or semi-solid phase dispersed in primarily organic continuous liquid phase, subclasses 38+ for colloid systems of colloid-sized bituminous, coal, or Carbon phase dispersed in aqueous continuous liquid phase, subclasses 77+ for colloid systems of colloid-sized solid phase dispersed in aqueous continuous liquid phase; subclass 901 for colloid system of substantially pure element Carbon; or agents for such systems or making or stabilizing such systems or agents; in each instance, when generically claimed or when there is no hierarchically superior provision in the USPC for the specifically claimed art.

300 LIQUID FUELS (EXCLUDING FUELS THAT ARE EXCLUSIVELY MIXTURES OF LIQUID HYDROCARBONS):

This subclass is indented under the class definition. Compositions pertaining to liquid fuels containing at least one nonhydrocarbon ingredient or solid hydrocarbon polymer ingredient; the fuel itself may be hydrocarbonaceous, such as gasoline, etc., or it may be a nonhydrocarbon fuel, such as alcohol, ether, etc.

- (1) Note. Since the lighter mineral oil fractions (naphtha, kerosene, gasoline, etc.) are inherently fuels, this subclass and its indents provide for compositions of such fractions admixed with nonhydrocarbon or solid hydrocarbon polymer material and not limited to a use or function provided for elsewhere; examples of such compositions are gasolines mixed with antioxidants, gum inhibitors, etc.
- (2) Note. This subclass and its indents provide not only for compositions of liquid fuels, as supra, but also for compositions of additives intended for incorporation into liquid fuels, the purpose of said additive compositions being to improve the combustion characteristics of the fuel characteristics, per se, of the liquid fuel. Examples of such additive compositions are antiknock compositions, cetane improving compositions, carbureting compositions, smoke reduction compositions, etc.
- (3) Note. Since additives to liquid fuel compositions may serve more than a single function, the primary basis of classification for this subclass and its indents is the chemical structure of the nonhydrocarbon ingredient(s) of the composition.
- (4) Note. This subclass and its indents provide for processes under the class definition not classified elsewhere, for the production and treatment of the liquid fuel compositions encompassed.
- (5) Note. Class 508, Solid Anti-Friction Devices, Materials Therefor, Lubricant or Separant Compositions for Moving Solid Surfaces, and Miscellaneous Mineral Oil Compositions, subclasses 110+ is the generic residuum for heavy mineral oil fractions admixed with nonhydrocarbon or solid hydrocarbon polymer additive. If such a composition is disclosed solely as a fuel or as a fuel containing a lubricant mixed therewith, Class 44 controls; if it is disclosed solely as a lubricant, Class 508 controls. If there is no use or function limitation, such compositions are divided between
- Classes 44 and 508 on the basis of their being light or heavy mineral oil fractions, respectively.
- (6) Note. Examples of liquid fuel compositions provided for in this subclass are: (a) the mixture of a liquid hydrocarbon fuel with diethyl selenide and (b) the mixture of a liquid hydrocarbon fuel with n-butyl lithium.
- SEE OR SEARCH CLASS:
- 208, Mineral Oils: Processes and Products, particularly subclasses 15+, for liquid fuels which are mineral oils or blends of two different mineral oils. The expression "mineral oil" embraces natural petroleum, asphalt, pitches, waxes, and tars which are primarily mixtures of hydrocarbons, as well as distillates of such tars of indeterminate composition. Included also are Fischer-Tropsch crudes, that is, the liquid hydrocarbonaceous mixture resulting from the hydrogenation of a carbon oxide, wood tars, wood tar oils, and wood tar distillates which are similar to coal tar in that they include an unidentified mixture, including hydrocarbons. It embraces "coke" and "resin" only if the "coke" or "resin" results from a Class 208 process performed on a mineral oil or a mineral oil fraction.
- 252, Compositions, subclasses 380+ for stabilizing compositions, per se, even though they may be intended for incorporation into liquid fuels.
- 585, Chemistry of Hydrocarbon Compounds, particularly subclass 14, for liquid fuels which are mixtures of hydrocarbons, at least one of which is a nonmineral oil hydrocarbon.
- 301 Emulsion fuel (e.g., water-gasoline emulsions, etc.):**
This subclass is indented under subclass 300. Compositions which are emulsions.
- (1) Note. To be placed in this subclass, the liquid fuel composition must be described as an "emulsion" or "microemulsion" in either the claims or the specification.

- (2) Note. Classified herein are emulsions of water and hydrocarbonaceous fuels, usually with added surfactants.
- (3) Note. See (5) Note in the class definition for the definition of hydrocarbon.

SEE OR SEARCH CLASS:

516, Colloid Systems and Wetting Agents; Subcombinations Thereof; Processes of Making, Stabilizing, Breaking, or Inhibiting, for colloid systems (e.g., emulsions) or agents for such systems or making or stabilizing such systems or agents, especially subclass 20 for oil-in-oil emulsion, subclasses 21+ for water-in-oil emulsion, subclasses 53+ for oil-in-water emulsion; in each instance, when generically claimed or when there is no hierarchically superior provision in the USPC for the specifically claimed art.

302 Alkanol component:

This subclass is indented under subclass 301. Compositions in which an alkanol, i.e., ROH, wherein R is an alkyl group, is a component of the emulsified fuel.

SEE OR SEARCH CLASS:

516, Colloid Systems and Wetting Agents; Subcombinations Thereof; Processes of Making, Stabilizing, Breaking, or Inhibiting, for colloid systems (e.g., emulsions) or agents for such systems or making or stabilizing such systems or agents, especially subclass 20 for oil-in-oil emulsion, subclasses 21+ for water-in-oil emulsion, subclasses 53+ for oil-in-water emulsion; in each instance, when generically claimed or when there is no hierarchically superior provision in the USPC for the specifically claimed art.

303 Oxo still bottoms containing (i.e., distillation residues from reaction product of carbon monoxide, hydrogen, and olefin):

This subclass is indented under subclass 300. Compositions which contain still bottoms from the oxo reaction.

- (1) Note. The reaction of carbon monoxide, olefin, and hydrogen is referred to as the "oxo" reaction. Desired products are generally removed from this reaction mixture by a distillation process. The residue remaining in the still pot after distillation, a mixture of diverse compounds, is the material encompassed by this subclass.

304 Organic compound of indeterminate structure which is a reaction product of an organic compound with sulfur halide or elemental sulfur containing:

This subclass is indented under subclass 300. Compositions which contain a compound of indeterminate structure which has been prepared by the reaction of an organic compound with sulfur or with a sulfur halide.

- (1) Note. Included within this subclass are both (a) the reaction products, per se, of sulfur or sulfur halide with an organic compound and (b) such reaction products which have been themselves further reacted.
- (2) Note. See Glossary in the class definition for the definition of "organic compound".

305 Phosphosulfurized or phosphooxidized organic compound of indeterminate structure containing (i.e., reaction products of organic compounds with phosphorus sulfides or oxides):

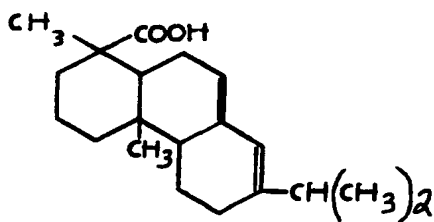
This subclass is indented under subclass 300. Compositions which contain a compound of indeterminate structure which has been prepared by the reaction of an organic compound with phosphorus sulfides or phosphorus oxides.

- (1) Note. Included within this subclass are both (a) the reaction products, per se, of phosphorus sulfide or phosphorus oxide with an organic compound, and (b) such reaction products which have been themselves further reacted.
- (2) Note. See Glossary in the class definition for the definition of "organic compound".

306 Rosin, tall oil, or derivatives thereof containing (except abietic acids or fatty acids derived therefrom):

This subclass is indented under subclass 300. Compositions which contain tall oil, rosin or derivatives thereof, excluding fatty acids, per se, or abietic acids, per se, derived from tall oil or rosin.

- (1) Note. Tall oil is a by-product of the wood pulp industry and is usually recovered from pine wood "black liquor" of the sulfate or kraft paper processes. A typical composition of tall oil includes 50-60 percent fatty acids (e.g., oleic, linoleic, etc.), 34-40 percent rosin acids, and 5-10 percent unsaponifiable matter, such as long chain alcohols and sterols.
- (2) Note. Rosin, also known as colophony, is usually designated according to its source, e.g., gum rosin (from exudate of incisions on living trees); wood rosin (from Southern pine stumps); and tall oil rosin (from by-products of the wood pulp industry). The principal constituents isolated from rosin are carboxylic acids with a hydrophenanthrene nucleus, comprising abietic acid and its isomers, such as pimaric acid. The acids may exist in rosin as acid anhydrides. The mixed acids are known in the trade as rosin acids or resin acids, the two expressions being used interchangeably.
- (3) Note. Abietic acid has the following structure:



307 Plant or animal extract mixtures or extracts of indeterminate structure containing:

This subclass is indented under subclass 300. Compositions which contain extracts from plant or animal matter, which extracts are

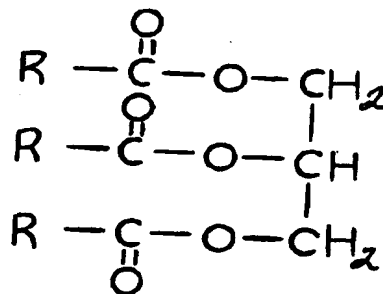
either (a) mixtures or (b) of indeterminate structure.

- (1) Note. Examples of ingredients provided for are extracts of slippery elm, alkanet, Irish moss, and onions.

308 Containing triglycerides (e.g., castor oil, corn oil, olive oil, lard, etc.):

This subclass is indented under subclass 307. Compositions wherein the extract contains triglycerides.

- (1) Note. Examples of ingredients provided for herein are linseed oil and coconut oil extracts.
- (2) Note. Triglycerides are characterized by the structure below, wherein the R's may be the same or different fatty acid radicals:



309 Organic oxidate of indeterminate composition containing (e.g., paraffin wax oxidate or petroleum oxidate, etc.):

This subclass is indented under subclass 300. Compositions which contain a compound of indeterminate structure which has been prepared by oxidation of an organic compound.

- (1) Note. Examples of ingredients provided for herein are naphthenic acid oxidates, petroleum lubricating oil oxidates, triisobutylene oxidate, paraffin oxidates, and triglyceride oxidates.
- (2) Note. The oxidates of this subclass are generally complex mixtures. An indication that the oxidate contains carboxylic acids is not sufficient to remove it from this subclass.

- (3) Note. See Glossary in the class definition for the definition of "organic compound".

310 Chemically reacted organic oxidate (e.g., esterified, etc.):

This subclass is indented under subclass 309. Compositions which contain an oxidate of indeterminate composition which has been made to undergo a further reaction, after being oxidized.

- (1) Note. Examples of ingredients provided for herein are oxidates which are reduced to decrease active oxygen content, and oxidates which have been reacted to esterify the carboxylic acid content thereof.

311 Sludge, pitch, tar, or tar distillate containing:

This subclass is indented under subclass 300. Compositions which contain tar, tar distillate, pitch, or sludge.

- (1) Note. Pitch, tar, and tar distillate are generally considered as mineral oils.

SEE OR SEARCH CLASS:

208, Mineral Oils: Processes and Products, especially subclasses 15+ for liquid fuel compositions which are mixtures of mineral oil materials only.

312 Quinone or anthraquinone containing (e.g., quinhydrone, benzoquinones, etc.):

This subclass is indented under subclass 300. Compositions which contain quinone compounds.

- (1) Note. Quinone compounds have one of the two following structures wherein substitution may be made for ring hydrogens only:



313 Carbohydrate containing:

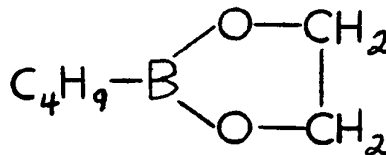
This subclass is indented under subclass 300. Compositions which contain a carbohydrate compound.

- (1) Note. See the Class 536 class definition for the definition of a carbohydrate.

314 Boron containing:

This subclass is indented under subclass 300. Compositions which contain elemental boron or a boron compound.

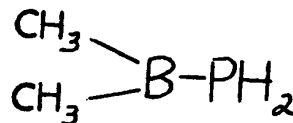
- (1) Note. An example of an ingredient provided for herein is:



315 Phosphorus attached directly or indirectly to the boron:

This subclass is indented under subclass 314. Compositions wherein the compound containing boron also contains phosphorus.

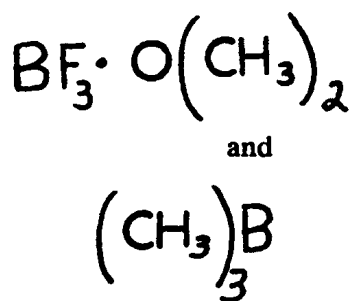
- (1) Note. An example of an ingredient provided for herein is:



316 Three carbons or three fluorines bonded directly to the boron:

This subclass is indented under subclass 314. Compositions wherein the boron is bonded directly to three carbons or to three fluorines.

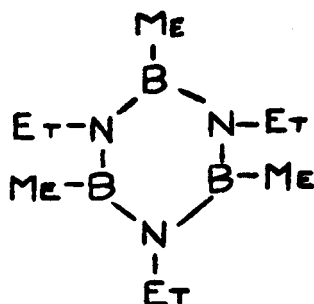
- (1) Note. Examples of ingredients provided for herein are:



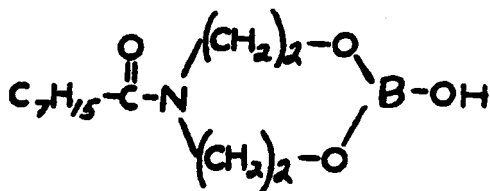
317 Nitrogen attached directly or indirectly to the boron:

This subclass is indented under subclass 314. Compositions wherein the boron is attached directly or indirectly to nitrogen.

- (1) Note. Examples of ingredients provided for herein are:



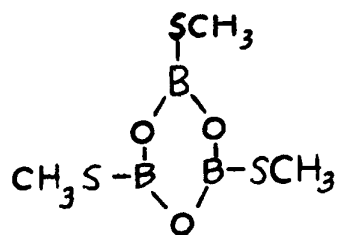
and



318 Three identical or diverse chalcogens bonded directly to the boron:

This subclass is indented under subclass 314. Compositions wherein the boron is bonded directly to three identical or diverse chalcogens (i.e., oxygen, sulfur, selenium, or tellurium).

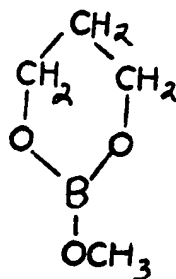
- (1) Note. Examples of ingredients provided for herein are boric acid, and:



319 Carbon, chalcogen, and boron in the same ring:

This subclass is indented under subclass 318. Compositions wherein the boron, carbon, and chalcogen (i.e., oxygen, sulfur, selenium or tellurium) are members of the same ring.

- (1) Note. An example of an ingredient provided for herein is:



320 Silicon containing:

This subclass is indented under subclass 300. Compositions which contain elemental silicon or a silicon compound.

321 Free metal or alloy containing:

This subclass is indented under subclass 300. Compositions which contain an alloy or an elemental metal.

- (1) Note. Coated metals are included within the scope of this subclass.

322 Containing acyclic oxygen single bonded to acyclic oxygen (i.e., peroxy compounds):

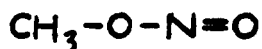
This subclass is indented under subclass 300. Compositions which contain a compound having two acyclic oxygens bonded directly to each other.

- (1) Note. Examples of ingredients provided for herein are: hydrogen peroxide, peroxycarboxylic acid esters, dialkyl peroxides, and alkyl hydroperoxides.

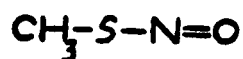
323 Containing -X-N(=X) or -X-N(=X)(=X) bonded directly to carbon, wherein the X's are the same or diverse chalcogens (e.g., thionitrite esters, etc.):

This subclass is indented under subclass 300. Compositions which contain a compound wherein carbon is bonded directly to an -X-N(=X) group or to an -X-N(=X)(=X) group, wherein the X's are the same or diverse chalcogens (i.e., oxygen, sulfur, selenium, or tellurium).

- (1) Note. Examples of ingredients provided for herein are:



and



324 Nitrates or thionitrates (i.e., -X-N(=O) (=O) bonded directly to carbon):

This subclass is indented under subclass 323. Compositions which contain a compound wherein carbon is bonded directly to an -X-N(=O)(=O) group, wherein X is oxygen or sulfur.

- (1) Note. Nitrate esters and thionitrate esters are the principal substances provided for herein.
- (2) Note. The ingredients provided for by this subclass generally exhibit cetane-improving properties in diesel fuels.

325 With organic nonnitrate nitrogen compound:

This subclass is indented under subclass 324. Compositions which contain, in addition to a nitrate or a thionitrate compound, an additional compound which is an organic nitrogen compound that does not contain an -X-N(=O)(=O) group.

- (1) Note. An organic nitrogen compound is one which has nitrogen attached directly or indirectly, by nonionic bonding, to carbon of an organic compound. See Glossary of the class definition for the definition of "organic compound".

326 With organic nonnitrate chalcogen compound:

This subclass is indented under subclass 324. Compositions which contain, in addition to a nitrate or a thionitrate compound, an additional compound which is an organic oxygen compound that does not contain an -X-N(=O)(=O) group.

- (1) Note. An organic oxygen compound is one which has oxygen attached, directly or indirectly, by nonionic bonding to carbon of an organic compound. See Glossary of the class definition for the definition of "organic compound".

327 Organic azide compound, or organic compound having acyclic nitrogen double bonded to acyclic nitrogen (e.g., diazo compounds, etc.):

This subclass is indented under subclass 300. Compositions which contain organic compounds having acyclic nitrogen double bonded to acyclic nitrogen or organic azide compounds.

- (1) Note. The azide group has no single definite structure; it can be represented by different resonance forms, such as:



The azide group is generally depicted as:



- (2) Note. Organic azide compounds have the azide group attached directly or indirectly, by nonionic bonding, to carbon of

an organic compound. See Glossary in the class definition for the definition of "organic compound".

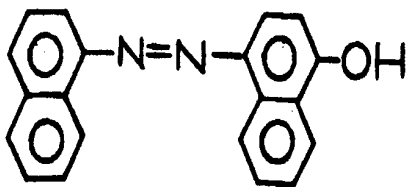
- (3) Note. Similarly, organic compounds having acyclic nitrogen double bonded to acyclic nitrogen must have the nitrogens attached directly or indirectly, by nonionic bonding, to carbon of an organic compound.
- (4) Note. An example of an ingredient provided for herein is:



328 Azo compound (i.e., each of the nitrogens is single bonded to carbon):

This subclass is indented under subclass 327. Compositions which contain an azo compound, i.e., a compound wherein carbon is bonded directly to each of two acyclic nitrogens that are double bonded directly to each other.

- (1) Note. Azo compounds are often used to give a distinctive coloration to fuels.
- (2) Note. An example of an ingredient provided for herein is:



329 Heterocyclic carbon compound containing a hetero ring having chalcogen or nitrogen as the only ring hetero atoms:

This subclass is indented under subclass 300. Compositions which contain a compound having a heterocyclic ring whose ring members are carbon and at least one hetero atom selected from nitrogen and chalcogen (i.e., oxygen, sulfur, selenium, and tellurium).

- (1) Note. Examples of ingredients provided for herein are heterocyclic ring compounds wherein seven or more ring members are present in the hetero ring.

330 Compound of indeterminate structure prepared by reacting a heterocyclic compound of known structure:

This subclass is indented under subclass 329. Compositions which contain a compound of indeterminate structure, resulting from the reaction of a heterocyclic compound of known structure.

331 The heterocyclic compound reactant is a dicarboxylic acid anhydride (e.g., reaction product of succinic anhydride with a polyamine, etc.):

This subclass is indented under subclass 330. Compositions which contain a compound of indeterminate structure resulting from the reaction of a cyclic dicarboxylic acid anhydride.

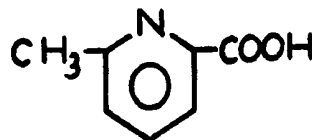
332 The heterocyclic compound reactant is an oxirane (e.g., reaction product of epihalohydrin with amine, epoxide reactions, etc.):

This subclass is indented under subclass 330. Compositions which contain a compound of indeterminate structure resulting from the reaction of a compound containing a three-membered hetero ring whose ring members are two carbons and one oxygen.

333 The hetero ring contains six members including nitrogen and carbon:

This subclass is indented under subclass 329. Compositions which contain a six-membered hetero ring compound with carbon and nitrogen ring members.

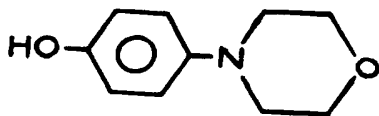
- (1) Note. An example of an ingredient provided for herein is:



334 Chalcogen in the hetero ring:

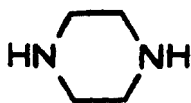
This subclass is indented under subclass 333. Compositions wherein the six-membered hetero ring has chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) as a ring member.

- (1) Note. An example of an ingredient provided for herein is:

**335 Plural nitrogens in the hetero ring (e.g., piperazines, etc.):**

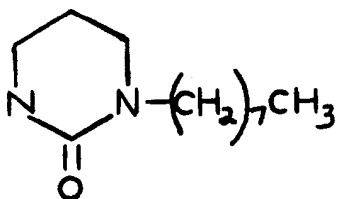
This subclass is indented under subclass 333. Compositions wherein the six-membered hetero ring has plural nitrogen ring members.

- (1) Note. Many of the ingredients provided for herein are piperazine compounds. Piperazine, per se, has the structure:

**336 Triazine or 1,3-diazine:**

This subclass is indented under subclass 333. Compositions wherein the six-membered hetero ring has three nitrogen ring members, or has two nitrogen ring members in the 1- and 3-positions of the ring.

- (1) Note. An example of an ingredient provided for herein is:

**337 Polymer or copolymer of a vinyl pyridine:**

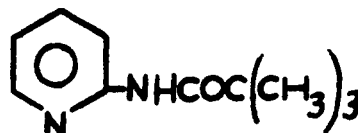
This subclass is indented under subclass 333. Compositions wherein the six-membered hetero ring compound results from polymerization or copolymerization of a vinyl pyridine.

- (1) Note. Polymerization or copolymerization normally occurs through the olefinically unsaturated vinyl group.
- (2) Note. An example of an ingredient provided for herein is a copolymer of vinyl pyridine and t-butyl styrene.

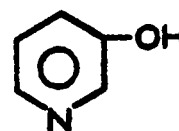
338 Acyclic chalcogen or acyclic nitrogen bonded directly to ring carbon of the hetero ring:

This subclass is indented under subclass 333. Compositions wherein a ring carbon of the six-membered hetero ring is bonded directly to acyclic nitrogen or to acyclic chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).

- (1) Note. Examples of ingredients provided for herein are:

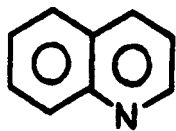


and

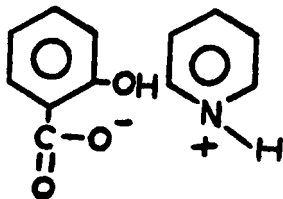
**339 The hetero ring is unsubstituted or hydrocarbyl substituted only, or salts thereof (e.g., pyridyl salicylate salts, isoquinoline, etc.):**

This subclass is indented under subclass 333. Compositions wherein the ring members of the six-membered hetero ring may be unsubstituted or hydrocarbyl-substituted only, or salts thereof.

- (1) Note. Examples of ingredients provided for herein are:



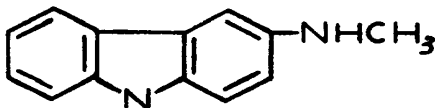
and



- 340 **The hetero ring contains five members including nitrogen and carbon (e.g., pyrrolidones, porphines, etc.):**

This subclass is indented under subclass 329. Compositions which contain a five-membered hetero ring compound with carbon and nitrogen ring members.

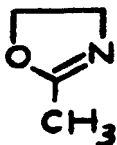
- (1) Note. An example of an ingredient provided for herein is:



- 341 **Chalcogen in the hetero ring:**

This subclass is indented under subclass 340. Compositions wherein the five-membered hetero ring has chalcogen (i.e. oxygen, sulfur, selenium, or tellurium) as a ring member.

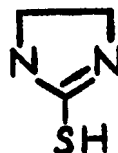
- (1) Note. An example of an ingredient provided for herein is:



- 342 **Plural nitrogens in the hetero ring (e.g., imidazolines, etc.):**

This subclass is indented under subclass 340. Compositions wherein the five-membered hetero ring has plural nitrogen ring members.

- (1) Note. An example of an ingredient provided for herein is:



- 343 **At least three nitrogens in the hetero ring (e.g., triazoles, tetrazoles, etc.):**

This subclass is indented under subclass 342. Compositions wherein the five-membered hetero ring has three or four nitrogen ring members.

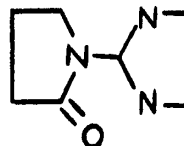
- (1) Note. An example of an ingredient provided for herein is:



- 344 **Having -C(=X)-, wherein X is chalcogen or NH, attached indirectly to the hetero ring by nonionic bonding:**

This subclass is indented under subclass 342. Compositions wherein the five-membered hetero ring is attached indirectly, by nonionic bonding, to carbon of a -C(=X)- group, where X is NH or chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).

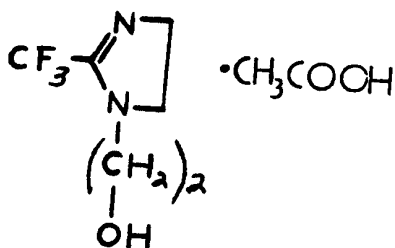
- (1) Note. An example of an ingredient provided for herein is:



345 Carboxylic acid salt of the hetero ring compound, or a free carboxylic acid is present:

This subclass is indented under subclass 342. Compositions wherein the five-membered hetero ring compound is saltified with a carboxylic acid, or exists in mixture with a carboxylic acid.

- (1) Note. An example of an ingredient provided for herein is:

**346 Polymeric or copolymeric compound having plural occurrences of the hetero ring (e.g., alpha-olefin maleimide copolymers, etc.):**

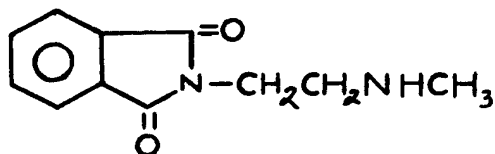
This subclass is indented under subclass 340. Compositions wherein the five-membered hetero ring is present plural times in a polymeric or copolymeric compound.

- (1) Note. An example of an ingredient provided for herein is the copolymer of N-vinyl pyrrolidone with lauryl methacrylate.

347 Acyclic chalcogen bonded directly to each carbon adjacent to the ring nitrogen (e.g., succinimides, etc.):

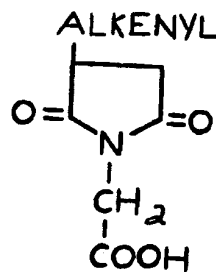
This subclass is indented under subclass 340. Compositions wherein each carbon adjacent to the ring nitrogen of the five-membered hetero ring is bonded directly to acyclic chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).

- (1) Note. An example of an ingredient provided for herein is:

**348 Substituent on the ring nitrogen contains an acyclic -C(=X)- group, wherein X is chalcogen:**

This subclass is indented under subclass 347. Compositions in which acyclic -C(=X)-, wherein X is chalcogen (i.e., oxygen, sulfur, selenium, or tellurium), is present in the ring nitrogen substituent.

- (1) Note. An example of an ingredient provided for herein is:

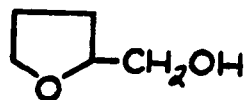
**349 The hetero ring contains six members including carbon and chalcogen (e.g., six-membered sorbitans, ketone peroxides, etc.):**

This subclass is indented under subclass 329. Compositions which contain a six-membered hetero ring compound with carbon and chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) as the only ring members.

350 The hetero ring contains five members including carbon and chalcogen:

This subclass is indented under subclass 329. Compositions which contain a five-membered hetero ring compound with carbon and chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) as the only ring members.

- (1) Note. An example of an ingredient provided for herein is:



351 Acyclic chalcogen bonded directly to ring carbon of the hetero ring (e.g., five-membered lactones, anhydrides, sorbitans, etc.):

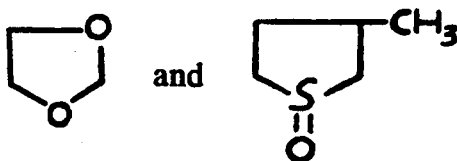
This subclass is indented under subclass 350. Compositions in which ring carbon of the five-membered hetero ring is bonded directly to acyclic chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).

- (1) Note. An example of an ingredient provided for herein is the copolymer of ethylene and maleic anhydride.

352 Ring carbons of the hetero ring are unsubstituted or hydrocarbyl substituted only:

This subclass is indented under subclass 350. Compositions in which the ring carbons of the five-membered hetero ring may be unsubstituted or hydrocarbyl substituted only.

- (1) Note. Examples of an ingredient provided for herein are:



353 The hetero ring contains three or four members:

This subclass is indented under subclass 329. Compositions which contain a hetero ring compound with three or four ring members.

354 Aluminum or heavy metal, other than lead, containing:

This subclass is indented under subclass 300. Compositions which contain an aluminum compound or a heavy metal, other than lead, compound.

- (1) Note. Arsenic is considered a heavy metal.
- (2) Note. Heavy metals are considered to be those having a specific gravity greater than 4.0.
- (3) Note. Lead compounds, except those containing lead and aluminum or an

additional heavy metal, are excluded from this subclass and its indents, and placed in appropriate subclasses below.

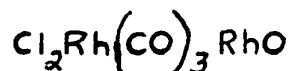
- (4) Note. Examples of ingredients provided for by this subclass are aluminum hydroxide, vanadium trichloride, silver iodide, and ferrous oxide.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 385, for lead acetate.
370+, for lead sulfonates, and other appropriate subclasses, for compounds containing both lead and an additional functional group.
454+, for tetrahydrocarbyl lead compounds.

355 Inorganic metal carbonyl compound (e.g., iron carbonyl, etc.):

This subclass is indented under subclass 354. Compositions wherein carbon of carbon monoxide is bonded directly to metal. Examples of ingredients provided for herein are iron pentacarbonyl and:



356 With organic -C(=O)O- containing compound (e.g., carboxylic acids, esters, etc.):

This subclass is indented under subclass 355. Compositions which contain, in addition to an inorganic metal carbonyl compound, an organic -C(=O)O- containing compound.

- (1) Note. An organic -C(=O)O- containing compound is one in which the carbon of the -C(=O)O- group is, or is attached directly or indirectly by nonionic bonding to, the carbon of an organic compound.
- (2) Note. See Glossary in the class definition for the definition of "organic compound".
- (3) Note. Examples of ingredients provided for herein are oleic acid and isopropyl formate.

357 Inorganic compound of Zr, Cr, Cu, Zn, or Ni:

This subclass is indented under subclass 354. Compositions which contain zirconium, chromium, copper, zinc, or nickel inorganic compounds.

358 Organic compound containing the heavy metal or aluminum:

This subclass is indented under subclass 354. Compositions wherein heavy metal or aluminum is bonded directly or indirectly to carbon of an organic compound.

- (1) Note. See Glossary in the class definition for the definition of "organic compound".
- (2) Note. Examples of ingredients provided for herein are dibutyl mercury and aluminum triethyl etherate.

359 Metal carbonyl compound (e.g., cyclopentadienyl manganese tricarbonyl, etc.):

This subclass is indented under subclass 358. Compositions wherein carbon of carbon monoxide is bonded directly to metal of the organo metal compound.

- (1) Note. An example of an ingredient provided for herein is benzene chromium tricarbonyl.

360 Substituted or unsubstituted cyclopentadienyl manganese tricarbonyl, with an organic compound having -C(=O)O-not bonded to heavy metal or aluminum:

This subclass is indented under subclass 359. Compositions which contain an organic -C(=O)O- compound, that is not a heavy metal or aluminum carboxylic acid salt, and which also contain cyclopentadienyl manganese tricarbonyl which may be substituted.

- (1) Note. See Glossary in the class definition for the definition of "organic compound".

361 Five-membered, unsaturated carbocycle bonded directly to the heavy metal or aluminum (e.g., ferrocene, etc.):

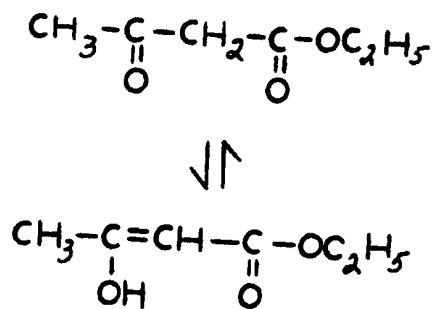
This subclass is indented under subclass 358. Compositions wherein heavy metal or aluminum is bonded directly to a five-membered unsaturated carbocycle.

- (1) Note. An example of an ingredient provided for herein is cyclopentadienyl nickel nitrosyl.

362 Heavy metal or aluminum complex of compounds having two -C(=X)- groups, wherein X is chalcogen, bonded to the same carbon, or enols thereof (e.g., iron acetylacetonate, etc.):

This subclass is indented under subclass 358. Compositions which contain complexes of compounds having two -C(=X)- groups, wherein X is chalcogen (i.e., oxygen, sulfur, selenium, or tellurium), bonded to the same carbon, or the enols thereof with heavy metal of aluminum.

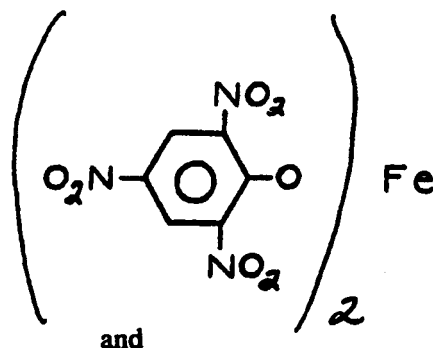
- (1) Note. An example of the keto-enol tautomerism referred to above is either of these two tautomer types, below, which can form complexes with heavy metal or aluminum:

**363 Heavy metal or aluminum carboxylate salt or complex:**

This subclass is indented under subclass 358. Compositions which contain a carboxylic acid salt or carboxylic acid complex of a heavy metal or aluminum.

364 The heavy metal is Cr, Zr, or a lanthanide:
This subclass is indented under subclass 363. Compositions wherein the heavy metal that forms the salt or complex is chromium, zirconium, or a lanthanide element.

- (1) Note. The lanthanide elements are those of atomic numbers 57-61.
- (2) Note. An example of an ingredient provided for herein is cerium naphthenate.



365 Heavy metal or aluminum sulfonate salt or complex:
This subclass is indented under subclass 358. Compositions which contain a sulfonic acid salt or sulfonic acid complex heavy metal or aluminum.

- (1) Note. The general formula of a sulfonic acid wherein R is an organic radical is:

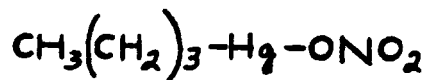


366 Heavy metal or aluminum salt of organic phosphorus acid:
This subclass is indented under subclass 358. Compositions which contain a phosphorus acid salt of aluminum or heavy metal.

- (1) Note. The phosphorus acids referred to herein are any organic phosphorus compounds having-XH, wherein X is chalcogen (i.e., oxygen, sulfur, selenium, or tellurium), bonded directly to the phosphorus.
- (2) Note. See Glossary in the class definition for the definition of "organic compound".

367 Nitrogen bonded directly or indirectly to the heavy metal or aluminum:
This subclass is indented under subclass 358. Compositions wherein the heavy metal or aluminum is bonded directly or indirectly to nitrogen.

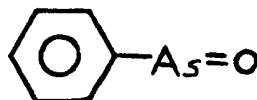
- (1) Note. Examples of ingredients provided for herein are:



368 Organic compound containing arsenic, antimony, or bismuth:

This subclass is indented under subclass 358. Compositions wherein the heavy metal is arsenic, antimony, or bismuth.

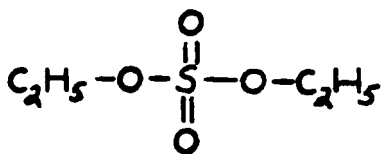
- (1) Note. An example of an ingredient provided for herein is:



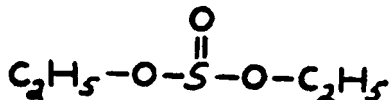
369 Containing -O-S(=O)(=O)O- or -O-S(=O)O- attached directly or indirectly to carbon by nonionic bonding (e.g., sulfate esters, sulfite esters, etc.):

This subclass is indented under subclass 300. Compositions which contain a compound having carbon attached directly or indirectly to -O-S(=O)(=O)O- or to -O-S(=O)O- by nonionic bonding.

- (1) Note. Examples of ingredients provided for herein are:



and



370 Containing organic -S(=O)(=O)O- compound (i.e., sulfonates):

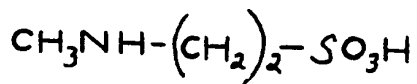
This subclass is indented under subclass 300. Compositions which contain a compound having an organic sulfonate, i.e., -S(=O)(=O)O-, group.

- (1) Note. An organic sulfonate group is one wherein the -S(=O)(=O)O- group is attached directly or indirectly to carbon of an organic compound by nonionic bonding. See Glossary in the class definition for the definition of "organic compound".
- (2) Note. An example of an ingredient provided for herein is an alkyl benzene sulfonic acid.

371 Nitrogen or -C(=X)-, wherein X is chalcogen, attached indirectly to the sulfonate group by nonionic bonding:

This subclass is indented under subclass 370. Compositions wherein the -S(=O)(=O)O- is attached indirectly to nitrogen or to -C(=X)-, wherein X is chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) by nonionic bonding.

- (1) Note. An example of an ingredient provided for herein is:



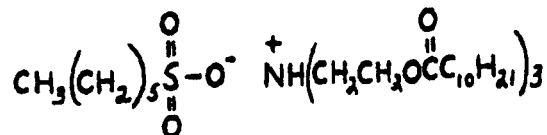
372 Hydrazine or organic nitrogen compound salts of sulfonic acids:

This subclass is indented under subclass 370. Compositions which contain a sulfonic acid which has been saltified with hydrazine or with an organic nitrogen compound.

- (1) Note. A sulfonic acid has the general formula, below, wherein R is an organic radical:



- (2) Note. By organic nitrogen compound is meant a compound having nitrogen attached directly or indirectly, by non-ionic bonding, to carbon of an organic compound. See Glossary in the class definition for the definition of "organic compound".
- (3) Note. An example of an ingredient provided for herein is:



373 Overbased sulfonate or carbonated alkaline earth metal sulfonate:

This subclass is indented under subclass 370. Compositions which contain sulfonate compounds which are overbased or are carbonated.

- (1) Note. An overbased sulfonate is one in which an amount of alkaline metal (i.e., Mg, Ca, Ba, Sr) is present which is greater than the stoichiometric amount of metal which would be present if the parent sulfonic acid, R-S(=O)(=O)OH, were fully neutralized. The exact structure of this type compound has not been determined.
- (2) Note. A carbonated alkaline earth metal sulfonate is the complex resulting from the reaction of carbon dioxide with alkaline earth metal sulfonate.

374 With organic -C(=O)O- compound (e.g., carboxylic acids, esters, etc.):

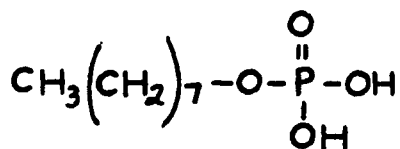
This subclass is indented under subclass 370. Compositions which contain, in addition to an organic sulfonate compound, an organic -C(=O)O- group containing compound.

- (1) Note. An organic -C(=O)O- containing compound is one in which the carbon of the -C(=O)O- group is, or is attached directly or indirectly by nonionic bonding to, the carbon of an organic compound.
- (2) Note. See Glossary in the class definition for the definition of "organic compound".

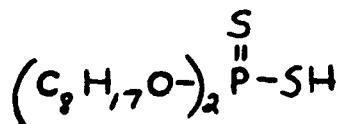
375 Containing compound having phosphorus bonded directly to chalcogen and directly or indirectly to carbon by nonionic bonding (e.g., alkyl acid phosphates, etc.):

This subclass is indented under subclass 300. Compositions which contain phosphorous, bonded directly or indirectly to carbon by nonionic bonding, and bonded directly to chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) by nonionic bonding.

- (1) Note. Examples of ingredients provided for herein are:

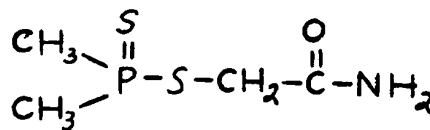


and

**376 Nitrogen attached to the phosphorus directly or indirectly by acyclic nonionic bonding:**

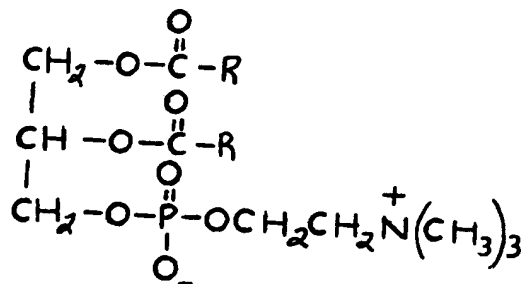
This subclass is indented under subclass 375. Compositions wherein the phosphorus is attached to nitrogen directly or indirectly by acyclic nonionic bonding.

- (1) Note. An example of an ingredient provided for herein is:

**377 Lecithin or indeterminate structure reaction product thereof:**

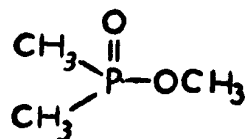
This subclass is indented under subclass 376. Compositions which contain a lecithin, or a product of indeterminate structure formed by reaction of a lecithin.

- (1) Note. Lecithins have the following structure wherein the R's are the same or different, and are acyclic hydrocarbon radicals of at least seven carbon atoms chain length:

**378 Carbon bonded directly to the phosphorus:**

This subclass is indented under subclass 375. Compositions wherein the phosphorus is bonded directly to carbon.

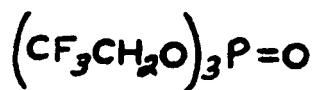
- (1) Note. An example of an ingredient provided for herein is:



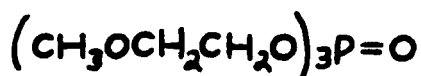
379 Chalcogen or halogen attached indirectly to the phosphorus by acyclic nonionic bonding:

This subclass is indented under subclass 375. Compositions wherein the phosphorus is attached indirectly to halogen or to chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) by acyclic nonionic bonding.

- (1) Note. Examples of ingredients provided for herein are:



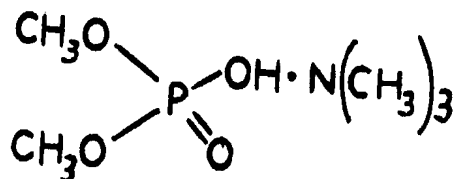
and



380 Organic nitrogen compound salt of organic phosphorus acids:

This subclass is indented under subclass 375. Compositions wherein an organic phosphorus acid is saltified with an organic nitrogen compound.

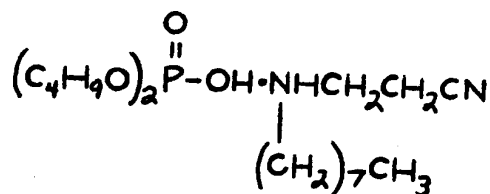
- (1) Note. By organic nitrogen compound is meant a compound having nitrogen attached directly or indirectly by non-ionic bonding to carbon of an organic compound. See Glossary in the class definition for the definition of "organic compound".
- (2) Note. by organic phosphorus acid is meant a compound having phosphorus attached directly or indirectly by non-ionic bonding to carbon of an organic compound, and having -XH, wherein X is chalcogen (i.e., oxygen, sulfur, selenium, or tellurium), bonded directly to the phosphorus.
- (3) Note. An example of an ingredient provided for herein is:



381 Chalcogen or additional nitrogen in the organic nitrogen compound:

This subclass is indented under subclass 380. Compositions wherein the organic nitrogen compound employed to saltify the phosphorus acid contains chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) or plural nitrogens.

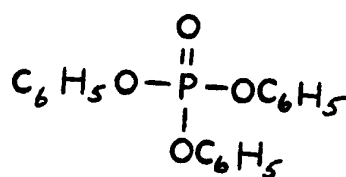
- (1) Note. An example of an ingredient provided for herein is:



382 Phosphorus triester:

This subclass is indented under subclass 375. Compositions wherein phosphorus is bonded directly to three chalcogens, each of which is bonded to carbon, which carbon is not multiple bonded to a hetero atom.

- (1) Note. An example of an ingredient provided for herein is:

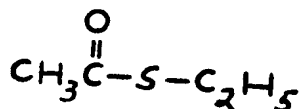


383 Containing organic -C(=X)X- compound, wherein the X's are the same or diverse chalcogens, with at least one X being sulfur:

This subclass is indented under subclass 300. Compositions wherein the carbon of -C(=X)X- group, in which the X's are the same or diverse chalcogens (i.e., oxygen, sulfur, selenium, or

tellurium), at least one X being sulfur, is, or is attached directly or indirectly by nonionic bonding to, carbon of an organic compound.

- (1) Note. See Glossary in the class definition for the definition of "organic compound".
- (2) Note. An example of an ingredient provided for herein is:



384 Organic compound containing -NC or -CN group:

This subclass is indented under subclass 300. Compositions which contain the cyano group, -CN, or the isocyno group, -NC, attached directly or indirectly to carbon of an organic compound by nonionic bonding.

- (1) Note. See Glossary in the class definition for the definition of "organic compound".
- (2) Note. Examples of ingredients provided for herein are olefin-heifenmethacrylonitrile polymers and methyl isonitrile.

385 Containing organic -C(=O)O- compound (e.g., fatty acids, etc.):

This subclass is indented under subclass 300. Compositions wherein the carbon of a -C(=O)O- group is, or is attached directly or indirectly by nonionic bonding to, the carbon of an organic compound.

- (1) Note. See Glossary in the class definition for the definition of "organic compound".
- (2) Note. Examples of ingredients provided for herein are saturated and unsaturated fatty acids, naphthenic acid, and alkali metal or ammonium salts of said fatty acids or naphthenic acid.

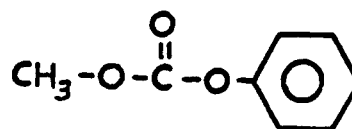
386 Compound of indeterminate structure prepared by reacting an organic -C(=O)O- compound:

This subclass is indented under subclass 385. Compositions which contain a compound or compounds of indeterminate structure resulting from the reaction of an organic -C(=O)O- compound.

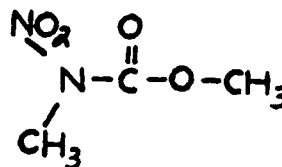
387 Nitrogen or oxygen bonded directly to the carbon of the -C(=O)O- group (e.g., carbamic and carbonic compounds, etc.):

This subclass is indented under subclass 385. Compositions wherein the carbon of the -C(=O)O- group is bonded directly to nitrogen or to oxygen.

- (1) Note. Examples of ingredients provided for herein are:



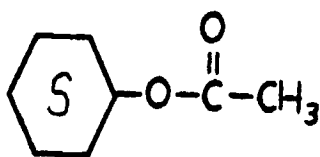
and



388 The single bonded oxygen is bonded directly to an additional carbon, which carbon may be single bonded to any element but may be multiple bonded only to carbon (i.e., carboxylic acid esters):

This subclass is indented under subclass 385. Compositions wherein an additional carbon is bonded directly to the single bonded oxygen, which additional carbon may be single bonded to any element but may be multiple bonded only to carbon.

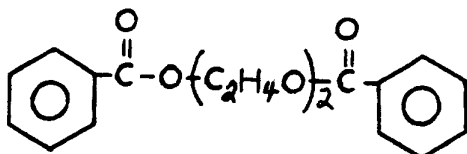
- (1) Note. An example of an ingredient provided for herein is:



- 389 Plural -C(=O)O- groups attached to each other directly or indirectly by nonionic bonding (e.g., polyesters, half ester-half acid compounds, etc.):**

This subclass is indented under subclass 388. Compositions wherein the -C(=O)O- group is attached directly or indirectly to an additional -C(=O)O- group by nonionic bonding.

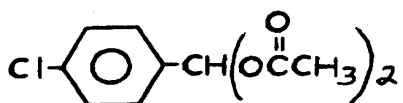
- (1) Note. An example of an ingredient provided for herein is:



- 390 Halogen or sulfur attached indirectly to the -C(=O)O- by nonionic bonding:**

This subclass is indented under subclass 389. Compositions wherein the -C(=O)O- group is attached indirectly to sulfur or to halogen by nonionic bonding.

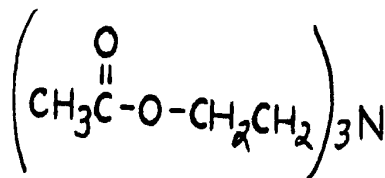
- (1) Note. Examples of ingredients provided for herein are chlorinated copolymers of ethylene and vinyl acetate, and:



- 391 Nitrogen attached indirectly to the -C(=O)O- by nonionic bonding:**

This subclass is indented under subclass 389. Compositions wherein the -C(=O)O- group is attached indirectly to nitrogen by nonionic bonding.

- (1) Note. An example of an ingredient provided for herein is:



- 392 Product polymerized through an olefinic double bond:**

This subclass is indented under subclass 391. Compositions in which the compound containing the nitrogen and plural -C(=O)O- groups has been formed by polymerization of an olefinic double bond.

- (1) Note. Olefinic double bonds are carbon to carbon double bond between acyclic carbons or alicyclic carbons.
- (2) Note. An example of an ingredient provided for herein is the tripolymer of styrene, lauryl methacrylate, and N-(3-dimethylaminopropyl) methacrylamide.

- 393 Copolymer of olefinically unsaturated hydrocarbon monomer and additional monomer (e.g., ethylene-vinyl acetate copolymers, etc.):**

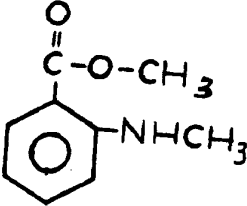
This subclass is indented under subclass 389. Compositions which are copolymers of a hydrocarbon monomer having an olefinic double bond and of one or more additional monomers.

- (1) Note. Olefinic double bonds are carbon to carbon double bonds between acyclic carbons or alicyclic carbons.

- 394 With organic nitrogen compound:**

This subclass is indented under subclass 393. Compositions which contain, in addition to the compound having plural -C(=O)O- groups, an additional compound which is an organic nitrogen compound.

- (1) Note. An organic nitrogen compound is one which has nitrogen attached directly or indirectly, by nonionic bonding, to carbon of an organic compound. See Glossary in the class definition for the definition of "organic compound".

- 395 **With additional synthetic nonhydrocarbon polymer:**
This subclass is indented under subclass 393. Compositions which contain, in addition to the compound having plural $-C(=O)O-$ groups, an additional compound which is a synthetic polymer having elements other than carbon and hydrogen.
- (1) Note. An example of an ingredient combination provided for herein is the combination of ethylene-vinyl acetate copolymer together with acylated polystyrene.
- 396 **One of the monomers contains a benzene ring (e.g., styrene, etc.):**
This subclass is indented under subclass 393. Compositions wherein a benzene ring is present in one of the monomers that forms the copolymer.
- (1) Note. Examples of ingredients provided for herein are: a copolymer of ethylene and vinyl benzoate, and alkyl esters of styrene-maleic anhydride copolymers.
- 397 **Polymer or copolymer or nonhydrocarbon olefinically unsaturated monomers polymerized through an olefinic double bond (e.g., trimer esters, etc.):**
This subclass is indented under subclass 389. Compositions wherein the compound having plural $-C(=O)O-$ groups is a polymer or a copolymer of nonhydrocarbon olefinically unsaturated monomer(s) polymerized through an olefinic double bond.
- (1) Note. Examples of ingredients provided for herein are: the homopolymer of lauryl methacrylate, and the esterified copolymer of vinyl methyl ether and maleic anhydride.
- 398 **Mono-, di-, or polyester of polycarboxylic acids:**
This subclass is indented under subclass 389. Compositions which contain a polycarboxylic acid which is mono-, di-, or polyesterified.
- (1) Note. By polycarboxylic acid is meant a compound in which the carbons of plural $-C(=O)O-$ groups are attached to each
- directly or through an acyclic or cyclic chain of atoms.
- 399 **Nitrogen attached indirectly to the $-C(=O)O-$ group by nonionic bonding:**
This subclass is indented under subclass 388. Compositions wherein the $-C(=O)O-$ group is attached indirectly to nitrogen by nonionic bonding.
- (1) Note. An example of an ingredient provided for herein is:
- 
- 400 **Chalcogen or halogen attached indirectly to the $-C(=O)O-$ group by nonionic bonding:**
This subclass is indented under subclass 388. Compositions wherein the $-C(=O)O-$ group is attached indirectly to halogen or to chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) by nonionic bonding.
- (1) Note. Examples of ingredients provided for herein are:
- $$\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{C}(\text{CH}_3)_2-\overset{\text{CH}_3}{\underset{|}{\text{C}}}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3$$

and

$$\text{Cl}_3-\text{C}(\text{CH}_3)_2-\text{O}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3$$
- 401 **Alkyl ester of formic or alkanolic acids:**
This subclass is indented under subclass 388. Compositions which contain formic or alkanolic acid alkyl esters.
- (1) Note. Examples of ingredients provided for herein are amyl acetate and methyl formate.

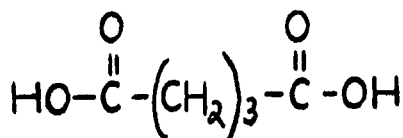
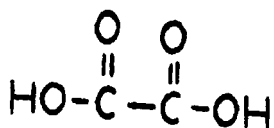
402 With alkanol or dialkyl ether:

This subclass is indented under subclass 401. Compositions which contain, in addition to the formic or alkanolic acid ester, an alkanol or a dialkyl ether; alkanols have the formula ROH and dialkyl ethers have the formula ROR, with R in each case being alkyl.

403 Plural -C(=O)O- groups attached to each other directly or indirectly by nonionic bonding:

This subclass is indented under subclass 385. Compositions wherein the -C(=O)O group is attached directly or indirectly to an additional -C(=O)O- group by nonionic bonding.

- (1) Note. Examples of ingredients provided for herein are:



SEE OR SEARCH THIS CLASS, SUBCLASS:

- 322, for ingredients containing the structural group:

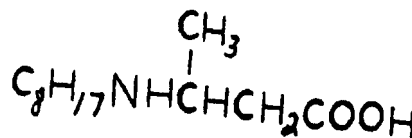
**404 Carboxylic acid dimer, trimer, or homopolymer:**

This subclass is indented under subclass 403. Compositions which contain dimers, trimers, or homopolymers of a carboxylic acid.

405 Nitrogen attached indirectly to the -C(=O)O- group by acyclic nonionic bonding:

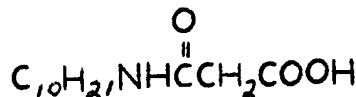
This subclass is indented under subclass 385. Compositions wherein the -C(=O)O- group is attached indirectly to nitrogen by acyclic nonionic bonding.

- (1) Note. An example of an ingredient provided for herein is:

**406 The nitrogen is bonded directly to an additional -C(=O)- group:**

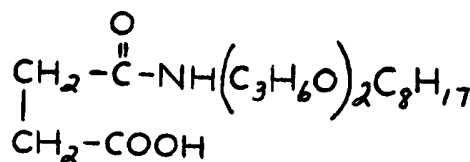
This subclass is indented under subclass 405. Compositions wherein an additional -C(=O)- group is bonded directly to the nitrogen.

- (1) Note. An example of an ingredient provided for herein is:

**407 Plural nitrogens or plural chalcogens attached indirectly to the -C(=O)O- group by acyclic nonionic bonding:**

This subclass is indented under subclass 406. Compositions wherein the -C(=O)O- group is attached indirectly by acyclic nonionic bonding to plural nitrogens or to plural chalcogens (i.e., oxygen, sulfur, selenium, or tellurium).

- (1) Note. An example of an ingredient provided for herein is:



408 Organic nitrogen compound salt of carboxylic acids:

This subclass is indented under subclass 385. Compositions which contain a carboxylic acid which has been salified with an organic nitrogen compound.

- (1) Note. By organic nitrogen compound is meant a compound having nitrogen attached directly or indirectly, by non-ionic bonding, to carbon of an organic compound. See Glossary in the class definition for the definition of "organic compound".

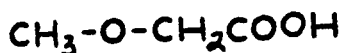
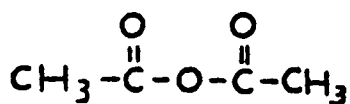
409 Plural nitrogens in the organic nitrogen compound (e.g., diamines, aminoamides, guanidines, etc.):

This subclass is indented under subclass 408. Compositions wherein the organic nitrogen compound salifying agent contains plural nitrogens.

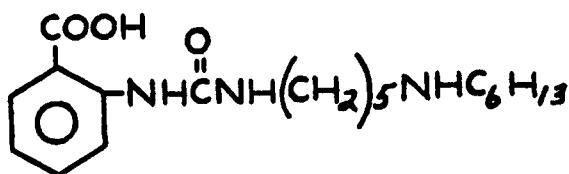
410 Nitrogen or chalcogen attached indirectly to the -C(=O)O- group by nonionic bonding:

This subclass is indented under subclass 385. Compositions wherein the -C(=O)O- group is attached indirectly by nonionic bonding to nitrogen or to chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).

- (1) Note. Examples of ingredients provided for herein are:



and

**411 With alkanol, ketone, or phenol:**

This subclass is indented under subclass 385. Compositions which contain, in addition to the -C(=O)O- compound, an alkanol, ketone, or phenol; alkanol has the formula ROH wherein R is alkyl, phenol is characterized by having the -OH group bonded directly to a benzene ring, and ketone is characterized by having a -C(=O)- group bonded directly to two carbon atoms.

412 Organic nitrogen compound containing:

This subclass is indented under subclass 300. Compositions which contain nitrogen compound, i.e., one in which an organic nitrogen is attached directly or indirectly, by nonionic bonding, to carbon of an organic compound.

- (1) Note. See Glossary in the class definition for the definition of "organic compound".
- (2) Note. Examples of ingredients provided for herein are alkyl monoamines, alkenyl monoamines, and alicyclic amines.

413 Nitro or nitroso bonded directly to carbon:

This subclass is indented under subclass 412. Compositions wherein carbon is bonded directly to a nitro or nitroso group.

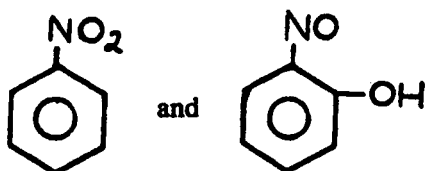
- (1) Note. The nitro group is depicted as:



- (2) Note. The nitroso group is depicted as:



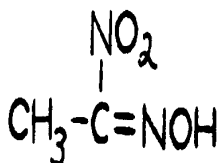
- (3) Note. Examples of ingredients provided for herein are:



414 The carbon is acyclic or alicyclic:

This subclass is indented under subclass 413. Compositions wherein the nitro or nitroso group is bonded directly to an acyclic or alicyclic carbon.

- (1) Note. An example of an ingredient provided for herein is:



415 Compound of indeterminate structure prepared by reacting a phenol, an aldehyde, and ammonia or substituted ammonia:

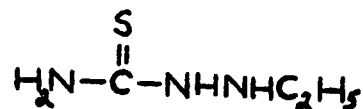
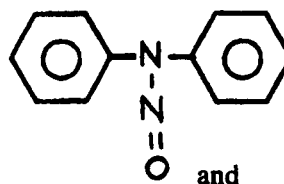
This subclass is indented under subclass 412. Compositions which contain a compound of indeterminate structure, resulting from the reaction of a phenol, an aldehyde, and ammonia or substituted ammonia.

- (1) Note. Many compounds which result from this type reaction are of known structure. In this class, subclasses 424+ provide for many compounds of this type.

416 The nitrogen is single bonded directly to nitrogen:

This subclass is indented under subclass 412. Compositions wherein two nitrogens of the organic nitrogen compound are single bonded directly to each other.

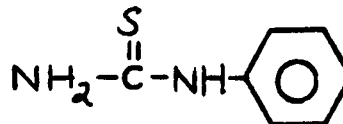
- (1) Note. Examples of ingredients provided for herein are:



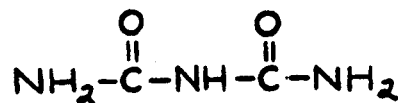
417 Plural nitrogens bonded directly to the same -C(=X)- group, wherein X is chalcogen (e.g., ureas, etc.).

This subclass is indented under subclass 412. Compositions wherein a -C(=X)- group, wherein X is chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) is bonded directly to plural nitrogens.

- (1) Note. Examples of ingredients provided for herein are:



and



418 Having -C(=X)- bonded directly to the nitrogen, wherein X is chalcogen:

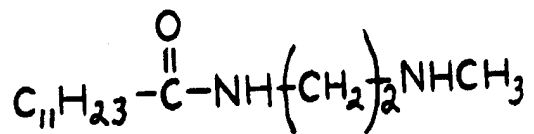
This subclass is indented under subclass 412. Compositions wherein the nitrogen is bonded directly to a -C(=X)- group, wherein X is chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).

- (1) Note. Carboxylic acid amides and thio-carboxylic acid amides are the principal ingredients for which provision is made herein.

419 Additional nitrogen attached indirectly to the -C(=X)- group by acyclic nonionic bonding:

This subclass is indented under subclass 418. Compositions wherein the -C(=X)- group is attached indirectly to an additional nitrogen by acyclic nonionic bonding.

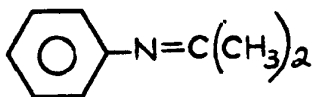
- (1) Note. An example of an ingredient provided for herein is:



420 Carbon double bonded to the nitrogen:

This subclass is indented under subclass 412. Compositions wherein the nitrogen is double bonded to carbon.

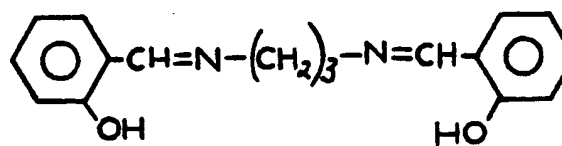
- (1) Note. An example of an ingredient provided for herein is:



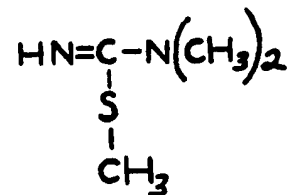
421 Plural nitrogens attached indirectly to each other by acyclic nonionic bonding:

This subclass is indented under subclass 420. Compositions wherein nitrogen is attached by acyclic nonionic bonding to a further nitrogen.

- (1) Note. Neither of the nitrogens in the text of this definition has to be the nitrogen that is double bonded to carbon.
- (2) Note. Examples of ingredients provided for herein are:



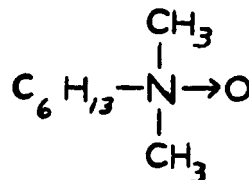
and



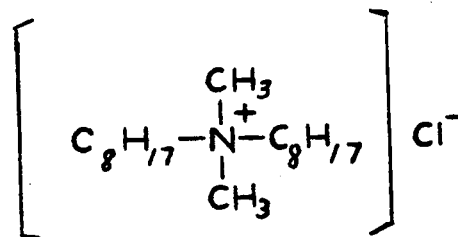
422 Quaternary ammonium salt or amine oxide:

This subclass is indented under subclass 412. Compositions which contain amine oxide compounds or quaternary ammonium salts.

- (1) Note. An example of an amine oxide ingredient provided for herein is:



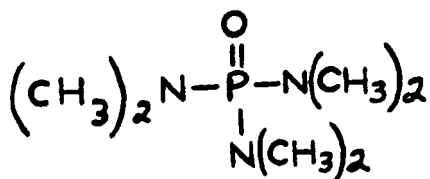
- (2) Note. An example of a quaternary amine salt ingredient provided for herein is:



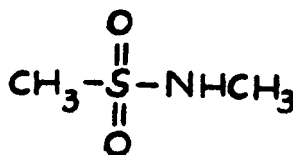
423 Chalcogen or phosphorus attached directly to the nitrogen by nonionic bonding:

This subclass is indented under subclass 412. Compositions wherein the nitrogen is attached directly to phosphorus or to chalcogen (i.e., oxygen, sulfur, selenium, or tellurium) by nonionic bonding.

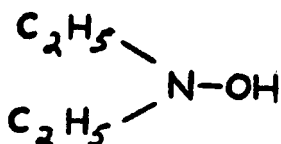
- (1) Note. Examples of ingredients provided for herein are:



and



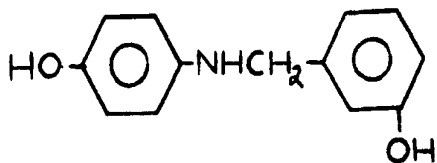
and



424 Benzene ring attached indirectly to the nitrogen by acyclic nonionic bonding:

This subclass is indented under subclass 412. Compositions wherein the nitrogen is attached indirectly to a benzene ring by acyclic nonionic bonding.

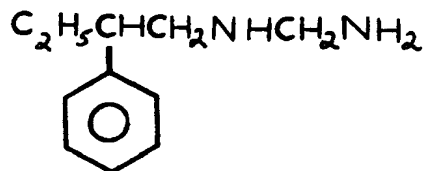
- (1) Note. An example of an ingredient provided for herein is:



425 Additional nitrogen attached indirectly to the nitrogen by acyclic nonionic bonding:

This subclass is indented under subclass 424. Compositions wherein the nitrogen is attached indirectly to an additional nitrogen by acyclic nonionic bonding.

- (1) Note. An example of an ingredient provided for herein is:



426 Benzene ring bonded directly to the nitrogen:

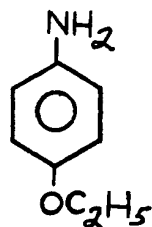
This subclass is indented under subclass 412. Compositions in which the nitrogen is bonded directly to a benzene ring.

- (1) Note. Examples of ingredients provided for herein are aniline and the various alkyl substituted anilines.

427 Chalcogen attached directly or indirectly to the benzene ring by nonionic bonding:

This subclass is indented under subclass 426. Compositions wherein the benzene ring is attached directly or indirectly by nonionic bonding to chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).

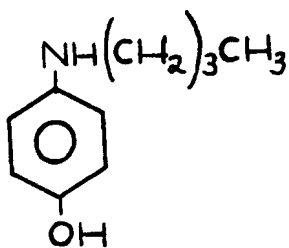
- (1) Note. An example of an ingredient provided for herein is:



428 Acyclic carbon bonded directly to the nitrogen:

This subclass is indented under subclass 427. Compositions wherein the nitrogen bonded to the benzene ring is also bonded directly to acyclic carbon.

- (1) Note. An example of an ingredient provided for herein is:



429 The benzene ring is part of a polycyclic ring system:

This subclass is indented under subclass 426. Compositions wherein the nitrogen is bonded directly to a benzene ring that is part of a polycyclic ring system.

(1) Note. An example of an ingredient provided for herein is alpha-naphthylamine.

430 Plural nitrogens bonded to the same benzene:

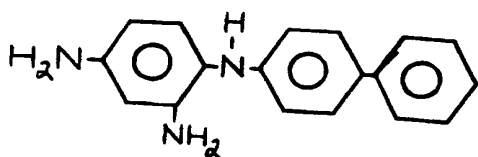
This subclass is indented under subclass 426. Compositions wherein the benzene ring is bonded directly to plural nitrogens.

(1) Note. An example of an ingredient provided for herein is phenylene diamine.

431 Plural rings bonded to the same nitrogen atom:

This subclass is indented under subclass 430. Compositions wherein a nitrogen is bonded directly to plural rings.

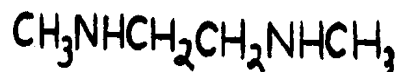
(1) Note. An example of an ingredient provided for herein is:



432 Plural nitrogens attached indirectly to each other by acyclic nonionic bonding:

This subclass is indented under subclass 412. Compositions in which an additional nitrogen is attached indirectly to the nitrogen by acyclic nonionic bonding.

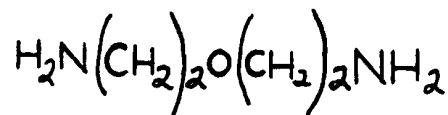
(1) Note. An example of an ingredient provided for herein is:



433 Chalcogen attached indirectly to one of the nitrogens by acyclic nonionic bonding:

This subclass is indented under subclass 432. Compositions wherein one of the nitrogens is attached indirectly by acyclic nonionic bonding to chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).

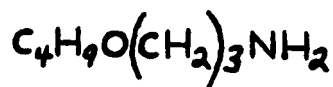
(1) Note. An example of an ingredient provided for herein is:



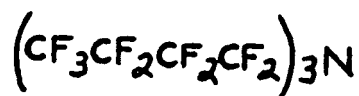
434 Chalcogen or halogen attached indirectly to the nitrogen by acyclic nonionic bonding:

This subclass is indented under subclass 412. Compositions wherein the nitrogen is attached indirectly by acyclic nonionic bonding to halogen or chalcogen (i.e., oxygen, sulfur, selenium, or tellurium).

(1) Note. Examples of ingredients provided for herein are:



and



435 Sulfur or phosphorus attached directly or indirectly, by nonionic bonding, to carbon of an organic compound:

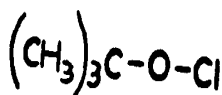
This subclass is indented under subclass 300. Compositions wherein carbon of an organic compound is attached directly or indirectly, by nonionic bonding, to phosphorus or sulfur.

- (1) Note. See Glossary in the class definition, for the definition of "organic compound".

436 Organic oxygen compound containing (e.g., alicyclic alcohols, hypochlorites, etc.):

This subclass is indented under subclass 300. Compositions which contain an organic oxygen compound, i.e., a compound wherein oxygen is attached directly or indirectly, by nonionic bonding, to carbon of an organic compound.

- (1) Note. See Glossary in the class definition for the definition of "organic compound".
- (2) Note. An example of an ingredient provided for herein is:

**437 The oxygen is part of a -C(=O)- group:**

This subclass is indented under subclass 436. Compositions wherein the organic compound has the oxygen present as a carbonyl group, -C(=O)-.

- (1) Note. Examples of ingredients provided for herein are aldehydes, aromatic ketones, and carboxylic acid halides.

438 With alkanol or dialkyl ether:

This subclass is indented under subclass 437. Compositions which contain, in addition to the -C(=O)- compound, an alkanol or a dialkyl ether; alkanol is ROH and dialkyl ether is ROR, with R in all occurrences being alkyl.

439 Acyclic ketone:

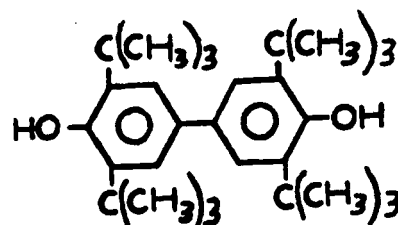
This subclass is indented under subclass 437. Compositions wherein the -C(=O)- compound is an acyclic ketone.

- (1) Note. An example of an ingredient provided for herein is acetone.

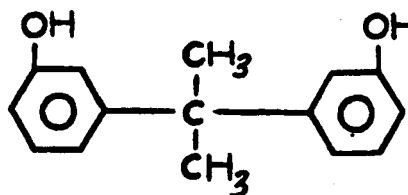
440 Plural benzene rings bonded directly to each other or to the same acyclic carbon:

This subclass is indented under subclass 436. Compositions wherein an acyclic carbon is bonded to plural benzene rings, or plural benzene rings are bonded directly to each other.

- (1) Note. Examples of ingredients provided for herein are:



and

**441 Oxygen bonded directly to a polycyclic carbocyclic ring system:**

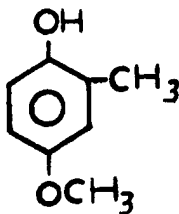
This subclass is indented under subclass 436. Compositions wherein a polycyclic carbocyclic ring system is bonded directly to oxygen.

- (1) Note. Examples of ingredients provided for herein are alpha- and beta-naphthol.

442 Plural oxygens bonded directly to the same monocyclic benzene ring:

This subclass is indented under subclass 436. Compositions wherein a benzene ring is bonded directly to more than one oxygen.

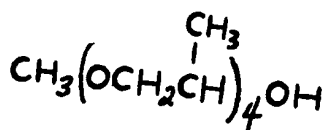
- (1) Note. An example of an ingredient provided for herein is:



443 Plural oxygens attached indirectly to each other by acyclic nonionic bonding:

This subclass is indented under subclass 436. Compositions wherein plural oxygens are attached, by acyclic nonionic bonding, indirectly to each other.

- (1) Note. An example of an ingredient provided for herein is:



444 Plural oxygens bonded directly to the same acyclic or alicyclic carbon (e.g., acetals, etc.):

This subclass is indented under subclass 443. Compositions wherein an acyclic or alicyclic carbon is bonded to more than one oxygen.

- (1) Note. An example of an ingredient provided for herein is:



445 All the oxygens are present as -OH groups (e.g., glycols, triols, etc.):

This subclass is indented under subclass 443. Compositions wherein the oxygens of the ingredient are present only as -OH groups.

- (1) Note. Examples of ingredients provided for herein are glycols and higher polyols.

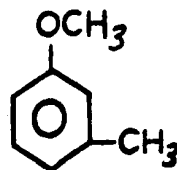
446 Alkanol compound with dialkyl ether compound:

This subclass is indented under subclass 436. Compositions which contain an alkanol compound, ROH, in combination with a dialkyl ether compound, ROR; R, in each instance, is alkyl.

447 Ether:

This subclass is indented under subclass 436. Compositions wherein an oxygen is bonded directly to two carbon atoms.

- (1) Note. An example of an ingredient provided for herein is:



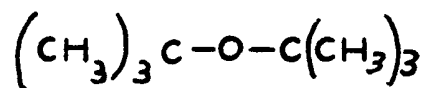
448 Dialkyl ether:

This subclass is indented under subclass 447. Compositions wherein oxygen is bonded directly to two identical or different alkyl groups.

449 Tertiary carbon bonded directly to the ether oxygen:

This subclass is indented under subclass 448. Compositions wherein the oxygen is bonded directly to a tertiary carbon atom.

- (1) Note. An example of an ingredient provided for herein is:



450 Phenol or salt thereof:

This subclass is indented under subclass 436. Compositions which contain the -OH group bonded directly to a benzene ring, and the salts thereof.

- (1) Note. Examples of ingredients provided for herein are phenol, the various alkyl-

substituted phenols, and the alkali metal salts of such compounds.

451 Alkanol:

This subclass is indented under subclass 436. Compositions wherein oxygen is present as an -OH group which is bonded directly to an alkyl group.

452 Mixture of alkanols:

This subclass is indented under subclass 451. Compositions wherein at least two different alkanols are present.

453 Dehydration processes, and products thereof:

This subclass is indented under subclass 451. Processes which are directed to removal of water from alkanols, and the products of such processes.

- (1) Note. An example of a process provided for herein is the treatment of a gasoline-isopropanol-water mixture with a water coalescer to remove water.

454 Lead-containing organic compound:

This subclass is indented under subclass 300. Compositions which contain compounds in which lead is attached directly or indirectly to carbon of an organic compound.

- (1) Note. See Glossary in the class definition for the definition of "organic compound".
- (2) Note. Examples of ingredients provided for herein are tetraethyl lead, tetraphenyl lead, and tetramethyl lead.
- (3) Note. Ingredients containing both a functional group, previously provided for, and lead in the same compound are classified with the functional group previously provided for. See the search notes in subclass 354.

455 With inorganic additive:

This subclass is indented under subclass 454. Compositions which contain, in addition to an organolead compound, an ingredient which is inorganic.

456 Halogen bonded directly to carbon:

This subclass is indented under subclass 300. Compositions which contain carbon bonded directly to halogen.

- (1) Note. Examples of ingredients provided for herein are dichloroacetylene and benzotrifluoride.

457 Inorganic component (e.g., carbon dioxide, etc.):

This subclass is indented under subclass 300. Compositions in which an inorganic ingredient is present.

- (1) Note. Water is provided for as an ingredient herein.

SEE OR SEARCH THIS CLASS, SUBCLASS:

301+, for liquid fuels which are aqueous emulsions.

458 Nitrogen or sulfur containing (e.g., carbon disulfide, etc.):

This subclass is indented under subclass 457. Compositions wherein the inorganic ingredient contains nitrogen or sulfur.

- (1) Note. Examples of ingredients provided for herein are ammonia, sodium nitrate, hydrazine, and hydrogen persulfides.

459 Solid hydrocarbon polymer containing:

This subclass is indented under subclass 300. Compositions which contain polymeric ingredients which are both solid and hydrocarbonaceous.

- (1) Note. The polymers provided for herein can be homopolymeric or copolymeric.
- (2) Note. An example of an ingredient provided for herein is solid polyisobutylene.

490 PEAT:

This subclass is indented under the class definition. Composition including peat, which is defined as partly decayed vegetable matter accumulation in marshes, containing about 25 percent water and about 50 percent wood fiber, and a method for preparing such composition.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:
605, for fuel compositions containing vegetation.
- 491 Briquet:**
This subclass is indented under subclass 490. Subject matter in the form of a fuel briquet, which form is described in the (2) Note to the class definition.
- 492 Process including heat:**
This subclass is indented under subclass 490. Process specific to preparing peat for a fuel, which utilizes the wet carbonizing processes and related steps to dehydrate the material.
- SEE OR SEARCH CLASS:
48, Gas: Heating and Illuminating, subclasses 209 through 211 for processes of making gas from wood, coal, or oil.
201, Distillation: Processes, Thermolytic, subclass 25 for a process of thermolytic distillation of peat.
- 500 PARTICULATE (E.G., POWDERED, ETC):**
This subclass is indented under the class definition. Product or process comprising a mass of solid fuel particles, each particle of which generally is too small to be manipulated individually by a human hand.
- (1) Note. A process for comminuting solid fuel to achieve a powdered state is included in this subclass when the comminution is the only step of the process, is the final step of a multi-step procedure or is otherwise not merely incidental to subsequent treatment step, e.g., purification, etc., of a fuel substance.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
595, for a fuel consolidation process using a specified comminuting condition or technique.
- SEE OR SEARCH CLASS:
201, Distillation: Processes, Thermolytic, subclass 42 for a collection of patents concerned with the particle size of a material fed to a process of that class (201).
- 501 Treated to reduce spontaneous ignition:**
This subclass is indented under subclass 500. Subject matter in which the fuel product mass has a reduced tendency to burst into flame or otherwise burn without the application or external energy.
- 502 Solid particles containing liquid fuel:**
This subclass is indented under subclass 500. Subject matter in which a fuel product particle has a normally-void portion or passageway which if filled or partly filled with a liquid fuel.
- 503 Mixed with particles of different size:**
This subclass is indented under subclass 500. Subject matter in which a fuel product particle has normally-void portion or passageway which is filled or partly filled with a liquid fuel.
- (1) Note. The other particle may be a fuel particle or a nonfuel particle.
- 504 Mixed with particles of different composition:**
This subclass is indented under subclass 500. Subject matter in which a fuel particle is mixed with another particle having a different chemical make-up.
- (1) Note. The other particle may be fuel particle or a nonfuel particle.
- 505 Process including removal of undesirable:**
This subclass is indented under subclass 500. Subject matter drawn to a process for making a particulate fuel in which, during the course of the procedure, impurities are removed from the fuel.
- 506 COMBINED WITH FRICTION IGNITING MASS OR SURFACE:**
This subclass is indented under the class definition. Product or process in which a fuel product or object carries a surface or mass which, upon frictional engagement with a suitable surface, can burst into flame.
- SEE OR SEARCH CLASS:
53, Package Making, subclass 1 for apparatus, and subclass 2 for a process, for making match-book packages.

- 102, Ammunition and Explosives, subclass 275.6, 275.11 and 380 for subject matter of that class having an igniter.
- 144, Woodworking, subclasses 50+ for a wood match-making process or apparatus.
- 149, Explosive and Thermic Compositions or Charges, appropriate subclasses for a match-head composition, per se.
- 206, Special Receptacle or Package, subclasses 85+ and 96+ for a match or matches with a holder, folder or case.
- 431, Combustion, subclasses 296+ for an igniting charge-holding and firing means.
- 507 Hand manipulable (e.g., match, etc.):**
This subclass is indented under subclass 506. Subject matter designed to be held in the hand of the user for ignition purposes.
- (1) Note. Patents which claim a match head composition and also a claim to a base having a single coating of the composition even though the composition of the base is specified with no inclusion of structure other than by name only, e.g., splint, stick, tape, card are classified as original in Class 149, Explosive and Thermic Compositions or Charges, and cross referenced to this class (44). A previously coated base to which the match head composition is applied is considered structure for this class (44).
- SEE OR SEARCH CLASS:
53, Package Making, subclasses 394+ for apparatus or a method for making a matchbook.
- 144, Woodworking, subclasses 50+ for a wood match-making process or apparatus.
- 149, Explosive and Thermic Compositions or Charges, appropriate subclasses, for thermic compositions, per se, and see (1) Note, above.
- 206, Special Receptacle or Package, subclasses 96+ for a match or matches with a holder, folder, or case.
- 431, Combustion, subclasses 269+ for an igniting charge holding and firing means.
- 508 Plural integral (e.g., string, etc.):**
This subclass is indented under subclass 507. Subject matter in which a single object has a plurality of ignition areas or surfaces, usually designed for being torn apart to constitute individual matches.
- (1) Note. In this subclass, the potentially individual matches are joined head-to-toe.
- 509 Parallel:**
This subclass is indented under subclass 508. Subject matter in which the potentially individual matches are arranged side-by-side, i.e., head-to-head and/or toe-to-toe.
- SEE OR SEARCH CLASS:
53, Package Making, subclass 395 for processes of making matchbook covers.
- 510 With scratcher:**
This subclass is indented under subclass 507. Devices in which each match has on its stem or otherwise individually associated with it a friction surface on which a match, usually another match, can be scratched.
- 511 MATCH SPLINT OR STICK:**
This subclass is indented under the class definition. Subject matter in which the composition comprises a hand-manipulable fuel object suitable for bearing an ignition device or surface.
- SEE OR SEARCH CLASS:
431, Combustion, subclasses 288+ for a candle or taper.
- 512 Process of making:**
This subclass is indented under subclass 511. Processes of handling or steps in manipulating the splints or sticks in constructing them.
- SEE OR SEARCH CLASS:
144, Woodworking, subclasses 50+ for a wood match-making process or apparatus.
- 519 PROVIDED WITH WICK OR FUSE:**
This subclass is indented under the class definition. Product or process in which fuel product carries an elongated element which, upon igni-

tion, either (a) has capillarity sufficient to convey a melted component of the fuel product from one part of the product to the point of ignition (flame), to be burned thereat or (b) comprises a thermic or explosive composition which rapidly conveys the flame or ignition point from one part to another or the fuel product.

SEE OR SEARCH CLASS:

- 102, Ammunition and Explosives, subclass 275.9 for a fuse, per se.
- 149, Explosive and Thermic Compositions or Charges, appropriate subclasses for a fuse composition, per se.
- 431, Combustion, for a wicked product in which all of the fuel is meltable, e.g., a candle.
- 502, Catalyst, Solid Sorbent or Support Therefor: Product or Process of Making, subclasses 400+ for a wick composition, per se.

520 FUEL PRODUCT HAVING PASSAGE WAY FOR GAS:

This subclass is indented under the class definition. Product or process having a void space which is specified as being suitable for the passage of gas or vapor.

SEE OR SEARCH CLASS:

- 149, Explosive and Thermic Compositions for Charges, subclasses 2+ for such subject matter under subclass 520 in which the fuel product comprises one integral fuel element attached to another element, the gas passageway extends from one side all the way through to an opposite side of the product, and no material obstructs the void.

521 Plural elements, with passageway unobstructed from side to opposite side:

This subclass is indented under subclass 520. Subject matter in which the fuel product comprises one integral fuel element attached to another element, the gas passageway extends from one side all the way through to an opposite side of the product, and no material obstructs the void.

- (1) Note. A criterion for considering a passageway as being unobstructed is

whether light can pass through the passageway.

522 Single element having aperture:

This subclass is indented under subclass 520. Subject matter in which an integral fuel element has one or more holes in it.

SEE OR SEARCH CLASS:

- 428, Stock Material or Miscellaneous Articles, subclasses 131+ for an apertured sheet or web in general.

530 FUEL PRODUCT OF DEFINED SHAPE OR STRUCTURE:

This subclass is indented under the class definition. Subject matter in which the composition is described in geometrical terms, e.g., round, hollow, tapered, etc., or in terms of the dimensions of one portion relative to another portion, e.g., smaller, etc.

SEE OR SEARCH CLASS:

- 102, Ammunition and Explosives, appropriate subclasses, especially subclasses 283+ for shaped explosive, pyrotechnic, and thermic compositions.
- 131, Tobacco, subclasses 1+ for a tobacco product intended to be burned.
- 149, Explosive and Thermic Compositions or Charges, subclasses 2+ for explosive or thermic compositions of a particular shape or structure.
- 431, Combustion, subclasses 288+ for a candle or taper, i.e., a shaped fuel block of a meltable material with an embedded wick.

531 Composed of moveable (e.g., articulated, etc.) or readily-breakable sections:

This subclass is indented under subclass 530. Subject matter having weakened (e.g., perforated, thinned, etc.) into smaller pieces, or having such pieces attached to each other in a moveable fashion, usually to change the overall dimensions of the product.

532 Shaped or arranged for easier ignition:

This subclass is indented under subclass 530. Subject matter having a fuel element so shaped or arranged with other elements that catching fire is made easier.

SEE OR SEARCH CLASS:

149, Explosive and Thermic Compositions or Charges, subclasses 2+ for explosive compositions of particular shape or structure.

533 And containing easier-igniting material:

This subclass is indented under subclass 532. Subject matter containing a first material which catches fire at a lower temperature than a second material making up the product.

534 Material acts as at least part of a wrapper or packaging:

This subclass is indented under subclass 533. Subject matter in which the first material encloses or ties up the second material.

SEE OR SEARCH THIS CLASS, SUBCLASS:

541, for a fuel product package or bundle in which the fuel elements are of undefined shape.

535 Cylindrical, e.g., log, etc.:

This subclass is indented under subclass 530. Subject matter in which the product is elongated and has a roughly circular cross-section.

SEE OR SEARCH THIS CLASS, SUBCLASS:

522, for a hollow log fuel product.

540 WITH INCOMBUSTIBLE CARRIER (E.G., TORCH ETC.):

This subclass is indented under the class definition. Product or process in which the fuel composition is contained within or is handlable by means of a nonburnable element.

- (1) Note. The carrier may be such that the burning fuel can be transported from place to place.

SEE OR SEARCH CLASS:

126, Stoves and Furnaces, subclass 59.5 for a smudge pot.

541 BUNDLED, COVERED OR WRAPPED:

This subclass is indented under the class definition. Product or process on which a plurality of fuel elements of generally undefined shape is covered by or contained within a wrapper or

has separable elements which can be handled together.

- (1) Note. The wrapping or bundling material is usually combustible.
- (2) Note. The wrapping or packaging may be for ease of selling or handling the fuel, for protection from the weather, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:

602, for a fuel composition having an anti-dusting additive mixed therewith or coated thereon on individual fuel elements or pieces.

SEE OR SEARCH CLASS:

206, Special Receptacle or Package, subclass 442 for a bale-tie package not primarily intended for fuel use.

428, Stock Material or miscellaneous Articles, subclass 2 for a compacted trash or refuse bundle, and subclass 576 for a shaped metallic configuration or package suitable for melting.

542 COATED OR IMPREGNATED FOR EASIER IGNITION:

This subclass is indented under the class definition. Product or process in which a first fuel material is coated or impregnated with a second material having a lower ignition temperature.

- (1) Note. The first material often is a conventional piece of wood, lump or coal, or body occurring in nature, e.g., a corn-cob, a pine-cone, etc.
- (2) Note. Where the lower-ignition material is added to fuel particles before consolidation and serves as a binder for the fuel particles, the composition is provided for below in subclasses 542+.

SEE OR SEARCH THIS CLASS, SUBCLASS:

533, for a shaped body coated or impregnated with a combustion-aiding composition.

SEE OR SEARCH CLASS:

- 149, Explosive and Thermic Compositions for Charges, subclasses 3+ for a product of that class having a coated component.
- 431, Combustion, subclass 327 for a burner comprising a flame holding structure including an incombustible porous, capillary or permeable member of the type charged with liquid fuel by immersion.

543 Solid fiber or particle in coating (e.g., sawdust, etc.):

This subclass is indented under subclass 542. Subject matter in which the second material envelops the first and includes particulate or fibrous material.

544 With wax:

Subject matter under subclass 542 in which the second material is one which melts under the influence of combustion.

545 With normally-liquid material:

This subclass is indented under subclass 542. Subject matter in which the second material is liquid under ambient conditions.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 502, for a fuel particle containing a liquid fuel.

550 CONSOLIDATED SOLIDS (E.G., BRIQUET, ETC.):

This subclass is indented under the class definition. Product or process in which a processed fuel comprises a larger object, particle, etc., than existed in the natural or synthetic starting fuel material.

SEE OR SEARCH CLASS:

- 201, Distillation: Processes, Thermolytic, subclass 42 for a collection of patents dealing with the size of particles fed to a process of that class (201).
- 264, Plastic and Nonmetallic Article Shaping or Treating: Processes, for molding processes in general.

551 Containing specified binder:

This subclass is indented under subclass 550. Subject matter wherein a material, described in terms of its chemical composition or chemical structure, is added to a solid fuel in order to achieve consolidation to a larger physical size.

- (1) Note. To be classified herein, a claim must recite a binding material characterized in terms of its chemical nature, i.e., its composition or structure; use of functional language, e.g., "agglomerating binder", etc., does not satisfy this criterion.
- (2) Note. A substance meeting the requirement of an indent under subclass 551 shall be presumed to serve a binding function, in the absence of a specific statement to the contrary. If a material in a consolidated fuel composition is stated specifically to serve a purpose other than binding, is not specified as a binder, and there is no specified binder in the claim, the composition shall be classified in another appropriate subclass under subclass 550.
- (3) Note. Examples of binding substances provided for herein as part of a consolidated solid fuel composition are: (1) hydrocarbon oils which are solid, (2) fly ash, and (3) liquid extract of cactus plants.

SEE OR SEARCH CLASS:

- 106, Compositions: Coating or Plastic, appropriate subclasses, for a coating or plastic composition which may be used as a binder for fuel particles or as coating for fuel, but which is not, per se, useful as a fuel.

552 With sewage, animal blood, or animal manure:

This subclass is indented under subclass 551. Subject matter wherein sewage, animal blood, or animal manure is a component in a consolidated solid fuel composition.

- (1) Note. The sewage, animal blood, or animal manure will normally, but not necessarily, serve a binding function.

- (2) Note. Such expressions as “town trash”, “town garbage”, “refuse”, etc. will not be construed to include sewage, animal blood, or animal manure, unless such is specifically stated. Claims classifiable on the basis of such substances as “town trash”, “town garbage”, and “refuse” are classified in this class, subclass 551.

553 With synthetic organic polymer prepared by polymerizing specified monomer (e.g., polyacrylonitrile, urea-formaldehyde resins, etc.):

This subclass is indented under subclass 551. Subject matter wherein a synthetic polymer or copolymer, prepared via polymerization of a specified monomer or copolymerization of specified monomers, is a component in a consolidated solid fuel composition.

- (1) Note. The polymers will normally, but not necessarily, serve a binding function.
- (2) Note. This subclass does not provide for consolidated solid fuel compositions solely because of the presence of a naturally-occurring polymeric substance which has been chemically modified.

SEE OR SEARCH THIS CLASS, SUBCLASS:

563, 573 and 579, for consolidated solid fuel compositions containing “resin” as a component.

554 With vegetable flour, vegetable meal, or dairy product:

This subclass is indented under subclass 551. Subject matter wherein vegetable flour, vegetable meal, or a dairy product is a component in a solid fuel composition.

- (1) Note. The vegetable flour, vegetable meal, or dairy product will normally, but not necessarily, serve a binding function.
- (2) Note. Description of a substance as “coal flour” does not qualify for inclusion in this subclass as a binder. Coal flour is generally considered as a solid fuel, per se, and, as such, may be classified in any of subclass 551 or its indents

when claimed in admixture with a specified binder.

- (3) Note. The vegetable flour and vegetable meal will most often be described as flour, flour paste, and meal; examples of dairy products provided for herein are milk and cheese.

555 With glue or gelatin:

This subclass is indented under subclass 551. Subject matter wherein glue or gelatin is a component in a consolidated solid fuel composition.

- (1) Note. The glue or gelatin will normally, but not necessarily, serve a binding function.
- (2) Note. The term “gelatinized” often has no reference to gelatin, per se, but instead refers to a modification of physical state; the term, therefore, does not, per se, qualify for classification herein.
- (3) Note. Gelatin is a protein; glue, without further specification, is a naturally occurring animal product.
- (4) Note. The term “glutinous” often refers simply to the consistency of a substance, and does not, per se, qualify for classification herein.

556 With nonproteinaceous organic nitrogen compound (e.g., hexamethyl enetetramine, alkanolamine salts, etc.):

This subclass is indented under subclass 551. Subject matter wherein a nonproteinaceous organic nitrogen compound is a component in a consolidated solid fuel composition.

- (1) Note. An organic nitrogen compound is one wherein nitrogen is attached directly or indirectly by nonionic bonding to carbon of an organic compound.
- (2) Note. See Glossary in the class definition for the definition of “organic compound”.
- (3) Note. The organic nitrogen compound normally, but not necessarily, serves a binding function.

557 With phosphorus- or boron-containing compound:

This subclass is indented under subclass 551. Subject matter wherein a phosphorus-containing compound or a boron-containing compound is a component in a consolidated solid fuel composition.

- (1) Note. The phosphorus- or boron-containing compound normally, but not necessarily, serves a binding function.

558 With oxidant (e.g., nitrates, chlorates, chromates, permanganates, black manganese oxide, etc.):

This subclass is indented under subclass 551. Subject matter wherein an oxygen-furnishing substance is a component in a consolidated solid fuel composition.

- (1) Note. The oxygen-furnishing substance may also serve a binding function.

SEE OR SEARCH CLASS:

149, Explosive and Thermic Compositions or Charges, subclasses 17+, for solidified matrices which include an oxidizing agent, and which function as explosives or propellants as provided by Class 149.

559 With gypsum or silicon-containing material (e.g., clay, portland cement, water glass, etc.):

This subclass is indented under subclass 551. Subject matter wherein gypsum or a silicon-containing material is a component in a consolidated solid fuel composition.

- (1) Note. The gypsum or silicon-containing material normally, but not necessarily, serves a binding function.
- (2) Note. Gypsum, calcium sulfate, is also known as plaster of paris.
- (3) Note. Cement, without further specification, shall be considered a silicon-containing material; there do exist, however, nonsiliceous cements, and such cements specified as being nonsiliceous shall be classified commensurate with their specified nature.

560 With nonfibrous carbohydrate (e.g., molasses, starch, etc.):

This subclass is indented under subclass 559. Subject matter wherein the consolidated solid fuel composition also contains a nonfibrous carbohydrate as a component.

- (1) Note. The nonfibrous carbohydrate normally, but not necessarily, serves a binding function.
- (2) Note. For the definition of carbohydrate, see the Class 536 class definition.
- (3) Note. The expression "nonfibrous" is intended to differentiate paper and raw, woody-type material, such as leaves, sawdust, seaweed, bark, etc., from carbohydrate substances which, by virtue of processing, no longer retain fibrous character.

561 With pitch, tar, tar oil, or bitumen:

This subclass is indented under subclass 559. Subject matter wherein the consolidated solid fuel composition also contains a pitch, tar, tar oil, or bitumen as a component.

- (1) Note. Bituminous coal is not a bitumen; asphalts and asphaltenes are bitumens.
- (2) Note. Pitch, tar, and tar oil must be identified as such in order to be classified herein; pitch, tar, and tar oil from any source are classified herein.

562 With paraffin, liquid hydrocarbon, or wax hydrocarbon:

This subclass is indented under subclass 559. Subject matter wherein the consolidated solid fuel composition also contains paraffin, a liquid hydrocarbon, or a hydrocarbon wax as a component.

- (1) Note. The paraffin, liquid hydrocarbon, and hydrocarbon wax normally, but not necessarily, serve a binding function.
- (2) Note. Hydrocarbon oils shall be considered to be liquid hydrocarbon oils, unless otherwise specified.

- (3) Note. Hydrocarbon residuums and petroleum residuums shall be considered liquid, unless otherwise specified.
- (4) Note. Wax, without further specification, shall be considered hydrocarbon wax.
- (5) Note. See Glossary in the class definition for the definition of hydrocarbon.

563 With fibrous vegetable material, resin, or organic -C(=O)O- compound (e.g., rosin, tall oil, tallow, pine resin, etc.):

This subclass is indented under subclass 559. Subject matter wherein the consolidated solid fuel composition also contains fibrous vegetable material, resin, or an organic -C(=O)O- compound.

- (1) Note. Fibrous vegetable material is vegetable material whose fibrous nature has not been destroyed by processing; examples of fibrous vegetable materials are paper, cellulose, wood, bark, and sawdust.
- (2) Note. The term “resin” is intended to include all material identified as unspecified resin, all natural resins, and synthetic resins not prepared by polymerization or copolymerization of a specified monomer or specified monomers.
- (3) Note. An organic -C(=O)O- compound is one in which the carbon of the -C(=O)O- group is, or is attached directly or indirectly by nonionic bonding to, the carbon of an organic compound.
- (4) Note. See Glossary in the class definition for the definition of “organic compound”.
- (5) Note. The components of the consolidated solid fuel compositions specified in this subclass normally, but not necessarily, serve a binding function.

564 Tar, pitch, or tar oil:

This subclass is indented under subclass 551. Subject matter wherein tar, pitch, or tar oil is a component in a consolidated solid fuel composition.

- (1) Note. The tar, pitch, or tar oil normally, but not necessarily, serves a binding function.
- (2) Note. Tar, pitch, or tar oil must be identified as such in order to be classified herein; tar, pitch, and tar oil from any source are classified herein.

565 With nonfibrous carbohydrate (e.g., molasses, starch, etc.):

This subclass is indented under subclass 564. Subject matter wherein the consolidated solid fuel composition also contains a nonfibrous carbohydrate as a component.

- (1) Note. The nonfibrous carbohydrate normally, but not necessarily, serves a binding function.
- (2) Note. For the definition of carbohydrate, see the Class 536 class definition.
- (3) Note. The expression “nonfibrous” is intended to differentiate paper and raw, woody-type material, such as leaves, sawdust, seaweed, bark, etc. from carbohydrate substances which, by virtue of processing, no longer retain fibrous character.

566 With elemental metal, metal oxide, limestone, or inorganic metal salt (e.g., lime, etc.):

This subclass is indented under subclass 564. Subject matter wherein the consolidated solid fuel composition also contains elemental metal, metal oxide, limestone, or an inorganic metal salt.

- (1) Note. The metal, metal oxide, limestone, or inorganic metal salt normally, but not necessarily, serves a binding function.

567 With fibrous vegetable material (e.g., cellulose, wood, paper, sawdust, etc.):

This subclass is indented under subclass 564. Subject matter wherein the consolidated solid fuel composition also contains fibrous vegetable material.

- (1) Note. The fibrous vegetable material normally, but not necessarily, serves a binding function.
- (2) Note. Fibrous vegetable material is vegetable material whose fibrous nature has not been destroyed by processing; examples of fibrous vegetable materials are paper, cellulose, wood, bark and sawdust.

568 Solid fuel, or solid fuel and water, are the only other components of the composition:

This subclass is indented under subclass 564. Subject matter wherein, besides the tar, pitch, or tar oil, the only additional components of the consolidated solid fuel composition are solid fuel, or a mixture of water and solid fuel.

569 With bitumen or asphaltic material:

This subclass is indented under subclass 551. Subject matter wherein a bitumen or asphaltic material is a component in a consolidated solid fuel composition.

- (1) Note. The bitumen or asphaltic material normally, but not necessarily, serves a binding function.
- (2) Note. Bituminous coal is not considered a bitumen.
- (3) Note. Asphalt, asphaltum, and asphaltene are the asphaltic materials intended to be classified herein.

570 With elemental metal, metal oxide, limestone or inorganic metal salt (e.g., lime, etc.):

This subclass is indented under subclass 569. Subject matter where the consolidated solid fuel composition also contains elemental metal, metal oxide, limestone, or inorganic metal salt.

- (1) Note. The metal, metal oxide, limestone, or inorganic metal salt normally, but not necessarily, serves a binding function.

571 With paraffin, liquid hydrocarbon, or wax hydrocarbon:

This subclass is indented under subclass 569. Subject matter wherein the consolidated solid fuel composition also contains paraffin, a liquid hydrocarbon, or a wax hydrocarbon as a component.

- (1) Note. The paraffin, liquid hydrocarbon, and hydrocarbon wax normally, but not necessarily, serve a binding function.
- (2) Note. Hydrocarbon oils shall be considered to be liquid hydrocarbon oils, unless otherwise specified.
- (3) Note. Hydrocarbon residuums and petroleum residuums shall be considered liquid, unless otherwise specified.
- (4) Note. Wax, without further specification, shall be considered hydrocarbon wax.
- (5) Note. See Glossary in the class definition for the definition of "organic compound".

572 With paraffin, liquid hydrocarbon, or wax hydrocarbon:

This subclass is indented under subclass 551. Subject matter wherein a paraffin, liquid hydrocarbon, or a wax hydrocarbon is a component in a consolidated solid fuel composition.

- (1) Note. The paraffin, liquid hydrocarbon, or wax hydrocarbon normally, but not necessarily, serves a binding function.
- (2) Note. Hydrocarbon oils shall be considered to be liquid hydrocarbon oils, unless otherwise specified.
- (3) Note. Hydrocarbon residuums and petroleum residuums shall be considered liquid, unless otherwise specified.

(4) Note. Wax, without further specification, shall be considered hydrocarbon wax.

(5) Note. See Glossary in the class definition for the definition of “organic compound”.

573 With resin or organic -C(=O)O- compound (e.g., rosin, tall oil, tallow, pine resin, carboxylic acid esters, etc.):

This subclass is indented under subclass 572. Subject matter wherein the consolidated solid fuel composition also contains a resin or an organic -C(=O)O- compound as a component.

(1) Note. The resin or organic-C(=O)O- compound normally, but not necessarily, serves a binding function.

(2) Note. The term “resin” is intended to include all material identified as unspecified resin, all natural resins, and synthetic resins not prepared by polymerization or copolymerization of a specified monomer or specified monomers.

(3) Note. An organic -C(=O)O- compound is one in which the carbon of the -C(=O)O- group is, or is attached directly or indirectly by nonionic bonding to, the carbon of an organic compound.

(4) Note. See Glossary in the class definition for the definition of “organic compound”.

574 With preliminary purification of coal (e.g., oil agglomerates of desulfurized or deashed coal, etc.):

This subclass is indented under subclass 572. Subject matter wherein the solid fuel to be consolidated is coal and, prior to consolidation with paraffin, liquid hydrocarbon, or wax hydrocarbon, the coal is subjected to a purification process.

(1) Note. Most often, the preliminary purification process concludes with a water washing, after which the coal is subject to, e.g., agglomeration with oil.

575 With elemental metal, metal oxide, limestone, or inorganic metal salt (e.g., lime, etc.):

This subclass is indented under subclass 572. Subject matter wherein the consolidated solid fuel composition also contains elemental metal, metal oxide, limestone, or an inorganic metal salt.

(1) Note. The elemental metal, metal oxide, limestone, or inorganic metal salt normally, but not necessarily, serves a binding function.

576 With fibrous vegetable material (e.g., cellulose, wood, paper, sawdust, etc.):

This subclass is indented under subclass 572. Subject matter wherein the consolidated solid fuel composition also contains a fibrous vegetable material as a component.

(1) Note. The fibrous vegetable material normally, but not necessarily, serves a binding function.

(2) Note. Fibrous vegetable material is vegetable material whose fibrous nature has not been destroyed by processing; examples of fibrous vegetable materials are paper, cellulose, wood, bark and sawdust.

577 With nonfibrous carbohydrate (e.g., molasses, starch, etc.):

This subclass is indented under subclass 551. Subject matter wherein a nonfibrous carbohydrate is a component in a consolidated solid fuel composition.

(1) Note. The nonfibrous carbohydrate normally, but not necessarily, serves a binding function.

(2) Note. For the definition of carbohydrate, see the Class 536 class definition.

(3) Note. The expression “nonfibrous” is intended to differentiate paper and raw, woody-type material, such as leaves, sawdust, seaweed, bark, etc., from carbohydrate substances which, by virtue of processing, no longer retain fibrous character.

578 With lignin, lignin derivative, or sulfite liquor (e.g., lignones, lignosulfonates, etc.):

This subclass is indented under subclass 551. Subject matter wherein a lignin, lignin derivative, or sulfite liquor is a component in a consolidated solid fuel composition.

- (1) Note. The lignin, lignin derivative, or sulfite liquor normally, but not necessarily, serves a binding function.
- (2) Note. Lignin is an amorphous product of indeterminate structure that forms the lamella of many plant fibers, and cements the plant fibers together.
- (3) Note. For purposes of this subclass, to be a lignin derivative, a substance must be identified as such; the prefix "ligno" is taken as prima facie indication of lignin derivation.
- (4) Note. Sulfite liquor is the waste liquor from the pulping of wood by the sulfite process; lignosulfonates, ash, calcium compounds, free sulfur dioxide, etc. are components thereof.
- (5) Note. Lignite is not considered as a lignin derivative for purposes of this subclass; rather, it is considered as a solid fuel and, as such, may be classified in any of subclass 551 or its indents when claimed in admixture with a specified binder.

579 With rubber, resin, or organic -C(=O)O- compound (e.g., rosin, tall oil, tallow, pine resin, carboxylic acids, etc.):

This subclass is indented under subclass 551. Subject matter wherein a rubber, resin, or organic -C(=O)O- compound is a component in a solid fuel composition.

- (1) Note. The rubber, resin, or organic -C(=O)O- compound normally, but not necessarily, serves a binding function.
- (2) Note. The term "resin" is intended to include all material identified as unspecified resin, all natural resins, and synthetic resins not prepared by polymerization or copolymerization of a

specified monomer or of specified monomers.

- (3) Note. An organic -C(=O)O- compound is one in which the carbon of the -C(=O)O- group is, or is attached directly or indirectly by nonionic bonding to, the carbon of an organic compound.
- (4) Note. See Glossary in the class definition for the definition of "organic compound".

580 With limestone, elemental metal, elemental sulfur, or inorganic compound (except water):

This subclass is indented under subclass 551. Subject matter wherein limestone, elemental metal, elemental sulfur, or an inorganic compound is a component in a consolidated fuel composition, excluding those compositions wherein water is the sole inorganic compound present.

- (1) Note. The limestone, elemental metal, elemental sulfur, or inorganic compound will normally, but not necessarily, serve a binding function.

SEE OR SEARCH THIS CLASS, SUBCLASS:

551, for consolidated solid fuel compositions with specified binders that contain undifferentiated inorganic or inorganic-organic materials such as earth, loam, etc.

589 Vegetation or refuse:

This subclass is indented under subclass 550. Subject matter in which the starting material is derived from a plant or a material which would ordinarily be thrown away if it were not salvaged for its fuel value.

- (1) Note. "Refuse" includes the ordinarily waste product of combustion or fuel processing, e.g., cinders, fly-ash, soot, coal fines, etc., as well as municipal waste, industrial waste, sewage products, etc.

- SEE OR SEARCH CLASS:
428, Stock Material or Miscellaneous Articles, subclass 2 for a compacted trash or refuse bundle not intended primarily for use as a fuel.
- 590 Wood, sawdust or paper:**
This subclass is indented under subclass 589. Subject matter in which the vegetation or refuse is a solid derived from the trunk or branches of trees or bushes, or from manufactured cellulosic sheet materials.
- 591 Carbonized material (e.g., coke, etc.):**
This subclass is indented under subclass 550. Subject matter in which the starting fuel material is one containing free carbon, usually produced by a thermolytic distillation process, or in which a product is claimed which results from the conversion of a carbon compound to free carbon.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
599, for a process of making a consolidated-solids fuel composition in which carbonization conditions or a carbonization technique is specified.
- SEE OR SEARCH CLASS:
201, Distillation: Processes, Thermolytic, appropriate subclasses for a process of complete carbonization with recovery of volatile materials.
- 592 “Low-rank” coal (e.g., lignite, etc.):**
This subclass is indented under subclass 550. Subject matter in which a starting material is coal of lesser heat value than bituminous coal, including brown coal, lignite, etc.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
491, for a fuel briquet having peat as a starting material.
- 593 Consolidation process using specified condition or technique:**
This subclass is indented under subclass 550. Process which includes a step which takes place under a described condition, e.g., a designated temperature, etc., or is described in more than merely nominal term, e.g., using a particular apparatus, material transportation method, etc.
- 594 Predrying or moistening:**
This subclass is indented under subclass 593. Subject matter in which the condition or technique described has the function or wetting a material or drying a material before the consolidation step or steps.
- 595 Comminuting (e.g., grinding, etc.):**
This subclass is indented under subclass 593. Subject matter in which the condition or technique described is one for making pieces of fuel smaller.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
500, for a comminuting process in which a particulate fuel is the desired final product.
- 596 Pressing:**
This subclass is indented under subclass 593. Subject matter in which the condition or technique described is one involving the application of pressure to the fuel composition.
- SEE OR SEARCH CLASS:
264, Plastic and Nonmetallic article Shaping or Treating: Processes, appropriate subclasses for a molding process, per se.
- 597 With applied heat:**
This subclass is indented under subclass 596. Subject matter in which the condition or technique is one for removing moisture from the consolidated product or subjecting the product to a temperature considerably above ambient temperature.
- 598 Baking or drying of formed product:**
This subclass is indented under subclass 593. Subject matter in which the condition or technique is one for removing moisture from the consolidated product or subjecting the product to a temperature considerably above ambient temperature.

- 599 With chemical reaction (e.g., carbonizing, etc.):**
This subclass is indented under subclass 593. Subject matter in which the condition or technique involves a chemical reaction to produce a compound or a material in elemental form not present in the composition before the reaction, for example, reducing a carbon compound to elemental carbon.
- SEE OR SEARCH CLASS:
201, Distillation: Process, Thermolytic, appropriate subclasses for the high-temperature treatment of carbonaceous materials to produce coke or charcoal along with recoverable gases or vapors.
208, Mineral Oils: Processes and Products, subclasses 50+ for a plural-conversion mineral-oil treating process which includes coking.
264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclasses 29.1+ for a process of that class which includes carbonizing to form an article.
- 600 WITH APPEARANCE MODIFYING ADDITIVE OR TREATMENT:**
This subclass is indented under the class definition. Product or process in which the fuel is treated or material is added to a fuel to result in a changed visual effect, e.g., dyeing or marking the fuel, polishing it, etc.
- (1) Note. It is the appearance of the cold fuel, before or after burning, which is modified.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
642, for a colorant composition for burning flames.
- SEE OR SEARCH CLASS:
40, Card, Picture, or Sign Exhibiting, for fluid-carried indicia, per se.
- 601 WITH ANTIFREEZING ADDITIVE OR TREATMENT:**
This subclass is indented under the class definition. Product or process in which fuel is treated or material is added to the fuel to prevent undesired clumping of fuel portions under the influence of cold temperatures.
- 602 WITH ANTIDUSTING ADDITIVE:**
This subclass is indented under the class definition. Product or process in which the fuel product contains a material which prevents formation of dust in handling the fuel or prevents fuel dust from being dispersed into the atmosphere or a combustion zone.
- SEE OR SEARCH CLASS:
252, Compositions, subclass 88.1 for a dust or particle-adherent composition, per se.
- 603 WITH COMBUSTION IMPROVER:**
This subclass is indented under the class definition. Product or process in which the fuel is combined with a material which imparts improved characteristics to the fuel which it is being burned.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
502, or 542, for a fuel particle or product, respectively, having combustion properties improved by containing a more readily ignitable coating or impregnant
520, for a fuel product having combustion characteristics improved by holes therein.
532, for a fuel product having combustion characteristics improved by its shape.
- 604 Sulfur bindant:**
This subclass is indented under subclass 603. Subject matter in which the additive improves burning by retarding sulfur-containing material form passing off with the combustion gases.
- 605 FROM VEGETATION OR REFUSE:**
This subclass is indented under the class definition. Product or process in which the starting material is plant materia or a material which would ordinarily be thrown away if it were not salvaged for its fuel value.
- (1) Note. "Refuse" Includes the ordinarily waste products of combustion or of fuel processing, e.g., cinders, fly-ash, soot, coal fines, etc., as well as municipal

- waste, industrial waste, sewage products, etc.
- 606 Wood, sawdust or paper:**
This subclass is indented under subclass 604. Subject matter in which the vegetation or refuse is a solid derived from the trunk or branches of trees for bushes, or from manufactured cellulosic sheet materials.
- 607 CARBONIZED COMPONENT (E.G., COKE, ETC.):**
This subclass is indented under the class definition. Product or process in which the product contains for is derived from the product of a thermolytic distillation or other chemical reaction which produces free carbon from a carbon compound.
- (1) Note. See the references under SEARCH CLASS in subclass 559.
- 608 "LOW-RANK" COAL (E.G., LIGNITE, ETC.):**
This subclass is indented under the class definition. Product or process in which a starting material is coal of less heat value than bituminous coal, including brown coal, lignite, etc.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
490, for fuel made of peat.
- 620 COAL TREATING PROCESS OR PRODUCT THEREOF:**
This subclass is indented under the class definition. Process in which a solid mineral hydrocarbonaceous material is treated by a chemical or physico-chemical procedure to improve its value as a fuel, or a product resulting from such a process.
- (1) Note. Where a patent claims a process only, and the process yields other recoverable products than treated coal, see the search notes to the main class definition for the proper placement of such patent.
- (2) Note. Where a treated coal solid product is the only product claimed, the patent is placed here (Class 44) regardless of any process claimed for its manufacture; however, where other products are also
- claimed, see (1) Note of the class definition.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
490, and 608, for the treatment of peat and subbituminous coal, respectively.
500, for a treatment process designed to result in a particulate coal product.
- SEE OR SEARCH CLASS:
201, Distillation: Processes, Thermolytic, appropriate subclasses especially subclass 6 and 8 for shaping or comminuting coal, respectively, prior to charging it to a carbonizing zone.
208, Mineral Oils: Processes and Products, subclasses 400+ for a coal liquefaction process, especially subclass 403 for a chemical modification of coal before hydrogenation.
423, Chemistry of Inorganic Compounds, subclass 461 for the recovery of pure elemental carbon from coal.
585, Chemistry of Hydrocarbon Compounds, subclass 943 for a collection of patents concerned with production of a relatively pure hydrocarbon from coal.
- 621 Removal of undesirable:**
Subject matter under subclasses 620 wherein the coal is purified.
- SEE OR SEARCH CLASS:
201, Distillation: Processes, Thermolytic, subclass 17 for such a process which includes refining the resulting char.
- 622 Sulfur:**
This subclass is indented under subclass 621. Subject matter wherein sulfur is removed from coal.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
604, for a process wherein a material is added to coal to retard escape of sulfur-containing materials with combustion gases, or the product of such a process.

623 Using a transition metal-containing material:

This subclass is indented under subclass 622. Subject matter wherein a process includes the use of a free metal or metal compound in which the metal has an inner electron shell, rather than an outer shell, partially filled.

- (1) Note. In the periodic table this class of metals includes elements 21 through 30 (scandium through zinc), 39 through 48 (yttrium through cadmium), 57 through 80 (lanthanum through mercury) and 80+ (actinium through the transuranium elements).

624 Using liquid aqueous material:

This subclass is indented under subclass 622. Subject matter wherein the process includes the use of a liquid material and requires the presence of liquid water.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 623, for a process wherein the liquid material contains a compound of a transition metal.

625 And treatment with gas:

This subclass is indented under subclass 624. Subject matter in which the coal is treated also with a gaseous material, prior, subsequent to or concurrently with, the liquid aqueous material.

626 Water (e.g., drying, etc.):

This subclass is indented under subclass 621. Subject matter in which free or combined water is removed from coal.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 594, and 598, for a drying procedure involved in the manufacture of fuel briquets.

627 Ash or ash-former:

This subclass is indented under subclass 621. Subject matter wherein incombustible materials are removed from coal, generally noncarbonaceous, earthy, materials.

628 MISCELLANEOUS FUEL COMPOSITION:

This subclass is indented under the class definition. Fuel composition not provided for above, or a process for making such a composition.

- (1) Note. The composition usually has a main component a synthetically produced solid carbonaceous material.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 589, and 605, for a fuel product made from industrial or municipal waste, e.g., ordinarily unusable resin or rubber compositions, etc.

SEE OR SEARCH CLASS:

- 149, Explosive and Thermic Compositions or Charges, subclasses 120+ for a collection of patents drawn to "high-energy" fuel compounds useful in rocket propellant compositions.

629 APPARATUS FOR MAKING OR TREATING FUEL COMPOSITION:

This subclass is indented under the class definition. Apparatus for performing a process of this class.

- (1) Note. A patent for apparatus performing only one operation or function, and of general character or utility, but which may be used in fuel-making, such as stirring, sawing, sifting, pressing, etc., is usually classed with a patent in the more general class, unless specifically limited to the making of fuel.

SEE OR SEARCH CLASS:

- 100, Presses, subclasses 70+ for presses combined with means to additionally treat the material.
144, Woodworking, subclasses 50+ for a wood match-making process or apparatus.
202, Distillation: Apparatus.
209, Classifying, Separating, and Assorting Solids.
241, Solid Material Comminution or Disintegration, appropriate subclasses for comminution combined with prior shaping operations.

- 366, Agitation, appropriate subclasses for agitation devices absent molding means.
- 422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing.
- 630 Peat:**
This subclass is indented under subclass 629. Apparatus specialized for working with peat in its preparation for fuel.
- SEE OR SEARCH CLASS:
100, Presses, appropriate subclasses, for presses not elsewhere provided for.
- 631 Plural operations:**
This subclass is indented under subclass 630. Apparatus special to the working of peat which performs more than one operation on the material.
- SEE OR SEARCH CLASS:
100, Presses, subclass 102, for presses not elsewhere provided for combined with other features.
- 632 With molding:**
This subclass is indented under subclass 631. Apparatus specialized for working peat by performing more than one operation and including the final molding of the peat into briquets.
- SEE OR SEARCH CLASS:
100, Presses, subclasses 70+ for presses combined with means to additionally treat the material, not otherwise provided for, especially subclasses 316+ for a piston and box type press having heating, cooling, or drying means.
425, Plastic Article or Earthenware Shaping or Treating: Apparatus, see the reference in the class definition of Class 44.
- 633 Disintegrating:**
This subclass is indented under subclass 630. Apparatus specially designed to disintegrate peat, generally to separate the coarser roots, stones, etc., from the finer material.
- SEE OR SEARCH CLASS:
241, Solid Material Comminution or Disintegration, for comminution of solid material, per se.
366, Agitating, for machines for mixing by agitation.
- 634 Briquetting:**
This subclass is indented under subclass 629. Subject matter specially adapted for use in manufacturing a fuel briquet.
- 635 Plural operations:**
This subclass is indented under subclass 634. Apparatus which performs more than one operation in the preparation of the fuel for briquetting.
- SEE OR SEARCH CLASS:
100, Presses, subclass 102, for presses not elsewhere provided for, combined with other features.
- 636 With molding:**
This subclass is indented under subclass 635. Apparatus which performs more than one operation in the making of briquets, and includes in such operations the final one of briquetting the material.
- SEE OR SEARCH CLASS:
100, Presses, subclasses 70+, for presses combined with means to additionally treat the material, not elsewhere provided for, especially subclasses 316+ for a piston and box type press having heating, cooling, or drying means.
241, Solid Material Comminution or Disintegration, appropriate subclasses, for comminution combined with shaping operations.
366, Agitating, appropriate subclasses.
- 639 Liquid:**
This subclass is indented under subclass 629. Subject matter specialized for use in the compounding of a liquid fuel.
- SEE OR SEARCH CLASS:
137, Fluid Handling, appropriate subclasses for process and apparatus for mixing, transporting and regulating

the flow of liquids and gases in general.

640 WALL DEPOSIT PREVENTING OR REMOVING COMPOSITION (E.G., SOOT REMOVAL, ETC.):

This subclass is indented under the class definition. Composition designed to be added to a fuel or a combustion apparatus so that in the combustion of the fuel carbonaceous deposits will be removed from the combustion and associated apparatus, or prevented from being deposited thereon, or a process for making such a composition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

603, for a solid fuel composition containing a soot preventing or removing component.

SEE OR SEARCH CLASS:

134, Cleaning and Liquid Contact With Solids, appropriate subclasses for a cleaning process in general.

252, Compositions, subclasses 175+ for scale preventing compositions.

510, Cleaning Compositions for Solid Surfaces, Auxiliary Compositions Therefor, or Processes of Preparing the Compositions, for cleaning compositions, including detergents, and subclasses 245+ for scale removing compositions.

641 SOLID FUEL COMBUSTION IMPROVING COMPOSITION:

This subclass is indented under the class definition. Composition which in itself is not a fuel, designed to be added to a solid fuel while it is being burned, or a process for making such a composition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

603, for a fuel product containing a combustion improver.

642 FLAME COLORANT COMPOSITION:

This subclass is indented under the class definition. Composition designed to be added to a solid fuel so that during burning of the fuel a flame will have a color different from the color

produced without the additive, or a process for making such a composition.

SEE OR SEARCH CLASS:

431, Combustion, subclass 126 for a combustion process wherein a flame coloring additive is used.

643 MATCH SCRATCHER COMPOSITION OR STRUCTURE:

This subclass is indented under the class definition. Composition or device carrying friction-surface on which matches may be scratched.

(1) Note. The devices are frequently formed on articles having some other function. Some are to be fastened on the wall, some to clothing; some are carried in the pocket.

SEE OR SEARCH CLASS:

51, Abrasive Tool Making Process, Material, or Composition, for an abrasive composition or configuration.

131, Tobacco, subclass 351, for match-scratching surfaces combined with cigars and cigarettes, and subclasses 185, 234, and 249, for match-scratching surfaces combined with tobacco users' appliances.

206, Special Receptacle or Package, subclasses 98+, 108+ 112+, and 137+ for a match packet, container or holder including scratcher means.

221, Article Dispensing, subclasses 137+, for article-dispensing devices including match striking means.

431, Combustion, subclass 250, for a burner having a flame enclosure with a match scratching surface within the enclosure; and subclasses 269+ for a residual igniting device holding and firing a charge type igniting unit, e.g., match, etc.

CROSS-REFERENCE ART COLLECTIONS

901 FUEL COMBINED WITH MATERIAL TO BE HEATED:

Collection of patents under the definition of this class or of Class 149 which show a heating means combined with a material or object to be heated.

- (1) Note. The purpose of this subclass is not completeness, but rather to show a variety of materials or objects, usually hand-manipulable material or objects, combined with means to heat them.

SEE OR SEARCH CLASS:

126, Stoves and Furnaces, for heating devices, per se, especially subclasses 263.01+ for the combination of a fuel with a container in which it is used, and the definitions thereto for a directory of similar subject matter.

- 902 Flameless or glowless, e.g., hair curler, etc.:**
This subclass is indented under subclass 901. Patents having a flameless or glowless fuel of the type provided for in subclasses 250+ of this class.
- 903 METHOD INCLUDING MEASURING, TESTING OR AUTOMATIC CONTROL:**
Collection of patents drawn to the manufacturing process of a fuel composition which process includes a step which is automatically controlled, or a step of measuring or testing a quality or quantity of a component, the resulting composition or a process variable.
- 904 METHOD INVOLVING ELECTRIC OR WAVE ENERGY:**
Collection of patents drawn to the manufacturing process of a fuel composition which process includes a step wherein electricity or wave energy, including conic energy, is directly applied to a starting, intermediate or final material in a process.
- 905 METHOD INVOLVING ADDED CATALYST:**
Collection of patents drawn to the manufacturing process of a fuel composition which process includes a step wherein a material described as a catalyst, reaction accelerator or acceleration retarder is added to a starting, intermediate or final material in the process.

END