CPC COOPERATIVE PATENT CLASSIFICATION

F MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING
(NOTE omitted)

ENGINES OR PUMPS

F02 COMBUSTION ENGINES; HOT-GAS OR COMBUSTION-PRODUCT ENGINE PLANTS

F02M SUPPLYING COMBUSTION ENGINES IN GENERAL WITH COMBUSTIBLE MIXTURES OR CONSTITUENTS THEREOF

NOTES
1. Attention is drawn to the notes preceding class F01.
2. In this subclass the following terms are used with the meanings indicated:
   • “Carburettors” means essentially apparatus for mixing fuel with air, the fuel being brought into mixing contact with the air by lowering the air pressure, e.g. in a venturi;
   • “Fuel injection apparatus” means apparatus for introducing fuel into a space, e.g. engine cylinder, by pressurising the fuel, e.g. by a pump acting behind the fuel, and thus embraces the so-called “solid fuel injection” in which liquid fuel is introduced without any admixture of gas;
   • “Low-pressure fuel injection” means fuel injection in which the fuel-air mixture containing fuel thus injected will be substantially compressed in the compression stroke of the engine;
   • “Pumping element” means a single piston-cylinder unit in a reciprocating-piston fuel-injection pump or the equivalent unit in any other type of fuel-injection pump.

WARNING
{ In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme. }

Carburettors for liquid fuels

1/00 Carburettors with means for facilitating engine's starting or its idling below operational temperatures

NOTE
- in this group the following indexing codes are used: F02M 2700/4302

1/005 [Remote display or control for displaying the operational situation of the starter]
1/02 the means to facilitate starting or idling being chokes for enriching fuel-air mixture (automatic chokes F02M 1/08)
1/04 the means to facilitate starting or idling being auxiliary carburettting apparatus able to be put into, and out of, operation, e.g. having automatically-operated disc valves
1/043 [Auxiliary carburettting apparatus controlled by rotary sliding valves]
1/046 [Auxiliary carburettting apparatus controlled by piston valves]
1/06 having axially-movable valves, e.g. piston-shaped
1/08 the means to facilitate starting or idling becoming operative or inoperative automatically (in connection with auxiliary carburettting apparatus F02M 1/04)
1/10 dependent on engine temperature, e.g. having thermostat
1/12 with means for electrically heating thermostat
1/14 dependent on pressure in combustion-air- or fuel-air-mixture intake (dependent on both pressure in combustion-air or fuel-air-mixture intake and engine temperature F02M 1/10)
1/16 Other means for enriching fuel-air mixture during starting: Priming cups; using different fuels for starting and normal operation
1/165 [Vaporizing light fractions from the fuel and condensing them for use during starting]
1/18 Enriching fuel-air mixture by depressing float to fuel carburettor
1/185 [Enriching the fuel-air mixture by altering the float chamber level by external means, e.g. by opening the input valve]

3/00 Idling devices for carburettors (with means for facilitating engine’s idling below operational temperatures F02M 1/00)

3/005 [Idling fuel enrichment with motor driven instead of driving; Switching the fuel supply from the main to idling jet system]
3/02 Preventing flow of idling fuel
3/04 under conditions where engine is driven instead of driving, e.g. driven by vehicle running down hill
3/041 [Removal of the fuel from the main jet system, e.g. by means of a pump]
3/042 [Fuel cut-off by altering the pressure in the float chamber; Arrangement of pneumatic accumulators for pressure equalization]
Carburettors for liquid fuels

3/043 . . . [Devices as described in F02M 3/005, F02M 3/041, F02M 3/042, F02M 3/045, F02M 3/05 and F02M 3/055 and also equipped with additional air]

3/045 . . . Control of valves situated in the idling nozzle system, or the passage system, by electrical means or by a combination of electrical means with fluidic or mechanical means

3/05 . . . Pneumatic or mechanical control, e.g. with speed regulation

3/055 . . . Fuel flow cut-off by introducing air, e.g. brake air, into the idling fuel system

3/06 . . . Increasing idling speed

3/062 . . . [by altering as a function of motor r.p.m. the throttle valve stop or the fuel conduit cross-section by means of pneumatic or hydraulic means (external damping elements F02M 19/122)]

3/065 . . . [by randomly altering the throttle valve stop]

2003/067 . . . [the valve for controlling the cross-section of the conduit being rotatable, but not being a screw-like valve]

3/07 . . . by positioning the throttle flap stop, or by changing the fuel flow cross-sectional area, by electrical, electromechanical or electropneumatic means, according to engine speed

3/075 . . . [the valve altering the fuel conduit cross-section being a slidable valve]

3/08 . . . Other details of idling devices (fighting ice-formation by heating idling ports F02M 15/02)

3/09 . . . Valves responsive to engine conditions, e.g. manifold vacuum (carburettors with means for facilitating engine’s idling below operational temperatures F02M 1/00)

3/10 . . . Fuel metering pins; Nozzles

2003/105 . . . [Needle adjustment limiter caps]

3/12 . . . Passageway systems

3/14 . . . Location of idling system outlet relative to throttle valve

5/00 Float-controlled apparatus for maintaining a constant fuel level

5/02 . . . with provisions to meet variations in carburettor position, e.g. upside-down position in aircraft

5/04 . . . with pivotally or rotatably mounted float chambers [basic adjustment of float chambers having variable position F02M 5/14]

5/06 . . . having adjustable float mechanism, e.g. to meet dissimilarities in specific gravity of different fuels

5/08 . . . having means for venting float chambers

5/085 . . . [consisting of an overflow from the float chamber]

5/10 . . . having means for preventing vapour lock, e.g. insulated float chambers or forced fuel circulation through float chamber with engine stopped

5/105 . . . [Auxiliary input valve which can be regulated to obtain an increased fuel supply from the float chamber]

5/12 . . . Other details, e.g. floats, valves, setting devices or tools

5/125 . . . [Shape of the jet needle]

5/14 . . . [Float chambers, e.g. adjustable in position (float chamber with a built-in intermediate reservoir F02M 7/06)]

5/16 . . . Floats

7/00 Carburettors with means for influencing, e.g. enriching or keeping constant, fuel/air ratio of charge under varying conditions (choke valves for starting F02M 1/00)

7/02 . . . Carburettors having aerated fuel spray nozzles

7/025 . . . [Fuel cut-off by introducing brake air in the conduit system leading to the main jet (fuel cut-off by introducing brake air into the idling fuel system F02M 3/055)]

7/04 . . . Means for enriching charge at high combustion-air flow

7/045 . . . [Mechanical adjustment of the spray nozzle cross-section in connection with the choke]

7/06 . . . Means for enriching charge on sudden [air] throttle opening, i.e. at acceleration, e.g. storage means in passage way system

WARNING
Group F02M 7/06 is impacted by reclassification into groups F02M 71/00, F02M 71/02, and F02M 71/04.

All groups listed in this Warning should be considered in order to perform a complete search.

7/08 . . . using pumps

WARNING
Group F02M 7/08 is impacted by reclassification into groups F02M 71/00, F02M 71/02, and F02M 71/04.

All groups listed in this Warning should be considered in order to perform a complete search.

7/083 . . . [a pump sucking fuel from the conduit system leading to the spray nozzle downstream of the metering cross-section during deceleration]

WARNING
Group F02M 7/083 is impacted by reclassification into groups F02M 71/00, F02M 71/02, and F02M 71/04.

All groups listed in this Warning should be considered in order to perform a complete search.

7/087 . . . changing output according to temperature in engine

WARNING
Group F02M 7/087 is impacted by reclassification into groups F02M 71/00, F02M 71/02, and F02M 71/04.

All groups listed in this Warning should be considered in order to perform a complete search.
Carburettors for liquid fuels

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7/093 . . . changing output according to intake vacuum

**WARNING**

Group F02M 7/093 is impacted by reclassification into groups F02M 7/00, F02M 7/02, and F02M 7/04.

All groups listed in this Warning should be considered in order to perform a complete search.

7/10 . . . Other installations, without moving parts, for influencing fuel/air ratio, e.g. electrical means (fuel aerating devices for influencing fuel/air ratio F02M 7/23)

**WARNING**

Group F02M 7/10 is impacted by reclassification into groups F02M 7/23, F02M 7/24, F02M 7/245, F02M 7/26, and F02M 7/28.

All groups listed in this Warning should be considered in order to perform a complete search.

7/103 . . . [with self-acting equaliser jets]

**WARNING**

Group F02M 7/103 is impacted by reclassification into groups F02M 7/23, F02M 7/24, F02M 7/245, F02M 7/26, and F02M 7/28.

All groups listed in this Warning should be considered in order to perform a complete search.

7/106 . . . [Fluid amplifier as a device for influencing the fuel-air mixture]

**WARNING**

Group F02M 7/106 is impacted by reclassification into groups F02M 7/23, F02M 7/24, F02M 7/245, F02M 7/26, and F02M 7/28.

All groups listed in this Warning should be considered in order to perform a complete search.

7/11 . . . Altering float-chamber pressure (enriching the fuel-air mixture during starting by depressing float to flood carburettor F02M 1/18)

**WARNING**

Group F02M 7/11 is impacted by reclassification into groups F02M 7/23, F02M 7/24, F02M 7/245, F02M 7/26, and F02M 7/28.

All groups listed in this Warning should be considered in order to perform a complete search.

7/12 . . . Other installations, with moving parts, for influencing fuel/air ratio, e.g. having valves (F02M 7/24 takes precedence)

7/127 . . . Altering the float-chamber pressure (enriching the fuel-air mixture during starting by depressing float to flood carburettor F02M 1/18)

7/133 . . . Auxiliary jets, i.e. operating only under certain conditions, e.g. full power (means for enriching charge at high combustion-air flow F02M 7/04; means for enriching charge on sudden throttle opening, i.e. at acceleration F02M 7/06)

7/14 . . . with means for controlling cross-sectional area of fuel spray nozzle (dependent on air-throttle valve position F02M 7/22)

7/16 . . . operated automatically, e.g. dependent on exhaust-gas analysis

7/17 . . . by a pneumatically adjustable piston-like element, e.g. constant depression carburettors

**WARNING**

Group F02M 7/17 is incomplete pending reclassification of documents from groups F02M 9/06 and F02M 9/065.

Groups F02M 7/06, F02M 9/065, and F02M 7/17 should be considered in order to perform a complete search.

7/18 . . . with means for controlling cross-sectional area of fuel-metering orifice (dependent on air-throttle valve position F02M 7/22)

7/20 . . . operated automatically, e.g. dependent on altitude

7/22 . . . fuel flow cross-sectional area being controlled dependent on air-throttle-valve position (the throttle valve being slidably arranged transversely to air passage F02M 9/06)

7/225 . . . (The fuel orifice opening is controlled by a manually actutable throttle valve so as to vary the cross-sectional area of the orifice)

7/23 . . . Fuel aerating devices

**WARNING**

Groups F02M 7/23, F02M 7/24, F02M 7/245, F02M 7/26, and F02M 7/28 are incomplete pending reclassification of documents from groups F02M 7/10, F02M 7/103, F02M 7/106, and F02M 7/11.

All groups listed in this Warning should be considered in order to perform a complete search.

7/24 . . . Controlling flow of aerating air

7/245 . . . (Accessories, e.g. sieves, accelerating wheels, whirl generating devices and the like, for the intimate mixing of emulsifying air with fuel)

7/26 . . . dependent on position of optionally operable throttle means

7/28 . . . dependent on temperature or pressure

9/00 Carburettors having air or fuel-air mixture passage throttling valves other than of butterfly type (register-type carburettors F02M 11/00)

Carburettors having fuel-air mixing chambers of variable shape or position

9/02 . . . having throttling valves, e.g. of piston shape, slidably arranged transversely to the passage

9/023 . . . [General constructional elements]

9/026 . . . [with plate-like throttle valve]

9/04 . . . with throttling valves sliding in a plane inclined to the passage
9/06 Carburettors for liquid fuels

9/06 . . with means for varying cross-sectional area of fuel spray nozzle dependent on throttle position (installations, operated automatically by a pneumatically adjustable piston-like element, for influencing fuel/air ratio F02M 7/17)

**WARNING**

Group F02M 9/06 is impacted by reclassification into group F02M 7/17. Groups F02M 9/06 and F02M 7/17 should be considered in order to perform a complete search.

9/065 . . . [Automatically and not automatically controlled throttle valves operating mutually]

**WARNING**

Group F02M 9/065 is impacted by reclassification into group F02M 7/17. Groups F02M 9/065 and F02M 7/17 should be considered in order to perform a complete search.

9/08 . . having throttling valves rotatably mounted in the passage
9/085 . . . [Fuel spray nozzles in the throttling valves]
9/10 . . having valves, or like controls, of elastic-wall type for controlling the passage, or for varying cross-sectional area, of fuel-air mixing chambers [or of the entry passage]
9/103 . . . [Mechanical control]
9/106 . . . [Pneumatic or hydraulic control]
9/12 . . having other specific means for controlling the passage, or for varying cross-sectional area, of fuel-air mixing chambers
9/121 . . . [Iris diaphragms]
9/122 . . . [consisting of lamellae or wires, e.g. a hyperboloid formed by twisting a wire cylinder]
9/123 . . . [Spiral springs]
9/124 . . . [Throttle valves with an action corresponding to those in apparatus for re-atomising condensed fuel or homogenising fuel-air mixture (shape of throttle valves F02M 3/14)]
9/125 . . . [specially shaped throttle valves not otherwise covered in groups F02M 9/121 - F02M 9/124]
9/127 . . . Axially movable throttle valves concentric with the axis of the mixture passage
9/1275 . . . [Venturi-nozzle shaped type, e.g. a venturi nozzle being moved relative to a fixed mushroom-shaped body]
9/133 . . . the throttle valves having mushroom-shaped bodies
9/14 . . having venturi and nozzle relatively displaceable essentially along the venture axis

**11/00 Multi-stage carburettors, Register-type carburettors, i.e. with slideable or rotatable throttling valves in which a plurality of fuel nozzles, other than only an idling nozzle and a main one, are sequentially exposed to air stream by throttling valve**

11/02 . . with throttling valve, e.g. of flap or butterfly type, in a later stage opening automatically
11/04 . . the later stage valves having damping means
11/06 . . Other carburettors with throttling valve of flap or butterfly type

11/08 . . Register carburettors with throttling valve moveable transversally to air passage
11/10 . . Register carburettors with rotatable throttling valves
11/105 . . [Shape of the idling system]

**13/00 Arrangements of two or more separate carburettors (re-atomising condensed fuel or homogenising fuel-air mixture F02M 29/00): Carburettors using more than one fuel (apparatus for adding small quantities of secondary fuel F02M 25/00)**

13/02 . . Separate carburettors
13/021 . . . [Particular constructional measures of the intake conduits between carburettors and cylinder]
13/023 . . . [Special construction of the control rods]
13/025 . . . [Equalizing pipes between the carburettors, e.g. between the float chambers]
13/026 . . . [Common functional groups for several carburettors, e.g. common idling system]
13/028 . . . [Tuning apparatus for multi-stage carburettors installations (other carburettor tuning apparatus F02M 19/01)]
13/04 . . structurally united
13/043 . . . [arranged in series, e.g. initial and main carburettor]
13/046 . . . [arranged in parallel, e.g. initial and main carburettor]
13/06 . . the carburettors using different fuels
13/08 . . Carburettors adapted to use liquid and gaseous fuels, e.g. alternatively

**15/00 Carburettors with heating, cooling or thermal insulating means for combustion-air, fuel, or fuel-air mixture**

15/02 . . with heating means, e.g. to combat ice-formation
15/022 . . . [near to manually operated throttle valve]
15/025 . . . [Fuel preheating]
15/027 . . . [Air or air-fuel mixture preheating]
15/04 . . . the means being electrical
15/045 . . . . . [for the fuel system, e.g. built into the fuel conduits or nozzles]
15/06 . . Heat shieldings, e.g. from engine radiations

**17/00 Carburettors having pertinent characteristics not provided for in, or of interest apart from, the apparatus of preceding main groups F02M 1/00 - F02M 15/00 (apparatus for treating combustion-air, fuel, or fuel-air mixture by catalysts, electric means, magnetism, rays, sonic waves, or the like F02M 27/00; combinations of carburettors and low-pressure fuel-injection apparatus F02M 71/00)**

17/02 . . Floatless carburettors
17/04 . . having fuel inlet valve controlled by diaphragm
17/06 . . having overflow chamber determining constant fuel level
17/08 . . Carburettors having one or more fuel passages opening in a valve-seat surrounding combustion-air passage, the valve being opened by passing air
17/09 . . . the valve being of an eccentrically mounted butterfly type
17/10 . . Carburettors having one or more fuel passages opening in valve-member of air throttle
17/12 . . . the valve member being of butterfly type
Carburettors for liquid fuels

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17/14 . Carburettors with fuel-supply parts opened and closed in synchronism with engine stroke {Valve carburettors}
17/142 . [with the fuel exit nozzles in or near the valve seat or valve]
17/145 . [the valve being opened by the pressure of the passing fluid]
17/147 . [Valve carburettor with simultaneous air and fuel control]
17/16 . Carburettors having continuously-rotating bodies, e.g. surface carburettors
17/18 . Other surface carburettors
17/20 . with fuel bath
17/22 . with air bubbling through bath
17/24 . with wicks
17/26 . with other wetted bodies
17/28 . fuel being drawn through a porous body
17/30 . Carburettors with fire-protecting devices, e.g. combined with fire-extinguishing apparatus
17/32 . automatically closing fuel conduits on outbreak of fire (fire protection devices for stopping flow from or in pipes or hoses F16L 55/1026)
17/34 . Other carburettors combined or associated with other apparatus, e.g. air filters
17/36 . Carburettors having fitments facilitating their cleaning
17/38 . Controlling of carburettors, not otherwise provided for (external control gear F02M 19/12)
17/40 . Selection of particular materials for carburettors, e.g. sheet metal, plastic, or translucent materials
17/42 . Float-controlled carburettors not otherwise provided for
17/44 . Carburettors characterised by draught direction and not otherwise provided for, [e.g. for model aeroplanes]
17/46 . with down-draught
17/48 . with up- draught [and float draught, e.g. for lawnmower and chain saw motors]
17/50 . Carburettors having means for combating ice-formation (thermally F02M 15/02)
17/52 . Use of cold, produced by carburettors, for other purposes
17/525 . [Use of the intake conduit vacuum]
19/00 Details, component parts, or accessories of carburettors, not provided for in, or of interest apart from, the apparatus of groups F02M 1/00 - F02M 17/00
19/01 . Apparatus for testing, tuning, or synchronising carburettors, e.g. carburettor glow stands
19/02 . Metering-orifices, e.g. variable in diameter (variable during operation F02M 7/18)
19/0203 . [the cross-sectional area being changed pneumatically, e.g. vacuum dependent]
19/0207 . [the cross-sectional area being changed electrically]
19/021 . [the cross-sectional area being changed mechanically]
19/0214 . [Changing the nozzle cross-sectional area as a function of temperature]
19/0217 . [Movable mushroom-shaped spray nozzles]
19/0221 . [with a roughened spray stimulating surface or the like, e.g. sieves near to the nozzle orifice]
19/0225 . [Arrangement of nozzle in the suction passage (idling nozzles F02M 3/08)]
19/0228 . [Ring nozzles]
19/0232 . [Fuel nozzle with device for return flow of leaked fuel]
19/0235 . [Arrangements of several spray nozzles not provided for in F02M 3/00 or F02M 11/00]
19/0239 . [in a fixed nozzle]
19/0242 . [with inserts of porous material]
19/0246 . [Nozzle cleaning]
19/025 . Metering orifices not variable in diameter
19/03 . Fuel atomising nozzles; Arrangement of emulsifying air conduits
19/035 . Mushroom-shaped atomising nozzles
19/04 . Fuel-metering pins or needles
19/06 . Other details of fuel conduits
19/063 . [Built-in electric heaters]
19/066 . [Built-in cleaning elements, e.g. filters]
19/08 . Venturis
19/081 . [Shape of venturi or cross-section of mixture passages being adjustable]
19/082 . [Venturi section being axially slidable in the mixture passages]
19/083 . [Venturi section consisting of a lamellae spring-like structure]
19/085 . [venturi section being made from elastic material, e.g. from rubber-like material]
19/086 . [Venturi suction bypass systems]
19/087 . [Venturi throat consisting of automatically adjusting balls]
19/088 . [Whirl devices and other atomising means in or on the venturi walls]
19/10 . in multiple arrangement, [e.g. arranged in series, fixed, arranged radially offset with respect to each other]
19/105 . [movable axially relative to each other]
19/12 . External control gear, e.g. having dash-pots (dampening means in later stages of multi-stage carburettors F02M 11/04)
19/122 . [Damping elements (pneumatic or hydraulic means for increasing idling speed F02M 3/0623)]
19/124 . [Connecting rods between at least two throttle valves (F02M 1/02 takes precedence)]
19/126 . [Connecting rods between at least a throttle valve and an accelerating pump (F02M 7/08 takes precedence)]
19/128 . [Reserve throttle idle return spring, e.g. for use upon failure of the main spring]

21/00 Apparatus for supplying engines with non-liquid fuels, e.g. gaseous fuels stored in liquid form

NOTE

- in this group the following indexing codes are used: F02M 2700/12 - F02M 2700/13

21/02 . for gaseous fuels
21/0203 . [characterised by the type of gaseous fuel]
21/0206 . [Non-hydrocarbon fuels, e.g. hydrogen, ammonia or carbon monoxide]
21/0209 . [Hydrocarbon fuels, e.g. methane or acetylene]
Gas-air mixing apparatus

F02M 21/0287 . . . . [Means to treat or clean gaseous fuels or fuel systems, e.g. removal of tar, cracking, reforming or enriching]

F02M 21/0286 . . . . [Details of the valve closing elements, e.g. valve seats, stems or arrangement of flow passages]

F02M 21/0284 . . . . [Arrangement of multiple injectors or fuel-air mixers per combustion chamber]

F02M 21/0282 . . . . [Means to treat or clean gaseous fuels or fuel systems, e.g. removal of tar, cracking, reforming or enriching]

F02M 21/0281 . . . . [Adapters, sockets or the like to mount injection valves onto engines; Fuel guiding passages between injectors and the air intake system or the combustion chamber]

F02M 21/0279 . . . . [Port fuel injectors for single or multipoint injection into the air intake system]

F02M 21/0278 . . . . [Details of the actuators therefor]

F02M 21/0275 . . . . [for in-cylinder direct injection, e.g. injector combined with spark plug]

F02M 21/0274 . . . . [Details of actuators therefor]

F02M 21/0273 . . . . [Electric actuators, e.g. solenoid or piezoelectric]

F02M 21/0272 . . . . [Lift valves, i.e. stem operated valves]

F02M 21/0271 . . . . [Details of the valve closing elements, e.g. valve seats, stems or arrangement of flow passages]

F02M 21/0269 . . . . [Outwardly opening valves, e.g. poppet valves]

F02M 21/0267 . . . . [Valves specially shaped for supplying secondary air]

F02M 21/0266 . . . . [Hollow stem valves; Piston valves; Stems having a spherical tip]

F02M 21/0265 . . . . [Details of actuators therefor]

F02M 21/0264 . . . . [Details of the valve closing elements, e.g. valve seats, stems or arrangement of flow passages]

F02M 21/0263 . . . . [Inwardly opening single or multi nozzle valves, e.g. needle valves]

F02M 21/0262 . . . . [Injectors]

F02M 21/0261 . . . . [Details of actuators therefor]

F02M 21/0260 . . . . [Electric actuators, e.g. electric, pneumatic, hydraulic, piezoelectric]

F02M 21/0257 . . . . [Electronic, e.g. solenoid or piezoelectric]

F02M 21/0256 . . . . [Details of the valve closing elements, e.g. valve seats, stems or arrangement of flow passages]

F02M 21/0255 . . . . [Lift valves, i.e. stem operated valves]

F02M 21/0254 . . . . [Electric actuators, e.g. solenoid or piezoelectric]

F02M 21/0253 . . . . [Details of actuators therefor]

F02M 21/0252 . . . . [Details of actuators therefor]

F02M 21/0251 . . . . [Details of actuators therefor]

25/0226 . . . . . [Arrangement of multiple injectors or fuel-air mixers per combustion chamber]

25/0225 . . . . . [Details of actuators therefor]

25/0224 . . . . . [Details of actuators therefor]

25/0223 . . . . . [Details of actuators therefor]

25/0222 . . . . . [Details of actuators therefor]

25/0221 . . . . . [Details of actuators therefor]

25/0220 . . . . . [Details of actuators therefor]

25/0219 . . . . . [Details of actuators therefor]

25/0218 . . . . . [Details of actuators therefor]

25/0217 . . . . . [Details of actuators therefor]

25/0216 . . . . . [Details of actuators therefor]

25/0215 . . . . . [Details of actuators therefor]

25/0214 . . . . . [Details of actuators therefor]

25/0213 . . . . . [Details of actuators therefor]

25/0212 . . . . . [Details of actuators therefor]
Engine-pertinent apparatus for feeding, or treating before their admission to engine, combustion-air, fuel, or...

25/0228 . . . [Adding fuel and water emulsion]
25/025 . . . Adding water
25/028 . . . into the charge intakes
25/03 . . . into the cylinder [or the pre-combustion chamber]
25/032 . . . Producing and adding steam
25/035 . . . into the charge intakes
25/038 . . . into the cylinder [or the pre-combustion chamber]
25/06 . . . adding lubricant vapours
25/08 . . . adding fuel vapours drawn from engine fuel reservoir [ (electrical control of purge system F02D 41/003) ]
25/0809 . . . [Judging failure of purge control system]
25/0818 . . . [having means for pressurising the evaporative emission space]
25/0827 . . . [by monitoring engine running conditions]
25/0836 . . . [Arrangement of valves controlling the admission of fuel vapour to an engine, e.g. valve being disposed between fuel tank or absorption canister and intake manifold]
25/0845 . . . [Electromagnetic valves]
25/0854 . . . [Details of the absorption canister]
25/0863 . . . [with means dealing with condensed fuel or water, e.g. having a liquid trap]
25/0872 . . . [Details of the fuel vapour pipes or conduits]
25/0881 . . . [with means to heat or cool the canister]
25/089 . . . [Layout of the fuel vapour installation]
25/10 . . . adding acetylene, non-waterborne hydrogen, non-airborne oxygen, or ozone
25/12 . . . the apparatus having means for generating such gases [using rays and simultaneously generating ozone F02M 27/06]
25/14 . . . adding anti-knock agents, not provided for in subgroups F02M 25/022 - F02M 25/10

26/00 Engine-pertinent apparatus for adding exhaust gases to combustion-air, main fuel or fuel-air mixture, e.g. by exhaust gas recirculation [EGR] systems

26/001 . . . [Arrangements; Control features; Details]
26/002 . . . [EGR valve being controlled by vacuum or overpressure]
26/0025 . . . [Intake vacuum or overpressure modulating valve]
26/003 . . . [EGR valve controlled by air measuring device]
26/004 . . . [EGR valve controlled by a temperature signal or an air/fuel ratio (lambda) signal]
26/005 . . . [EGR valve controlled by an engine speed signal]
26/0055 . . . [EGR valve controlled by inertia, e.g. having a pendulum controlling the EGR valve]
26/006 . . . [EGR specially adapted for intake systems having two or more fuel injectors per cylinder]
26/007 . . . [EGR specially adapted for engines having two or more spark plugs per cylinder]
26/008 . . . [EGR specially adapted for engines having a combustion chamber divided by the piston at TDC into two or more sub-chambers]
26/009 . . . [EGR combined with means to change air/fuel ratio, ignition timing, charge swirl in the cylinder]
26/001 . . . Internal exhaust gas recirculation, i.e. wherein the residual exhaust gases are trapped in the cylinder or pushed back from the intake or the exhaust manifold into the combustion chamber without the use of additional passages
26/002 . . . EGR systems specially adapted for supercharged engines
26/003 . . . with a single mechanically or electrically driven intake charge compressor
26/004 . . . with a single turbocharger
26/005 . . . High pressure loops, i.e. wherein recirculated exhaust gas is taken out from the exhaust system upstream of the turbine and reintroduced into the intake system downstream of the compressor
26/006 . . . Low pressure loops, i.e. wherein recirculated exhaust gas is taken out from the exhaust downstream of the turbocharger turbine and reintroduced into the intake system upstream of the compressor
26/007 . . . Mixed pressure loops, i.e. wherein recirculated exhaust gas is either taken out upstream of the turbine and reintroduced upstream of the compressor, or is taken out downstream of the turbine and reintroduced downstream of the compressor
26/008 . . . for engines having two or more intake charge compressors or exhaust gas turbines, e.g. a turbocharger combined with an additional compressor
26/009 . . . Constructional details, e.g. structural combinations of EGR systems and supercharger systems; Arrangement of the EGR and supercharger systems with respect to the engine
26/10 . . . having means to increase the pressure difference between the exhaust and intake system, e.g. venturis, variable geometry turbines, check valves using pressure pulsations or throttles in the air intake or exhaust system
26/11 . . . Manufacture or assembly of EGR systems; Materials or coatings specially adapted for EGR systems
26/12 . . . characterised by means for attaching parts of an EGR system to each other or to engine parts
26/13 . . . Arrangement or layout of EGR passages, e.g. in relation to specific engine parts or for incorporation of accessories
26/14 . . . in relation to the exhaust system
26/15 . . . in relation to engine exhaust purifying apparatus
26/16 . . . with EGR valves located at or near the connection to the exhaust system
26/17 . . . in relation to the intake system
26/18 . . . Thermal insulation or heat protection
26/19 . . . Means for improving the mixing of air and recirculated exhaust gases, e.g. venturis or multiple openings to the intake system
26/20 . . . Feeding recirculated exhaust gases directly into the combustion chambers or into the intake runners
26/21 . . . with EGR valves located at or near the connection to the intake system
26/22 . . . with coolers in the recirculation passage
26/23 . . . Lay out, e.g. schematics
26/24 . . . with two or more coolers
with coolers having bypasses
characterised by details of the bypass valve
with air-cooled heat exchangers
with liquid-cooled heat exchangers
Constructional details of the coolers, e.g. pipes, plates, ribs, insulation or materials
Connections of coolers to other devices, e.g. to valves, heaters, compressors or filters; Coolers characterised by their location on the engine
Air-cooled heat exchangers
Liquid-cooled heat exchangers
controlling the temperature of the recirculated gases
with compressors, turbines or the like in the recirculation passage
with means for clearing or treating the recirculated gases, e.g. catalysts, condensate traps, particle filters or heaters
with means for adding fluids other than exhaust gas to the recirculation passage; with reformers
with temporary storage of recirculated exhaust gas (internal exhaust gas recirculation F02M 26/01)
with two or more EGR valves disposed in parallel
with two or more EGR valves disposed in series
with timing means in the recirculation passage, e.g. cyclically operating valves or regenerators; with arrangements involving pressure pulsations characterised by the arrangement of the recirculation passage in relation to the engine, e.g. to cylinder heads, liners, spark plugs or manifolds; characterised by the arrangement of the recirculation passage in relation to specially adapted combustion chambers
having two or more EGR passages; EGR systems specially adapted for engines having two or more cylinders
in which exhaust from only one cylinder or only a group of cylinders is directed to the intake of the engine
in which a main EGR passage is branched into multiple passages
Sensors specially adapted for EGR systems
for determining the characteristics of gases, e.g. composition
the characteristics being temperatures, pressures or flow rates
EGR valve position sensors (details of the sensor installation in the valve housing F02M 26/72)
Detecting, diagnosing or indicating an abnormal function of the EGR system
Arrangements or methods for preventing or reducing deposits, corrosion or wear caused by impurities (arrangement or layout of EGR passages with means for cleaning or treating the recirculated gases F02M 26/35; protection of EGR valves from damage F02M 26/74)
EGR valves combined with other devices, e.g. with intake valves or compressors (combined with intake air throttles F02M 26/64)
Systems for actuating EGR valves
using electric actuators, e.g. solenoids
Rotary actuators, e.g. step motors
using vacuum actuators
having pressure modulation valves
using electronic means, e.g. electromagnetic valves
Constructional details of the actuator; Mounting thereof
using positive pressure actuators; Check valves therefor
in response to air intake pressure
in response to exhaust pressure
[the exhaust back pressure]
in response to fuel pressure
the EGR valve being directly controlled by an operator (the EGR valve being operated together with an intake air throttle F02M 26/64)
the EGR valve being operated together with an intake air throttle
Constructional details of EGR valves
Lift valves, e.g. poppet valves
Pintles; Spindles; Springs; Bearings; Sealing; Connections to actuators
Closing members; Valve seats; Flow passages
having two or more valve-closing members
Flap valves; Rotary valves; Sliding valves; Resilient valves
Multi-way valves
Housings
with means for heating or cooling the EGR valve
Protection from damage, e.g. shielding means
Apparatus for treating combustion-air, fuel, or fuel-air mixture, by catalysts, electric means, magnetism, rays, sound waves, or the like
by catalysts
by electric means, [ionisation, polarisation] or magnetism
(by plasma)
(by permanent magnets)
(with a pulsating magnetic field)
by rays [, e.g. infra-red and ultra-violet]
[Radioactive radiation]
by sonic or ultrasonic waves
Apparatus for re-atomising condensed fuel or homogenising fuel-air mixture (combined with secondary-air supply F02M 23/12 (; collecting condensed fuel F02M 33/02))
having rotary parts [, e.g. fan wheels]

WARNING
Group F02M 29/02 is impacted by reclassification into groups F02M 29/04, F02M 29/06, F02M 29/08, and F02M 29/10.
All groups listed in this Warning should be considered in order to perform a complete search.
Engine-pertinent apparatus for feeding, or treating before their admission to engine, combustion-air, fuel, or...
Engine-pertinent apparatus for feeding, or treating before their admission to engine, combustion-air, fuel, or...

31/068 . . . . [particular constructional aspects of the switching devices, e.g. connecting linkage between two control valves]

**WARNING**

Group **F02M 31/068** is impacted by reclassification into group **F02M 37/30**.

Groups **F02M 31/068** and **F02M 37/30** should be considered in order to perform a complete search.

31/07 . . . . Temperature-responsive control, e.g. using thermostatically-controlled valves (temperature-responsive control of the amount of exhaust gas or combustion air directed to the heat exchange surface **F02M 31/083**)

**WARNING**

Group **F02M 31/07** is impacted by reclassification into group **F02M 37/30**.

Groups **F02M 31/07** and **F02M 37/30** should be considered in order to perform a complete search.

31/08 . . . . the gases being exhaust gases (adding exhaust gases to the air intake passage **F02M 26/00**)

**WARNING**

Group **F02M 31/08** is impacted by reclassification into group **F02M 37/30**.

Groups **F02M 31/08** and **F02M 37/30** should be considered in order to perform a complete search.

31/0805 . . . . [Pneumatic control of the amount of exhaust gas or combustion air directed to the heat exchange surfaces, e.g. as a function of the pressure in the air intake passage]

**WARNING**

Group **F02M 31/0805** is impacted by reclassification into group **F02M 37/30**.

Groups **F02M 31/0805** and **F02M 37/30** should be considered in order to perform a complete search.

31/081 . . . . [Manual switching of the fluids directed to the heat exchange surfaces]

**WARNING**

Group **F02M 31/081** is impacted by reclassification into group **F02M 37/30**.

Groups **F02M 31/081** and **F02M 37/30** should be considered in order to perform a complete search.

31/0815 . . . . [Heat exchange surfaces arranged inside a flange]

**WARNING**

Group **F02M 31/0815** is impacted by reclassification into group **F02M 37/30**.

Groups **F02M 31/0815** and **F02M 37/30** should be considered in order to perform a complete search.

31/082 . . . . [Particular shape of air input passage near to the branch]

**WARNING**

Group **F02M 31/082** is impacted by reclassification into group **F02M 37/30**.

Groups **F02M 31/082** and **F02M 37/30** should be considered in order to perform a complete search.

31/0825 . . . . [Particular constructional characteristics of the heat exchange surfaces, e.g. finned pipes, coiled pipes or the like]

**WARNING**

Group **F02M 31/0825** is impacted by reclassification into group **F02M 37/30**.

Groups **F02M 31/0825** and **F02M 37/30** should be considered in order to perform a complete search.

31/083 . . . . Temperature-responsive control of the amount of exhaust gas or combustion air directed to the heat exchange surface

**WARNING**

Group **F02M 31/083** is impacted by reclassification into group **F02M 37/30**.

Groups **F02M 31/083** and **F02M 37/30** should be considered in order to perform a complete search.

31/087 . . . . Heat-exchange arrangements between the air intake and exhaust gas passages, e.g. by means of contact between the passages

**WARNING**

Group **F02M 31/087** is impacted by reclassification into group **F02M 37/30**.

Groups **F02M 31/087** and **F02M 37/30** should be considered in order to perform a complete search.
Air intake passage surrounding the exhaust gas passage; Exhaust gas passage surrounding the air intake passage

**WARNING**

Group F02M 31/093 is impacted by reclassification into group F02M 37/30.

Groups F02M 31/093 and F02M 37/30 should be considered in order to perform a complete search.

**WARNING**

Group F02M 31/10 is impacted by reclassification into group F02M 37/30.

Groups F02M 31/10 and F02M 37/30 should be considered in order to perform a complete search.

**WARNING**

Group F02M 31/102 is impacted by reclassification into group F02M 37/30.

Groups F02M 31/102 and F02M 37/30 should be considered in order to perform a complete search.

**WARNING**

Group F02M 31/105 is impacted by reclassification into group F02M 37/30.

Groups F02M 31/105 and F02M 37/30 should be considered in order to perform a complete search.

**WARNING**

Group F02M 31/107 is impacted by reclassification into group F02M 37/30.

Groups F02M 31/107 and F02M 37/30 should be considered in order to perform a complete search.

**WARNING**

Group F02M 31/12 is impacted by reclassification into group F02M 37/30.

Groups F02M 31/12 and F02M 37/30 should be considered in order to perform a complete search.

**WARNING**

Group F02M 31/125 is impacted by reclassification into group F02M 37/30.

Groups F02M 31/125 and F02M 37/30 should be considered in order to perform a complete search.

**WARNING**

Group F02M 31/13 is impacted by reclassification into group F02M 37/30.

Groups F02M 31/13 and F02M 37/30 should be considered in order to perform a complete search.

**WARNING**

Group F02M 31/135 is impacted by reclassification into group F02M 37/30.

Groups F02M 31/135 and F02M 37/30 should be considered in order to perform a complete search.

**WARNING**

Group F02M 31/14 is impacted by reclassification into group F02M 37/30.

Groups F02M 31/14 and F02M 37/30 should be considered in order to perform a complete search.

**WARNING**

Group F02M 31/145 is impacted by reclassification into group F02M 37/30.

Groups F02M 31/145 and F02M 37/30 should be considered in order to perform a complete search.

**WARNING**

Group F02M 31/16 is impacted by reclassification into group F02M 37/30.

Groups F02M 31/16 and F02M 37/30 should be considered in order to perform a complete search.

**WARNING**

Group F02M 31/163 is impacted by reclassification into group F02M 37/30.

Groups F02M 31/163 and F02M 37/30 should be considered in order to perform a complete search.
Engine-pertinent apparatus for feeding, or treating before their admission to engine, combustion-air, fuel, or...

31/166 . . . [with mechanical generation of heat, e.g. by surface friction]

**WARNING**

Group F02M 31/166 is impacted by reclassification into group F02M 37/30.
Groups F02M 31/166 and F02M 37/30 should be considered in order to perform a complete search.

31/18 . . . to vapourise fuel

**WARNING**

Group F02M 31/18 is impacted by reclassification into group F02M 37/30.
Groups F02M 31/18 and F02M 37/30 should be considered in order to perform a complete search.

31/183 . . . [Control]

**WARNING**

Group F02M 31/183 is impacted by reclassification into group F02M 37/30.
Groups F02M 31/183 and F02M 37/30 should be considered in order to perform a complete search.

31/186 . . . [with simultaneous mixing of secondary air]

**WARNING**

Group F02M 31/186 is impacted by reclassification into group F02M 37/30.
Groups F02M 31/186 and F02M 37/30 should be considered in order to perform a complete search.

31/20 . . . for cooling ([F02M 31/005 takes precedence; use of cold F02M 17/52:] cooling of charging-air or of scavenging-air F02B 29/04)

31/205 . . . [Control]

33/00 Other apparatus for treating combustion-air, fuel or fuel-air mixture (combustion-air cleaners F02M 35/00; arrangements for purifying liquid fuel F02M 37/22)

33/02 . . . for collecting and returning condensed fuel ([apparatus for re-atomising condensed fuel F02M 29/00])

33/025 . . . [Means not otherwise provided for]

33/04 . . . returning to the intake passage

33/043 . . . [Coating of the intake passage with a porous material]

33/046 . . . [Coating of the intake passage with material preventing the formation of condensation]

33/06 . . . with simultaneous heat supply

33/08 . . . returning to the fuel tank

35/00 Combustion-air cleaners, air intakes, intake silencers, or induction systems specially adapted for, or arranged on, internal-combustion engines

35/02 . . . Air cleaners

35/0201 . . . [Housings; Casings; Frame constructions; Lids; Manufacturing or assembling thereof]

35/0202 . . . [Manufacturing or assembling; Materials for air cleaner housings]

35/0203 . . . [by using clamps, catches, locks or the like, e.g. for disposable plug-in filter cartridges]

35/0204 . . . [for connecting or joining to other devices, e.g. pipes]

35/0205 . . . [Details, e.g. sensors or measuring devices]

35/0207 . . . [on the clean air side]

35/0208 . . . [with sensing means on both, the air feeding side and the clean air side]

35/0209 . . . [comprising flexible, resilient, movable or rotatable elements, e.g. with vibrating or contracting movements; Springs; Valves; Flaps (F02M 35/06, F02M 35/08 take precedence)]

35/021 . . . [Arrangements of air flow meters in or on air cleaner housings]

35/0212 . . . [Multiple cleaners]

35/0214 . . . [arranged concentrically or coaxially]

35/0215 . . . [arranged in parallel]

35/0216 . . . [arranged in series, e.g. pre- and main filter in series]

35/0217 . . . [acting by electric discharge; Electrostatic precipitators therefor]

35/0218 . . . [acting by absorption or adsorption; trapping or removing vapours or liquids, e.g. originating from fuel]

35/022 . . . acting by gravity, by centrifugal, or by other inertial forces, e.g. with moistened walls

35/0223 . . . [by centrifugal forces, e.g. cyclones]

35/0226 . . . [by gravity or by mass inertia, e.g. labyrinths, deflectors]

35/024 . . . using filters, e.g. moistened (F02M 35/026 takes precedence; cleaning of the filtering material F02M 35/08)

35/02408 . . . [Manufacturing filter elements]

35/02416 . . . [Fixing, mounting, supporting or arranging filter elements; Filter element cartridges]

35/02425 . . . [Support structures increasing the stability or stiffness of the filter element]

35/02433 . . . [Special alignment with respect to the air intake flow, e.g. angled or in longitudinal flow direction]

35/02444 . . . [Materials or structure of filter elements, e.g. foams]

35/0245 . . . [Pleated, folded, corrugated filter elements, e.g. made of paper]

35/02458 . . . [consisting of multiple layers, e.g. coarse and fine filters; Coatings; Impregnations; Wet or moistened filter elements]

35/02466 . . . [Meshes; Grids; Perforated plates]

35/02475 . . . [characterised by the shape of the filter element]

35/02483 . . . [Cylindrical, conical, oval, spherical or the like filter elements; wounded filter elements]

35/02491 . . . [Flat filter elements, e.g. rectangular]

35/026 . . . acting by guiding the air over or through an oil or other liquid bath, e.g. combined with filters

35/04 . . . specially arranged with respect to engine [, to intake system or specially adapted to vehicle]; Mounting thereon [, Combinations with other devices (combined with silencers F02M 35/14)]

35/042 . . . [combined with other devices, e.g. heaters (F02M 35/021, F02M 35/06, F02M 35/14 take precedence); for use other than engine air intake cleaning, e.g. air intake filters arranged in the fuel vapour recovery system]
Engine-pertinent apparatus for feeding, or treating before their admission to engine, combustion-air, fuel, or...

35/044 . . . [Special arrangements of cleaners in or with respect to the air intake system, e.g. in the intake plenum, in ducts or with respect to carburettors]
35/046 . . . . [Inline cleaners, i.e. the cleaner being arranged along the length of a wall of a pipe or manifold]
35/048 . . . . [Arranging or mounting on or with respect to engines or vehicle bodies]
35/06 . . . . combined or associated with engine's cooling blower or fan, or with flywheel
35/08 . . . with means for removing dust, {particles or liquids} from cleaners; with means for indicating clogging; with by-pass means; {Regeneration of cleaners}
35/082 . . . . [By-pass means]
35/084 . . . . [Dust collection chambers or discharge sockets, e.g. chambers fed by gravity or closed by a valve]
35/086 . . . . [Dust removal by flushing, blasting, pulsating or aspirating flow, washing or the like; Mechanical dust removal, e.g. by using scrapers]
35/088 . . . . [Water, snow or ice proofing; Separation or drainage of water, snow or ice]
35/09 . . . . Clogging indicators {; Diagnosis or testing of air cleaners (sensors therefore F02M 35/10373)}
35/10 . . . Air intakes; Induction systems
35/10006 . . . . [characterised by the position of elements of the air intake system in direction of the air intake flow, i.e. between ambient air inlet and supply to the combustion chamber]
35/10013 . . . . [Means upstream of the air filter; Connection to the ambient air]
35/10019 . . . . [Means upstream of the fuel injection system, carburettor or plenum chamber (F02M 35/10013 takes precedence)]
35/10026 . . . . [Plenum chambers]
35/10032 . . . . [specially shaped or arranged connecting duct between carburettor or air inlet duct and the plenum chamber; specially positioned carburettors or throttle bodies with respect to the plenum chamber]
35/10039 . . . . [Intake ducts situated partly within or on the plenum chamber housing]
35/10045 . . . . [Multiple plenum chambers; Plenum chambers having inner separation walls (for V-engines F02M 35/116; for resonance charging F02B 27/02)]
35/10052 . . . . [special shapes or arrangements of plenum chambers; Constructional details]
35/10059 . . . . [Swirl chamber upstream of the plenum chamber]
35/10065 . . . . [Valves arranged in the plenum chamber]
35/10072 . . . . [Intake runners]
35/10078 . . . . [Connections of intake systems to the engine]
35/10085 . . . . [having a connecting piece, e.g. a flange, between the engine and the air intake being foreseen with a throttle valve, fuel injector, mixture ducts or the like]
35/10091 . . . . [characterised by details of intake ducts: shapes; connections; arrangements (ducts within or on the plenum chamber F02M 35/10039)]
35/10098 . . . . [Straight ducts]
35/10104 . . . . [Substantially vertically arranged ducts]
35/10111 . . . . [Substantially V-, C- or U-shaped ducts in direction of the flow path]
35/10118 . . . . [with variable cross-sections of intake ducts along their length; Venturis; Diffusers]
35/10124 . . . . [Ducts with special cross-sections, e.g. non-circular cross-section]
35/10131 . . . . [Ducts situated in more than one plane; Ducts of one plane crossing ducts of another plane]
35/10137 . . . . [Flexible ducts, e.g. bellows or hoses]
35/10144 . . . . [Connections of intake ducts to each other or to another device]
35/1015 . . . . [characterised by the engine type (engine intake manifolds F02M 35/1041)]
35/10157 . . . . [Supercharged engines]
35/10163 . . . . [having air intakes specially adapted to selectively deliver naturally aspirated fluid or supercharged fluid]
35/1017 . . . . [Small engines, e.g. for handheld tools, or model engines; Single cylinder engines]
35/10177 . . . . [Engines having multiple fuel injectors or carburettors per cylinder]
35/10183 . . . . [Engines having intake ducts fed from a separate carburettor or injector, the idling system being considered as a separate carburettor]
35/1019 . . . . [Two-stroke engines; Reverse-flow scavenged or cross scavenged engines]
35/10196 . . . . [Carburetted engines]
35/10203 . . . . [Rotary, e.g. "Wankel", engines; Engines with cylinders in star arrangement; Radial piston engines; W-engines (F02M 35/112 and F02M 35/116 take precedence)]
35/10209 . . . . [Fluid connections to the air intake system; their arrangement of pipes, valves or the like]
35/10216 . . . . [Fuel injectors; Fuel pipes or rails; Fuel pumps or pressure regulators]
35/10222 . . . . [Exhaust gas recirculation [EGR]; Positive crankcase ventilation [PCV]; Additional air admission, lubricant or fuel vapour admission]
35/10229 . . . . [the intake system acting as a vacuum or overpressure source for auxiliary devices, e.g. brake systems; Vacuum chambers (air storage chamber F02B 21/00)]
35/10236 . . . . [Overpressure or vacuum relief means; Burst protection]
35/10242 . . . . [Devices or means connected to or integrated into air intakes; Air intakes combined with other engine or vehicle parts (filters F02M 35/02; silencers F02M 35/12 and F02M 35/14; air coolers F02B 29/04; heaters F02M 31/00; air storage tanks F02B 21/00; compressors F02B 33/00; sensors F02M 35/10373)]
35/10249 . . . . [Electrical or electronic devices fixed to the intake system; Electric wiring (electric heaters F02M 31/12; sensors F02M 35/10373)]
35/10255 . . . . [Arrangements of valves; Multi-way valves (F02M 35/10032 takes precedence; valves in the plenum chamber F02M 35/10065; check valves F02M 35/10275)]
35/10262 . . . . [Flow guides, obstructions, deflectors or the like (for generating a charge motion in the cylinder F02B 31/00; for re-atomising condensed fuel or homogenising fuel-air mixture F02M 29/00)]
Engine-pertinent apparatus for feeding, or treating before their admission to engine, combustion-air, fuel, or...

35/10268 . . . [Heating, cooling or thermal insulating means (air coolers F02B 29/04; thermal treatment of combustion-air, fuel or fuel-air mixture F02M 31/00; details of the throttle valve housing F02D 9/1035)]

35/10275 . . . [Means to avoid a change in direction of incoming fluid, e.g. all intake ducts diverging from plenum chamber at acute angles; Check valves; Flame arrestors for backfire prevention]

35/10281 . . . [Means to remove, re-atomise or redistribute condensed fuel; Means to avoid fuel particles from separating from the mixture (apparatus for re-atomising condensed fuel or homogenising fuel-air mixture F02M 29/00; other apparatus for treating combustion-air, fuel or fuel-air mixture F02M 33/00)]

35/10288 . . . [Air intakes combined with another engine part, e.g. cylinder head cover or being cast in one piece with the exhaust manifold, cylinder head or engine block]

35/10295 . . . [Damping means, e.g. tranquillising chamber to dampen air oscillations (intake silencers F02M 35/12)]

35/10301 . . . [Flexible, resilient, pivotally or movable parts; Membranes (F02M 35/10255 and F02M 35/10032 take precedence)]

35/10308 . . . [Equalizing conduits, e.g. between intake ducts or between plenum chambers]

35/10314 . . . [Materials for intake systems (for sound damping F02M 35/12; for air cleaners F02M 35/02)]

35/10321 . . . [Plastics; Composites; Rubbers]

35/10327 . . . [Metals; Alloys (catalysts F02M 27/02)]

35/10334 . . . [Foams; Fabrics; Porous media; Laminates; Ceramics; Coatings]

35/1034 . . . [Manufacturing and assembling intake systems]

35/10347 . . . [Moulding, casting or the like]

35/10354 . . . [Joining multiple sections together (joining plastic materials together in general B29C 65/00)]

35/1036 . . . [by welding, bonding or the like (welding plastic materials together in general B29C 65/02)]

35/10367 . . . [Machining, e.g. milling, grinding, punching, sanding; Bending; Surface treatments]

35/10373 . . . [Sensors for intake systems (throttle position sensors F02D 9/105)]

35/1038 . . . [for temperature or pressure]

35/10386 . . . [for flow rate (air flow meters in air cleaners F02M 35/021; circuit arrangements for generating control signals by measuring intake air flow F02D 41/18)]

35/10393 . . . [for characterising a multi-component mixture, e.g. for the composition such as humidity, density or viscosity]

35/104 . . . Intake manifolds

35/1042 . . . [characterised by provisions to avoid mixture or air supply from one plenum chamber to two successively firing cylinders]

35/1045 . . . [characterised by the charge distribution between the cylinders/combustion chambers or its homogenisation]

35/1047 . . . [characterised by some cylinders being fed from one side of engine block and the other cylinders being fed from the other side of engine block]

35/108 . . . with primary and secondary intake passages

WARNING

Group F02M 35/108 is impacted by reclassification into groups F02M 35/112, F02M 35/116, and F02M 35/1165.

All groups listed in this Warning should be considered in order to perform a complete search.

35/1085 . . . [the combustion chamber having multiple intake valves (modifying induction systems for imparting a rotation to the charge in the cylinder and having multiple air inlets F02B 31/08; shape or arrangement of intake or exhaust channels in cylinder heads F02F 1/42)]

WARNING

Group F02M 35/1085 is impacted by reclassification into groups F02M 35/112, F02M 35/116, and F02M 35/1165.

All groups listed in this Warning should be considered in order to perform a complete search.

35/112 . . . for engines with cylinders all in one line

WARNING

Group F02M 35/112 is incomplete pending reclassification of documents from groups F02M 35/108 and F02M 35/1085.

Groups F02M 35/108, F02M 35/1085, and F02M 35/112 should be considered in order to perform a complete search.

35/116 . . . for engines with cylinders in V-arrangement or arranged oppositely relative to the main shaft

WARNING

Group F02M 35/116 is incomplete pending reclassification of documents from groups F02M 35/108 and F02M 35/1085.

Groups F02M 35/108, F02M 35/1085, and F02M 35/116 should be considered in order to perform a complete search.

35/1165 . . . [Boxer or pancake engines]

WARNING

Group F02M 35/1165 is incomplete pending reclassification of documents from groups F02M 35/108 and F02M 35/1085.

Groups F02M 35/108, F02M 35/1085, and F02M 35/116 should be considered in order to perform a complete search.

35/12 . . . Intake silencers [Sound modulation, transmission or amplification (intake silencers also used as exhaust silencer F01N 13/007; filters for compressors F04B 39/16)]

35/1205 . . . [Flow throttling or guiding]
Engine-pertinent apparatus for feeding, or treating before their admission to engine, combustion-air, fuel, or...

37/0029 . . . [Pressure regulator in the low pressure fuel system (pressure regulator in low-pressure injection apparatus F02M 69/54)]

37/0035 . . . [Thermo sensitive valves]

37/0041 . . . [Means for damping pressure pulsations (equalisation of pulses in positive displacement pumps F04B 1/00; devices for damping fluid pulsations in pipes F16L 55/04)]

37/0047 . . . [Layout or arrangement of systems for feeding fuel (fuel injection apparatus characterised by their conduits and venting means F02M 55/00; fuel injection apparatus having a common rail F02M 63/0225; arrangement of fuel conduits of low pressure fuel injection apparatus F02M 69/462)]

37/0052 . . . [Details on the fuel return circuit; Arrangement of pressure regulators]

37/0058 . . . [Returnless fuel systems, i.e. the fuel return lines are not entering the fuel tank]

37/0064 . . . [for engines being fed with multiple fuels or fuels having special properties, e.g. bio-fuels; varying the fuel composition (controlling engines working with pluralities of fuels F02D 19/06)]

37/007 . . . [characterised by its use in vehicles, in stationary plants or in small engines, e.g. hand held tools]

37/0076 . . . [Details of the fuel feeding system related to the fuel tank (vehicle fuel tanks B60K 15/03)]

37/0082 . . . [Devices inside the fuel tank other than fuel pumps or filters (electrical pumps submerged in fuel tanks F02M 37/10, jet pumps F02M 37/025)]

37/0088 . . . [Multiple separate fuel tanks or tanks being at least partially partitioned]

37/0094 . . . [Saddle tanks; Tanks having partition walls]

37/02 . . . [Feeding by means of suction apparatus, e.g. by air flow through carburettors (by driven pumps F02M 37/04)]

37/025 . . . [Feeding by means of a liquid fuel-driven jet pump (jet pumps per se F04F)]

37/04 . . . [Feeding by means of driven pumps]

37/041 . . . [Arrangements for driving gear-type pumps]

37/043 . . . [Arrangements for driving reciprocating piston-type pumps]

37/045 . . . [Arrangements for driving rotary positive-displacement pumps]

37/046 . . . [Arrangements for driving diaphragm-type pumps]

37/048 . . . [Arrangements for driving regenerative pumps, i.e. side-channel pumps]

37/06 . . . [mechanically driven]

37/08 . . . [electrically driven]

2037/082 . . . [Details of the entry of the current supply lines into the pump housing, e.g. wire connectors, grommets, plugs or sockets]

2037/085 . . . [Electric circuits therefor]

2037/087 . . . [Controlling fuel pressure valve]

37/10 . . . [submerged in fuel, e.g. in reservoir]

37/103 . . . [Mounting pumps on fuel tanks]

37/106 . . . [the pump being installed in a sub-tank]

37/12 . . . [fluid-driven, e.g. by compressed combustion-air]

37/14 . . . [the pumps being combined with other apparatus]

37/16 . . . [characterised by provision of personally-, e.g. manually-, operated pumps]

37/18 . . . [characterised by provision of main and auxiliary pumps]

37/20 . . . [characterised by means for preventing vapour lock]
Arrangements for purifying liquid fuel specially adapted for, or arranged on, internal-combustion engines, e.g. arrangements in the feeding system

**WARNING**

Group F02M 37/22 is impacted by reclassification into groups F02M 37/24, F02M 37/26, F02M 37/28, F02M 37/30, F02M 37/32, F02M 37/34, F02M 37/36, F02M 37/38, F02M 37/40, F02M 37/42, F02M 37/44, F02M 37/46, F02M 37/48, F02M 37/50, F02M 37/52, and F02M 37/54.

All groups listed in this Warning should be considered in order to perform a complete search.

**37/24**

. . . characterised by water separating means

**WARNING**

Group F02M 37/24 is impacted by reclassification into groups F02M 37/24 – F02M 37/30.

All groups listed above should be considered in order to perform a complete search.

**37/26**

. . . with water detection means

**WARNING**

Group F02M 37/26 is incomplete pending reclassification of documents from groups F02M 37/22 and F02M 37/24.

Groups F02M 37/22, F02M 37/24, and F02M 37/26 should be considered in order to perform a complete search.

**37/28**

. . . with means activated by the presence of water, e.g. alarms or means for automatic drainage

**WARNING**

Group F02M 37/28 is incomplete pending reclassification of documents from groups F02M 37/22 and F02M 37/24.

Groups F02M 37/22, F02M 37/24, and F02M 37/28 should be considered in order to perform a complete search.

**37/30**

. . . characterised by heating means

**WARNING**

Group F02M 37/30 is incomplete pending reclassification of documents from groups F02M 31/02, F02M 31/04, F02M 31/042, F02M 31/045, F02M 31/047, F02M 31/06, F02M 31/062, F02M 31/064, F02M 31/066, F02M 31/068, F02M 31/07, F02M 31/08, F02M 31/0805, F02M 31/081, F02M 31/0815, F02M 31/082, F02M 31/0825, F02M 31/083, F02M 31/087, F02M 31/093, F02M 31/10, F02M 31/102, F02M 31/105, F02M 31/107, F02M 31/12, F02M 31/125, F02M 31/13, F02M 31/135, F02M 31/14, F02M 31/145, F02M 31/16, F02M 31/163, F02M 31/166, F02M 31/18, F02M 31/183, F02M 31/186, F02M 37/22, and F02M 37/24.

All groups listed in this Warning should be considered in order to perform a complete search.

**37/32**

. . . characterised by filters or filter arrangements

**WARNING**

Group F02M 37/32 is incomplete pending reclassification of documents from group F02M 37/22.

Groups F02M 37/22, and F02M 37/32 should be considered in order to perform a complete search.

**37/34**

. . . by the filter structure, e.g. honeycomb, mesh or fibrous

**WARNING**

Group F02M 37/34 is incomplete pending reclassification of documents from group F02M 37/22.

Groups F02M 37/22, and F02M 37/34 should be considered in order to perform a complete search.

**37/36**

. . . with bypass means

**WARNING**

Group F02M 37/36 is incomplete pending reclassification of documents from group F02M 37/22.

Groups F02M 37/22, and F02M 37/36 should be considered in order to perform a complete search.

**37/38**

. . . with regeneration means

**WARNING**

Group F02M 37/38 is incomplete pending reclassification of documents from group F02M 37/22.

Groups F02M 37/22, and F02M 37/38 should be considered in order to perform a complete search.
Engine-pertinent apparatus for feeding, or treating before their admission to engine, combustion-air, fuel, or...

37/40 . . . with means for detection of clogging

**WARNING**

Group F02M 37/40 is incomplete pending reclassification of documents from group F02M 37/22.
Groups F02M 37/22 and F02M 37/40 should be considered in order to perform a complete search.

37/42 . . . Installation or removal of filters

**WARNING**

Group F02M 37/42 is incomplete pending reclassification of documents from group F02M 37/22.
Groups F02M 37/22 and F02M 37/42 should be considered in order to perform a complete search.

37/44 . . . Filters structurally associated with pumps

**WARNING**

Group F02M 37/44 is incomplete pending reclassification of documents from group F02M 37/22.
Groups F02M 37/22 and F02M 37/44 should be considered in order to perform a complete search.

37/46 . . . Filters structurally associated with pressure regulators

**WARNING**

Group F02M 37/46 is incomplete pending reclassification of documents from group F02M 37/22.
Groups F02M 37/22 and F02M 37/46 should be considered in order to perform a complete search.

37/48 . . . Filters structurally associated with fuel valves

**WARNING**

Group F02M 37/48 is incomplete pending reclassification of documents from group F02M 37/22.
Groups F02M 37/22 and F02M 37/48 should be considered in order to perform a complete search.

37/50 . . . Filters arranged in or on fuel tanks

**WARNING**

Group F02M 37/50 is incomplete pending reclassification of documents from group F02M 37/22.
Groups F02M 37/22 and F02M 37/50 should be considered in order to perform a complete search.

37/52 . . . using magnetic means

**WARNING**

Group F02M 37/52 is incomplete pending reclassification of documents from group F02M 37/22.
Groups F02M 37/22 and F02M 37/52 should be considered in order to perform a complete search.

37/54 . . . characterised by air purging means (having priming pumps F02M 37/16)

**WARNING**

Group F02M 37/54 is incomplete pending reclassification of documents from group F02M 37/22.
Groups F02M 37/22 and F02M 37/54 should be considered in order to perform a complete search.

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**Fuel-injection apparatus** (carrying the fuel into cylinders by high-pressure gas F02M 67/00; low-pressure fuel-injection F02M 69/00)

39/00 Arrangements of fuel-injection apparatus with respect to engines; Pump drives adapted to such arrangements (fuel-injection apparatus in which injection pumps are driven, or injectors are actuated, by the pressure in engine working cylinders, or by impact of engine working piston F02M 49/00; arrangements of injectors F02M 61/14)

**NOTE**

Low-pressure fuel injection is classified in groups F02M 51/00, F02M 69/00 or F02M 71/00.

**WARNING**

Group F02M 39/00 is impacted by reclassification into groups F02M 49/00, F02M 49/02, and F02M 49/04.
All groups listed in this Warning should be considered in order to perform a complete search.

39/005 . . . (Arrangements of fuel feed-pumps with respect to fuel injection apparatus (F02M 37/00 takes precedence))

**WARNING**

Group F02M 39/005 is impacted by reclassification into groups F02M 49/00, F02M 49/02, and F02M 49/04.
All groups listed in this Warning should be considered in order to perform a complete search.

39/02 . . . Arrangements of fuel-injection apparatus to facilitate the driving of pumps; Arrangements of fuel-injection pumps; Pump drives

41/00 Fuel-injection apparatus with two or more injectors fed from a common pressure-source sequentially by means of a distributor

**NOTE**

- in this group the following indexing codes are used: F02M 2700/1329

41/02 . . . the distributor being spaced from pumping elements
Fuel-injection apparatus

41/04 . . . the distributor reciprocating
41/042 . . . [by means of mechanical drive]
41/045 . . . [by means of hydraulic or pneumatic drive]
41/047 . . . [by means of electric drive]
41/06 . . . the distributor rotating
41/063 . . . [the distributor and rotary valve controlling fuel passages to pumping elements being combined]
41/066 . . . [Arrangements for adjusting the rotary valve-distributor]
41/08 . . . the distributor and pumping elements being combined
41/10 . . . pump pistons acting as the distributor
41/12 . . . the pistons rotating to act as the distributor
41/121 . . . [with piston arranged axially to driving shaft (F02M 41/123 takes precedence)]
41/122 . . . [with piston arranged radially to driving shaft (F02M 41/123 takes precedence)]
41/123 . . . [characterised by means for varying fuel delivery or injection timing]
41/124 . . . [Throttling of fuel passages to or from the pumping chamber]
41/125 . . . [Varily-timed valves controlling fuel passages]
41/126 . . . [valves being mechanically or electrically adjustable sleeves slidably mounted on rotary piston]
41/127 . . . [valves being fluid-actuated slide-valves, e.g. differential rotary-piston pump]
41/128 . . . [Varying injection timing by angular adjustment of the face-cam or the rollers support]
41/14 . . . rotary distributor supporting pump pistons
41/1405 . . . [pistons being disposed radially with respect to rotation axis]
41/1411 . . . [characterised by means for varying fuel delivery or injection timing]
41/1416 . . . [Devices specially adapted for angular adjustment of annular cam]
41/1422 . . . [Injection being effected by means of a free-piston displaced by the pressure of fuel]
41/1427 . . . [Arrangements for metering fuel admitted to pumping chambers, e.g. by shuttles or by throttle-valves]
41/1433 . . . [pistons being parallel to rotation axis]

2041/1438 . . . [Arrangements or details pertaining to the devices classified in F02M 41/14 and subgroups]
2041/1444 . . . [Feed-pumps; Arrangements or pressure regulation therefor]
2041/145 . . . [Throttle valves for metering fuel to the pumping chamber]
2041/1455 . . . [Shuttles per se, or shuttles associated with throttle valve for metering fuel admitted to the pumping chamber]
2041/1461 . . . [Axial displacement of rotor for varying piston stroke or for controlling fuel passages]
2041/1466 . . . [Piston-stroke variation by other means than axial displacement of rotor]

2041/1472 . . . . . [Devices for limiting maximum delivery or for providing excess fuel for starting or for correcting advance at starting]
2041/1477 . . . . . [Releasing fuel pressure or adjusting quantity-time characteristics of fuel delivery, e.g. by conducting pressurised fuel to a variable volume space, an accumulator or a return conduit]
2041/1483 . . . . . [Varily timed valves controlling fuel passages, e.g. sleeve-valves mounted on the rotor]
2041/1488 . . . . . [Electric actuation of valves or other parts]
2041/1494 . . . . . [Details of cams, tappets, rotors, venting means, specially arranged valves, e.g. in the rotor]

41/16 . . . characterised by the distributor being fed from a constant pressure source, e.g. accumulator (or constant pressure positive displacement pumps)
43/00 Fuel-injection apparatus operating simultaneously on two or more fuels or on a liquid fuel and another liquid, e.g. the other liquid being an anti-knock additive
43/02 . . . Pumps peculiar thereto
43/04 . . . Injectors peculiar thereto
45/00 Fuel-injection apparatus characterised by having a cyclic delivery of specific time/pressure or time/quantity relationship (pumps having such delivery by means of delivery valves F02M 59/462)
45/02 . . . with each cyclic delivery being separated into two or more parts
45/04 . . . with a small initial part, e.g. initial part for partial load and initial and main part for full load
45/06 . . . Pumps peculiar thereto
45/063 . . . . . [Delivery stroke of piston being divided into two or more parts, e.g. by using specially shaped cams]
45/066 . . . . . [Having specially arranged spill port and spill contour on the piston (F02M 45/063 takes precedence)]
45/08 . . . Injectors peculiar thereto
45/083 . . . . . [Having two or more closing springs acting on injection-valve]
45/086 . . . . . [Having more than one injection-valve controlling discharge orifices]
45/10 . . . . . Other injectors with multiple-part delivery, e.g. with vibrating valves
45/12 . . . providing a continuous (cyclic) delivery with variable pressure
47/00 Fuel-injection apparatus operated cyclically with fuel-injection valves actuated by fluid pressure (fuel-injectors actuated by the pressure in engine working cylinders F02M 49/00)
47/02 . . . . . of accumulator-injector type, i.e. having fuel pressure of accumulator tending to open, and fuel pressure in other chamber tending to close, injection valves and having means for periodically releasing that closing pressure
47/022 . . . . . [Mechanically actuated valves draining the chamber to release the closing pressure]
47/025 . . . . . [Hydraulically actuated valves draining the chamber to release the closing pressure]
47/027 . . . . . [Electrically actuated valves draining the chamber to release the closing pressure]
Fuel-injection apparatus

47/04 . using fluid, other than fuel, for injection-valve actuation

47/043 . [Fluid pressure acting on injection-valve in the period of non-injection to keep it closed]

47/046 . [Fluid pressure acting on injection-valve in the period of injection to open it]

47/06 . Other fuel injectors peculiar thereto

49/00 Fuel-injection apparatus in which injection pumps are driven or injectors are actuated, by the pressure in engine working cylinders, or by impact of engine working piston

WARNING

Groups F02M 49/00, F02M 49/02, and F02M 49/04 are incomplete pending reclassification of documents from groups F02M 39/00 and F02M 39/005.

Groups F02M 39/00, F02M 39/005, and F02M 49/00 should be considered in order to perform a complete search.

49/02 . using the cylinder pressure, e.g. compression end pressure

49/04 . using the piston impact

51/00 Fuel-injection apparatus characterised by being operated electrically

51/005 . { Arrangement of electrical wires and connections, e.g. wire harness, sockets, plugs; Arrangement of electronic control circuits in or on fuel injection apparatus}

51/02 . specially for low-pressure fuel-injection ((F02M 51/005 takes precedence:) pumpse per se F02M 51/04; injectors per se F02M 51/08)

51/04 . Pumps peculiar thereto

51/06 . Injectors peculiar thereto {with means directly operating the valve needle}

WARNING

Group F02M 51/06 is impacted by reclassification into group F02M 51/08.

Groups F02M 51/06 and F02M 51/08 should be considered in order to perform a complete search.

51/0603 . . . [using piezo-electric or magnetostrictive operating means]

51/0607 . . . [the actuator being hollow, e.g. with needle passing through the hollow space]

51/061 . [using electromagnetic operating means]

51/0614 . . . [characterised by arrangement of electromagnets or fixed armature]

51/0617 . . . . . [having two or more electromagnets]

51/0621 . . . . . . [acting on one mobile armature (F02M 51/0628 takes precedence)]

51/0625 . . . [characterised by arrangement of mobile armatures]

51/0628 . . . . . [having a stepped armature]

51/0632 . . . . . [having a spherically or partly spherically shaped armature, e.g. acting as valve body]

51/0635 . . . . . . [having a plate-shaped or undulated armature not entering the winding (if entering the winding F02M 51/0664)]

51/0639 . . . . . [the armature acting as a valve]

51/0642 . . . . . [the armature having a valve attached thereto]

51/0646 . . . . . [the valve being a short body, e.g. sphere or cube]

51/065 . . . . . . [the valve being spherical or partly spherical]

51/0653 . . . . . . [the valve being an elongated body, e.g. a needle valve]

51/0657 . . . . . . [the body being hollow and its interior communicating with the fuel flow]

51/066 . . . . . . [the armature and the valve being allowed to move relatively to each other or not being attached to each other]

51/0664 . . . . . . [having a cylindrically or partly cylindrically shaped armature, e.g. entering the winding; having a plate-shaped or undulated armature entering the winding]

51/0667 . . . . . . [the armature acting as a valve or having a short valve body attached thereto]

51/0671 . . . . . . [the armature having an elongated valve body attached thereto]

51/0675 . . . . . . [the valve body having cylindrical guiding or metering portions, e.g. with fuel passages]

51/0678 . . . . . . . [all portions having fuel passages, e.g. flats, grooves, diameter reductions]

51/0682 . . . . . . . [the body being hollow and its interior communicating with the fuel flow (F02M 51/0675 takes precedence)]

51/0685 . . . . . . . [the armature and the valve being allowed to move relatively to each other or not being attached to each other]

51/0689 . . . . . . . [and permanent magnets (F02M 51/0696 takes precedence)]

51/0692 . . . . . . . [as valve or armature return means]

51/0696 . . . . . . . [characterised by the use of movable windings]

51/08 . specially for low-pressure fuel-injection

WARNING

Group F02M 51/08 is incomplete pending reclassification of documents from group F02M 51/06.

Groups F02M 51/06 and F02M 51/08 should be considered in order to perform a complete search.

53/00 Fuel-injection apparatus characterised by having heating, cooling or thermally-insulating means

NOTE

- In this group the following indexing codes are used: F02M 37/0077

53/02 . . . with fuel-heating means, e.g. for vaporising

53/04 . . . Injectors with heating, cooling, or thermally-insulating means

53/043 . . . [with cooling means other than air cooling]

53/046 . . . [with thermally-insulating means]

53/06 . . . with fuel-heating means, e.g. for vaporising

53/08 . . . with air cooling
Fuel-injection apparatus

55/00 Fuel-injection apparatus characterised by their fuel conduits or their venting means;
{Arrangements of conduits between fuel tank and pump F02M 37/00 (venting in general B01D 19/00)}

55/001 . [Pumps with means for preventing erosion on fuel discharge]
55/002 . [Arrangement of leakage or drain conduits in or from injectors]
55/004 . [Joints; Sealings]
55/005 . . [for high pressure conduits, e.g. connected to pump outlet or to injector inlet]
55/007 . [Venting means]
55/008 . [Arrangement of fuel passages inside of injectors]
55/02 . Conduits between injection pumps and injectors, e.g. conduits between pump and common-rail or conduits between common-rail and injectors
55/025 . . [Common rails]
55/04 . Means for damping vibrations, pressure fluctuations in injection pump inlets or outlets

57/00 Fuel-injectors combined or associated with other devices

NOTE in this group the following indexing codes are used: F02M 2700/1335

57/005 . [the devices being sensors]
57/02 . Injectors structurally combined with fuel-injection pumps
57/021 . . [the injector being of valveless type, e.g. the pump piston co-operating with a conical seat of an injection nozzle at the end of the pumping stroke]
57/022 . . [characterised by the pump drive]
57/023 . . . [mechanical]
57/024 . . . . . [with hydraulic link for varying the piston stroke]
57/025 . . . [hydraulic, e.g. with pressure amplification]
57/026 . . . . . . [Construction details of pressure amplifiers, e.g. fuel passages or check valves arranged in the intensifier piston or head, particular diameter relationships, stop members, arrangement of ports or conduits]
57/027 . . . [electric]
57/028 . . . . [pneumatic (using engine cylinder pressure F02M 49/02)]
57/04 . the devices being combustion-air intake or exhaust valves
57/06 . the devices being sparking plugs

59/00 Pumps specially adapted for fuel-injection and not provided for in groups F02M 39/00 - F02M 57/00 (e.g. rotary cylinder-block type of pumps)

NOTE - in this group the following indexing codes are used: F02M 2700/1323, F02M 2700/1341, F02M 2700/1352, F02M 2700/1388

59/02 . of reciprocating-piston {or reciprocating-cylinder} type
59/022 . . [having an accumulator storing pressurised fuel during pumping stroke of the piston for subsequent delivery to the injector]
59/025 . . [characterised by a single piston]

59/027 . . . . [Unit-pumps, i.e. single piston and cylinder pump-units, e.g. for cooperating with a camshaft]
59/04 . . . characterised by special arrangement of cylinders with respect to piston-driving shaft, e.g. arranged parallel to that shaft (or swash-plate type pumps with rotary valve F02M 59/362)
59/06 . . . with cylinders arranged radially to driving shaft, e.g. in V or star arrangement
59/08 . . . characterised by two or more pumping elements with conjoint outlet (or several pumping elements feeding one engine cylinder (feeding common rails F02M 63/0225))
59/10 . . . characterised by the piston-drive
59/102 . . . . [Mechanical drive, e.g. tappets or cams (F02M 45/063 takes precedence)]
59/105 . . . . [hydraulic drive (F02M 59/32 takes precedence)]
59/107 . . . . [pneumatic drive, e.g. crankcase pressure drive (F02M 49/00 takes precedence)]
59/12 . . having other positive-displacement pumping elements, e.g. rotary
59/14 . . . of elastic-wall type
59/16 . . . characterised by having multi-stage compression of fuel
59/18 . . . characterised by the pumping action being achieved through release of pre-compressed springs
59/20 . . . Varying fuel delivery in quantity or timing
59/205 . . . . [Quantity of fuel admitted to pumping elements being metered by an auxiliary metering device]
59/22 . . . . Varying quantity (or timing) by adjusting cylinder-head space
59/24 . . . . with constant-length-stroke pistons having variable effective portion of stroke
59/243 . . . . [caused by movement of cylinders pistons having variable effective portion of stroke]
59/246 . . . . . [Mechanisms therefor]
59/26 . . . . . [caused by movements of pistons relative to their cylinders]
59/265 . . . . . . . [characterised by the arrangement or form of spill port of spill contour on the piston (F02M 45/066 takes precedence)]
59/28 . . . . . . . . Mechanisms therefor
59/30 . . . with variable-length-stroke pistons (swash-plate type pumps F02M 59/04)
59/32 . . . fuel delivery being controlled by means of fuel-displaced auxiliary pistons, which effect injection (combined with rotary distributor supporting pump pistons F02M 41/1422; low pressure fuel-injection F02M 69/12)
59/34 . . . by throttling of passages to pumping elements or of overflow passages (e.g. throttling by means of a pressure-controlled sliding valve having liquid stop or abutment)
59/36 . . . by variably-timed valves controlling fuel passages to pumping elements or overflow passages
59/361 . . . [Valves being actuated mechanically]
59/362 . . . . [Rotary valves]
59/363 . . . . . . . {arrangements for adjusting the rotary valve}
Fuel-injection apparatus

F02M 61/145 . . . (the injection nozzle opening into the air intake conduit)

F02M 61/16 . . . Details not provided for in, or of interest apart from, the apparatus of groups F02M 61/02 - F02M 61/14

F02M 61/161 . . . (Means for adjusting injection-valve lift)

F02M 61/162 . . . (Means to impart a whirling motion to fuel upstream or near discharging orifices)

F02M 61/163 . . . (Means being injection-valves with helically or spirally shaped grooves)

F02M 61/165 . . . (Filtering elements specially adapted in fuel inlets to injector)

F02M 61/166 . . . (Selection of particular materials)

F02M 61/167 . . . (Means for compensating clearance or thermal expansion)

F02M 61/168 . . . (Assembling; Disassembling; Manufacturing; Adjusting)

F02M 61/18 . . . Injection nozzles, e.g. having valve seats;

F02M 61/1806 . . . (characterised by the arrangement of discharge orifices, e.g. orientation or size)

F02M 61/1813 . . . (Discharge orifices having different orientations with respect to valve member direction of movement, e.g. orientations being such that fuel jets emerging from discharge orifices collide with each other)

F02M 61/182 . . . (Discharge orifices being situated in different transversal planes with respect to valve member direction of movement)

F02M 61/1826 . . . (Discharge orifices having different sizes)

F02M 61/1833 . . . (Discharge orifices having changing cross sections, e.g. being divergent)

F02M 61/184 . . . (Discharge orifices having non circular sections)

F02M 61/1846 . . . (Dimensional characteristics of discharge orifices)

F02M 61/1853 . . . (Orifice plates)

F02M 61/186 . . . (Multi-layered orifice plates)

F02M 61/1866 . . . (Valve seats or member ends having multiple cones)

F02M 61/1873 . . . (Valve seats or member ends having circumferential grooves or ridges, e.g. toroidal)

F02M 61/188 . . . (Spherical or partly spherical shaped valve member ends)

F02M 61/1886 . . . (Details of valve seats not covered by groups F02M 61/1866 - F02M 61/188)

F02M 61/1893 . . . (Details of valve member ends not covered by groups F02M 61/1866 - F02M 61/188)

F02M 61/20 . . . Closing valves mechanically, e.g. arrangements of springs or weights; (or permanent magnets; Damping of valve lift)

F02M 61/205 . . . (Means specially adapted for varying the spring tension or assisting the spring force to close the injection-valve, e.g. with damping of valve lift)
Fuel-injection apparatus

63/00 Other fuel-injection apparatus having pertinent characteristics not provided for in groups F02M 39/00 - F02M 67/00; Details, component parts, or accessories of fuel-injection apparatus, not provided for in, or of interest apart from, the apparatus of groups F02M 39/00 - F02M 61/00 or F02M 67/00;

[Combination of fuel pump with other devices, e.g. lubricating oil pump]

NOTE
- in this group the following indexing codes are used: F02M 2700/05, F02M 2700/072

63/0001. {Fuel-injection apparatus with specially arranged lubricating system, e.g. by fuel oil (lubrication of engines F01M)}

63/0003. {Fuel-injection apparatus having a cyclically-operated valve for connecting a pressure source, e.g. constant pressure pump or accumulator, to an injection valve held closed mechanically, e.g. by springs, and automatically opened by fuel pressure (having a distributor F02M 41/16; low pressure fuel injection F02M 69/14) }

63/0005 . . . {using valves actuated by fluid pressure}
63/0007 . . . {using electrically actuated valves (injection valves F02M 51/06) }
63/0008 . . . {using mechanically actuated valves}
63/001 . {Fuel-injection apparatus having injection valves held closed mechanically, e.g. by springs, and opened by a cyclically-operated mechanism for a time (F02M 67/12 takes precedence; operated by fluid pressure F02M 47/00; operated electrically F02M 51/06; opened by fuel pressure F02M 61/00) }

63/0012 . . . {Valves (for fuel metering see the relevant groups, e.g. F02M 59/34; inlet or outlet check valves for fuel injection pumps F02M 59/46; for fuel injectors see the relevant groups, e.g. F02M 61/00) }

63/0014 . . . . . {characterised by the valve actuating means }
63/0015 . . . . . {electrical, e.g. using solenoid}
63/0017 . . . . . . {using electromagnetic operating means}
63/0019 . . . . . . . {characterised by the arrangement of electromagnets or fixed armatures}
63/0021 . . . . . {characterised by the arrangement of mobile armatures}
63/0022 . . . . . . {the armature and the valve being allowed to move relatively to each other}
63/0024 . . . . . . . {in combination with permanent magnet }
63/0026 . . . . . . {using piezoelectric or magnetostrictive actuators }
63/0028 . . . . {hydraulic}
63/0029 . . . . {using a pilot valve controlling a hydraulic chamber}
63/0031 . . . . . . . {characterized by the type of valves, e.g. special valve member details, valve seat details, valve housing details}
63/0033 . . . . {Lift valves, i.e. having a valve member that moves perpendicularly to the plane of the valve seat}
63/0035 . . . . . {Poppet valves, i.e. having a mushroom-shaped valve member that moves perpendicularly to the plane of the valve seat}
63/0036 . . . . . . {with spherical or partly spherical shaped valve member ends }
63/0038 . . . . . {rotary }
63/004 . . . . . {Sliding valves, e.g. spool valves, i.e. whereby the closing member has a sliding movement along a seat for opening and closing}
63/0042 . . . . {combined with valve seats of the lift valve type}
63/0043 . . . . {Two-way valves}
63/0045 . . . . {Three-way valves}
63/0047 . . . . {Four-way valves or valves with more than four ways}
63/0049 . . . { Combined valve units, e.g. for controlling pumping chamber and injection valve }
63/005 . . . . . {Pressure relief valves }
63/0052 . . . . . {with means for adjusting the opening pressure, e.g. electrically controlled }
63/0054 . . . . . {Check valves ( F02M 59/462, F02M 59/464 take precedence )}
63/0056 . . . . . {Throttling valves, e.g. having variable opening positions throttling the flow }
63/0057 . . . . . {Means for avoiding fuel contact with valve actuator, e.g. isolating actuators by using bellows or diaphragms}
63/0059 . . . . . {Arrangements of valve actuators}
63/0061 . . . . . {Single actuator acting on two or more valve bodies}
63/0063 . . . . . {Two or more actuators acting on a single valve body }
63/0064 . . . . . {Two or more actuators acting on two or more valve bodies}
63/0066 . . . . . {Combination of electromagnetic and piezoelectric or magnetostrictive actuators }
63/0068 . . . . . {Actuators specially adapted for partial and full opening of the valves }
63/007 . . . . . . {Details not provided for in, or of interest apart from, the apparatus of the groups F02M 63/0014 - F02M 63/0059 }
63/0071 . . . . . . {characterised by guiding or centering means in valves including the absence of any guiding means, e.g. "flying arrangements" } 
63/0073 . . . . . . {Pressure balanced valves}
63/0075 . . . . . . {Stop members in valves, e.g. plates or disks limiting the movement of armature, valve or spring }
63/0077 . . . . . . {Valve seat details }
63/0078 . . . . . {Valve member details, e.g. special shape, hollow or fuel passages in the valve member }
63/008 . . . . . . . {Hollow valve members, e.g. members internally guided }
63/02 . . Fuel-injection apparatus having several injectors fed by a common pumping element, or having several pumping elements feeding a common injector; Fuel-injection apparatus having provisions for cutting-out pumps, pumping elements, or injectors; Fuel-injection apparatus having provisions for variably interconnecting pumping elements and injectors alternatively
Fuel-injection apparatus

65/00 Testing fuel-injection apparatus, e.g. testing injection timing; (testing of ignition F02P 17/00; measuring fuel consumption G01F 9/00; Cleaning of fuel-injection apparatus)

65/001 . . . (Measuring fuel delivery of a fuel injector)
65/002 . . . (Measuring fuel delivery of multi-cylinder injection pumps)
65/003 . . . (Measuring variation of fuel pressure in high pressure line)
65/005 . . . (Measuring or detecting injection-valve lift, e.g. to determine injection timing)
65/006 . . . (Measuring or detecting fuel leakage of fuel injection apparatus)
65/007 . . . (Cleaning)
65/008 . . . (of injectors only)

Fuel-injection by high-pressure gas carrying the fuel into engine working cylinders: Low-pressure fuel-injection

67/00 Apparatus in which fuel-injection is effected by means of high-pressure gas, the gas carrying the fuel into working cylinders of the engine, e.g. air-injection type (using compressed air for low-pressure fuel-injection apparatus F02M 69/08)

NOTE
- in this group the following indexing codes are used: F02B 2720/25

67/005 . . . (fuel-gas mixture being compressed in a pump for subsequent injection into the engine)
67/002 . . . (the gas being compressed air, e.g. compressed in pumps (arrangements or adaptations of such pumps F02B))
67/004 . . . (the air being extracted from working cylinders of the engine)
67/006 . . . (the gas being other than air, e.g. steam, combustion gas)
67/008 . . . (the gas being generated by combustion of part of the fuel other than in engine working cylinders)
67/10 . . . (Injectors peculiar thereto, e.g. valve less type)
67/12 . . . (having valves)
67/14 . . . (characterised by provisions for injecting different fuels, e.g. main fuel and readily self-igniting starting fuel)

69/00 Low-pressure fuel-injection apparatus ( ; Apparatus with both continuous and intermittent injection; Apparatus injecting different types of fuel)

NOTE
- in this group the following indexing codes are used: F02B 2720/15

69/002 . . . (characterised by means for intermittently metering the portion of fuel injected (F02M 69/12, F02M 69/14 take precedence))
69/005 . . . (characterised by control of air admission to the engine according to the fuel injected)
69/007 . . . (by means of devices using fuel pressure deviated from main fuel circuit acting on air throttle valve)
69/002 . . . (Pumps peculiar thereto ((elastic wall type pumps F02M 59/14))
69/04 . . . (Injectors peculiar thereto)
69/041 . . . (having vibrating means for atomizing the fuel, e.g. with sonic or ultrasonic vibrations)
69/042 . . . (Positioning of injectors with respect to engine, e.g. in the air intake conduit (mounting of injectors F02M 61/14))
69/043 . . . (for injecting into the intake conduit upstream of an air throttle valve)
69/044 . . . (for injecting into the intake conduit downstream of an air throttle valve)
69/045 . . . (for injecting into the combustion chamber (F02M 69/046 takes precedence))
69/046 . . . (for injecting into both the combustion chamber and the intake conduit)
69/047 . . . (injectors with air chambers, e.g. communicating with atmosphere for aerating the nozzles (F02M 69/325 takes precedence))
Fuel-injection by high-pressure gas carrying the fuel into engine working cylinders; Low-pressure fuel-injection

69/048 . . . [having variable fuel outlets, e.g. controlled by a valve actuated by operator]

69/06 . characterised by the pressurisation of the fuel being caused by centrifugal force acting on the fuel

69/08 . characterised by the fuel being carried by compressed air into main stream of combustion-air

69/10 . peculiar to scavenged two-stroke engines, e.g. injecting into crankcase-pump chamber

69/12 . comprising a fuel-displaced free-piston for intermittently metering and supplying fuel to injection nozzles [(high-pressure fuel-injection with fuel-displaced auxiliary pistons F02M 59/32)]

69/125 . . . [Means for varying the stroke of the free-piston]

69/14 . having cyclically- operated valves connecting injection nozzles to a source of fuel under pressure during the injection period [(high-pressure fuel injection apparatus F02M 63/0003)]

69/142 . . . [the valves being operated by fluid impulses, e.g. using bistable fluid operated valves]

69/145 . . . [the valves being actuated electrically (electrically-operated injectors F02M 51/06)]

69/147 . . . [the valves being actuated mechanically, e.g. rotating]

69/16 . characterised by means for metering continuous fuel flow to injectors or means for varying fuel pressure upstream of [continuously or intermittently operated] injectors

69/18 . . . the means being metering valves throttling fuel passages to injectors or by-pass valves throttling overflow passages, the metering valves being actuated by a device responsive to the engine working parameters, e.g. engine load, speed, temperature or quantity of air (the means varying fuel pressure in a fuel by-pass passage, the pressure acting on a throttle valve against the action of metered or throttled fuel pressure for variably throttling fuel flow to injection nozzles F02M 69/26)

69/20 . . . the device being a servo-motor, e.g. using engine intake air pressure or vacuum (the actuating device comprising a member movably mounted in the air intake conduit and displaced according to the quantity of air admitted to the engine F02M 69/22)

69/22 . . . the device comprising a member movably mounted in the air intake conduit and displaced according to the quantity of air admitted to the engine

69/24 . . . the device comprising a member for transmitting the movement of the air throttle valve actuated by the operator to the valves controlling fuel passages

69/26 . . . the means varying fuel pressure in a fuel by-pass passage, the pressure acting on a throttle valve against the action of metered or throttled fuel pressure for variably throttling fuel flow to injection nozzles, e.g. to keep constant the pressure differential at the metering valve

69/28 . characterised by means for cutting- out the fuel supply to the engine or to main injectors during certain operating periods, e.g. deceleration

69/30 . characterised by means for facilitating the starting-up or idling of engines or by means for enriching fuel charge, e.g. below operational temperatures or upon high power demand of engines

69/32 . . . with an air by-pass around the air throttle valve or with an auxiliary air passage, e.g. with a variably controlled valve therein

69/325 . . . [with an auxiliary injection nozzle therein (F02M 69/34 takes precedence)]

69/34 . . . with an auxiliary fuel circuit supplying fuel to the engine, e.g. with the fuel pump outlet being directly connected to injection nozzles

69/36 . . . having an enrichment mechanism modifying fuel flow to injectors, e.g. by acting on the fuel metering device or on the valves throttling fuel passages to injection nozzles or overflow passages [(at acceleration F02M 69/44)]

69/38 . . . using fuel pressure, e.g. by varying fuel pressure in the control chambers of the fuel metering device (the means varying fuel pressure in a fuel by-pass passage, the pressure acting on a throttle valve against the action of metered or throttled fuel pressure for variably throttling fuel flow to injection nozzles F02M 69/26)

69/383 . . . . . . . . [the fuel passing through different passages to injectors or to a drain, the pressure of fuel acting on valves to close or open selectively these passages]

69/386 . . . . . . . . [varially controlling the pressure of the fuel by-passing the metering valves, e.g. by valves responsive to signals of temperature or oxygen sensors]

69/40 . . . using variably controlled air pressure, e.g. by modifying the intake air vacuum signal acting on the fuel metering device

69/42 . . . using other means than variable fluid pressure, e.g. acting on the fuel metering device mechanically or electrically

69/44 . . . characterised by means for supplying extra fuel to the engine on sudden air throttle opening, e.g. at acceleration

69/46 . . . Details, component parts or accessories not provided for in, or of interest apart from, the apparatus covered by groups

69/462 . . . [Arrangement of fuel conduits, e.g. with valves for maintaining pressure in the pipes after the engine being shut-down]

69/465 . . . . . . . . [of fuel rails]

69/467 . . . [Devices using intake air for generating a control signal acting on fuel delivery (F02M 69/125, F02M 69/20, F02M 69/40) take precedence]

69/48 . . . Arrangement of air sensors (F02M 69/22 takes precedence)

69/50 . . . Arrangement of fuel distributors, e.g. with means for supplying equal portion of metered fuel to injectors (F02M 69/147 takes precedence)

69/52 . . . Arrangement of fuel metering devices (F02M 69/18 takes precedence)

69/54 . . . Arrangement of fuel pressure regulators

71/00 Combinations of carburettors and low-pressure fuel-injection apparatus

NOTE
- in this group the following indexing codes are used: F02M 2700/1347
Fuel-injection by high-pressure gas carrying the fuel into engine working cylinders; Low-pressure fuel-injection

**F02M**

**F02M 71/00 (continued)**

**WARNING**

Groups F02M 71/00, F02M 71/02, and F02M 71/04 are incomplete pending reclassification of documents from groups F02M 7/06, F02M 7/08, F02M 7/083, F02M 7/087, and F02M 7/093.

All groups listed in this Warning should be considered in order to perform a complete search.

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<th>Class</th>
<th>Description</th>
</tr>
</thead>
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<tr>
<td>71/02</td>
<td>with fuel-air mixture being produced by the carburettor and being compressed by a pump for subsequent injection into main combustion-air</td>
</tr>
<tr>
<td>71/04</td>
<td>with carburettor being used at starting or idling only and injection apparatus being used during normal operation of engine (or vice versa)</td>
</tr>
</tbody>
</table>

**99/00 Subject matter not provided for in other groups of this subclass**

**2200/00** Details of fuel-injection apparatus, not otherwise provided for

- 2200/02 Fuel-injection apparatus having means for reducing wear
- 2200/03 Fuel-injection apparatus having means for reducing or avoiding stress, e.g. the stress caused by mechanical force, by fluid pressure or by temperature variations
- 2200/04 Fuel-injection apparatus having means for avoiding effect of cavitation, e.g. erosion
- 2200/05 Fuel-injection apparatus having means for preventing corrosion
- 2200/06 Fuel-injection apparatus having means for preventing coking, e.g. of fuel injector discharge orifices or valve needles
- 2200/07 Fuel-injection apparatus having means for avoiding sticking of valve or armature, e.g. preventing hydraulic or magnetic sticking of parts
- 2200/08 Fuel-injection apparatus having special means for influencing magnetic flux, e.g. for shielding or guiding magnetic flux
- 2200/09 Fuel-injection apparatus having means for reducing noise
- 2200/16 Sealing of fuel injection apparatus not otherwise provided for
- 2200/18 Fuel-injection apparatus having means for maintaining safety not otherwise provided for
- 2200/185 means for improving crash safety
- 2200/20 Fuel-injection apparatus with permanent magnets
- 2200/21 Fuel-injection apparatus with piezo-electric or magnetostrictive elements
- 2200/215 Piezo-electric or magnetostrictive elements being able to tilt in its housing
- 2200/22 Fuel-injection apparatus with bimetallic or memory shape alloy elements
- 2200/24 Fuel-injection apparatus with sensors
- 2200/241 Acceleration or vibration sensors
- 2200/242 Displacement sensors
- 2200/244 Force sensors
- 2200/245 Position sensors, e.g. Hall sensors
- 2200/247 Pressure sensors
- 2200/248 Temperature sensors
- 2200/25 Fuel-injection apparatus with heat-expansible elements
- 2200/26 Fuel-injection apparatus with elastically deformable elements other than coil springs
- 2200/27 Fuel-injection apparatus with filters
- 2200/28 Details of throttles in fuel-injection apparatus
- 2200/29 Fuel-injection apparatus having rotating means (rotary valves F02M 63/0038)
- 2200/30 Fuel-injection apparatus having mechanical parts, the movement of which is damped
- 2200/302 Fuel-injection apparatus having hydraulic pressure fluctuations damping elements
- 2200/315 Fuel-injection apparatus having hydraulic pressure fluctuations damping elements
- 2200/40 Fuel-injection apparatus with fuel accumulators, e.g. a fuel injector having an integrated fuel accumulator
- 2200/44 Valves, e.g. injectors, with valve bodies arranged side-by-side
- 2200/46 Valves, e.g. injectors, with concentric valve bodies
- 2200/50 Arrangements of springs for valves used in fuel injectors or fuel injection pumps
- 2200/502 Springs biasing the valve member to the open position
- 2200/505 Adjusting spring tension by sliding spring seats
- 2200/507 Adjusting spring tension by screwing spring seats
- 2200/60 Fuel-injection apparatus having means for facilitating the starting of engines, e.g. with valves or fuel passages for keeping residual pressure in common rails
- 2200/70 Linkage between actuator and actuated element, e.g. between piezoelectric actuator and needle valve or pump plunger
- 2200/701 Mechanical
- 2200/702 with actuator and actuated element moving in different directions, e.g. in opposite directions
- 2200/703 Hydraulic
- 2200/704 with actuator and actuated element moving in different directions, e.g. in opposite directions
- 2200/705 with means for filling or emptying hydraulic chamber, e.g. for compensating clearance or thermal expansion
- 2200/706... Valves for filling or emptying hydraulic chamber
- 2200/707 with means for avoiding fuel contact with actuators, e.g. isolating actuators by using bellows or diaphragms
- 2200/708 with hydraulic chambers formed by a movable sleeve
- 2200/80 Fuel injection apparatus manufacture, repair or assembly
- 2200/8007 Storing data on fuel injection apparatus, e.g. by printing, by using bar codes or EPROMs
- 2200/8015 Provisions for assembly of fuel injection apparatus in a certain orientation, e.g. markings, notches or specially shaped sleeves other than a clip
- 2200/8023 the assembly involving use of quick-acting mechanisms, e.g. clips
- 2200/803 using clamp elements and fastening means; e.g. bolts or screws
- 2200/8038 the assembly involving use of adhesives, glue or the like

(CPC - 2020.02)
2200/8046  . . the manufacture involving injection moulding, e.g. of plastic or metal
2200/8053  . . involving mechanical deformation of the apparatus or parts thereof
2200/8061  . . involving press-fit, i.e. interference or friction fit
2200/8069  . . involving removal of material from the fuel apparatus, e.g. by punching, hydro-erosion or mechanical operation
2200/8076  . . involving threaded members
2200/8084  . . involving welding or soldering
2200/8092  . . adjusting or calibration
2200/85  . . Mounting of fuel injection apparatus
2200/851  . . provisions for adjusting the angular, rotational or axial position of injectors
2200/852  . . provisions for mounting the fuel injection apparatus in a certain orientation, e.g. markings or notches
2200/853  . . involving use of quick-acting mechanism, e.g. clips
2200/855  . . using clamp elements or fastening means, e.g. bolts or screws
2200/856  . . characterised by mounting injector to fuel or common rail, or vice versa
2200/857  . . characterised by mounting fuel or common rail to engine
2200/858  . . sealing arrangements between injector and engine
2200/90  . . Selection of particular materials
2200/9007  . . Ceramic materials
2200/9015  . . Elastomeric or plastic materials
2200/9023  . . Fibrous materials
2200/903  . . Glass
2200/9038  . . Coatings
2200/9046  . . Multi-layered materials
2200/9053  . . Metals
2200/9061  . . Special treatments for modifying the properties of metals used for fuel injection apparatus, e.g. modifying mechanical or electromagnetic properties
2200/9069  . . Non-magnetic metals
2200/9076  . . Non-ferrous metals
2200/9084  . . Rheological fluids
2200/9092  . . Sintered materials
2200/95  . . Fuel injection apparatus operating on particular fuels, e.g. biodiesel, ethanol, mixed fuels
2200/953  . . Dimethyl ether, DME
2200/956  . . Ethanol

2547/00  Special features for fuel-injection valves actuated by fluid pressure
2547/001  . . Control chambers formed by movable sleeves
2547/003  . . Valve inserts containing control chamber and valve piston
2547/005  . . Fuel injectors without fuel return, i.e. the pressure in the control chamber is released into the combustion chamber with fluid flow only in one direction
2547/006  . . Springs assisting hydraulic closing force
2547/008  . . Means for influencing the flow rate out of or into a control chamber, e.g. depending on the position of the needle

2700/00  Supplying, feeding or preparing air, fuel, fuel air mixtures or auxiliary fluids for a combustion engine; Use of exhaust gas; Compressors for piston engines
2700/05  . . Miscellaneous constructional elements; Leakage detection
2700/055  . . Fuel distribution among injection nozzles
2700/07  . . Nozzles and injectors with controllable fuel supply
2700/071  . . Injectors having valves
2700/072  . . Injection valve actuated by engine for supply of pressurised fuel; Electrically or electromagnetically actuated injectors
2700/074  . . Injection valve actuated by fuel pressure for pressurised fuel supply
2700/075  . . Injection valve actuated by cylinder pressure or other air pressure for pressurised fuel supply
2700/077  . . Injectors having cooling or heating means
2700/078  . . Injectors combined with fuel injection pump
2700/12  . . Devices or methods for making a gas mixture for a combustion engine
2700/123  . . Fuel supply devices
2700/126  . . Devices for the supply or mixing of air and gas
2700/13  . . Special devices for making an explosive mixture; Fuel pumps
2700/1305  . . Auxiliary air supply devices for carburettors
2700/1311  . . Devices for controlling register carburettors or for carburettors disposed in parallel
2700/1317  . . Fuel pumpo for internal combustion engines
2700/1323  . . Controlled diaphragm type fuel pump
2700/1329  . . Controlled rotary fuel pump with parallel pistons or with a single piston in the extension of the driving shaft
2700/1335  . . Fuel pump combined with the fuel injector
2700/1341  . . Fuel pump driven by the differential pressure of a gas
2700/1347  . . Fuel pump acting on a carburettor; Acceleration pumps
2700/1352  . . Fuel pump with a constant stroke piston without control means
2700/1358  . . Fuel pump with control of fuel inlet to the pumping chamber
2700/1364  . . Fuel pump controlled by means of a fuel return valve
2700/137  . . Fuel pump with control of fuel outlet of pumping chamber to delivery pipe
2700/1376  . . Fuel pump with control of the pump piston stroke
2700/1382  . . Fuel pump with control of the cylinder relative to non-rotary piston
2700/1388  . . Fuel pump with control of the piston relative to a fixed cylinder
2700/1394  . . Knock sensors
2700/31  . . Use of exhaust gas of combustion engines
2700/33  . . Compressors for piston combustion engines
2700/331  . . Charging and scavenging compressors
2700/333  . . Drive thereof
2700/335  . . Control thereof
2700/336  . . Arrangements thereof on the engine
2700/338  . . Injection air compressors
2700/34  . . Measures, also constructive measures, for avoiding the generation of nixious products such as CO in the exhaust gases
2700/43  . . Arrangements for supplying air, fuel or auxiliary fluids to a combustion space of mixture compressing engines working with liquid fuel
2700/4302  . . whereby air and fuel are sucked into the mixture conduit
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<td>2700/4371</td>
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</tr>
<tr>
<td>2700/4373</td>
<td>Mixture improving devices</td>
</tr>
<tr>
<td>2700/4376</td>
<td>Mechanical devices</td>
</tr>
<tr>
<td>2700/4378</td>
<td>Other devices</td>
</tr>
<tr>
<td>2700/438</td>
<td>Supply of liquid to a carburettor reservoir with limitation of the liquid level; Aerating devices; Mounting of fuel filters</td>
</tr>
<tr>
<td>2700/4383</td>
<td>with fuel displacement by gas pressure working on the fuel</td>
</tr>
<tr>
<td>2700/4385</td>
<td>the pressure being an overpressure</td>
</tr>
<tr>
<td>2700/4388</td>
<td>with fuel displacement by a pump</td>
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<tr>
<td>2700/439</td>
<td>the pump being a membrane pump</td>
</tr>
<tr>
<td>2700/4392</td>
<td>Conduits, manifolds, as far as heating and cooling if not concerned; Arrangements for removing condensed fuel</td>
</tr>
<tr>
<td>2700/4395</td>
<td>Other details</td>
</tr>
<tr>
<td>2700/4397</td>
<td>whereby air or fuel are admitted in the mixture conduit by means other than vacuum or an acceleration pump</td>
</tr>
</tbody>
</table>