

ECLA**EUROPEAN CLASSIFICATION****F02M****SUPPLYING COMBUSTION ENGINES IN GENERAL, WITH COMBUSTIBLE MIXTURES OR CONSTITUENTS THEREOF (charging such engines F02B)**

[N: **WARNING** [C2012.01]

1. The following IPC groups are not used in the internal ECLA classification scheme. Subject matter covered by these groups is classified in the following ECLA groups:

[F02M7/23](#) covered by [F02M7/10B](#)
[F02M51/08](#) " " [F02M51/06](#)
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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.

Guide heading: [Carburettors \(for gaseous fuels F02M21/00; combined with low-pressure fuel-injection apparatus F02M71/00\)](#)

F02M1/00

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

[N: **Note** [M1207]

- in this group the following indexing codes are used: [R02M700/43B](#)
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F02M1/00B

- [N: Remote display or control for displaying the operational situation of the starter]

F02M1/02

- the means to facilitate starting or idling being chokes for enriching fuel-air mixture (automatic chokes [F02M1/08](#))

- F02M1/04 . the means to facilitate starting or idling being auxiliary carburetting apparatus able to be put into, and out of, operation, e.g. having automatically-operated disc valves
- F02M1/04B . . [N: Auxiliary carburetting apparatus controlled by rotary sliding valves]
- F02M1/04C . . [N: Auxiliary carburetting apparatus controlled by piston valves]
- F02M1/06 . . having axially-movable valves, e.g. piston-shaped
- F02M1/08 . the means to facilitate starting or idling becoming operative or inoperative automatically (in connection with auxiliary carburetting apparatus [F02M1/04](#))
- F02M1/10 . . dependent on engine temperature, e.g. having thermostat
- F02M1/12 . . . with means for electrically heating thermostat
- F02M1/14 . . dependent on pressure in combustion-air or fuel-air-mixture intake ([F02M1/10](#) takes precedence)
- F02M1/16 . Other means for enriching fuel-air mixture during starting; Priming cups; Using different fuels for starting and normal operation
- F02M1/16B . . [N: Vaporizing light fractions from the fuel and condensing them for use during starting] [N9909]
- F02M1/18 . . Enriching fuel-air mixture by depressing float to flood carburettor
- F02M1/18B . . . [N: Enriching the fuel-air mixture by altering the float chamber level by external means, e.g. by opening the input valve]
- F02M3/00** **Idling devices** (with means for facilitating idling below operational temperatures [F02M1/00](#))
- F02M3/00B . [N: Idling fuel enrichment with motor driven instead of driving; Switching the fuel supply from the main to idling jet system]
- F02M3/02 . Preventing flow of idling fuel
- F02M3/04 . . under conditions where engine is driven instead of driving, e.g. driven by vehicle running down hill
- F02M3/04F . . . [N: Removal of the fuel from the main jet system, e.g. by means of a pump]
- F02M3/04G . . . [N: Fuel cut-off by altering the pressure in the float chamber; Arrangement of pneumatic accumulators for pressure equalization]
- F02M3/04J . . . [N: Devices as described in [F02M3/00B](#), [F02M3/04E](#), [F02M3/04G](#), [F02M3/045](#), [F02M3/05](#) and [F02M3/055](#) and also equipped with additional air]
- F02M3/045 . . . 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
- F02M3/05 . . . Pneumatic or mechanical control, e.g. with speed regulation
- F02M3/055 . . . Fuel flow cut-off by introducing air, e.g. brake air, into the idling fuel system
- F02M3/06 . Increasing idling speed
- F02M3/06C . . [N: 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 [F02M19/12B](#))]
- F02M3/06D . . [N: by randomly altering the throttle valve stop]
- F02M3/07 . . 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
- F02M3/07B . . . [N: the valve altering the fuel conduit cross-section being a slidable valve]
- F02M3/08 . Other details of idling devices (fighting ice-formation by heating idling ports [F02M15/02](#))
- F02M3/09 . . Valves responsive to engine conditions, e.g. manifold vacuum ([F02M1/00](#), [F02M5/00](#) to [F02M33/00](#) take precedence)
- F02M3/10 . . Fuel metering pins; nozzles
- F02M3/12 . . Passageway systems
- F02M3/14 . . Location of idling system outlet relative to throttle valve

- F02M5/00** **Float-controlled apparatus for maintaining a constant fuel level**

- F02M5/02 . with provisions to meet variations in carburettor position, e.g. upside-down position in aircraft
- F02M5/04 . . with pivotally or rotatably mounted float chambers [N: (basic adjustment of float chambers having variable position [F02M5/14](#))]
- F02M5/06 . having adjustable float mechanism, e.g. to meet dissimilarities in specific gravity of different fuels
- F02M5/08 . having means for venting float chambers
- F02M5/08B . . [N: consisting of an overflow from the float chamber]
- F02M5/10 . having means for preventing vapour lock, e.g. insulated float chambers or forced fuel circulation through float chamber with engine stopped
- F02M5/10B . . [N: Auxiliary input valve which can be regulated to obtain an increased fuel supply from the float chamber]
- F02M5/12 . Other details, e.g. floats, valves, setting devices or tools (floats in general [F16K33/00](#))
- F02M5/12C . . [N: Shape of the jet needle]
- F02M5/14 . . [N: IPC3] Float chambers, e.g. adjustable in position [N: (float chamber with a built-in intermediate reservoir [F02M7/06](#))]
- F02M5/16 . . Floats [N9602]

- F02M7/00** **Carburettors with means for influencing, e.g. enriching or keeping constant, fuel/air ratio of charge under varying conditions (choke valves for starting [F02M1/00](#))**

- F02M7/02 . Carburettors having aerated fuel spray nozzles (with valve control for amount of air for aerating fuel [F02M7/24](#))
- F02M7/02B . . [N: 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 [F02M3/055](#))] [C9809]
- F02M7/04 . Means for enriching charge at high combustion-air flow
- F02M7/04B . . [N: Mechanical adjustment of the spray nozzle cross-section in connection with the choke]
- F02M7/06 . [N: Means for enriching charge on sudden air throttle opening, i.e. at acceleration, e.g. storage means in passage way system]

- F02M7/08 . . . using pumps
- F02M7/08D [N: a pump sucking fuel from the conduit system leading to the spray nozzle downstream of the metering cross-section during deceleration] [C9602]
- F02M7/087 changing output according to temperature in engine [N9602]
- F02M7/093 changing output according to intake vacuum [N9602]

- F02M7/10 . . Other installations, without moving parts, for influencing fuel/air ratio, e.g. electrical means
- F02M7/10B . . . [N: with self-acting equaliser jets]
- F02M7/10D . . . [N: Fluid amplifier as a device for influencing the fuel-air mixture]
- F02M7/11 . . . Altering float-chamber pressure (enriching the fuel-air mixture during starting by depressing float to flood carburettor [F02M1/18](#))

- F02M7/12 . . Other installations, with moving parts, for influencing fuel/air ratio, e.g. having valves ([F02M7/24](#) takes precedence)
- F02M7/127 . . . Altering the float-chamber pressure (enriching the fuel-air mixture during starting by depressing float to flood carburettor [F02M1/18](#)) [N9602]
- F02M7/133 . . . Auxiliary jets, i.e. operating only under certain conditions, e.g. full power ([F02M7/04](#), [F02M7/06](#) take precedence)
- F02M7/14 . . . with means for controlling cross-sectional area of fuel spray nozzle (dependent on air-throttle valve position [F02M7/22](#))
- F02M7/16 operated automatically, e.g. dependent on exhaust-gas analysis
- F02M7/17 by a pneumatically adjustable piston-like element, e.g. constant depression carburettors [N9602]
- F02M7/18 . . . with means for controlling cross-sectional area of fuel-metering orifice (dependent on air-throttle position [F02M7/22](#))
- F02M7/20 operated automatically, e.g. dependent on altitude
- F02M7/22 . . . fuel flow cross-sectional area being controlled dependent on air-throttle-valve position (the throttle valve being slidably arranged transversely to air passage [F02M9/06](#))
- F02M7/22B [N: The fuel orifice opening is controlled by a manually actuatable throttle valve so as to vary the cross-sectional area of the orifice]
- F02M7/24 . . . with means for controlling amount of air for aerating fuel
- F02M7/24B [N: Accessories, e.g. sieves, accelerating wheels, whirl generating devices and the like, for the intimate mixing of emulsifying air with fuel]
- F02M7/26 dependent on position of optionally operable throttle means [N9602]
- F02M7/28 dependent on temperature or pressure [N9602]

- F02M9/00** **Carburettors having air or fuel-air mixture passage throttling valves other than of butterfly type (register-type carburettors [F02M11/00](#)); Carburettors having fuel-air mixing chambers of variable shape or position**

- F02M9/02 . . . having throttling valves, e.g. of piston shape, slidably arranged transversely to the passage
- F02M9/02B [N: General constructional elements]
- F02M9/02C [N: with plate-like throttle valve]
- F02M9/04 . . . with throttling valves sliding in a plane inclined to the passage
- F02M9/06 . . . with means for varying cross-sectional area of fuel spray nozzle dependent on

- throttle position
- F02M9/06B . . . [N: Automatically and not automatically controlled throttle valves operating mutually]
 - F02M9/08 . having throttling valves rotatably mounted in the passage
 - F02M9/08B . . [N: Fuel spray nozzles in the throttling valves]
 - F02M9/10 . having valves, or like controls, of elastic-wall type for controlling the passage, or for varying cross-sectional area, of fuel-air mixing chambers [N: or of the entry passage]
 - F02M9/10B . . [N: Mechanical control]
 - F02M9/10C . . [N: Pneumatic or hydraulic control]
 - F02M9/12 . having other specific means for controlling the passage, or for varying cross-sectional area, of fuel-air mixing chambers
 - F02M9/12B . . [N: Iris diaphragms]
 - F02M9/12D . . [N: consisting of lamellae or wires, e.g. a hyperboloid formed by twisting a wire cylinder]
 - F02M9/12F . . [N: Spiral springs]
 - F02M9/12G . . [N: Throttle valves with an action corresponding to those in apparatus for re-atomising condensed fuel or homogenising fuel-air mixture (shape of throttle valves F02M3/14)]
 - F02M9/12J . . [N: specially shaped throttle valves not otherwise covered in groups [F02M9/12B](#) to [F02M9/12G](#)]
 - F02M9/127 . . Axially movable throttle valves concentric with the axis of the mixture passage
 - F02M9/127B . . . [N: Venturi-nozzle shaped type, e.g. a venturi nozzle being moved relative to a fixed mushroom-shaped body]
 - F02M9/133 . . . the throttle valves having mushroom-shaped bodies
 - F02M9/14 . having venturi and nozzle relatively displaceable essentially along the venturi axis
 - F02M11/00** **Multi-stage carburettors, Register-type carburettors, i.e. with slidable 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**
 - F02M11/02 . with throttling valve, e.g. of flap or butterfly type, in a later stage opening automatically
 - F02M11/04 . . the later stage valves having damping means
 - F02M11/06 . Other carburettors with throttling valve of flap or butterfly type
 - F02M11/08 . Register carburettors with throttling valve movable transversally to air passage
 - F02M11/10 . Register carburettors with rotatable throttling valves
 - F02M11/10B . . [N: Shape of the idling system]
 - F02M13/00** **Arrangements of two or more separate carburettors (re-atomising condensed fuel or homogenising fuel-air mixture [F02M29/00](#)); Carburettors using more than one fuel (apparatus for adding small quantities of secondary fuel [F02M25/00](#))**
 - F02M13/02 . Separate carburettors

- F02M13/02B . . [N: Particular constructional measures of the intake conduits between carburettors and cylinder]
- F02M13/02C . . [N: Special construction of the control rods]
- F02M13/02D . . [N: Equalizing pipes between the carburettors, e.g. between the float chambers]
- F02M13/02F . . [N: Common functional groups for several carburettors, e.g. common idling system]
- F02M13/02G . . [N: Tuning apparatus for multi-stage carburettors installations (other carburettor tuning apparatus [F02M19/01](#))]
- F02M13/04 . . structurally united
- F02M13/04B . . . [N: arranged in series, e.g. initial and main carburettor]
- F02M13/04C . . . [N: arranged in parallel, e.g. initial and main carburettor]
- F02M13/06 . the carburettors using different fuels
- F02M13/08 . Carburettors adapted to use liquid and gaseous fuels, e.g. alternatively

- F02M15/00** **Carburettors with heating, cooling, or thermal insulating means for combustion-air, fuel, or fuel-air mixture** (heating, cooling, or thermally insulating float apparatus [F02M5/00](#); apparatus for thermally treating combustion-air, fuel, or fuel-air mixture not being part of a carburettor [F02M31/00](#))
- F02M15/02 . with heating means, e.g. to combat ice-formation
- F02M15/02B . . [N: near to manually operated throttle valve]
- F02M15/02C . . [N: Fuel preheating]
- F02M15/02D . . [N: Air or air-fuel mixture preheating]
- F02M15/04 . . the means being electrical
- F02M15/04B . . . [N: for the fuel system, e.g. built into the fuel conduits or nozzles]
- F02M15/06 . Heat shieldings, e.g. from engine radiations

- F02M17/00** **Carburettors having pertinent characteristics not provided for in, or of interest apart from, the apparatus of preceding main groups** (apparatus for treating combustion-air, fuel, or fuel-air mixture by catalysts, electric means, magnetism, rays, sound waves, or the like [F02M27/00](#); combinations of carburettors and low-pressure fuel-injection apparatus [F02M71/00](#))
- F02M17/02 . Floatless carburettors
- F02M17/04 . . having fuel inlet valve controlled by diaphragm
- F02M17/06 . . having overflow chamber determining constant fuel level
- F02M17/08 . Carburettors having one or more fuel passages opening in a valve-seat surrounding combustion-air passage, the valve being opened by passing air
- F02M17/09 . . the valve being of an eccentrically mounted butterfly type
- F02M17/10 . Carburettors having one or more fuel passages opening in valve-member of air throttle
- F02M17/12 . . the valve member being of butterfly type
- F02M17/14 . Carburettors with fuel-supply parts opened and closed in synchronism with engine stroke [N: Valve carburettors]

- F02M17/14B . . [N: with the fuel exit nozzles in or near the valve seat or valve]
- F02M17/14C . . [N: the valve being opened by the pressure of the passing fluid]
- F02M17/14D . . [N: Valve carburettor with simultaneous air and fuel control]

- F02M17/16 . Carburettors having continuously-rotating bodies, e.g. surface carburettors (fuel injection by centrifugal forces [F02M69/06](#))

- F02M17/18 . Other surface carburettors
- F02M17/20 . . with fuel bath
- F02M17/22 . . . with air bubbling through bath
- F02M17/24 . . with wicks
- F02M17/26 . . with other wetted bodies
- F02M17/28 . . . fuel being drawn through a porous body

- F02M17/30 . Carburettors with fire-protecting devices, e.g. combined with fire-extinguishing apparatus
- F02M17/32 . . automatically closing fuel conduits on outbreak of fire [N: (fire protection devices for stopping flow from or in pipes or hoses [F16L55/10P](#))]
- F02M17/34 . Other carburettors combined or associated with other apparatus, e.g. air filters (predominant aspects of the apparatus, see the relevant classes for such apparatus)
- F02M17/36 . Carburettors having fitments facilitating their cleaning
- F02M17/38 . Controlling of carburettors, not otherwise provided for ([external control gear F02M19/12](#))
- F02M17/40 . Selection of particular materials for carburettors, e.g. sheet metal, plastic, or translucent materials
- F02M17/42 . Float-controlled carburettors not otherwise provided for
- F02M17/44 . Carburettors characterised by draught direction and not otherwise provided for [N: e.g. for model aeroplanes]
- F02M17/46 . . with down- draught
- F02M17/48 . . with up- draught [N: and float draught, e.g. for lawnmower and chain saw motors]
- F02M17/50 . Carburettors having means for combating ice-formation ([thermally F02M15/02](#))
- F02M17/52 . Use of cold, produced by carburettors, for other purposes (apparatus using the cold, see the relevant classes for such apparatus)
- F02M17/52B . . [N: Use of the intake conduit vacuum]

- F02M19/00** **Details, component parts, or accessories of carburettors, not provided for in, or of interest apart from, the apparatus of groups [F02M1/00](#) to [F02M17/00](#) (measuring or testing apparatus in general [G01](#))**
- F02M19/01 . Apparatus for testing, tuning, or synchronising carburettors, e.g. carburettor glow stands
- F02M19/02 . Metering-orifices, e.g. variable in diameter ([variable during operation F02M7/18](#))

- F02M19/02B . . [N: the cross-sectional area being changed pneumatically, e.g. vacuum dependent]
- F02M19/02C . . [N: the cross-sectional area being changed electrically]
- F02M19/02D . . [N: the cross-sectional area being changed mechanically]
- F02M19/02F . . [N: Changing the nozzle cross-sectional area as a function of temperature]
- F02M19/02M . . [N: Movable mushroom-shaped spray nozzles]
- F02M19/02N . . [N: with a roughened spray stimulating surface or the like, e.g. sieves near to the nozzle orifice]
- F02M19/02P . . [N: Arrangement of nozzle in the suction passage (idling nozzles [F02M3/08](#))]
- F02M19/02Q . . [N: Ring nozzles]
- F02M19/02R . . [N: Fuel nozzle with device for return flow of leaked fuel]
- F02M19/02S . . [N: Arrangements of several spray nozzles not provided for in [F02M3/00](#) or [F02M11/00](#)]
- F02M19/02T . . [N: in a fixed aerofoil profile]
- F02M19/02V . . [N: with inserts of porous material]
- F02M19/02W . . [N: Nozzle cleaning]
- F02M19/025 . . Metering orifices not variable in diameter [N9602]
- F02M19/03 . . Fuel atomising nozzles; Arrangement of emulsifying air conduits (atomising in general [B05B](#)) [N9602]
- F02M19/035 . . Mushroom-shaped atomising nozzles [N9602]
- F02M19/04 . Fuel-metering pins or needles
- F02M19/06 . Other details of fuel conduits
- F02M19/06B . . [N: Built-in electric heaters]
- F02M19/06C . . [N: Built-in cleaning elements, e.g. filters]
- F02M19/08 . Venturis
- F02M19/08B . . [N: Shape of venturis or cross-section of mixture passages being adjustable]
- F02M19/08C . . [N: Venturi section being axially slidable in the mixture passages]
- F02M19/08D . . [N: Venturi section consisting of a lamellae spring-like structure]
- F02M19/08F . . [N: venturi section being made from elastic material, e.g. from rubber-like material]
- F02M19/08G . . [N: Venturi suction bypass systems]
- F02M19/08J . . [N: Venturi throat consisting of automatically adjusting balls]
- F02M19/08K . . [N: Whirl devices and other atomising means in or on the venturi walls]
- F02M19/10 . . in multiple arrangement [N: e.g. arranged in series, fixed, arranged radially offset with respect to each other]
- F02M19/10B . . . [N: movable axially relative to each other]
- F02M19/12 . External control gear, e.g. having dashpots (dampening means in later stages of multistage carburettors [F02M11/04](#); carburettor control gear in which the carburettor aspects do not predominate, see the relevant classes)
- F02M19/12B . . [N: Damping elements (pneumatic or hydraulic means for increasing idling speed [F02M3/06C](#))]
- F02M19/12C . . [N: Connecting rods between at least two throttle valves ([F02M1/02](#) takes precedence)]

- F02M19/12D . . . [N: Connecting rods between at least a throttle valve and an accelerating pump (F02M7/08 takes precedence)]
- F02M19/12E . . . [N: Reserve throttle idle return spring, e.g. for use upon failure of the main spring]
- F02M21/00** **Apparatus for supplying engines with non-liquid fuels, e.g. gaseous fuels stored in liquid form**
- [N: **Note** [M1207]
- in this group the following indexing codes are used: [R02M700/12](#) to [R02M700/13](#)
]
- F02M21/02 . . . for gaseous fuels (apparatus for vaporising liquid fuel by heat [F02M31/00](#); engines with apparatus generating gas from solid fuel, e.g. from wood, [F02B43/08](#))
- F02M21/02F . . . [N: characterised by the type of gaseous fuel] [N1202]
- F02M21/02F2 [N: Non-hydrocarbon fuels, e.g. hydrogen, ammonia or carbon monoxide] [N1202]
- F02M21/02F4 [N: Hydrocarbon fuels, e.g. methane or acetylene] [N1202]
- F02M21/02F4L [N: comprising at least 3 C-Atoms, e.g. liquefied petroleum gas (LPG), propane, butane or dimethyl ether (DME)] [N1202]
- F02M21/02F6 [N: Mixtures of gaseous fuels; Natural gas; Biogas; Mine gas; Landfill gas] [N1202]
- F02M21/02S . . . [N: Details on the gaseous fuel supply system, e.g. tanks, valves, pipes, pumps, rails, injectors or mixers] [N1202]
- F02M21/02S2 [N: Fuel storage reservoirs, e.g. cryogenic tanks] [N1202]
- F02M21/02S2M [N: Secondary gaseous fuel storages] [N1202]
- F02M21/02S4 [N: Means to treat or clean gaseous fuels or fuel systems, e.g. removal of tar, cracking, reforming or enriching] [N1202]
- F02M21/02S6 [N: Valves; Pressure or flow regulators in the fuel supply or return system] [N1202]
- F02M21/02S6A [N: Details of actuators therefor] [N1202]
- F02M21/02S6M [N: Multi-way valves; Multiple valves forming a multi-way valve system] [N1202]
- F02M21/02S6P [N: Pressure or flow regulators therefor] [N1202]
- F02M21/02S6S [N: Shut-off valves; Check valves; Safety valves; Pressure relief valves] [N1202]
- F02M21/02S8 [N: High pressure fuel supply systems; Rails; Pumps; Arrangement of valves] [N1202]
- F02M21/02S10 [N: Injectors] [N1202]
- F02M21/02S10A [N: Details of actuators therefor] [N1202]
- F02M21/02S10A2 [N: Electric actuators, e.g. solenoid or piezoelectric] [N1202]
- F02M21/02S10C [N: Details of the valve closing elements, e.g. valve seats, stems or arrangement of flow passages] [N1202]
- F02M21/02S10C2 [N: Lift valves, i.e. stem operated valves] [N1202]
- F02M21/02S10C2N [N: Inwardly opening single or multi nozzle valves, e.g. needle valves] [N1202]
- F02M21/02S10C2N2 {7 dots} [N: Hollow stem valves; Piston valves; Stems having a spherical tip] [N1202]
- F02M21/02S10C2P [N: Outwardly opening valves, e.g. poppet valves] [N1202]

- F02M21/02S10C4 [N: Ball valves; Plate valves; Valves having deformable or flexible parts, e.g. membranes; Rotatable valves] [N1202]
- F02M21/02S10D [N: for in-cylinder direct injection, e.g. injector combined with spark plug] [N1202]
- F02M21/02S10M [N: Port fuel injectors for single or multipoint injection into the air intake system] [N1202]
- F02M21/02S10S [N: 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] [N1202]
- F02M21/02S12 [N: Arrangement of multiple injectors or fuel-air mixers per combustion chamber] [N1202]
- F02M21/02S14 [N: characterised by the transition from liquid to gaseous phase ([F02M21/06](#) takes precedence); Injection in liquid phase; Cooling and low temperature storage] [N1202]
- F02M21/02S16 [N: Arrangement on engines or vehicle bodies; Conversion to gaseous fuel supply systems] [N1202]
- F02M21/02S17 [N: Safety devices; Fail-safe measures] [N1202]
- F02M21/02S18 [N: Manufacturing or assembly; Materials, e.g. coatings] [N1202]
- F02M21/04 Gas-air mixing apparatus (carburettors adapted to use liquid and gaseous fuels [F02M13/08](#); carburetting gases in general [C10J](#))
- F02M21/04M [N: Mixer comprising a plurality of bores or flow passages] [N1202]
- F02M21/04S [N: Vortex mixer] [N1202]
- F02M21/04V [N: Venturi mixer] [N1202]
- F02M21/06 Apparatus for de-liquefying, e.g. by heating (discharging liquefied gases in general [F17C](#))
- F02M21/08 for non-gaseous fuels (for engines operating on fuel containing oxidants [F02B](#))
- F02M21/10 for fuels with low melting point, e.g. apparatus having heating means
- F02M21/12 for fuels in pulverised state (engine plants with fuel-pulverising apparatus [F02B](#))

Guide heading: Engine-pertinent apparatus for feeding, or treating before their admission to engine, combustion-air, fuel, or fuel-air mixture [N: treatment by admission of activating fluids]

F02M23/00 Apparatus for adding secondary air to fuel-air mixture

- F02M23/00B [N: built into a flange]
- F02M23/00C [N: Particular shape of air intake]
- F02M23/00D [N: with a damping element in the secondary air control]
- F02M23/00F [N: Valves specially shaped for supplying secondary air]
- F02M23/02 with personal control, or with secondary-air valve controlled by main combustion-air throttle
- F02M23/02C [N: Optional operation by means of a hand or foot switch]
- F02M23/03 the secondary air-valve controlled by main combustion-air throttle [N9602]

- F02M23/04 . with automatic control
- F02M23/06 . . dependent on engine speed
- F02M23/06B . . . [N: Secondary air flow cut-off at low speed]
- F02M23/06C . . . [N: Secondary air flow cut-off at high torque]
- F02M23/06D . . . [N: Secondary air admission flow at high speeds and with the main butterfly valve closed, e.g. during deceleration]
- F02M23/08 . . dependent on pressure in main combustion-air induction system, [N: e.g. pneumatic-type apparatus]
- F02M23/08D . . . [N: specially adapted for secondary air admission during braking or travelling down steep slopes]
- F02M23/09 . . . using valves directly opened by low pressure [N9602]
- F02M23/09B [N: with balls which are not spring loaded] [N9602]
- F02M23/10 . . dependent on temperature, e.g. engine temperature

- F02M23/12 . characterised by being combined with device for, or by secondary air effecting, re-atomising of condensed fuel

- F02M23/14 . characterised by adding hot [N: secondary] air

- F02M25/00** **Engine-pertinent apparatus for adding non-fuel substances or small quantities of secondary fuel to combustion-air, main fuel, or fuel-air mixture** ([F02M43/00](#) takes precedence; adding secondary air to fuel-air mixture [F02M23/00](#))

- F02M25/022 . Adding fuel and water emulsion, water or steam [N1204]
- F02M25/022A . . [N: Details of the water supply system, e.g. pumps or arrangement of valves] [N1204]
- F02M25/022A2 . . . [N: Water recovery or storage] [N1204]
- F02M25/022A4 . . . [N: Water treatment or cleaning ([F02M25/032](#) takes precedence)] [N1204]
- F02M25/022A6 . . . [N: Water atomisers or mixers, e.g. using ultrasonic waves] [N1204]
- F02M25/022C . . [N: Control aspects; Arrangement of sensors; Diagnostics; Actuators] [N1204]
- F02M25/022E . . [N: Adding fuel and water emulsion] [N1204]
- F02M25/025 . . Adding water [N1204]
- F02M25/028 . . . into the charge intakes [N1204]
- F02M25/03 . . . into the cylinder [N: or the pre-combustion chamber] [N1204]
- F02M25/032 . . Producing and adding steam [N1207]
- F02M25/035 . . . into the charge intakes [N1207]
- F02M25/038 . . . into the cylinder [N: or the pre-combustion chamber] [N1207]

- F02M25/06 . adding lubricant vapours or exhaust gases
- F02M25/07 . . adding exhaust gases; [N: Exhaust gas recirculation (EGR)] [C0901]
- F02M25/07C . . . [N: Handling or preventing deposits, corrosion or wear caused by impurities, e.g. means or measures for preventing sticking of EGR valves ([F02M25/07P2C](#) and [F02M25/07P10](#) take precedence)] [N0901]
- F02M25/07D . . . [N: Detecting, diagnosing or alerting an abnormal function of the EGR system] [C0901]
- F02M25/07H . . . [N: having means for connecting parts of the EGR system to each other or to

		another engine part]
F02M25/07J	. . .	[N: EGR systems specially adapted for supercharged engines] [N0302]
F02M25/07J2	. . . .	[N: for a single mechanically or electrically driven intake charge compressor][N0501]
F02M25/07J4	. . . .	[N: for a single turbocharger][N0501]
F02M25/07J4H	. . . . .	[N: 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][N0501]
F02M25/07J4L	. . . . .	[N: 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][N0501]
F02M25/07J4M	. . . . .	[N: 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][N0501]
F02M25/07J6	. . . . .	[N: for engines having multiple intake charge compressors or exhaust gas turbines, e.g. a turbocharger combined with an additional compressor][N0501]
F02M25/07J8	. . . . .	[N: Constructional details of the exhaust gas circulation (EGR) combined with a supercharger system; Structural combinations of a supercharger with elements of the EGR system; Arrangement of the EGR and supercharger system with respect to the engine][N0501]
F02M25/07J8P	. . . . .	[N: having means to increase the pressure difference between the exhaust and intake system, e.g. an intake air or backpressure throttle, a venturi, a variable geometry turbine or a check valve using pressure pulsations][N0501]
F02M25/07M	. . .	[N: Manufacturing or assembling of EGR systems; Special materials or coatings therefor; Design details not provided for in groups F02M25/07H or F02M25/07P6D] [N0901]
F02M25/07P	. . .	[N: Details or layout of the EGR duct, e.g. arrangement in relation to engine parts or by having a cleaner, a cooler, an impeller or mixer in the recirculation duct] [N0901]
F02M25/07P2	. . . .	[N: Connections of the EGR duct to the exhaust system] [N0901]
F02M25/07P2C	. . . . .	[N: EGR in combination with means to clean engine-out exhaust gases (the means being installed in the recirculation duct F02M25/07P10)] [N0901]
F02M25/07P2V	. . . . .	[N: an EGR valve being located at or near the connection portion] [N0901]
F02M25/07P4	. . . .	[N: Connections of the EGR duct to the intake system] [N0901]
F02M25/07P4H	. . . . .	[N: Heat shielding or protection means] [N0901]
F02M25/07P4M	. . . . .	[N: Means for improving the mixing of air and recirculated exhaust gases, e.g. multiple openings to the intake system; Venturis] [N0901]
F02M25/07P4P	. . . . .	[N: Feeding recirculated exhaust gases into the intake runner in close proximity to the intake valve or directly into the combustion chamber] [N0901]
F02M25/07P4V	. . . . .	[N: an EGR valve being located at or near the connection portion] [N0901]
F02M25/07P6	. . . .	[N: Coolers in the recirculation duct] [N0901]
F02M25/07P6C	. . . . .	[N: Layout or concepts, e.g. flow charts] [N0901]
F02M25/07P6C2	. . . . .	[N: with coolers having a bypass] [N0901]

F02M25/07P6C2V	. . . . .	{7 dots} [N: characterised by details of the bypass valve] [N0901]
F02M25/07P6C4	. . . . .	[N: with air cooled heat exchangers] [N0901]
F02M25/07P6C6	. . . . .	[N: with liquid cooled heat exchangers] [N0901]
F02M25/07P6C8	. . . . .	[N: with a plurality of coolers] [N0901]
F02M25/07P6D	. . . . .	[N: Constructional details of the cooler, e.g. pipes, plates, ribs, insulation or materials] [N0901]
F02M25/07P6D2	. . . . .	[N: the cooler being combined with another device e.g. valve, heater, compressor, filter, or being arranged on a special engine location] [N0901]
F02M25/07P6D4	. . . . .	[N: Air cooled heat exchangers (layout or concepts thereof F02M25/07C4)] [N0901]
F02M25/07P6D6	. . . . .	[N: Liquid cooled heat exchangers (layout or concepts thereof F02M25/07C6)] [N0901]
F02M25/07P6T	. . . . .	[N: Temperature control] [N0901]
F02M25/07P8	. . . . .	[N: Compressors or the like in the recirculation duct] [N0901]
F02M25/07P10	. . . . .	[N: Means installed in the EGR duct to clean or treat the recirculated gases, e.g. by catalyst, condensate trap, particulate filter, heater or by electric means] [N0901]
F02M25/07P12	. . . . .	[N: Means for adding another fluid to the recirculation duct; Reformers] [N0901]
F02M25/07P14	. . . . .	[N: Temporary storage of recirculated exhaust gas (F02M25/07R takes precedence)] [N0901]
F02M25/07P16	. . . . .	[N: Two or more EGR valves disposed in parallel] [N0901]
F02M25/07P18	. . . . .	[N: Two or more EGR valves disposed in series] [N0901]
F02M25/07P20	. . . . .	[N: Timing means in the recirculation duct, e.g. Rotex chargers, cyclically operating valves, regenerators; Means to handle pressure pulsations] [N0901]
F02M25/07P22	. . . . .	[N: Special arrangements of the recirculation duct on the engine, e.g. cylinder head, liner, piston, spark plug, in the manifolds, or with a specially adapted combustion chamber] [N0901]
F02M25/07P24	. . . . .	[N: EGR specially adapted for multicylinder engines or engines having multiple EGR passages] [N0901]
F02M25/07P24G	. . . . .	[N: EGR specially adapted for engines where exhaust from one cylinder or a cylinder group is directed to the intake of the engine] [N0901]
F02M25/07P24S	. . . . .	[N: a main EGR passage being split-up into multiple passages] [N0901]
F02M25/07R	. . . . .	[N: Internal exhaust gas recirculation, i.e. 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 pipes] [N0901]
F02M25/07S	. . . . .	[N: Sensors in or related to EGR systems] [N0901]
F02M25/07S2	. . . . .	[N: for temperature, pressure or flow rate] [N0901]
F02M25/07S4	. . . . .	[N: for characterising a multi-component gas, e.g. for the composition, density or viscosity of the gas] [N0901]
F02M25/07S6	. . . . .	[N: EGR valve position sensors (details on the sensor installation in the valve housing F02M25/07V4H)] [N0901]
F02M25/07V	. . . . .	[N: Details of EGR valves] [N0901]
F02M25/07V2	. . . . .	[N: related to the EGR valve actuator or actuation systems] [N0901]
F02M25/07V2E	. . . . .	[N: the EGR valve being positioned by an electric actuator, e.g. a solenoid-type actuator] [N0901]

F02M25/07V2E2	. . . . .	[N: the actuator being a rotary actuator, e.g. stepper motor] [N0901]
F02M25/07V2F	. . . . .	[N: the EGR valve being positioned by vacuum] [N0901]
F02M25/07V2F2	. . . . .	[N: having pressure modulation valves controlling the vacuum] [N0901] [C1001]
F02M25/07V2F2E	. . . . .	{7 dots} [N: using electronic means, e.g. electromagnetic valves] [N1001]
F02M25/07V2F4	. . . . .	[N: Constructional details of the pneumatic actuator or mounting thereof] [N0901]
F02M25/07V2G	. . . . .	[N: the EGR valve being positioned by positive pressure; Check valves therefor] [N0901]
F02M25/07V2G2	. . . . .	[N: the EGR valve being controlled by changing the air intake pressure] [N0901]
F02M25/07V2G4	. . . . .	[N: the EGR valve being controlled by exhaust pressure] [N0901]
F02M25/07V2G4B	. . . . .	{7 dots} [N: the EGR valve being controlled by changing the exhaust back pressure] [N0901]
F02M25/07V2G6	. . . . .	[N: the EGR valve being controlled by fuel pressure] [N0901]
F02M25/07V2P	. . . . .	[N: the EGR valve being directly controlled by the operator (F02M25/07V2T takes precedence)] [N0901]
F02M25/07V2T	. . . . .	[N: an intake air throttle and EGR valve being operated together] [N0901]
F02M25/07V4	. . . . .	[N: Constructional details of the EGR valve output members, e.g. type of valve, closing members or housings] [N0901]
F02M25/07V4B	. . . . .	[N: Lift valves, e.g. poppet valves] [N0901]
F02M25/07V4B2	. . . . .	[N: Details of the pintle, spindle, springs, bearings, or the connection or sealing towards the actuator] [N0901]
F02M25/07V4B4	. . . . .	[N: Details of the valve closing member, the valve seat or the flow passages] [N0901]
F02M25/07V4B4T	. . . . .	{7 dots} [N: having two or more valve closing members] [N0901]
F02M25/07V4F	. . . . .	[N: Flap valves, rotary valves or other sliding valves; Resilient valves] [N0901]
F02M25/07V4H	. . . . .	[N: Details related to the EGR valve housing] [N0901]
F02M25/07V4H2	. . . . .	[N: with means for heating or cooling the EGR valve] [N0901]
F02M25/07V4M	. . . . .	[N: Multi-way valves (F02M25/07P6C2V takes precedence)] [N0901]
F02M25/07V4S	. . . . .	[N: Shielding or protection, means or methods therefor, e.g. to prevent damage or corrosion] [N0901]
F02M25/07V4T	. . . . .	[N: the EGR valve being combined with another device, e.g. with an intake valve or a compressor (F02M25/07V2T and F02M25/07P6C2V take precedence)] [N0901]
F02M25/08	. . . . .	adding fuel vapours drawn from engine fuel reservoir [N: (electrical control of purge system F02D41/00F4)] [C0501]
F02M25/08B	. . . . .	[N: Judging failure of purge control system]
F02M25/08B1	. . . . .	[N: having means for pressurising the evaporative emission space] [N9604]
F02M25/08B2	. . . . .	[N: by monitoring engine running conditions] [N0501]
		[N: WARNING [N0501] Not complete, see also F02M25/08B . The backlog is being continuously reclassified]

F02M25/08C . . [N: 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] [N9504]

F02M25/08F . . [N: Details of the absorption canister] [N0211]

F02M25/08H . . [N: Details of the fuel vapour pipes or conduits] [N0211]

F02M25/08L . . [N: Layout of the fuel vapour installation] [N0211]

F02M25/10 . adding acetylene, non-waterborne hydrogen, non-airborne oxygen, or ozone

F02M25/12 . . the apparatus having means for generating such gases (using rays and simultaneously generating ozone [F02M27/06](#))

F02M25/14 . adding anti-knock agents, not provided for in subgroups [F02M25/02](#) to [F02M25/10](#)

F02M27/00 Apparatus for treating combustion-air, fuel, or fuel-air mixture, by catalysts, electric means, magnetism, rays, sound waves, or the like

F02M27/02 . by catalysts

F02M27/04 . by electric means, [N: ionisation, polarisation] or magnetism

F02M27/04B . . [N: by plasma]

F02M27/04M . . [N: by permanent magnets] [N0001]

F02M27/06 . by rays, [N: e.g. infra-red and ultra-violet]

F02M27/06B . . [N: Radioactive radiation]

F02M27/08 . by sonic or ultrasonic waves

F02M29/00 Apparatus for re-atomising condensed fuel or homogenising fuel-air mixture (combined with secondary-air supply [F02M23/12](#)) [N: (collecting condensed fuel [F02M33/02](#))]

F02M29/02 . having rotary parts, [N: e.g. fan wheels]

F02M29/04 . having screens, gratings, baffles, or the like (rotary [F02M29/02](#))

F02M29/06 . . generating whirling motion of mixture

F02M29/08 . . having spirally-wound wires

F02M29/10 . . adjustable

F02M29/12 . having homogenising valves held open by mixture current

F02M29/14 . re-atomising or homogenising being effected by unevenness of internal surfaces of mixture intake

F02M31/00 Apparatus for thermally treating combustion-air, fuel, or fuel-air mixture ([F02M21/06](#), [F02M21/10](#) take precedence; such apparatus being part of a carburettor or fuel-injection apparatus [F02M15/00](#), [F02M53/00](#); adding hot secondary air to fuel-air mixture [F02M23/14](#))

F02M31/00B . [N: using a heat-pipe (heat-pipe per se [F28D](#))]

- F02M31/02 . . . for heating [N: ([F02M31/00B](#) takes precedence)]
- F02M31/04 . . . combustion-air or fuel-air mixture (electrically [F02M31/12](#); by using heat from working cylinders or cylinder heads [F02M31/14](#); heating of combustion-air as an engine starting aid [F02N7/04](#))
- F02M31/04B [N: Combustion air]
- F02M31/04C [N: Fuel-air mixture]
- F02M31/04C1 [N: for fuel enriched partial mixture flow path]
- F02M31/06 by hot gases, e.g. by mixing cold and hot air
- F02M31/06A [N: with thermostat and pneumatic actuator both working on the air mixture control valve]
- F02M31/06C [N: pneumatically controlled ([F02M31/06A](#) takes precedence)]
- F02M31/06D [N: operated manually, e.g. by means of valves on the air filter]
- F02M31/06E [N: particular constructional aspects of the switching devices, e.g. connecting linkage between two control valves]
- F02M31/07 Temperature-responsive control, e.g. using thermostatically-controlled valves ([F02M31/083](#) takes precedence) [N9602]
- F02M31/08 the gases being exhaust gases [N: ([adding exhaust gases to the air intake passage](#) [F02M25/07](#))] [C9809]
- F02M31/08F [N: 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]
- F02M31/08G [N: Manual switching of the fluids directed to the heat exchange surfaces]
- F02M31/08J [N: Heat exchange surfaces arranged inside a flange]
- F02M31/08K [N: Particular shape of air input passage near to the branch]
- F02M31/08L [N: Particular constructional characteristics of the heat exchange surfaces, e.g. finned pipes, coiled pipes or the like]
- F02M31/083 Temperature-responsive control of the amount of exhaust gas or combustion air directed to the heat exchange surface [N9602]
- F02M31/087 Heat-exchange arrangements between the air intake and exhaust gas passages, e.g. by means of contact between the passages
- F02M31/093 Air intake passage surrounding the exhaust gas passage; Exhaust gas passage surrounding the air intake passage
- F02M31/10 by hot liquids, e.g. lubricants [N: or cooling water]
- F02M31/10B [N: Particular constructional characteristics of the shape of the heat exchange surfaces]
- F02M31/10C [N: Particular constructional characteristics of the switching apparatus]
- F02M31/10D [N: Controlled or manual switching]
- F02M31/12 . . . electrically
- F02M31/125 Fuel
- F02M31/13 Combustion air
- F02M31/135 Fuel-air mixture
- F02M31/14 . . . by using heat from working cylinders or cylinder heads
- F02M31/14B [N: with particular constructional means]
- F02M31/16 . . . Other apparatus for heating fuel
- F02M31/16B [N: Preheating by burning an auxiliary mixture]

- F02M31/16C . . . [N: with mechanical generation of heat, e.g. by surface friction]
- F02M31/18 . . . to vaporise fuel
- F02M31/18B [N: Control]
- F02M31/18C [N: with simultaneous mixing of secondary air]
- F02M31/20 . for cooling (cooling of charging-air or of scavenging-air [F02B](#)) [N: (Use of cold [F02M17/52](#); [F02M31/00B](#) takes precedence)]
- F02M31/20B . . [N: Control]

F02M33/00

Other apparatus for treating combustion-air, fuel, or fuel-air mixture (combustion-air cleaners [F02M35/00](#); arrangements for purifying liquid fuel [F02M37/22](#))

- F02M33/02 . for collecting and returning condensed fuel [N: (apparatus for re-atomising condensed fuel [F02M29/00](#))]
- F02M33/02F . . [N: Means not otherwise provided for]
- F02M33/04 . . returning to the intake passage
- F02M33/04B . . . [N: Coating of the intake passage with a porous material]
- F02M33/04C . . . [N: Coating of the intake passage with material preventing the formation of condensation]
- F02M33/06 . . . with simultaneous heat supply
- F02M33/08 . . returning to the fuel tank

F02M35/00

Combustion-air cleaners, air intakes, intake silencers, or induction systems specially adapted for, or arranged on, internal-combustion engines (air cleaners in general [B01D](#))

- F02M35/02 . Air cleaners
- F02M35/02H . . [N: Housings; Casings; Frame constructions; Lids; Manufacturing or assembling thereof] [N1201]
- F02M35/02H2 . . . [N: Manufacturing or assembling; Materials for air cleaner housings] [N1201]
- F02M35/02H2C [N: by using clamps, catches, locks or the like, e.g. for disposable plug-in filter cartridges] [N1201]
- F02M35/02H4 . . . [N: for connecting or joining to other devices, e.g. pipes] [N1201]
- F02M35/02H6 . . . [N: Details, e.g. sensors or measuring devices] [N1201]
- F02M35/02H6C [N: on the clean air side] [N1201]
- F02M35/02H6D [N: with sensing means on both, the air feeding side and the clean air side] [N1201]
- F02M35/02H8 . . . [N: comprising flexible, resilient, movable or rotatable elements, e.g. with vibrating or contracting movements; Springs; Valves; Flaps ([F02M35/06](#), [F02M35/08](#) take precedence)] [N1201]
- F02M35/02H10 . . . [N: Arrangements of air flow meters in or on air cleaner housings] [N1201]
- F02M35/02M . . [N: Multiple cleaners] [N1201]
- F02M35/02M2 . . . [N: arranged concentrically or coaxially] [N1201]
- F02M35/02M4 . . . [N: arranged in parallel] [N1201]
- F02M35/02M6 . . . [N: arranged in series, e.g. pre- and main filter in series] [N1201]
- F02M35/02P . . [N: acting by electric discharge; Electrostatic precipitators therefor] [N1208]

- F02M35/02V . . . [N: acting by absorption or adsorption; trapping or removing vapours or liquids, e.g. originating from fuel] [N1201]
- F02M35/022 . . . acting by gravity, by centrifugal, or by other inertial forces, e.g. with moistened walls
- F02M35/022C [N: by centrifugal forces, e.g. cyclones] [N1201]
- F02M35/022G [N: by gravity or by mass inertia, e.g. labyrinths, deflectors] [N1201]
- F02M35/024 . . . using filters, e.g. moistened ([F02M35/026](#) takes precedence; cleaning of the filtering material [F02M35/08](#))
- F02M35/024B [N: Manufacturing filter elements] [N1201]
- F02M35/024F [N: Fixing, mounting, supporting or arranging filter elements; Filter element cartridges] [N1201]
- F02M35/024F2 [N: Support structures increasing the stability or stiffness of the filter element] [N1201]
- F02M35/024F4 [N: Special alignment with respect to the air intake flow, e.g. angled or in longitudinal flow direction] [N1201]
- F02M35/024M [N: Materials or structure of filter elements, e.g. foams] [N1201]
- F02M35/024M2 [N: Pleated, folded, corrugated filter elements, e.g. made of paper] [N1201]
- F02M35/024M4 [N: consisting of multiple layers, e.g. coarse and fine filters; Coatings; Impregnations; Wet or moistened filter elements] [N1201]
- F02M35/024M6 [N: Meshes; Grids; Perforated plates] [N1201]
- F02M35/024S [N: characterised by the shape of the filter element] [N1201]
- F02M35/024S2 [N: Cylindrical, conical, oval, spherical or the like filter elements; wounded filter elements] [N1201]
- F02M35/024S4 [N: Flat filter elements, e.g. rectangular] [N1201]
- F02M35/026 . . . acting by guiding the air over or through an oil or other liquid bath, e.g. combined with filters
- F02M35/04 . . . specially arranged with respect to engine, [N: to intake system or specially adapted to vehicle]; Mounting thereon; [N: Combinations with other devices (**combined with silencers [F02M35/14](#)**)] [C1201]
- F02M35/04C [N: combined with other devices, e.g. heaters ([F02M35/02H10](#), [F02M35/06](#), [F02M35/14](#) take precedence); for use other than engine air intake cleaning, e.g. air intake filters arranged in the fuel vapour recovery system] [N1201]
- F02M35/04P [N: 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] [N1201]
- F02M35/04P2 [N: Inline cleaners, i.e. the cleaner being arranged along the length of a wall of a pipe or manifold] [N1201]
- F02M35/04V [N: Arranging or mounting on or with respect to engines or vehicle bodies] [N1201]
- F02M35/06 combined or associated with engine`s cooling blower or fan, or with flywheel
- F02M35/08 . . . with means for removing dust, [N: particles or liquids] from cleaners; with means for indicating clogging; with by-pass means; [N: Regeneration of cleaners] [C1201]
- F02M35/08B [N: By-pass means] [N1201]
- F02M35/08C [N: Dust collection chambers or discharge sockets, e.g. chambers fed by gravity or closed by a valve] [N1201]
- F02M35/08F [N: Dust removal by flushing, blasting, pulsating or aspirating flow, washing or the like; Mechanical dust removal, e.g. by using scrapers] [N1201]
- F02M35/08W [N: Water, snow or ice proofing; Separation or drainage of water snow or ice] [N1201]

- F02M35/09 . . . Clogging indicators; [N: Diagnosis or testing of air cleaners (sensors therefore [F02M35/10S](#))] [N9602] [C1201]
- F02M35/10 . Air intakes; Induction systems (using kinetic or wave energy of charge in induction systems for improving quantity of charge [N: [F02B27/00](#)]) [C9905]
- F02M35/10A . . [N: 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] [C1101]
- F02M35/10A2 . . . [N: Means upstream of the air filter; Connection to the ambient air] [N1101]
- F02M35/10A4 . . . [N: Means upstream of the fuel injection system, carburettor or plenum chamber ([F02M35/10A2](#) takes precedence)] [N1101]
- F02M35/10A6 . . . [N: Plenum chambers] [N1101]
- F02M35/10A6C [N: 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] [N1101]
- F02M35/10A6D [N: Intake ducts situated partly within or on the plenum chamber housing] [N1101]
- F02M35/10A6M [N: Multiple plenum chambers; Plenum chambers having inner separation walls (for V-engines [F02M35/116](#); for resonance charging [F02B27/02](#))] [N1101]
- F02M35/10A6S [N: special shapes or arrangements of plenum chambers; Constructional details] [N1101]
- F02M35/10A6T [N: Swirl chamber upstream of the plenum chamber] [N1101]
- F02M35/10A6V [N: Valves arranged in the plenum chamber] [N1101]
- F02M35/10A8 . . . [N: Intake runners] [N1101]
- F02M35/10A10 . . . [N: Connections of intake systems to the engine] [N1101]
- F02M35/10A10F [N: 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] [N1101]
- F02M35/10D . . [N: characterised by details of intake ducts: shapes; connections; arrangements (ducts within or on the plenum chamber [F02M35/10A6D](#))] [C1101]
- F02M35/10D2 . . . [N: Straight ducts] [N1101]
- F02M35/10D4 . . . [N: Substantially vertically arranged ducts] [N1101]
- F02M35/10D6 . . . [N: Substantially V-, C- or U-shaped ducts in direction of the flow path] [N1101]
- F02M35/10D8 . . . [N: with variable cross-sections of intake ducts along their length; Venturis; Diffusers] [N1101]
- F02M35/10D10 . . . [N: Ducts with special cross-sections, e.g. non-circular cross-section] [N1101]
- F02M35/10D12 . . . [N: Ducts situated in more than one plane; Ducts of one plane crossing ducts of another plane] [N1101]
- F02M35/10D14 . . . [N: Flexible ducts, e.g. bellows or hoses] [N1101]
- F02M35/10D16 . . . [N: Connections of intake ducts to each other or to another device] [N1101]
- F02M35/10E . . [N: characterised by the engine type (engine intake manifolds [F02M35/104](#))] [N1101]
- F02M35/10E2 . . . [N: Supercharged engines] [N1101]
- F02M35/10E2A [N: having air intakes specially adapted to selectively deliver naturally aspirated fluid or supercharged fluid] [N1101]
- F02M35/10E4 . . . [N: Small engines, e.g. for handheld tools, or model engines; Single cylinder engines] [N1101]

- F02M35/10E6 . . . [N: Engines having multiple fuel injectors or carburettors per cylinder] [N1101]
- F02M35/10E8 . . . [N: Engines having intake ducts fed from a separate carburettor or injector, the idling system being considered as a separate carburettor] [N1101]
- F02M35/10E10 . . . [N: Two-stroke engines; Reverse-flow scavenged or cross scavenged engines] [N1101]
- F02M35/10E12 . . . [N: Carburetted engines] [N1101]
- F02M35/10E14 . . . [N: Rotary, e.g. "Wankel", engines; Engines with cylinders in star arrangement; Radial piston engines; W-engines ([F02M35/112](#) and [F02M35/116](#) take precedence)] [N1101]
- F02M35/10F . . . [N: Fluid connections to the air intake system; their arrangement of pipes, valves or the like] [N1101]
- F02M35/10F2 . . . [N: Fuel injectors; Fuel pipes or rails; Fuel pumps or pressure regulators] [N1101]
- F02M35/10F4 . . . [N: Exhaust gas recirculation (EGR); Positive crankcase ventilation (PCV); Additional air admission, lubricant or fuel vapour admission] [N1101]
- F02M35/10F6 . . . [N: the intake system acting as a vacuum or overpressure source for auxiliary devices; e.g. brake systems; Vacuum chambers ([air storage chamber F02B21/00](#))] [N1101]
- F02M35/10F8 . . . N: Overpressure or vacuum relief means; Burst protection] [N1101]
- F02M35/10K . . . [N: Devices or means connected to or integrated into air intakes; Air intakes combined with other engine or vehicle parts ([filters F02M35/02](#); [silencers F02M35/12](#) and [F02M35/14](#); [air coolers F02B29/04](#); [heaters F02M31/00](#); [air storage tanks F02B21/00](#); [compressors F02B33/00](#); [sensors F02M35/10S](#))] [N1101]
- F02M35/10K2 . . . [N: Electrical or electronic devices fixed to the intake system; Electric wiring ([electric heaters F02M31/12](#); [sensors F02M35/10S](#))] [N1101]
- F02M35/10K4 . . . [N: Arrangements of valves; Multi-way valves ([F02M35/10A6C](#) takes precedence; [valves in the plenum chamber F02M35/10A6V](#); [check valves F02M35/10K10](#))] [N1101]
- F02M35/10K6 . . . [N: Flow guides, obstructions, deflectors or the like ([for generating a charge motion in the cylinder F02B31/00](#); [for re-atomising condensed fuel or homogenising fuel-air mixture F02M29/00](#))] [N1101]
- F02M35/10K8 . . . [N: Heating, cooling or thermal insulating means ([air coolers F02B29/04](#); [thermal treatment of combustion-air, fuel or fuel-air mixture F02M31/00](#); [details of the throttle valve housing F02D9/10H](#))] [N1101]
- F02M35/10K10 . . . [N: 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] [N1101]
- F02M35/10K12 . . . [N: 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 F02M29/00](#); [other apparatus for treating combustion-air, fuel or fuel-air mixture F02M33/00](#))] [N1101]
- F02M35/10K14 . . . [N: 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] [N1101]
- F02M35/10K16 . . . [N: Damping means, e.g. tranquillising chamber to dampen air oscillations ([intake silencers F02M35/12](#))] [N1101]
- F02M35/10K18 . . . [N: Flexible, resilient, pivotally or movable parts; Membranes ([F02M35/10K4](#) and [F02M35/10A6C](#) take precedence)] [N1101]
- F02M35/10K20 . . . [N: Equalizing conduits, e.g. between intake ducts or between plenum chambers] [N1101]

- F02M35/10M . . . [N: Materials for intake systems (for sound damping [F02M35/12](#); for air cleaners [F02M35/02](#))] [N1101]
- F02M35/10M2 . . . [N: Plastics; Composites; Rubbers] [N1101]
- F02M35/10M4 . . . [N: Metals; Alloys (catalysts [F02M27/02](#))] [N1101]
- F02M35/10M6 . . . [N: Foams; Fabrics; Porous media; Laminates; Ceramics; Coatings] [N1101]
- F02M35/10N . . . [N: Manufacturing and assembling intake systems] [N1101]
- F02M35/10N2 . . . [N: Moulding, casting or the like] [N1101]
- F02M35/10N4 . . . [N: Joining multiple sections together (joining plastic materials together in general [B29C65/00](#))] [N1101] [C1204]
- F02M35/10N4W [N: by welding, bonding or the like (welding plastic materials together in general [B29C65/02](#))] [N1101] [C1204]
- F02M35/10N6 . . . [N: Machining, e.g. milling, grinding, punching, sanding; Bending; Surface treatments] [N1101]
- F02M35/10S . . . [N: Sensors for intake systems (throttle position sensors [F02D9/10H4](#))] [N1101]
- F02M35/10S2 . . . [N: for temperature or pressure] [N1101]
- F02M35/10S4 . . . [N: for flow rate (air flow meters in air cleaners [F02M35/04A](#); circuit arrangements for generating control signals by measuring intake air flow [F02D41/18](#))] [N1101]
- F02M35/10S6 . . . [N: for characterising a multi-component mixture, e.g. for the composition such as humidity, density or viscosity] [N1101]
- F02M35/104 . . . Intake manifolds [N9702] [C1101]
- F02M35/104F . . . [N: characterised by provisions to avoid mixture or air supply from one plenum chamber to two successively firing cylinders] [N1101]
- F02M35/104H . . . [N: characterised by the charge distribution between the cylinders/combustion chambers or its homogenisation] [N1101]
- F02M35/104S . . . [N: 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] [N1101]
- F02M35/108 . . . with primary and secondary intake passages [N9702]
- F02M35/108V [N: 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 [F02B31/08](#); shape or arrangement of intake or exhaust channels in cylinder heads [F02F1/42](#))] [N1101]
- F02M35/112 . . . for engines with cylinders all in one line ([F02M35/108](#) takes precedence) [N9702]
- F02M35/116 . . . for engines with cylinders in V-arrangement or arranged oppositely relative to the main shaft ([F02M35/108](#) takes precedence) [N9702]
- F02M35/116B [N: Boxer or pancake engines] [N1101]
- F02M35/12 . . . Intake silencers [N: Sound modulation, transmission or amplification (intake silencers also used as exhaust silencer [F01N7/00D](#); filters for compressors [F04B39/16](#))] [C1201]
- F02M35/12F . . . [N: Flow throttling or guiding] [N1201]
- F02M35/12F2 . . . [N: by using inserts in the air intake flow path, e.g. baffles, throttles or orifices; Flow guides ([F02M35/12H](#) takes precedence)] [N1201]
- F02M35/12F4 . . . [N: by using a plurality of holes, slits, protrusions, perforations, ribs or the like; Surface structures; Turbulence generators] [N1201]
- F02M35/12F6 . . . [N: by using adjustable or movable elements, e.g. valves, membranes, bellows, expanding or shrinking elements] [N1201]
- F02M35/12F8 . . . [N: by using multiple air intake flow paths, e.g. bypass, honeycomb or pipes]

- opening into an expansion chamber] [N1201]
- F02M35/12F10 . . . [N: by using expansion chambers in the air intake flow path] [N1201]
- F02M35/12F12 . . . [N: by using secondary connections to the ambient, e.g. covered by a membrane or a porous member] [N1201]
- F02M35/12H . . . [N: using interference; Masking or reflecting sound] [N1201]
- F02M35/12H2 . . . [N: by using active elements, e.g. speakers] [N1201]
- F02M35/12R . . . [N: using resonance] [N1201]
- F02M35/12R2 . . . [N: Helmholtz resonators] [N1201]
- F02M35/12R4 . . . [N: comprising multiple chambers or compartments] [N1201]
- F02M35/12S . . . [N: using absorbing, damping, insulating or reflecting materials, e.g. porous foams, fibres, rubbers, fabrics, coatings or membranes] [N1201]
- F02M35/12T . . . [N: Reinforcement of walls, e.g. with ribs or laminates; Walls having air gaps or additional sound damping layers] [N1201]
- F02M35/12V . . . [N: Manufacturing or assembly; Connectors; Fixations] [N1201]
- F02M35/12W . . . [N: combined with or integrated into other devices (F02M35/14 takes precedence); Plurality of air intake silencers (F02M35/12R4 takes precedence)] [N1201]
- F02M35/12Z . . . [N: Amplifying, modulating, tuning or transmitting sound, e.g. directing sound to the passenger cabin; Sound modulation] [N1201]
- F02M35/14 . . . Combined air cleaners and silencers
- F02M35/16 . . . characterised by use in vehicles (predominant vehicle aspects, see the relevant classes for the vehicles)
- F02M35/16B . . . [N: Arrangement of the air intake system in the engine compartment, e.g. with respect to the bonnet or the vehicle front face] [N1101]
- F02M35/16C . . . [N: Motorcycles; All-terrain vehicles, e.g. quads, snowmobiles; Small vehicles, e.g. forklifts] [N1101]
- F02M35/16H . . . [N: Heavy duty vehicles; e.g. trucks, trains, agricultural or construction machines] [N1101]
- F02M35/16M . . . [N: Marine vessels; Ships; Boats] [N1101]
- F02M35/16M2 [N: having outboard engines; Jet-skis] [N1101]
- F02M35/16M2W [N: with means, e.g. valves, to prevent water entry] [N1101]
- F02M37/00** **Apparatus or systems for feeding liquid fuel from storage containers to carburettors or fuel-injection apparatus (F02M69/00 takes precedence; [N: fuel injection apparatus characterised by their conduits and venting means F02M55/00; fuel injection apparatus having a common rail F02M63/02C; control of fuel feeding F02D33/00B; feeding liquid fuel to combustion apparatus, in general F23K5/00; fuel supply to apparatus for generating combustion products of high pressure or high velocity F23R3/28); Arrangements for purifying liquid fuel specially adapted for, or arranged on, internal-combustion engines (separating apparatus, filters per se B01D; centrifuges B04B) [C0707]**
- F02M37/00D . . . [N: Constructional details; Manufacturing or assembly of elements of fuel systems; Materials therefor] [N0707]
- F02M37/00D2 . . . [N: related to fuel pipes or their connections, e.g. joints or sealings (F02M55/00D takes precedence)] [N0707]
- F02M37/00D4 . . . [N: Valves in the fuel supply and return system] [N0707]
- F02M37/00D4P [N: Pressure regulator in the low pressure fuel system (pressure regulator in

- low-pressure injection apparatus F02M69/54)] [N0707]
- F02M37/00D4T . . . [N: Thermo sensitive valves] [N0707]
- F02M37/00D6 . . [N: Means for damping pressure pulsations (equalisation of pulses in positive displacement pumps F04B1/00; devices for damping fluid pulsations in pipes F16L55/04)] [N0707]
- F02M37/00L . [N: Layout or arrangement of systems for feeding fuel (fuel injection apparatus characterised by their conduits and venting means F02M55/00; fuel injection apparatus having a common rail F02M63/02C; arrangement of fuel conduits of low pressure fuel injection apparatus F02M69/46B)] [N0707]
- F02M37/00L2 . . [N: Details on the fuel return circuit; Arrangement of pressure regulators] [N0707]
- F02M37/00L2R . . . [N: Returnless fuel systems, i.e. the fuel return lines are not entering the fuel tank] [N0707]
- F02M37/00L4 . . [N: 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 F02D19/06)] [N0707]
- F02M37/00L6 . . [N: characterised by its use in vehicles, in stationary plants or in small engines, e.g. hand held tools] [N0707]
- F02M37/00T . [N: Details of the fuel feeding system related to the fuel tank (vehicle fuel tanks B60K15/03)] [N0707]
- F02M37/00T2 . . [N: Devices inside the fuel tank other than fuel pumps or filters (electrical pumps submerged in fuel tanks F02M37/10, jet pumps F02M37/02S)] [N0707]
- F02M37/00T4 . . [N: Multiple separate fuel tanks or tanks being at least partially partitioned] [N0707]
- F02M37/00T4S . . . [N: Saddle tanks; Tanks having partition walls] [N0707]
- F02M37/02 . Feeding by means of suction apparatus, e.g. by air flow through carburettors (by driven pumps F02M37/04)
- F02M37/02B . . [N: Feeding by means of a liquid fuel-driven jet pump (jet pumps per se F04F)] [N9705]
- F02M37/04 . Feeding by means of driven pumps (pump construction F04)
- F02M37/04B . . [N: Arrangements for driving gear-type pumps] [N9507]
- F02M37/04C . . [N: Arrangements for driving reciprocating piston-type pumps] [N9507]
- F02M37/04D . . [N: Arrangements for driving rotary positive-displacement pumps] [N9507]
- F02M37/04E . . [N: Arrangements for driving diaphragm-type pumps] [N9507]
- F02M37/04F . . [N: Arrangements for driving regenerative pumps, i.e. side-channel pumps] [N9507]
- F02M37/06 . . mechanically driven
- F02M37/08 . . electrically driven
- F02M37/10 . . . submerged in fuel, e.g. in reservoir
- F02M37/10B [N: Mounting pumps on fuel tanks]
- F02M37/10S [N: the pump being installed in a sub-tank] [N0211]
- F02M37/12 . . fluid-driven, e.g. by compressed combustion-air
- F02M37/14 . . the pumps being combined with other apparatus
- F02M37/16 . . characterised by provision of personally-, e.g. manually-, operated pumps
- F02M37/18 . . characterised by provision of main and auxiliary pumps
- F02M37/20 . characterised by means for preventing vapour lock

- F02M37/22 . Arrangements for purifying liquid fuel specially adapted for, or arranged on, internal-combustion engines, e.g. arrangement in the feeding system [C9605]
- F02M37/22A . . [N: having water separator means] [N9601]
- F02M37/22B . . [N: having heating means (F02M37/22A takes precedence)] [N9601]

Guide heading: **Fuel-injection apparatus** (carrying the fuel into cylinders by high-pressure gas F02M67/00; low-pressure fuel-injection F02M69/00)

F02M39/00 **Arrangements of fuel-injection apparatus with respect to engines; Pump drives adapted to such arrangements** (arrangements of injectors F02M61/14)

[N: **Notes**[N0904]

Low-pressure fuel injection is classified in groups F02M51/00, F02M69/00 or F02M71/00.]

- F02M39/00B . [N: Arrangements of fuel feed-pumps with respect to fuel injection apparatus (F02M37/00 takes precedence)]
- F02M39/02 . Arrangements of fuel-injection apparatus to facilitate the driving of pumps; Arrangements of fuel-injection pumps; Pump drives (F02M49/00 takes precedence)

F02M41/00 **Fuel-injection apparatus with two or more injectors fed from a common pressure-source sequentially by means of a distributor**

[N: **Note**

[M1207] - in this group the following indexing codes are used: R02M700/13E2]

- F02M41/02 . the distributor being spaced from pumping elements
- F02M41/04 . . the distributor reciprocating
- F02M41/04B . . . [N: by means of mechanical drive]
- F02M41/04C . . . [N: by means of hydraulic or pneumatic drive]
- F02M41/04D . . . [N: by means of electric drive]
- F02M41/06 . . the distributor rotating
- F02M41/06C . . . [N: the distributor and rotary valve controlling fuel passages to pumping elements being combined]
- F02M41/06C2 [N: Arrangements for adjusting the rotary valve-distributor]
- F02M41/08 . the distributor and pumping elements being combined
- F02M41/10 . . pump pistons acting as the distributor
- F02M41/12 . . . the pistons rotating to act as the distributor
- F02M41/12B [N: with piston arranged axially to driving shaft (F02M41/12D takes precedence)]
- F02M41/12C [N: with piston arranged radially to driving shaft (F02M41/12D takes precedence)]
- F02M41/12D [N: characterised by means for varying fuel delivery or injection timing]
- F02M41/12D1 [N: Throttling of fuel passages to or from the pumping chamber]

- F02M41/12D2 [N: Variably-timed valves controlling fuel passages]
- F02M41/12D2B [N: valves being mechanically or electrically adjustable sleeves slidably mounted on rotary piston]
- F02M41/12D2C [N: valves being fluid-actuated slide-valves, e.g. differential rotary-piston pump]
- F02M41/12D3 [N: Varying injection timing by angular adjustment of the face-cam or the rollers support]
- F02M41/14 . . . rotary distributor supporting pump pistons
- F02M41/14B . . . [N: pistons being disposed radially with respect to rotation axis]
- F02M41/14B2 [N: characterised by means for varying fuel delivery or injection timing]
- F02M41/14B2B [N: Devices specially adapted for angular adjustment of annular cam]
- F02M41/14B2C [N: Injection being effected by means of a free-piston displaced by the pressure of fuel]
- F02M41/14B2D [N: Arrangements for metering fuel admitted to pumping chambers, e.g. by shuttles or by throttle-valves]
- F02M41/14C . . . [N: pistons being parallel to rotation axis]
- F02M41/16 . . . characterised by the distributor being fed from a constant pressure source, e.g. accumulator [N: or constant pressure positive displacement pumps]

- F02M43/00** **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**
- F02M43/02 . . . Pumps peculiar thereto
- F02M43/04 . . . Injectors peculiar thereto

- F02M45/00** **Fuel-injection apparatus characterised by having a cyclic delivery of specific time/pressure or time/quantity relationship (fuel-injectors having such deliveries by means of valves furnished at seated ends with pintle- or plug-shaped extensions [F02M61/06](#)) [N: pumps having such delivery by means of delivery valves [F02M59/46B](#)]**
- F02M45/02 . . . with each cyclic delivery being separated into two or more parts
- F02M45/04 . . . with a small initial part, [N: e.g. initial part for partial load and initial and main part for full load] [C0303]
- F02M45/06 Pumps peculiar thereto
- F02M45/06B [N: Delivery stroke of piston being divided into two or more parts, e.g. by using specially shaped cams]
- F02M45/06C [N: Having specially arranged spill port and spill contour on the piston ([F02M45/06B](#) takes precedence)]
- F02M45/08 Injectors peculiar thereto
- F02M45/08B [N: Having two or more closing springs acting on injection-valve]
- F02M45/08C [N: Having more than one injection-valve controlling discharge orifices]
- F02M45/10 . . . Other injectors with multiple-part delivery, e.g. with vibrating valves
- F02M45/12 . . . providing a continuous [N: cyclic] delivery with variable pressure [C0303]

- F02M47/00** **Fuel-injection apparatus operated cyclically with fuel-injection valves actuated by fluid pressure ([F02M49/00](#) takes precedence; apparatus with injection valves opened by**

fuel pressure and closed by non-fluid means, see the groups providing for other characteristics)

- F02M47/02 . 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
- F02M47/02B . . [N: Mechanically actuated valves draining the chamber to release the closing pressure]
- F02M47/02C . . [N: Hydraulically actuated valves draining the chamber to release the closing pressure]
- F02M47/02D . . [N: Electrically actuated valves draining the chamber to release the closing pressure]
- F02M47/04 . using fluid, other than fuel, for injection-valve actuation
- F02M47/04B . . [N: Fluid pressure acting on injection-valve in the period of non-injection to keep it closed]
- F02M47/04C . . [N: Fluid pressure acting on injection-valve in the period of injection to open it]
- F02M47/06 . Other fuel injectors peculiar thereto
- F02M49/00** **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**
- F02M49/02 . using the cylinder pressure, e.g. compression end pressure
- F02M49/04 . using the piston impact
- F02M51/00** **Fuel-injection apparatus characterised by being operated electrically**
- F02M51/00C . [N: Arrangement of electrical wires and connections, e.g. wire harness, sockets, plugs; Arrangement of electronic control circuits in or on fuel injection apparatus] [C9707]
- F02M51/02 . specially for low-pressure fuel-injection ([N: [F02M51/00C](#) takes precedence]; pumps per se [F02M51/04](#))
- F02M51/04 . Pumps peculiar thereto
- F02M51/06 . Injectors peculiar thereto [N: with means directly operating the valve needle] [C0807]
- F02M51/06A . . [N: using piezo-electric or magnetostrictive operating means]
- F02M51/06A2 . . . [N: the actuator being hollow, e.g. with needle passing through the hollow space] [N1208]
- F02M51/06B . . [N: using electromagnetic operating means]
- F02M51/06B1 . . . [N: characterised by arrangement of electromagnets or fixed armature]
- F02M51/06B1A [N: having two or more electromagnets]
- F02M51/06B1A1 [N: acting on one mobile armature ([F02M51/06B2B](#) takes precedence)]
- F02M51/06B2 . . . [N: characterised by arrangement of mobile armatures]

- F02M51/06B2B [N: having a stepped armature]
- F02M51/06B2C [N: having a spherically or partly spherically shaped armature, e.g. acting as valve body]
- F02M51/06B2D [N: having a plate-shaped or undulated armature not entering the winding (if entering the winding [F02M51/06B2E](#))]
- F02M51/06B2D1 [N: the armature acting as a valve]
- F02M51/06B2D2 [N: the armature having a valve attached thereto]
- F02M51/06B2D2A [N: the valve being a short body, e.g. sphere or cube]
- F02M51/06B2D2A1 {7 dots} [N: the valve being spherical or partly spherical]
- F02M51/06B2D2B [N: the valve being an elongated body, e.g. a needle valve]
- F02M51/06B2D2B1 {7 dots} [N: the body being hollow and its interior communicating with the fuel flow]
- F02M51/06B2D3 [N: the armature and the valve being allowed to move relatively to each other or not being attached to each other]
- F02M51/06B2E [N: having a cylindrically or partly cylindrically shaped armature, e.g. entering the winding; having a plate-shaped or undulated armature entering the winding]
- F02M51/06B2E1 [N: the armature acting as a valve or having a short valve body attached thereto]
- F02M51/06B2E2 [N: the armature having an elongated valve body attached thereto]
- F02M51/06B2E2A [N: the valve body having cylindrical guiding or metering portions, e.g. with fuel passages]
- F02M51/06B2E2A1 {7 dots} [N: all portions having fuel passages, e.g. flats, grooves, diameter reductions]
- F02M51/06B2E2B [N: the body being hollow and its interior communicating with the fuel flow ([F02M51/06B2E2A](#) takes precedence)]
- F02M51/06B2E3 [N: the armature and the valve being allowed to move relatively to each other or not being attached to each other]
- F02M51/06B3 [N: and permanent magnets ([F02M51/06B4](#) takes precedence)]
- F02M51/06B3A [N: as valve or armature return means]
- F02M51/06B4 [N: characterised by the use of movable windings]

F02M53/00 Fuel-injection apparatus characterised by having heating, cooling or thermally-insulating means

[N: [Notes](#)[C0807] [M1207]
 - in this group the following indexing codes are used : [R02M700/07H](#)
]

- F02M53/02 . . with fuel-heating means, e.g. for vaporising
- F02M53/04 . . Injectors with heating, cooling, or thermally-insulating means
- F02M53/04C . . . [N: with cooling means other than air cooling] [N1106]
- F02M53/04D . . . [N: with thermally-insulating means] [N1106]
- F02M53/06 . . with fuel-heating means, e.g. for vaporising
- F02M53/08 . . with air cooling

F02M55/00 Fuel-injection apparatus characterised by their fuel conduits or their venting means; [N: Arrangements of conduits between fuel tank and pump [F02M37/00](#) (venting

in general [B01D19/00](#)]

- F02M55/00B . [N: Pumps with means for preventing erosion on fuel discharge]
- F02M55/00C . [N: Arrangement of leakage or drain conduits in or from injectors] [C9804]
- F02M55/00D . [N: Joints; Sealings] [N9810]
- F02M55/00D2 . . [N: for high pressure conduits, e.g. connected to pump outlet or to injector inlet] [N9810]
- F02M55/00F . [N: Venting means] [N0311]
- F02M55/00H . [N: Arrangement of fuel passages inside of injectors] [N1106]
- F02M55/02 . Conduits between injection pumps and injectors, [N: e.g. conduits between pump and common-rail or conduits between common-rail and injectors] [C0807]
- F02M55/02B . . [N: Common rails] [N9709]
- F02M55/04 . Means for damping vibrations [N: or pressure fluctuations] in injection pump inlets [N: or outlets] [C0303]

F02M57/00

Fuel-injectors combined or associated with other devices

[N: **Note**
[M1207] in this group the following indexing codes are used: [R02M700/07J](#),
[R02M700/13E3](#)
]

- F02M57/00B . [N: the devices being sensors] [N1010]
- F02M57/02 . Injectors structurally combined with fuel-injection pumps
- F02M57/02B . . [N: 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]
- F02M57/02C . . [N: characterised by the pump drive]
- F02M57/02C1 . . . [N: mechanical]
- F02M57/02C1B [N: with hydraulic link for varying the piston stroke]
- F02M57/02C2 . . . [N: hydraulic, e.g. with pressure amplification]
- F02M57/02C2B [N: 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] [N0807]
- F02M57/02C3 . . . [N: electric]
- F02M57/02C4 . . . [N: pneumatic (using engine cylinder pressure [F02M49/02](#))]
- F02M57/04 . the devices being combustion-air intake or exhaust valves
- F02M57/06 . the devices being sparking plugs

F02M59/00

Pumps specially adapted for fuel-injection and not provided for in groups [F02M39/00](#) to [F02M57/00](#), [N: e.g. rotary cylinder-block type pumps] (general features of pumps F04) [C0303]

[N: **Note** [[M1207]

- in this group the following indexing codes are used: [R02M700/07G](#), [R02M700/13E](#), [R02M700/13E1](#), [R02M700/13E4](#), [R02M700/13E6](#), [R02M700/13E12](#)

]

- F02M59/02 . of reciprocating-piston [N: or reciprocating-cylinder] type [C0303]
- F02M59/02B . . [N: having an accumulator storing pressurised fuel during pumping stroke of the piston for subsequent delivery to the injector]
- F02M59/02C . . [N: characterised by a single piston] [N1208]
- F02M59/02C2 . . . [N: Unit-pumps, i.e. single piston and cylinder pump-units, e.g. for cooperating with a camshaft] [N1208]
- F02M59/04 . . characterised by special arrangement of cylinders with respect to piston-driving shaft, e.g. arranged parallel to that shaft [N: or swash-plate type pumps (with rotary valve [F02M59/36B2](#))] [C0303]
- F02M59/06 . . . with cylinders arranged radially to driving shaft, e.g. in V or star arrangement
- F02M59/08 . . characterised by two or more pumping elements with conjoint outlet [N: or several pumping elements feeding one engine cylinder (feeding common rails [F02M63/02C](#))] [C9709]
- F02M59/10 . . characterised by the piston-drive
- F02M59/10B . . . [N: Mechanical drive, e.g. tappets or cams ([F02M45/06B](#) takes precedence)]
- F02M59/10C . . . [N: hydraulic drive ([F02M59/32](#) takes precedence)]
- F02M59/10D . . . [N: pneumatic drive, e.g. crankcase pressure drive ([F02M49/00](#) takes precedence)] [C0303]
- F02M59/12 . having other positive-displacement pumping elements, e.g. rotary
- F02M59/14 . . of elastic-wall type
- F02M59/16 . characterised by having multi-stage compression of fuel
- F02M59/18 . characterised by the pumping action being achieved through release of pre-compressed springs
- F02M59/20 . Varying fuel delivery in quantity or timing (for distributor pumps [F02M41/12D](#), [F02M41/14B2](#))
- F02M59/20B . . [N: Quantity of fuel admitted to pumping elements being metered by an auxiliary metering device]
- F02M59/22 . . Varying quantity [N: or timing] by adjusting cylinder-head space [C0303]
- F02M59/24 . . with constant-length-stroke pistons having variable effective portion of stroke
- F02M59/24B . . . [N: caused by movement of cylinders relative to their pistons]
- F02M59/24B1 [N: Mechanisms therefor]
- F02M59/26 . . . caused by movements of pistons relative to their cylinders
- F02M59/26B [N: characterised by the arrangement or form of spill port of spill contour on the piston ([F02M45/06C](#) takes precedence)]
- F02M59/28 Mechanisms therefor
- F02M59/30 . . with variable-length-stroke pistons [N: (swash-plate type pumps [F02M59/04](#))] [C0303]

- F02M59/32 . . fuel delivery being controlled by means of fuel-displaced auxiliary pistons, which effect injection [N: (combined with rotary distributor supporting pump pistons [F02M41/14B2C](#); low pressure fuel-injection [F02M69/12](#))]
- F02M59/34 . . by throttling of passages to pumping elements or of overflow passages, [N: e.g. throttling by means of a pressure-controlled sliding valve having liquid stop or abutment] [C0303]
- F02M59/36 . . by variably-timed valves controlling fuel passages [N: to pumping elements or overflow passages] [C9709]
- F02M59/36B . . . [N: Valves being actuated mechanically]
- F02M59/36B2 [N: valves rotating (combined with rotary fuel distributor [F02M41/06C](#))]
- F02M59/36B2B [N: arrangements for adjusting the rotary valve]
- F02M59/36C . . . [N: valves being actuated by the fluid pressure produced in an auxiliary pump, e.g. pumps with differential pistons; Regulated pressure of supply pump actuating a metering valve, e.g. a sleeve surrounding the pump piston] [C0303]
- F02M59/36D . . . [N: Valves being actuated electrically]
- F02M59/36D2 [N: Pump inlet valves of the check valve type being open when actuated] [N1208]
- F02M59/36D3 [N: Pump inlet valves being closed when actuated] [N1208]
- F02M59/38 . Pumps characterised by adaptations to special use or conditions
- F02M59/40 . . for reversible engines
- F02M59/42 . . for starting of engines [N: (supply of excess fuel [F02M59/44D](#))] [C0303]
- F02M59/44 . Details, components parts, or accessories not provided for in, or of interest apart from, the apparatus of groups [F02M59/02](#) to [F02M59/42](#); [N: Pumps having transducers, e.g. to measure displacement of pump rack or piston] [C0303]
- F02M59/44B . . [N: means preventing fuel leakage around pump plunger, e.g. fluid barriers]
- F02M59/44C . . [N: Selection of particular materials]
- F02M59/44D . . [N: means specially adapted to limit fuel delivery or to supply excess of fuel temporarily, e.g. for starting of the engine (combined with fuel pump regulating devices [F02D](#))]
- F02M59/46 . . Valves (in general F16K) [C1010]
- F02M59/46B . . . [N: Delivery valves]
- F02M59/46C . . . [N: Inlet valves of the check valve type] [N1010]
- F02M59/46E . . . [N: Electrically operated valves, e.g. using electromagnetic or piezo-electric operating means]
- F02M59/46E2 [N: using piezo-electric operating means]
- F02M59/48 . . Assembling; Disassembling; Replacing
- F02M59/48B . . . [N: Means for fixing delivery valve casing and barrel to each other or to pump casing]

- F02M61/00** **Fuel-injectors not provided for in groups [F02M39/00](#) to [F02M57/00](#) or [F02M67/00](#) [C0904]**
 [N: **Note** [M1207]
 - in this group the following indexing codes are used: [R02M700/07](#), [R02M700/07B](#), [R02M700/07F](#)
]
- F02M61/02 . of valveless type

- F02M61/04 . having valves, [N: e.g. having a plurality of valves in series] (valves in general [F16K](#)) [C0303]
- F02M61/04B . . [N: The valves being provided with fuel passages]
- F02M61/04B2 . . . [N: The valves being provided with fuel discharge orifices]
- F02M61/04C . . [N: the valves being formed by deformable nozzle parts, e.g. flexible plates or discs with fuel discharge orifices]
- F02M61/06 . . the valves being furnished at seated ends with pintle or plug shaped extensions
- F02M61/08 . . the valves opening in direction of fuel flow [N: [F02M61/04C](#) takes precedence]
- F02M61/10 . . Other injectors with elongated valve bodies, i.e. of needle-valve type
- F02M61/12 . . . characterised by the provision of guiding or centring means for valve bodies

- F02M61/14 . Arrangements of injectors with respect to engines; Mounting of injectors
- F02M61/14B . . [N: the injection nozzle opening into the air intake conduit] [N9804]

- F02M61/16 . Details not provided for in, or of interest apart from, the apparatus of groups [F02M61/02](#) to [F02M61/14](#)
- F02M61/16B . . [N: Means for adjusting injection-valve lift]
- F02M61/16C . . [N: Means to impart a whirling motion to fuel upstream or near discharging orifices] [C0303]
- F02M61/16C2 . . . [N: Means being injection-valves with helically or spirally shaped grooves]
- F02M61/16D . . [N: Filtering elements specially adapted in fuel inlets to injector]
- F02M61/16F . . [N: Selection of particular materials]
- F02M61/16G . . [N: Means for compensating clearance or thermal expansion] [N0103]
- F02M61/16H . . [N: Assembling; Disassembling; Manufacturing; Adjusting]
- F02M61/18 . . Injection nozzles, e.g. having valve seats; [N: Details of valve member seated ends, not otherwise provided for] [C0303]
- F02M61/18B . . . [N: characterised by the arrangement of discharge orifices, e.g. orientation or size] [C0303]
- F02M61/18B3 [N: 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] [N0807]
- F02M61/18B5 [N: Discharge orifices being situated in different transversal planes with respect to valve member direction of movement] [N0807]
- F02M61/18B7 [N: Discharge orifices having different sizes] [N0807]
- F02M61/18B8 [N: Discharge orifices having changing cross sections, e.g. being divergent] [N1208]
- F02M61/18B9 [N: Discharge orifices having non circular sections] [N0807]
- F02M61/18B11 [N: Dimensional characteristics of discharge orifices] [N0807]
- F02M61/18C . . . [N: Orifice plates] [N9804]
- F02M61/18C2 [N: Multi-layered orifice plates] [N0807]
- F02M61/18E . . . [N: Valve seats or member ends having multiple cones] [N0807]
- F02M61/18G . . . [N: Valve seats or member ends having circumferential grooves or ridges, e.g. toroidal] [N0807]
- F02M61/18K . . . [N: Spherical or partly spherical shaped valve member ends] [N0807] [M1011]
- F02M61/18Y . . . [N: Details of valve seats not covered by groups [F02M61/18E](#) to [F02M61/18K](#)] [N0807]

- F02M61/18Z . . . [N: Details of valve member ends not covered by groups [F02M61/18E](#) to [F02M61/18K](#)] [N0807]
- F02M61/20 . . . Closing valves mechanically, e.g. arrangements of springs or weights [N: or permanent magnets; Damping of valve lift ([F02M61/20B](#) takes precedence)] [C0303]
- F02M61/20B . . . [N: 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] [C0303]

- F02M63/00** **Other fuel-injection apparatus having pertinent characteristics not provided for in groups [F02M39/00](#) to [F02M57/00](#) or [F02M67/00](#); Details, component parts, or accessories of fuel-injection apparatus, not provided for in, or of interest apart from, the apparatus of groups [F02M39/00](#) to [F02M61/00](#) or [F02M67/00](#); [N: Combination of fuel pump with other devices, e.g. lubricating oil pump] [C0904]**
 - [N: **Note** [M1207]
 - in this group the following indexing codes are used: [R02M700/05](#), [R02M700/07E](#)
 -]

- F02M63/00B . . [N: Fuel-injection apparatus with specially arranged lubricating system, e.g. by fuel oil (lubrication of engines [F01M](#))]
- F02M63/00C . . [N: 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 [F02M41/16](#); low pressure fuel injection [F02M69/14](#))] [C0909]
- F02M63/00C2 . . . [N: using valves actuated by fluid pressure]
- F02M63/00C3 . . . [N: using electrically actuated valves (injection valves [F02M51/06](#))]
- F02M63/00C4 . . . [N: using mechanically actuated valves]
- F02M63/00D . . [N: Fuel-injection apparatus having injection valves held closed mechanically, e.g. by springs, and opened by a cyclically-operated mechanism for a time ([F02M67/12](#) takes precedence; operated by fluid pressure [F02M47/00](#); operated electrically [F02M51/06](#); opened by fuel pressure [F02M61/00](#))] [C0303]
- F02M63/00E . . [N: Valves (for fuel metering see the relevant groups, e.g. [F02M59/34](#); inlet or outlet check valves for fuel injection pumps [F02M59/46](#); for fuel injectors see the relevant groups, e.g. [F02M61/00](#))] [N0509]
- F02M63/00E2 . . . [N: characterised by the valve actuating means] [N0509]
- F02M63/00E2B [N: electrical, e.g. using solenoid] [N0509]
- F02M63/00E2B1 [N: using electromagnetic operating means] [N1004]
- F02M63/00E2B1A [N: characterised by the arrangement of electromagnets or fixed armatures] [N1004]
- F02M63/00E2B1C [N: characterised by the arrangement of mobile armatures] [N1004]
- F02M63/00E2B1C1 [N: the armature and the valve being allowed to move relatively to each other] [N1202]
- F02M63/00E2B2 [N: in combination with permanent magnet] [N0509]
- F02M63/00E2B4 [N: using piezoelectric or magnetostrictive actuators] [N0509]
- F02M63/00E2F [N: hydraulic] [N0509]
- F02M63/00E2F2 [N: using a pilot valve controlling a hydraulic chamber] [N0509]
- F02M63/00E4 . . . [N: characterized by the type of valves, e.g. special valve member details, valve seat details, valve housing details] [N0509] [C0807]

- F02M63/00E4A . . . [N: Lift valves, i.e. having a valve member that moves perpendicularly to the plane of the valve seat] [N1004]
- F02M63/00E4A2 [N: Poppet valves, i.e. having a mushroom-shaped valve member that moves perpendicularly to the plane of the valve seat] [N1004]
- F02M63/00E4A4 [N: with spherical or partly spherical shaped valve member ends] [N1004] [M1011]
- F02M63/00E4B . . . [N: rotary] [N0509]
- F02M63/00E4C . . . [N: Sliding valves, e.g. spool valves, i.e. whereby the closing member has a sliding movement along a seat for opening and closing] [N0509] [C1004]
- F02M63/00E4C2 [N: combined with valve seats of the lift valve type] [N1106]
- F02M63/00E4D . . . [N: Two-way valves] [N0509]
- F02M63/00E4F . . . [N: Three-way valves] [N0509]
- F02M63/00E4G . . . [N: Four-way valves or valves with more than four ways] [N0509]
- F02M63/00E4H . . . [N: Combined valve units, e.g. for controlling pumping chamber and injection valve] [N0509]
- F02M63/00E4J . . . [N: Pressure relief valves] [N1010]
- F02M63/00E4J2 [N: with means for adjusting the opening pressure, e.g. electrically controlled] [N1010]
- F02M63/00E4K . . . [N: Check valves ([F02M59/46B](#), [F02M59/46C](#) take precedence)] [N1010]
- F02M63/00E4L . . . [N: Throttling valves, e.g. having variable opening positions throttling the flow] [N1010]
- F02M63/00E8 . . . [N: Means for avoiding fuel contact with valve actuator, e.g. isolating actuators by using bellows or diaphragms] [N0509]
- F02M63/00E10 . . . [N: Arrangements of valve actuators] [N0509]
- F02M63/00E10B [N: Single actuator acting on two or more valve bodies] [N0509]
- F02M63/00E10D [N: Two or more actuators acting on a single valve body] [N0509]
- F02M63/00E10F [N: Two or more actuators acting on two or more valve bodies] [N0509]
- F02M63/00E10H [N: Combination of electromagnetic and piezoelectric or magnetostrictive actuators] [N0509]
- F02M63/00E10K [N: Actuators specially adapted for partial and full opening of the valves] [N0509]
- F02M63/00E12 . . . [N: Details not provided for in, or of interest apart from, the apparatus of the groups [F02M63/00E2](#) to [F02M63/00E10](#)] [N0509]
- F02M63/00E12G [N: characterised by guiding or centering means in valves including the absence of any guiding means, e.g. "flying arrangements"] [N1202]
- F02M63/00E12P [N: Pressure balanced valves] [N1202]
- F02M63/00E12S [N: Stop members in valves, e.g. plates or disks limiting the movement of armature, valve or spring] [N1202]
- F02M63/00E12T [N: Valve seat details] [N1010]
- F02M63/00E12V [N: Valve member details, e.g. special shape, hollow or fuel passages in the valve member] [N1202]
- F02M63/00E12V2 [N: Hollow valve members, e.g. members internally guided] [N1202]
- F02M63/02 . . . 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 provision for cutting-out pumps, pumping elements, or injectors; Fuel-injection apparatus having provisions for variably interconnecting pumping elements and injectors alternatively

- F02M63/02B . . . [N: for cutting-out pumps or injectors in case of abnormal operation of the engine or the injection apparatus, e.g. over-speed, break-down of fuel pumps or injectors (safety devices acting on engine fuel system on lubricant pressure failure [F01M1/24](#)); for cutting-out pumps for stopping the engine] [C0303]
- F02M63/02B2 [N: by locking pump pistons]
- F02M63/02B3 [N: by draining or closing fuel conduits] [C0107]
- F02M63/02B4 [N: by acting on fuel control mechanism]
- F02M63/02C . . . [N: Fuel-injection apparatus having a common rail feeding several injectors ([F02M63/00C](#) takes precedence); Means for varying pressure in common rails; Pumps feeding common rails] [N9709] [C9804]
- F02M63/02C4 [N: Means for varying pressure in common rails (pressure control [F02D41/38C6B](#))] [N0807]
- F02M63/02C4B [N: by bleeding fuel pressure] [N0807]
- F02M63/02C4B2 [N: between the low pressure pump and the high pressure pump] [N0807]
- F02M63/02C4B4 [N: between the high pressure pump and the common rail] [N0807]
- F02M63/02C4B6 [N: from the common rail] [N0807]
- F02M63/02C4B6A [N: using the injectors to bleed fuel, e.g. by operating the control valve of an accumulator type injector during very short periods] [N1208]
- F02M63/02C4E [N: Means for reducing the pressure in common rails at power off (pressure control [F02D41/38C6B](#))] [N1208]
- F02M63/02C6 [N: Pumps feeding common rails] [N0807]
- F02M63/02C6B [N: More than one high pressure pump feeding a single common rail] [N0807]
- F02M63/02C8 [N: Arrangement of common rails] [N0807]
- F02M63/02C8B [N: Returnless common rail system] [N0807]
- F02M63/02C8C [N: having more than one common rail] [N0807]
- F02M63/02C8C2 [N: per cylinder bank; e.g. storing different fuels or fuels at different pressure levels per cylinder bank] [N0807]
- F02M63/02C8C4 [N: for V- or star- or boxer-engines] [N0807]
- F02M63/04 . . . Fuel-injection apparatus having injection valves held closed by a cyclically-operated mechanism for a time and automatically opened by fuel pressure, e.g. constant-pressure pump or accumulator, when that mechanism releases the valve
- F02M63/06 . . . Use of pressure wave generated by fuel inertia to open injection valves
- F02M65/00** . . . **Testing fuel-injection apparatus, e.g. testing injection timing** [N: (testing of ignition [F02P17/00](#); measuring fuel consumption [G01F9/00](#)); Cleaning of fuel-injection apparatus] [C0303]
- F02M65/00A . . . [N: Measuring fuel delivery of a fuel injector] [N1010]
- F02M65/00B . . . [N: Measuring fuel delivery of multi-cylinder injection pumps] [C9702]
- F02M65/00C . . . [N: Measuring variation of fuel pressure in high pressure line] [C9702]
- F02M65/00D . . . [N: Measuring or detecting injection-valve lift, e.g. to determine injection timing] [C9702]
- F02M65/00E . . . [N: Measuring or detecting fuel leakage of fuel injection apparatus] [N1208]

- F02M65/00F . [N: Cleaning] [N9701]
 F02M65/00F1 . . [N: of injectors only] [N9701]
- Guide heading:** **Fuel-injection by high-pressure gas carrying the fuel into engine working cylinders: Low-pressure fuel-injection**
- F02M67/00** **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 [F02M69/08](#))**
- [N: **Note** [M1207]
 - in this group the following indexing codes are used: [R02B720/25](#)
]
- F02M67/00B . [N: fuel-gas mixture being compressed in a pump for subsequent injection into the engine] [N0303]
- F02M67/02 . the gas being compressed air, e.g. compressed in pumps ([arrangements or adaptation of such pumps F02B](#))
- F02M67/04 . . the air being extracted from working cylinders of the engine
- F02M67/06 . the gas being other than air, e.g. steam, combustion gas
- F02M67/08 . . the gas being generated by combustion of part of fuel other than in engine working cylinders
- F02M67/10 . Injectors peculiar thereto, e.g. valve less type
- F02M67/12 . . having valves
- F02M67/14 . characterised by provisions for injecting different fuels, e.g. main fuel and readily self-igniting starting fuel
- F02M69/00** **Low-pressure fuel-injection apparatus(electrically operatedF02M51/00);[N: Apparatus with both continuous and intermittent injection; Apparatus injecting different types of fuel][C0303]**
- [N: **Note** [M1207]
 - in this group the following indexing codes are used: [R02M700/43C](#), [R02B720/15](#)
]
- F02M69/00B . [N: characterised by means for intermittently metering the portion of fuel injected ([F02M69/12](#), [F02M69/14](#) take precedence)]
- F02M69/00K . [N: characterised by control of air admission to the engine according to the fuel injected]
- F02M69/00K2 . . [N: by means of devices using fuel pressure deviated from main fuel circuit acting on air throttle valve]
- F02M69/02 . Pumps peculiar thereto [N: ([elastic wall type pumps F02M59/14](#))] [C0303]
- F02M69/04 . Injectors peculiar thereto

- F02M69/04B . . [N: having vibrating means for atomizing the fuel, e.g. with sonic or ultrasonic vibrations]
- F02M69/04C . . [N: Positioning of injectors with respect to engine, e.g. in the air intake conduit (mounting of injectors [F02M61/14](#))]
- F02M69/04C1 . . . [N: for injecting into the intake conduit upstream of an air throttle valve] [N9709] [M1106]
- F02M69/04C2 . . . [N: for injecting into the intake conduit downstream of an air throttle valve] [N9709] [M1106]
- F02M69/04C3 . . . [N: for injecting into the combustion chamber ([F02M69/04C4](#) takes precedence)] [N9709] [M1106]
- F02M69/04C4 . . . [N: for injecting into both the combustion chamber and the intake conduit] [N0704] [M1106]
- F02M69/04D . . [N: injectors with air chambers, e.g. communicating with atmosphere for aerating the nozzles ([F02M69/32B](#) takes precedence)]
- F02M69/04F . . [N: having variable fuel outlets, e.g. controlled by a valve actuated by operator]
- F02M69/06 . characterised by the pressurisation of the fuel being caused by centrifugal force acting on the fuel
- F02M69/08 . characterised by the fuel being carried by compressed air into main stream of combustion-air
- F02M69/10 . peculiar to scavenged two-stroke engines, e.g. injecting into crankcase-pump chamber
- F02M69/12 . comprising a fuel-displaced free-piston for intermittently metering and supplying fuel to injection nozzles [N: (high-pressure fuel-injection with fuel-displaced auxiliary pistons [F02M59/32](#))]
- F02M69/12B . . [N: Means for varying the stroke of the free-piston]
- F02M69/14 . having cyclically-operated valves connecting injection nozzles to a source of fuel under pressure during the injection period [N: (high-pressure fuel injection apparatus [F02M63/00C](#))]
- F02M69/14B . . [N: the valves being operated by fluid impulses, e.g. using bistable fluid operated valves]
- F02M69/14C . . [N: the valves being actuated electrically (electrically-operated injectors [F02M51/06](#))]
- F02M69/14D . . [N: the valves being actuated mechanically, e.g. rotating]
- F02M69/16 . characterised by means for metering continuous fuel flow to injectors or means for varying fuel pressure upstream of [N: continuously or intermittently operated] injectors [C0303]
- F02M69/18 . . 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 ([F02M69/26](#) takes precedence)
- F02M69/20 . . . the device being a servo-motor, e.g. using engine intake air pressure or vacuum ([F02M69/22](#) takes precedence)
- F02M69/22 . . . the device comprising a member movably mounted in the air intake conduit and displaced according to the quantity of air admitted to the engine
- F02M69/24 . . . the device comprising a member for transmitting the movement of the air throttle valve actuated by the operator to the valves controlling fuel passages

- F02M69/26 . . 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
- F02M69/28 . characterised by means for cutting-out the fuel supply to the engine or to main injectors during certain operating periods, e.g. deceleration
- F02M69/30 . 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 (at acceleration [F02M69/44](#))
- F02M69/32 . . with an air by-pass around the air throttle valve or with an auxiliary air passage, e.g. with a variably controlled valve therein
- F02M69/32B . . . [N: with an auxiliary injection nozzle therein ([F02M69/34](#) takes precedence)]
- F02M69/34 . . with an auxiliary fuel circuit supplying fuel to the engine, e.g. with the fuel pump outlet being directly connected to injection nozzles
- F02M69/36 . . 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 [N: (at acceleration [F02M69/44](#))]
- F02M69/38 . . . using fuel pressure, e.g. by varying fuel pressure in the control chambers of the fuel metering device ([F02M69/26](#) takes precedence)
- F02M69/38B [N: 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]
- F02M69/38C [N: variably controlling the pressure of the fuel by-passing the metering valves, e.g. by valves responsive to signals of temperature or oxygen sensors]
- F02M69/40 . . . using variably controlled air pressure, e.g. by modifying the intake air vacuum signal acting on the fuel metering device
- F02M69/42 . . . using other means than variable fluid pressure, e.g. acting on the fuel metering device mechanically or electrically
- F02M69/44 . characterised by means for supplying extra fuel to the engine on sudden air throttle opening, e.g. at acceleration
- F02M69/46 . Details, component parts or accessories not provided for in, or of interest apart from, the apparatus covered by groups [F02M69/02](#) to [F02M69/44](#)
- F02M69/46B . . [N: Arrangement of fuel conduits, e.g. with valves for maintaining pressure in the pipes after the engine being shut-down]
- F02M69/46B2 . . . [N: of fuel rails]
- F02M69/46C . . [N: Devices using intake air for generating a control signal acting on fuel delivery ([F02M69/12B](#), [F02M69/20](#), [F02M69/40](#) take precedence)]
- F02M69/48 . . Arrangement of air sensors [N: ([F02M69/22](#) takes precedence)]
- F02M69/50 . . Arrangement of fuel distributors, [N: e.g. with means for supplying equal portion of metered fuel to injectors ([F02M69/14D](#) takes precedence)]
- F02M69/52 . . Arrangement of fuel metering devices [N: ([F02M69/18](#) takes precedence)]
- F02M69/54 . . Arrangement of fuel pressure regulators
- F02M71/00** **Combinations of carburettors and low-pressure fuel-injection apparatus** (means for enriching charge on sudden air throttle opening of carburettors [F02M7/06](#))

[N: **Note** [M1207]

- in this group the following indexing codes are used: [R02M700/13E5](#)

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[F02M71/02](#)

- with fuel-air mixture being produced by the carburettor and being compressed by a pump for subsequent injection into main combustion-air ([adaptations or arrangements of such pumps F02B](#))

[F02M71/04](#)

- with carburettor being used at starting or idling only and injection apparatus being used during normal operation of engine [N: [or vice-versa](#)]

[F02M99/00](#)

Subject matter not provided for in other groups of this subclass [N0704]