F02M

SUPPLYING COMBUSTION ENGINES IN GENERAL, WITH COMBUSTIBLE MIXTURES OR CONSTITUENTS THEREOF (charging such engines F02B)

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Carburettors	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	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 includes the so-called "solid-fuel injection" in which liquid fuel is introduced without any admixture of gas
Low-pressure fuel injection	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	A single piston-cylinder unit in a reciprocating-piston fuel-injection pump or the equivalent unit in any other type of fuel-injection pump

F02M 1/00

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

Definition statement

This subclass/group covers:

When the engine is cold, fuel vaporizes less readily and tends to condense on the walls of the intake manifold, starving the cylinders of fuel and making the engine difficult to start; thus, a richer mixture is required to start and run the engine until it warms up. To provide the extra fuel, a choke is typically used;

this is a device that restricts the flow of air at the entrance to the carburettor, before the venturi. With this restriction in place, extra vacuum is developed in the carburettor venturi, which pulls extra fuel through the main metering system to supplement the fuel being pulled from the idle and off-idle circuits. This provides the rich mixture required to sustain operation at low engine temperatures. In addition, the choke can be connected to a cam or other device which prevents the throttle plate from closing fully while the choke is in operation. This causes the engine to idle at a higher speed. Fast idle serves as a way to help the engine warm up quickly, and give a more stable idle while cold by increasing airflow throughout the intake system which helps to better atomize the cold fuel. In many carburetted cars, the choke is controlled by a cable connected to a pull-knob on the dashboard operated by the driver. In some carburetted cars it is automatically controlled by a thermostat employing a bimetallic spring, which is exposed to engine heat, or to an electric heating element. This heat may be transferred to the choke thermostat via simple convection, via engine coolant, or via air heated by the exhaust. Some carburettors do not have a choke but instead use a mixture enrichment circuit. Typically used on small engines, enricheners work by opening a secondary fuel circuit below the throttle valves. This circuit works exactly like the idle circuit, and when engaged it simply supplies extra fuel when the throttle is closed.

Relationship between large subject matter areas

Carburettors are used in all types of engines. Nowadays new inventions mainly take place in the field of small engines. e.g. motorcycles, lawn mowers.

References relevant to classification in this group

This subclass/group does not cover:

Carburettors for gaseous fuel	F02M 21/00
Carburettors combined with low pressure fuel injection	F02M 71/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Idling devices	F02M 3/00

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Idling	Engine running stationary
Priming	Pumping extra fuel
Float chamber	Fuel collection chamber controlled by float member

F02M 3/00

Idling devices (with means for facilitating idling below operational temperatures F02M 1/00)

Definition statement

This subclass/group covers:

Devices for delivering the correct amount of fuel and air under idling i.e. slow running conditions of the engine.

Relationship between large subject matter areas

Low-pressure fuel-injection apparatus, F02M 69/00.

References relevant to classification in this group

This subclass/group does not cover:

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

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

Informative references

Attention is drawn to the following places, which may be of interest for search:

Apparatus for adding secondary air to fuel-air mixture

	F02M 23/00

F02M 5/00

Float-controlled apparatus for maintaining a constant fuel level

Definition statement

This subclass/group covers:

To ensure a ready mixture, the carburettor has a float chamber that contains a quantity of fuel at near-atmospheric pressure, ready for use. This reservoir is constantly replenished with fuel supplied by a fuel pump. The correct fuel level in the bowl is maintained by means of a float controlling an inlet valve When fuel is used up, the float drops, opening the inlet valve and admitting fuel. As the fuel level rises, the float rises and closes the inlet valve. The level of fuel maintained in the float bowl can usually be adjusted by a setscrew.

Relationship between large subject matter areas

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

References relevant to classification in this group

This subclass/group does not cover:

Floatless carburettors	F02M 17/02

Informative references

Attention is drawn to the following places, which may be of interest for search:

Details, component parts, or accessories of carburettors, not provided for in, or of interest apart from, the apparatus of groups F02M 1/00 to F02M 17/00

	F02M 19/00

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Float	Hollow body floating on fuel level and acting on fuel inlet valve

F02M 7/00

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

Definition statement

This subclass/group covers:

Under all engine operating conditions, the carburettor must measure the airflow of the engine, deliver the correct amount of fuel to keep the air/fuel mixture in the proper range and distribute the two finely and evenly. This job would be simple if air and gasoline were ideal fluids; in practice, however, their deviations from ideal behaviour due to viscosity, fluid drag, inertia, etc. require a great deal of complexity to compensate for exceptionally high or low engine speeds. A carburettor must provide the proper air/fuel mixture across a wide range of ambient temperatures, atmospheric pressures, engine speeds and loads and centrifugal forces, like cold start, hot start, idling, acceleration, high speed at full throttle (high load), slow speed at part throttle (light load).

To function correctly under all these conditions, carburettors contain a complex set of mechanisms to support several different operating modes.

Relationship between large subject matter areas

Electrical control of supply of combustible mixture or its constituents, F02D 41/00.

References relevant to classification in this group

This subclass/group does not cover:

Carburettors with means for facilitating engine's starting or its idling below operational temperatures	F02M 1/00
Idling devices	F02M 3/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Carburettors with means for influencing, e.g. enriching or keeping constant, fuel/air ratio of charge under varying conditions	F02D 35/00

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Aerated fuel spray nozzles	Nozzle with air and fuel dispersion
Equaliser jets	Jets for equalising the air/fuel ratio

F02M 9/00

Carburettors having air or fuel-air mixture passage throttling valves other than of butterfly type (register-type carburettors F02M 11/00); Carburettors having fuel-air mixing chambers of variable shape or position

Definition statement

This subclass/group covers:

A carburettor basically consists of an open pipe through which the air passes into the inlet manifold of the engine. The pipe is in the form of a venture, which narrows in section and then widens again, causing the airflow to increase in speed in the narrowest part. Below the venturi is a valve called the throttle valve. This valve controls the flow of air through the carburettor throat and thus the quantity of air/fuel mixture the system will deliver, thereby regulating engine power and speed. The throttle valve is connected through a mechanical linkage of rods and joints to the accelerator pedal.

Relationship between large subject matter areas

Controlling engines by throttling air or fuel-and-air induction conduits or exhaust conduits, F02D 9/00.

References relevant to classification in this group

This subclass/group does not cover:

Register-type carburettors	F02M 11/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Throttle valves having slidably mounted valve members	F02D 9/12

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Iris diaphragms	Series of metal plates that can fold in over an opening on each other

Synonyms and Keywords

In patent documents the following expressions " Carburettor throat" and "Carburettor venturi " are often used as synonyms.

F02M 11/00

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

Definition statement

This subclass/group covers:

Carburettors with a plurality of means for adjusting the air to fuel mixing ratio according to the operational requirements, like acceleration, deceleration and idling of the engine.

Relationship between large subject matter areas

Electrical control of supply of combustible mixture or its constituents, F02D 41/00.

References relevant to classification in this group

This subclass/group does not cover:

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

Informative references

Attention is drawn to the following places, which may be of interest for search:

Arrangements of two or more separate carburettors	F02M 13/00
Carburettors using more than one fuel	F02M 13/06

Synonyms and Keywords

In patent documents the following expressions " Multi stage carburettor" and "Register carburettor" are often used as synonyms.

F02M 13/00

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

Definition statement

This subclass/group covers:

The arrangement of two or more carburettors on the intake conduits of internal combustion engines and related constructional features.

Relationship between large subject matter areas

Combustion air cleaners, air intakes, intake silencers or induction systems specially adapted for, or arranged on, internal combustion engines, F02M 35/00.

References relevant to classification in this group

This subclass/group does not cover:

Multi-stage carburettors	F02M 11/00
Apparatus for adding small quantities of secondary fuel	F02M 25/00
Re-atomising condensed fuel or homogenising fuel-air mixture	F02M 29/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Controlling engines by throttling air or fuel and air induction conduits or exhaust conduits.	F02D 9/00

F02M 15/00

Carburettors with heating, cooling, or thermal insulating means for combustion-air, fuel, or fuel-air mixture (heating, cooling, or thermally insulating float apparatus F02M 5/00; apparatus for thermally treating combustion-air, fuel, or fuel-air mixture not being part of a carburettor F02M 31/00)

Definition statement

This subclass/group covers:

Carburettors with means for preventing freezing or overheating of the carburettor.

Relationship between large subject matter areas

Apparatus for thermally treating combustion-air, fuel, or fuel-air mixture, F02M 31/00.

References relevant to classification in this group

This subclass/group does not cover:

Carburettors with means for facilitating engine's starting or its idling below operational temperatures	F02M 1/00
Heating, cooling, or thermally insulating float apparatus	F02M 5/00
Apparatus for thermally treating combustion-air, fuel, or fuel-air mixture not being part of a carburettor	F02M 31/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Carburettors having pertinent characteristics not provided for in, or of interest apart from, the apparatus of preceding main groups	F02M 17/00

F02M 17/00

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 F02M 27/00; combinations of carburettors and low-pressure fuel-injection apparatus F02M 71/00)

Definition statement

This subclass/group covers:

Carburettors with a different type of configuration, like fuel bath carburettors or normal carburettors having special properties, like membrane carburettors.

Relationship between large subject matter areas

Low-pressure fuel-injection apparatus, F02M 69/00.

References relevant to classification in this group

This subclass/group does not cover:

Apparatus for treating combustion-air, fuel or fuel-air mixture by catalysts, electric means, magnetism, rays, sound waves or the like	F02M 27/00
Combinations of carburettors and low-pressure fuel-injection apparatus	F02M 71/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Combinations of carburettors and low-pressure fuel-injection apparatus.	F02M 71/00

F02M 19/00

Details, component parts, or accessories of carburettors, not provided for in, or of interest apart from, the apparatus of groups F02M 1/00 to F02M 17/00 (measuring or testing apparatus in general G01)

Definition statement

This subclass/group covers:

Details of carburettors, e.g. metering orifices, spray nozzles, venturis, external control gear.

Relationship between large subject matter areas

Low-pressure fuel-injection apparatus, F02M 69/00.

References relevant to classification in this group

This subclass/group does not cover:

Aspects from preceding groups	F02M 1/00- F02M 17/00
Measuring or testing apparatus in general	G01/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Carburettors having pertinent characteristics not provided for in, or of interest apart from, the apparatus of preceding main groups	F02M 17/00

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Dashpot	Type of damper

Synonyms and Keywords

In patent documents the following expressions "Carburettor throat" and "Carburettor venturi" are often used as synonyms.

F02M 21/00

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

Definition statement

This subclass/group covers:

Systems like tanks, vaporizers, pumps and injectors for supplying engines with a non-liquid, mostly gaseous fuel. A gas engine differs from a petrol engine in many ways. The fuel and air are mixed differently. The combustion of a gas/ air mixture is different form a liquid fuel/ air mixture and requires adaptation of the combustion space. Also the energy contents of gas is much lower than that of a liquid fuel. Since (natural) gas is a clean, economical and readily available fuel, many industrial engines are either designed or modified to use gas, as distinguished from gasoline.

Relationship between large subject matter areas

Controlling engines characterised by their use of non-liquid fuels, pluralities of fuels, or non-fuel substances added to the combustible mixtures, F02D 19/00.

References relevant to classification in this group

This subclass/group does not cover:

Engines characterised by operating on gaseous fuels; plants including such engines	F02B 43/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Engines characterised by pre-combustion chambers	F02B 19/00
Carburettors adapted to use liquid and gaseous fuels	F02M 13/08

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Gaseous fuel	Fuel being a gas at atmospheric pressure and room temperature

F02M 23/00

Apparatus for adding secondary air to fuel-air mixture

Definition statement

This subclass/group covers:

Apparatus for adding secondary air to the air/fuel mixture for varying or keeping constant the air/fuel ratio under varying engine operating circumstances, like acceleration, deceleration, cold start and high torque.

Relationship between large subject matter areas

Engine-pertinent apparatus for adding non-fuel substances or small quantities of secondary fuel to combustion-air, main fuel, or fuel-air mixture, F02M 25/00.

References relevant to classification in this group

Engines characterised by air-storage chambers	F02B 21/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

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

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Secondary air	air not entering the engine via the main air intake

F02M 25/00

Engine-pertinent apparatus for adding non-fuel substances or small quantities of secondary fuel to combustion-air, main fuel, or fuel-air mixture (F02M 43/00 takes precedence; adding secondary air to fuel-air mixture F02M 23/00)

Definition statement

This subclass/group covers:

Apparatus for adding water, lubricant vapours, fuel vapours or exhaust gases to the combustion mixture. These substances are added to improve the combustion properties of the fuel/air mixture and/or make the exhaust gases cleaner or prevent harmful gases from escaping to atmosphere.

Relationship between large subject matter areas

Controlling engines characterised by their being supplied with non-airborne oxygen or other non-fuel gas, F02D 21/00.

References relevant to classification in this group

This subclass/group does not cover:

Exhaust or silencing apparatus having means for purifying, rendering innocuous, or otherwise treating exhaust	F01N 3/00
Adding secondary air to fuel-air mixture	F02M 23/00
Fuel injection apparatus working simultaneously on two or more fuels	F02M 43/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Methods of operating engines involving adding non-fuel substances or anti-knock agents to combustion	F02B 47/00

air, fuel or fuel-air mixtures of engines	

Synonyms and Keywords

In patent documents the following abbreviations are often used:

EGR	Exhaust Gas Recirculation
PCV	Positive Carter Ventilation

F02M 27/00

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

Definition statement

This subclass/group covers:

Apparatus for treating combustion-air, fuel or fuel-air mixture by catalysts, electric means, magnetism, (radioactive) rays or sound waves in order to improve the combustibility of the fuel-air-mixture.

Relationship between large subject matter areas

Chemical, physical or physic-chemical processes in general; their relevant apparatus, B01J 19/00.

References relevant to classification in this group

This subclass/group does not cover:

Engine-pertinent apparatus for adding non-fuel substances or small quantities of secondary fuel to combustion-air, main fuel or fuel-air mixture	F02M 25/00
Apparatus for thermally treating combustion-air, fuel or fuel-air mixture	F02M 31/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Other methods of operating engines involving pre-treating of or adding substances to combustion air, fuel or fuel-air mixture for the engine.	F02B 51/00

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Sonic waves	Sound waves

F02M 29/00

Apparatus for re-atomising condensed fuel or homogenising fuel-air mixture (combined with secondary-air supply F02M 23/12) [N: (collecting condensed fuel F02M 33/02)]

Definition statement

This subclass/group covers:

Especially when the air is cold the process of vaporisation of fuel into the air is more difficult. Apparatus for re-atomising condensed fuel, e.g. fuel droplets on the inner side of the air intake tube, or homogenising fuel-air mixture, e.g. distribution of fuel and air, help to improve this process.

Relationship between large subject matter areas

Modifying induction systems for imparting a rotation to the charge in the cylinder, F02B 31/00.

References relevant to classification in this group

This subclass/group does not cover:

This group does not cover

Combined with secondary-air supply	F02M 23/12
Apparatus for thermally treating combustion-air, fuel, or fuel-air mixture	F02M 31/00

Apparatus for collecting and returning condensed fuel	F02M 33/02

Informative references

Attention is drawn to the following places, which may be of interest for search:

Apparatus for adding secondary air to fuel-air mixture	F02M 23/00

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Secondary air	Air entering the intake via an extra opening

Synonyms and Keywords

In patent documents the following expressions "Re-atomising " and "Re-evaporating" are often used as synonyms.

F02M 31/00

Apparatus for thermally treating combustion-air, fuel, or fuel-air mixture (F02M 21/06, F02M 21/10 take precedence; such apparatus being part of a carburettor or fuel-injection apparatus F02M 15/00, F02M 53/00; adding hot secondary air to fuel-air mixture F02M 23/14)

Definition statement

This subclass/group covers:

Apparatus for thermally treating combustion-air, fuel or fuel-air mixture for improving the combustion properties of the fuel-air mixture.

Relationship between large subject matter areas

Carburettors with heating, F02M 15/00; fuel injection apparatus with heating, F02M 53/00; fuel filters with heating, F02M 37/223; air filters with heating, F02M 35/024.

References relevant to classification in this group

This subclass/group does not cover:

Such apparatus being part of the carburettor	F02M 15/00
Apparatus for de-liquefying gas by heating	F02M 21/06
Heating means for fuels with low melting point	F02M 21/10
Adding hot secondary air to the fuel-air mixture	F02M 23/14
Such apparatus being part of the fuel injection apparatus	F02M 53/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Apparatus for treating combustion-air, fuel or fuel-air mixture by catalysts, electric means, magnetism, rays, sound waves or the like	F02M 27/00

F02M 33/00

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

Definition statement

This subclass/group covers:

Other apparatus for treating combustion-air, fuel or fuel-air mixture, like collectors for condensed fuel, coatings of intake passages.

Relationship between large subject matter areas

Engine pertinent apparatus for adding for adding non-fuel substances or small quantities of secondary fuel to combustion-air, main fuel or fuel-air mixture,

F02M 25/00.

References relevant to classification in this group

This subclass/group does not cover:

Combustion-air cleaners	F02M 35/00
Arrangements for purifying liquid fuel	F02M 37/22

Informative references

Attention is drawn to the following places, which may be of interest for search:

Apparatus for re-atomising condensed fuel or homogenising fuel-air mixture	F02M 29/00

F02M 35/00

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

Relationship between large subject matter areas

F02M 35/00 has relationships with many subject matter areas in the field F02B, F02D and F02M dealing with the air and fuel supply to the internal combustion engine.

References relevant to classification in this group

This subclass/group does not cover:

Air cleaners in general	B01D

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of kinetic or wave energy of charge in induction systems	F02B 27/00
Modifying induction systems for	F02B 31/00

imparting a rotation to the charge in the cylinder	
Controlling engines by throttling air or fuel-and-air induction conduits or exhaust conduits	F02D 9/00

F02M 37/00

Apparatus or systems for feeding liquid fuel from storage containers to carburettors or fuel-injection apparatus (F02M 69/00 takes precedence; [N: fuel injection apparatus characterised by their conduits and venting means F02M 55/00; fuel injection apparatus having a common rail F02M 63/0225; control of fuel feeding F02D 33/003; feeding liquid fuel to combustion apparatus, in general F23K 5/00; fuel supply to apparatus for generating combustion products of high pressure or high velocity F23R 3/28); Arrangements for purifying liquid fuel specially adapted for, or arranged on, internal-combustion engines (separating apparatus, filters per se B01D; centrifuges B04B)

Definition statement

This subclass/group covers:

Apparatus or systems for feeding liquid fuel from storage containers to carburettors or fuel-injection apparatus, like pumps, fuel conduits and venting means.

Relationship between large subject matter areas

Fuel injection apparatus characterized by their conduits and venting means, F02M 55/00

References relevant to classification in this group

This subclass/group does not cover:

Arrangements for purifying liquid fuel specially adapted for, or arranged on, internal-combustion engines	B01D
Centrifuges	B04B
Control of fuel feeding	F02D 33/003

Fuel injection apparatus having a common rail	F02M 63/0225
Feeding liquid fuel to combustion apparatus, in general	F23K 5/00
Fuel supply to apparatus for generating combustion products of high pressure or high velocity	F23R 3/28

F02M 39/00

Arrangements of fuel-injection apparatus with respect to engines; Pump drives adapted to such arrangements (arrangements of injectors F02M 61/14)

Definition statement

This subclass/group covers:

E.g. the physical relation of fuel-injection apparatus to an engine or the drive arrangement of a fuel pump.

References relevant to classification in this group

This subclass/group does not cover:

Arrangements of injectors with respect to engines	F02M 61/14

Informative references

Attention is drawn to the following places, which may be of interest for search:

Charging fuel-injection engines	F02B
Fuel-injection apparatus carrying the fuel into cylinders by high-pressure gas	F02M 67/00
Low-pressure fuel-injection	F02M 69/00

F02M 39/02

Arrangements of fuel-injection apparatus to facilitate the driving of pumps; Arrangements of fuel-injection pumps; Pump drives (F02M 49/00 takes precedence)

Definition statement

This subclass/group covers:

Arrangements of fuel-injection pumps including mounting, i.e. fitting or attaching the pumps to the engines.

F02M 41/00

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

Definition statement

This subclass/group covers:

Fuel injection apparatus having a driven sequential distributor, combined with or separated from a pump or common pressure source.

Injection pumps for metering and distributing fuel.

References relevant to classification in this group

This subclass/group does not cover:

Common rail or accumulator injection systems	F02M 47/02, F02M 63/0003, F02M 63/0225

Synonyms and Keywords

In patent documents the word "pump" is often used with the meaning "distributor-type pumps".

F02M 41/06

the distributor rotating

References relevant to classification in this group

This subclass/group does not cover:

Radial pistons carried by the distributor	F02M 41/1405

F02M 41/121

[N: with piston arranged axially to driving shaft (F02M 41/123 takes precedence)]

References relevant to classification in this group

This subclass/group does not cover:

Characterised by means for varying fuel delivery or injection timing	F02M 41/123

F02M 41/122

[N: with piston arranged radially to driving shaft (F02M 41/123 takes precedence)]

References relevant to classification in this group

This subclass/group does not cover:

Characterised by means for varying fuel delivery or injection timing	F02M 41/123

F02M 41/124

[N: Throttling of fuel passages to or from the pumping chamber]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Details of valves	F02M 63/0012

F02M 41/125

[N: Variably-timed valves controlling fuel passages]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Details of valves	F02M 63/0012

F02M 41/126

[N: valves being mechanically or electrically adjustable sleeves slidably mounted on rotary piston]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Details of valves	F02M 63/0012

F02M 41/127

[N: valves being fluid-actuated slide-valves, e.g. differential rotary-piston pump]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Details of valves	F02M 63/0012

F02M 41/1427

[N: Arrangements for metering fuel admitted to pumping chambers, e.g. by shuttles or by throttle-valves]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Details of valves	F02M 63/0012

F02M 43/00

Fuel-injection apparatus operating simultaneously on two or more fuels or on a liquid fuel and another liquid, e.g. the other liquid being an anti-knock additive

Definition statement

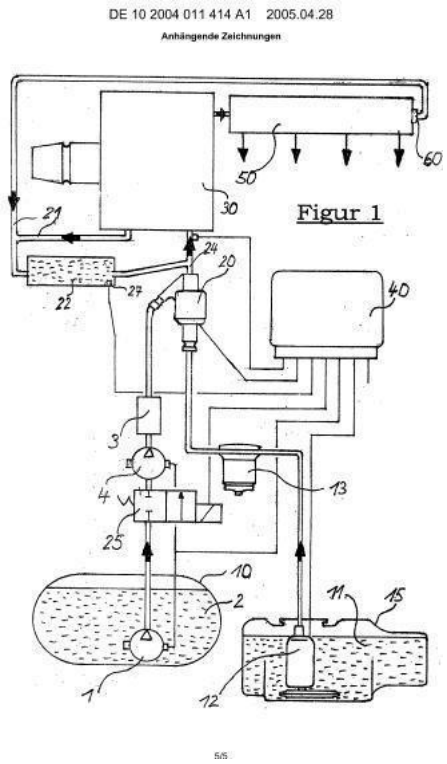
This subclass/group covers:

Fuel injection apparatuses operating simultaneously on two or more fuels or on a liquid fuel and another liquid, the other liquid can e.g. be an antiknock additive, e.g. water.

One of the fuels may be gaseous.

This group does not contain documents describing gaseous fuel injection system. It is limited to constructional aspects of pumps or injectors.

However fuel injection apparatuses operating simultaneously on two or more fuels, one of them being gaseous, also fall under F02M 43/00.



References relevant to classification in this group

This subclass/group does not cover:

Engines operating on gaseous fuel	F02B 43/00
Engines operating on other non-liquid fuels	F02B 45/00
Injection valves for gaseous fuels	**F02M21/02A**
Engine-pertinent apparatus for adding non-fuel substances or small quantities of secondary fuel to	F02M 25/00

combustion-air, main fuel, or fuel-air mixture	

F02M 45/00

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 F02M 61/06) [N:pumps having such delivery by means of delivery valves F02M 59/462]

Definition statement

This subclass/group covers:

Both functional and constructional aspects of injection apparatus. When a pump or injector is specially designed for such injection, then they are classified in these groups.

References relevant to classification in this group

This subclass/group does not cover:

Controlling fuel injection	F02D 41/30

Synonyms and Keywords

In patent documents the following expressions/words "rate shaping", "pilot" and "main injection" are often used as synonyms.

F02M 45/02

with each cyclic delivery being separated into two or more parts

Definition statement

This subclass/group covers:

Apparatus with each cyclic delivery being separated into two or more parts or if there is "a continuous cyclic delivery with variable pressure", or

in case "each cyclic delivery" is not "separated into two or more parts", i.e. in case injector doesn't close between parts.

References relevant to classification in this group

This subclass/group does not cover:

Two or more closing springs acting on injection-valve, and "each cyclic delivery" is NOT "separated into two or more parts"	F02M 45/083

F02M 45/04

with a small initial part, [N: e.g. initial part for partial load and initial and main part for full load]

Definition statement

This subclass/group covers:

Functional and constructional aspects of injection apparatus.

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pumps having such delivery by means of delivery valves	F02M 59/462
Fuel-injectors having such deliveries by means of valves furnished at seated ends with pintle- or plug-shaped extensions	F02M 61/06

Synonyms and Keywords

In patent documents the following expressions/words "rate shaping", "pilot" and "main injection" are often used as synonyms.

F02M 45/066

[N: Having specially arranged spill port and spill contour on the piston (F02M 45/063 takes precedence)]

References relevant to classification in this group

This subclass/group does not cover:

Delivery stroke of piston being divided into two or more parts, e.g. by using specially shaped cams	F02M 45/063

F02M 45/086

[N: Having more than one injection-valve controlling discharge orifices]

Definition statement

This subclass/group covers:

Apparatus having more than one injection-valve controlling discharge orifices, even if "each cyclic delivery" is not "separated into two or more parts". Also used if there is "a continuous cyclic delivery with variable pressure".

F02M 45/12

providing a continuous [N: cyclic] delivery with variable pressure

Definition statement

This subclass/group covers:

Apparatus providing a continuous cyclic delivery with variable pressure. "Variable pressure" is understood to include "variable flow rate".

References relevant to classification in this group

This subclass/group does not cover:

If "2 or more closing springs are acting on injection-valve", even if, as here, "each cyclic delivery" is not "separated into two or more parts", but is "a continuous cyclic delivery with variable pressure"	F02M 45/083
If there is "more than one injection valve controlling discharge orifices", even if, as here, "each cyclic delivery" is not "separated into two or more parts", but is "a continuous cyclic delivery with variable pressure"	F02M 45/086

F02M 47/00

Fuel-injection apparatus operated cyclically with fuel-injection valves actuated by fluid pressure (F02M 49/00 takes precedence; apparatus with injection valves opened by fuel pressure and closed by non-fluid means, see the groups providing for other characteristics)

Definition statement

This subclass/group covers:

Injectors only. The needle valves of these injectors are closed by a fluid pressure, with the exception of injectors classified in F02M 47/046

References relevant to classification in this group

This subclass/group does not cover:

Fuel-injection apparatus in which injection pumps are driven or injectors are actuated, by the pressure in engine working cylinder, or by impact by engine working piston	F02M 49/00
Fuel injectors with spring for needle closing and using fluid for assisting the spring force	F02M 61/205
Fuel injection valves opened by fuel pressure and closed by non-fluid means	F02M 63/04

Informative references

Attention is drawn to the following places, which may be of interest for search:

Solenoid or piezoelectric control valves used in these injectors	F02M 63/0012
Apparatus with injection valves opened by fuel pressure and closed by non-fluid means	F02M 63/04
Low-pressure fuel-injection	F02M 69/00

F02M 47/022

[N: Mechanically actuated valves draining the chamber to release the closing pressure]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Details of valves	F02M 63/0012

F02M 47/025

[N: Hydraulically actuated valves draining the chamber to release the closing pressure]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Details of valves	F02M 63/0012

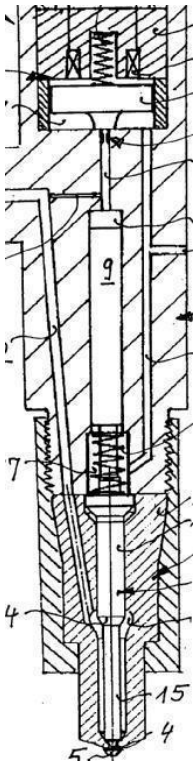
F02M 47/027

[N: Electrically actuated valves draining the chamber to release the closing pressure]

Definition statement

This subclass/group covers:

Illustrative example of subject matter classified in this group.



Informative references

Attention is drawn to the following places, which may be of interest for search:

Details of injection valves	F02M 61/00, F02M 2063/0082
Details of control valves	F02M 63/0012

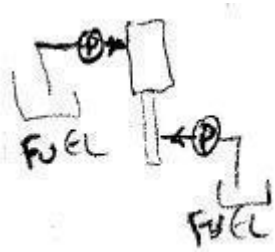
F02M 47/04

using fluid, other than fuel, for injection-valve actuation

Definition statement

This subclass/group covers:

Using fuel for injection-valve actuation, provided that the fuel used for injection-valve actuation is not taking part of the injection or stems from a separate fuel line, i.e.:



F02M 47/06

Other fuel injectors peculiar thereto

Definition statement

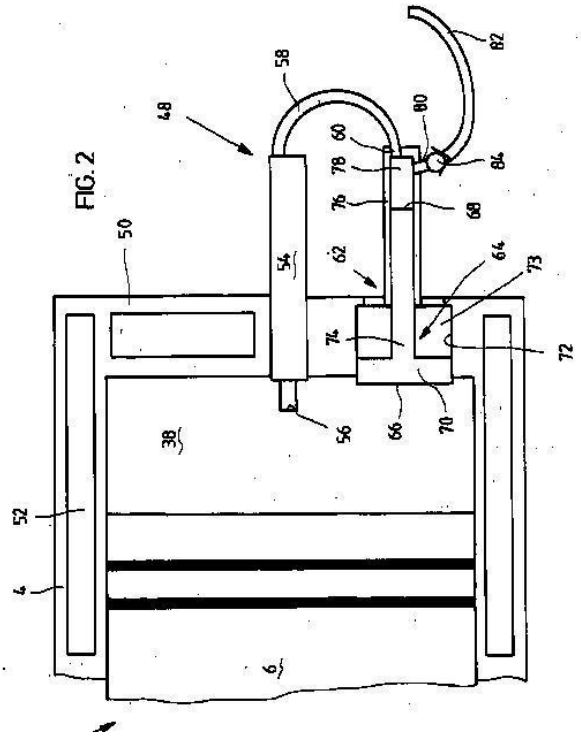
This subclass/group covers:
Fuel injectors not covered by F02M 47/02 and F02M 47/04.

F02M 49/00

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

Definition statement

This subclass/group covers:
Illustrative example of subject matter classified in this group.



F02M 51/00

Fuel-injection apparatus characterised by being operated electrically

Definition statement

This subclass/group covers:

E.g.: electrical wirings, pumps with electric plunger drive and injectors with electric needle drive (solenoid, piezoelectric etc.)

References relevant to classification in this group

This subclass/group does not cover:

Injectors with electric control valves	F02M 47/027, F02M 63/0007
Pumps with electric control valves	F02M 59/366

F02M 51/02

specially for low-pressure fuel-injection ([N: F02M 51/005 takes precedence]; pumps per se F02M 51/04)

References relevant to classification in this group

This subclass/group does not cover:

Pumps per se	F02M 51/04
Injectors per se	F02M 51/06
Arrangement of electrical wires and connections	F02M 51/005

F02M 51/06

Injectors peculiar thereto [N: with means directly operating the valve needle]

Definition statement

This subclass/group covers:

Injectors peculiar thereto, with electrical means directly or indirectly via a hydraulic or mechanical linkage operating the valve needle.

References relevant to classification in this group

This subclass/group does not cover:

Fluid pressure operated valve needles	F02M 47/027, F02M 63/0003

Informative references

Attention is drawn to the following places, which may be of interest for search:

Injector details not provided for under F02M 51/06	F02M 61/00; F02M 2063/0082

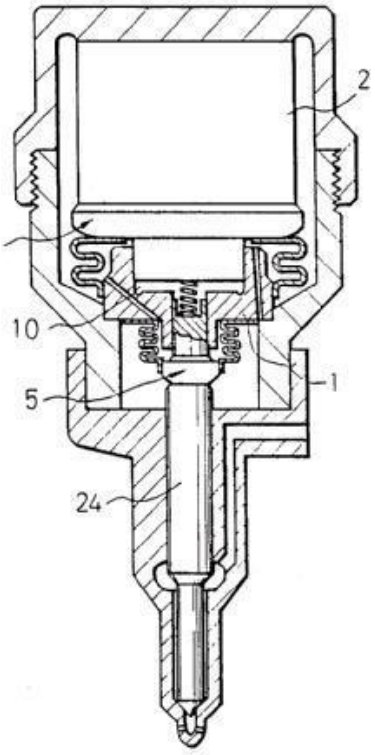
F02M 51/0603

[N:using piezo-electric or magnetostrictive operating means]

Definition statement

This subclass/group covers:

Illustrative example of subject matter classified in this group.



References relevant to classification in this group

This subclass/group does not cover:

Valves in general actuated by piezo-electric means	F16K 31/004
Piezo-electric devices; Electrostrictive	H01L 41/00

devices; Magnetostrictive devices; Processes or apparatus peculiar to the manufacture or treatment thereof or of parts thereof; Details thereof	

Informative references

Attention is drawn to the following places, which may be of interest for search:

Linkage between operating means and valve member	F02M 2063/0087

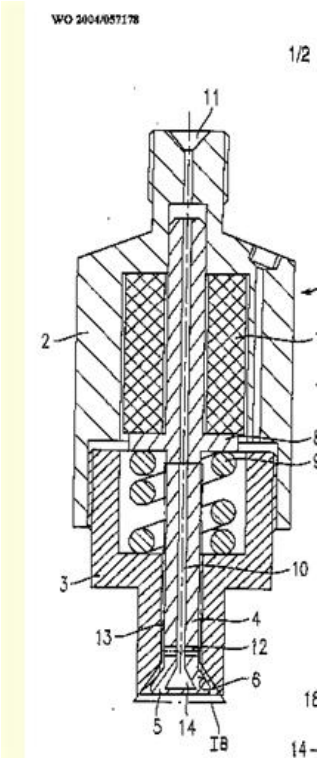
F02M 51/0607

[N: actuator being hollow, e.g. the needle passing through the hollow space]

Definition statement

This subclass/group covers:

Injectors featuring hollow actuators, e.g. the needle passing through the hollow space. Example:



F02M 51/061

[N: using electromagnetic operating means]

References relevant to classification in this group

This subclass/group does not cover:

Valves in general actuated by electromagnetic means	F16K 31/06

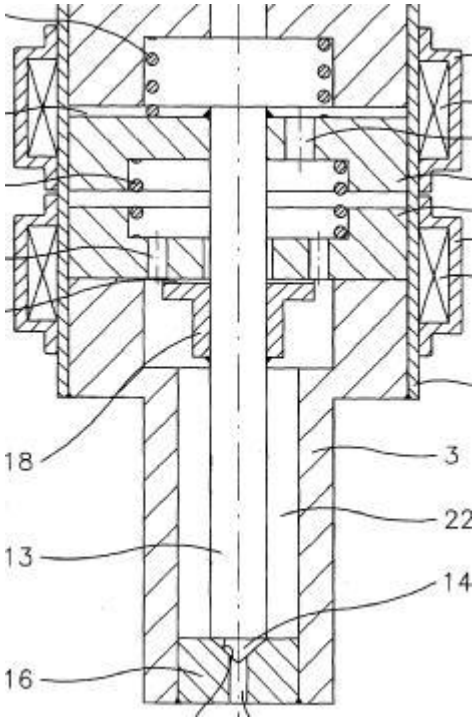
F02M 51/0617

[N: having two or more electromagnets]

Definition statement

This subclass/group covers:

Illustrative example of subject matter classified in this group.

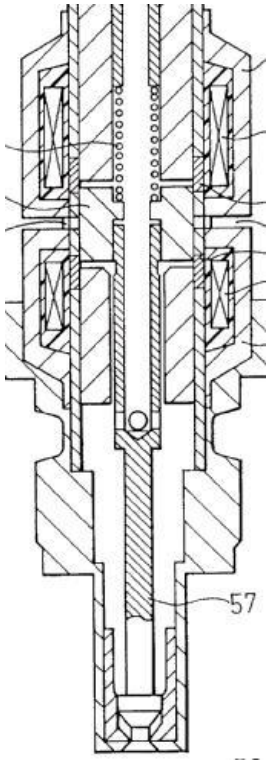


F02M 51/0621

[N: acting on one mobile armature (F02M 51/0628 takes precedence)]

Definition statement

This subclass/group covers:
Illustrative example of subject matter classified in this group.

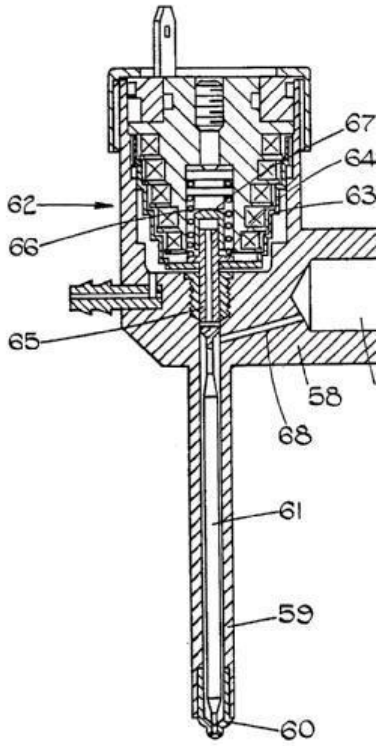


F02M 51/0628

[N: having a stepped armature]

Definition statement

This subclass/group covers:
Illustrative example of subject matter classified in this group.



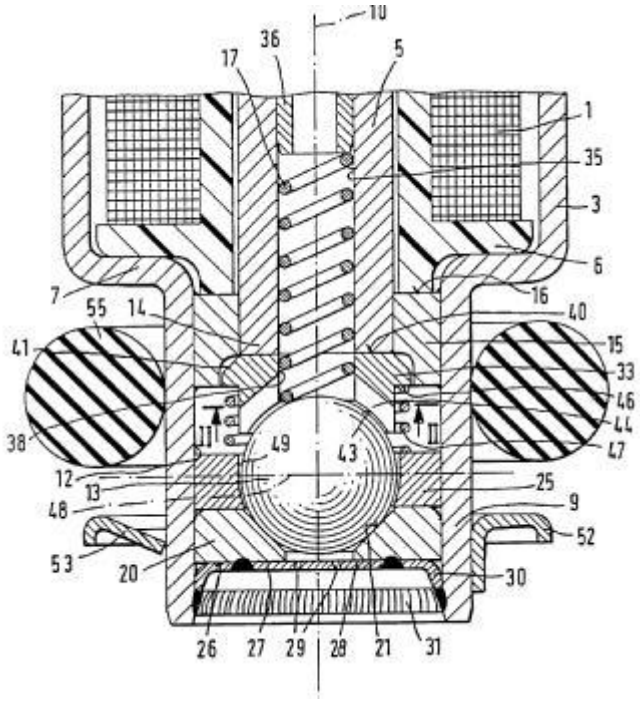
F02M 51/0632

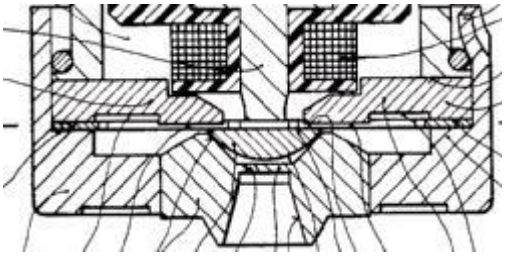
[N: having a spherically or partly spherically shaped armature, e.g. acting as valve body]

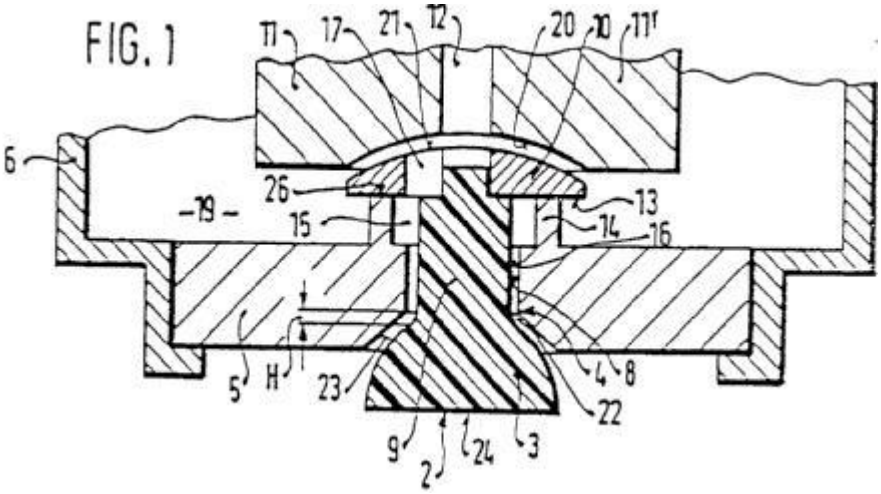
Definition statement

This subclass/group covers:

Illustrative examples of subject matter classified in this group.







F02M 51/0635

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

References relevant to classification in this group

This subclass/group does not cover:

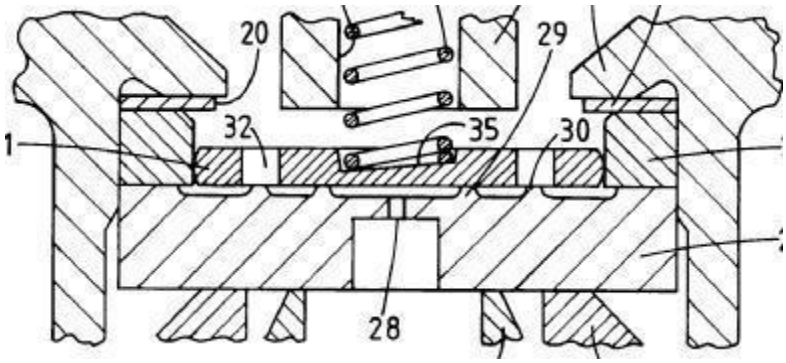
Armatures entering the winding	F02M 51/0664

F02M 51/0639

[N: the armature acting as a valve]

Definition statement

This subclass/group covers:
Illustrative example of subject matter classified in this group.



F02M 51/0642

[N: the armature having a valve attached thereto]

Definition statement

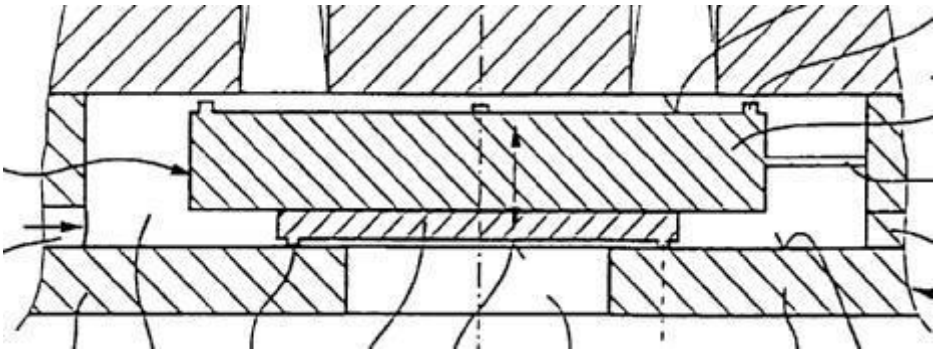
This subclass/group covers:
Armatures having a valve attached thereto or integrated therewith.

F02M 51/0646

[N: the valve being a short body, e.g. sphere or cube]

Definition statement

This subclass/group covers:
Illustrative example of subject matter classified in this group.



F02M 51/065

[N: the valve being spherical or partly spherical]

Definition statement

This subclass/group covers:
Illustrative example of subject matter classified in this group.

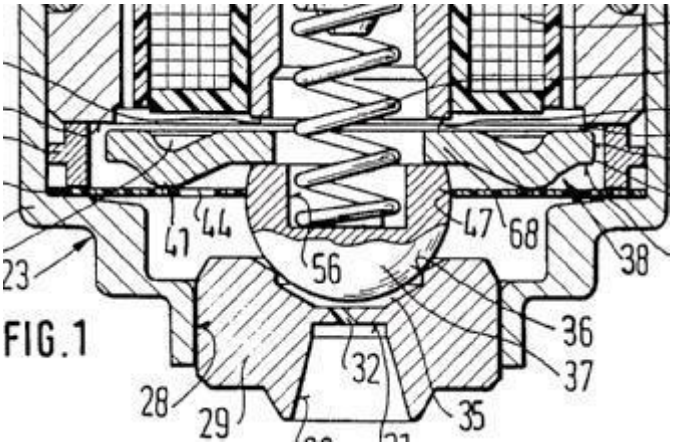


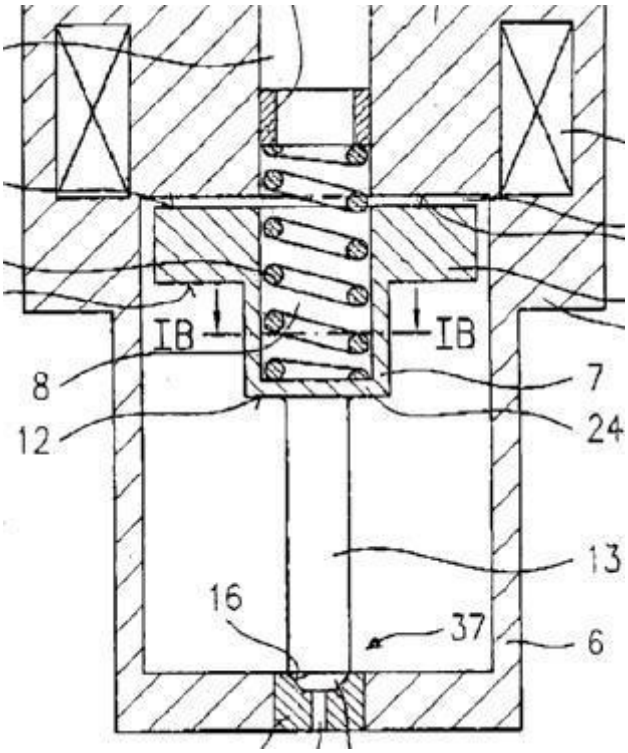
FIG.1

F02M 51/0653

[N: the valve being an elongated body, e.g. a needle valve]

Definition statement

This subclass/group covers:
Illustrative example of subject matter classified in this group.



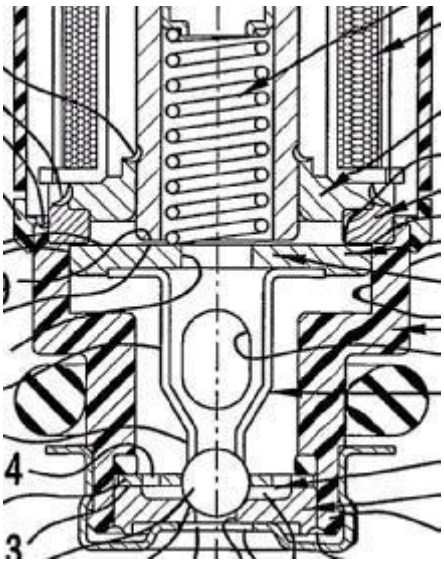
F02M 51/0657

[N: the body being hollow and its interior communicating with the fuel flow]

Definition statement

This subclass/group covers:

Illustrative example of subject matter classified in this group.



F02M 51/066

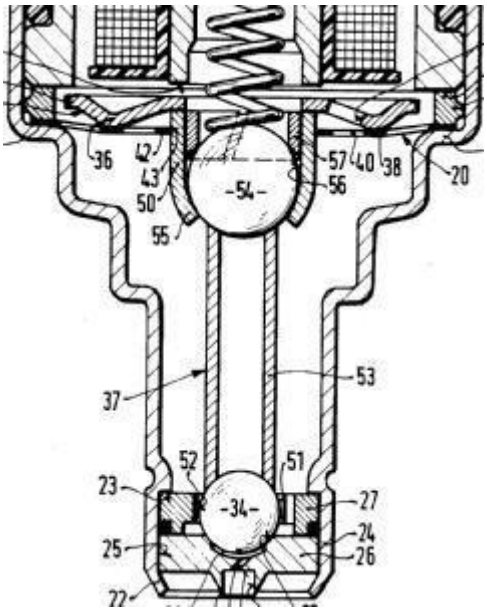
[N: the armature and the valve being allowed to move relatively to each other or not being attached to each other]

Definition statement

This subclass/group covers:

The armature and the valve being allowed to move relatively to each other or not being attached to each other or at least part of valve being flexible.

E.g.:



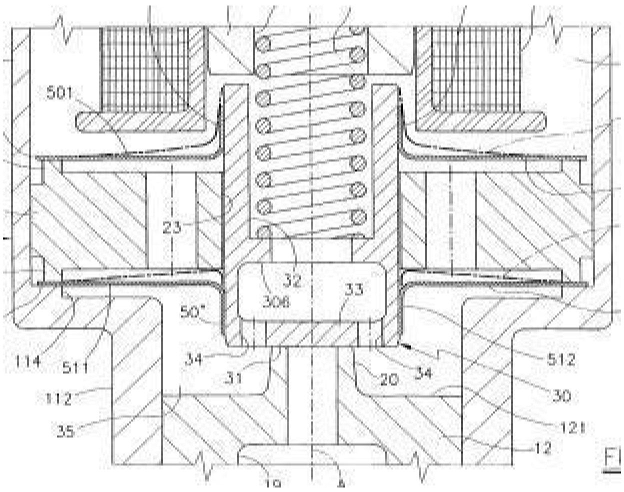
F02M 51/0667

[N: the armature acting as a valve or having a short valve body attached thereto]

Definition statement

This subclass/group covers:

Illustrative examples of subject matter classified in this group.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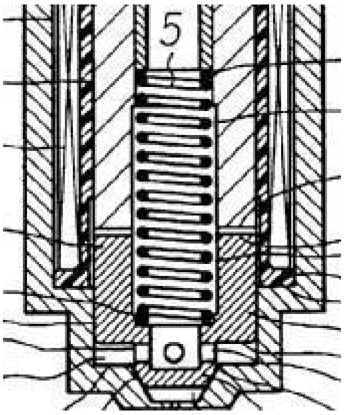
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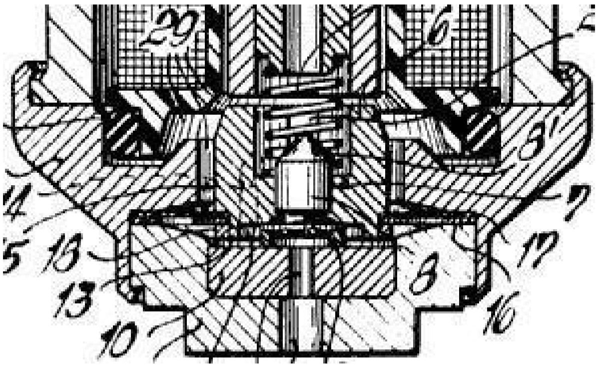
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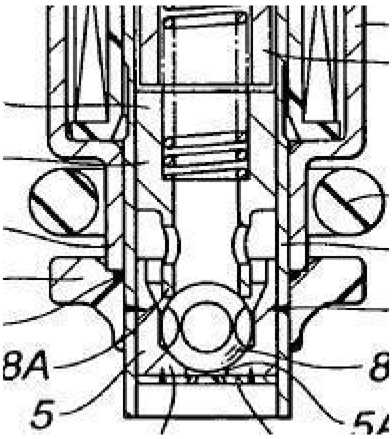
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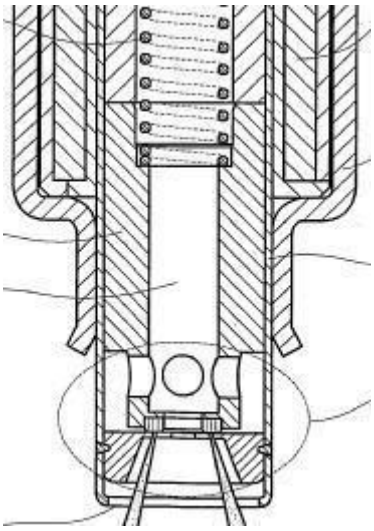
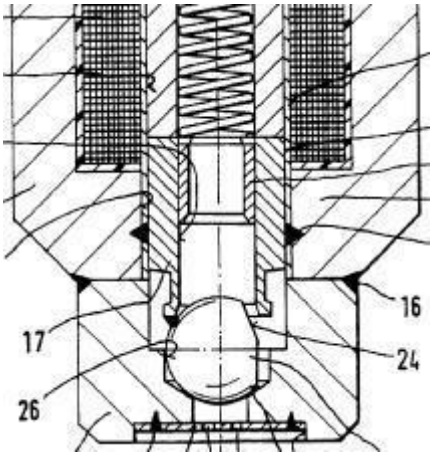




Special rules of classification within this group

In cases where it cannot be easily determined whether the valve body attached to the armature is short or elongated both F02M 51/0667 and F02M 51/0671 should be used.

F02M 51/0671

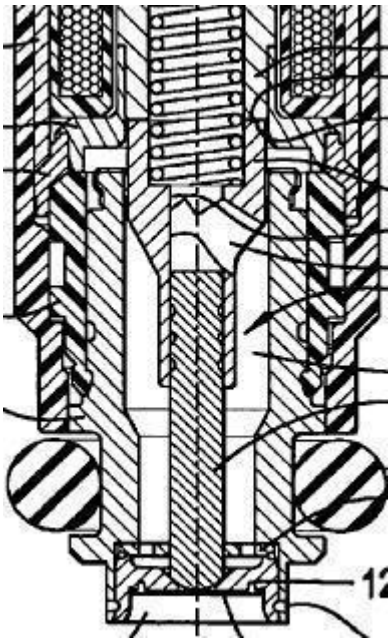
[N: the armature having an elongated valve body attached thereto]

Definition statement

This subclass/group covers:

The armature having an elongated valve body attached thereto, or the armature having an elongated valve body integrated therewith, e.g. the armature constituting in itself an elongated valve body. Eg.:

E.g.:



Special rules of classification within this group

In cases where it cannot be easily determined whether the valve body attached to the armature is short or elongated both F02M 51/0667 and F02M 51/0671 should be used.

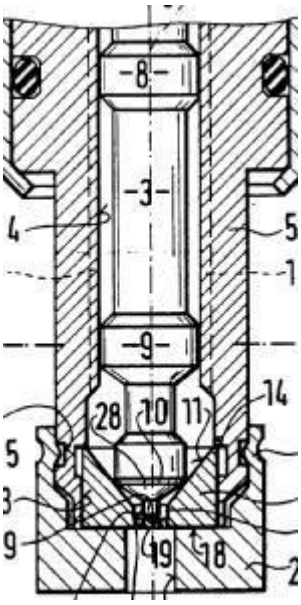
F02M 51/0675

[N: the valve body having cylindrical guiding or metering portions, e.g. with fuel passages]

Definition statement

This subclass/group covers:

The valve body having cylindrical guiding or metering portions, e.g. with fuel passages. E.g.:



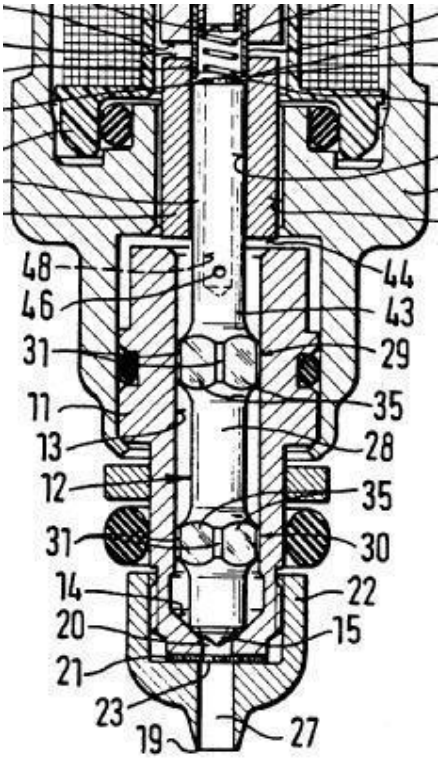
F02M 51/0678

[N: all portions having fuel passages, e.g. flats, grooves, diameter reductions]

Definition statement

This subclass/group covers:

Illustrative example of subject matter classified in this group.



References relevant to classification in this group

This subclass/group does not cover:

If the passage isn't in the cylindrical guiding or metering portion, but in another part of the valve member, e.g. its central part	F02M 51/0675

F02M 51/0682

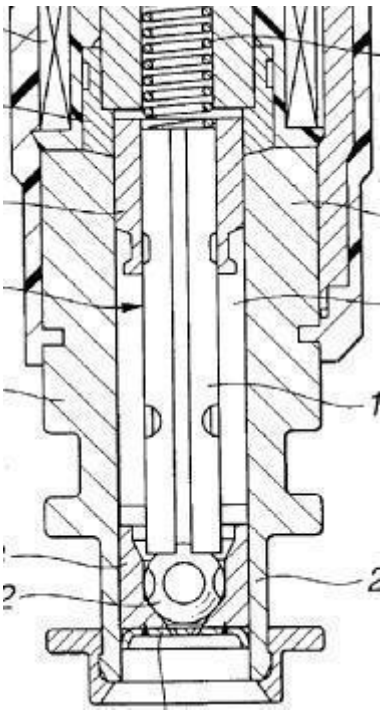
[N: the body being hollow and its interior communicating with the fuel flow (F02M 51/0675 takes precedence)]

Definition statement

This subclass/group covers:

This group covers

Illustrative example of subject matter classified in this group.



Special rules of classification within this group

In cases where it cannot be easily determined whether the valve body attached to the armature is short or elongated both F02M 51/0667 and the appropriate class/code F02M 51/0671+ should be used.

F02M 51/0685

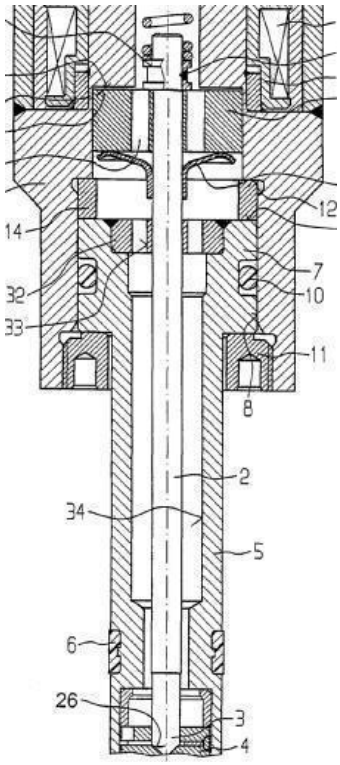
[N: the armature and the valve being allowed to move relatively to each other or not being attached to each other]

Definition statement

This subclass/group covers:

The armature and the valve being allowed to move relatively to each other or not being attached to each other or at least part of valve being flexible.

Example:



F02M 51/0689

[N: and permanent magnets (F02M 51/0696 takes precedence)]

Definition statement

This subclass/group covers:

Injectors using electromagnetic operating means and permanent magnets

References relevant to classification in this group

This subclass/group does not cover:

Fuel injection apparatus characterised by the use of movable	F02M 51/0696

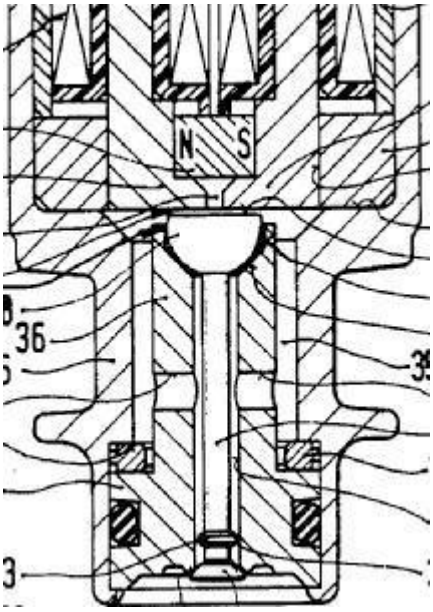
windings	

F02M 51/0692

[N: as valve or armature return means]

Definition statement

This subclass/group covers:
Illustrative example of subject matter classified in this group.

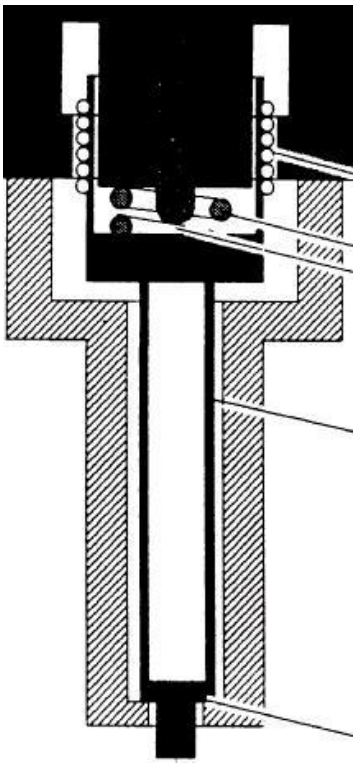


F02M 51/0696

[N: characterised by the use of movable windings]

Definition statement

This subclass/group covers:
Illustrative example of subject matter classified in this group.



F02M 53/00

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

Definition statement

This subclass/group covers:

E.g. injectors or common rails having heating, cooling or thermally-insulating means.

References relevant to classification in this group

This subclass/group does not cover:

Carburettors with heating, cooling or thermally insulating means	F02M 15/00
Apparatus for de-liquefying gaseous fuels by heating	F02M 21/06
Apparatus for heating fuels with low melting point	F02M 21/10
Adding hot secondary air to fuel-air mixture	F02M 23/14

Apparatus for thermally treating combustion-air, fuel, or fuel-air mixture	F02M 31/00

F02M 53/02

with fuel-heating means, e.g. for vaporising

References relevant to classification in this group

This subclass/group does not cover:

Carburettors with heating, cooling or thermally insulating means	F02M 15/00
Apparatus for de-liquefying gaseous fuels by heating	F02M 21/06
Apparatus for heating fuels with low melting point	F02M 21/10
Adding hot secondary air to fuel-air mixture	F02M 23/14
Apparatus for thermally treating combustion-air, fuel, or fuel-air mixture	F02M 31/00

F02M 53/04

Injectors with heating, cooling, or thermally-insulating means

References relevant to classification in this group

This subclass/group does not cover:

Carburettors with heating, cooling or thermally insulating means	F02M 15/00
Apparatus for de-liquefying gaseous fuels by heating	F02M 21/06
Apparatus for heating fuels with low melting point	F02M 21/10

Adding hot secondary air to fuel-air mixture	F02M 23/14
Apparatus for thermally treating combustion-air, fuel, or fuel-air mixture	F02M 31/00

F02M 53/06

with fuel-heating means, e.g. for vaporising

References relevant to classification in this group

This subclass/group does not cover:

Carburettors with heating, cooling or thermally insulating means	F02M 15/00
Apparatus for de-liquefying gaseous fuels by heating	F02M 21/06
Apparatus for heating fuels with low melting point	F02M 21/10
Adding hot secondary air to fuel-air mixture	F02M 23/14
Apparatus for thermally treating combustion-air, fuel, or fuel-air mixture	F02M 31/00

F02M 55/00

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

Definition statement

This subclass/group covers:

E.g. fuel conduits between pump and injector, their coupling, constructional aspects of accumulators or common rails.

References relevant to classification in this group

This subclass/group does not cover:

Venting in general	B01D 19/00
Fuel feed and filtering systems	F02M 37/00
Arrangements of conduits between fuel tank and pump and apparatus or systems for feeding liquid fuel from storage containers to carburettors or fuel-injection apparatus	F02M 37/00
General layout of a common rail system with fuel circuit and valving for control of fuel pressure	F02M 63/0225
Low pressure fuel rails and fuel circuits	F02M 69/462, F02M 69/465
Pipes in general	F16L

F02M 55/004

[N: Joints; Sealings]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Joints in general	F16L
Sealings in general	F16J
Sealing arrangements between injector and engine, e.g. to avoid leakage of combustion chamber gases to the outside through the space between fuel injector and engine	**R02M63/00T85S**
Sealing of fuel injection apparatus not otherwise provided for	**R02M63/00T130**

F02M 55/007

[N: Venting means]

Definition statement

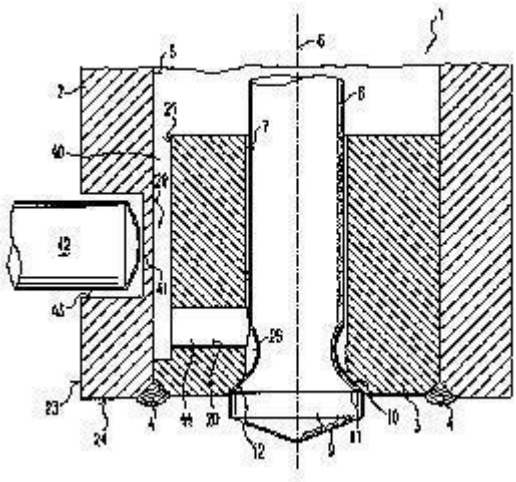
This subclass/group covers:
Venting means, i.e. for venting gases.

F02M 55/008

[N: Arrangement of fuel passages inside of injectors]

Definition statement

This subclass/group covers:
Specific arrangements or details of fuel passages inside injectors. E.g.



or

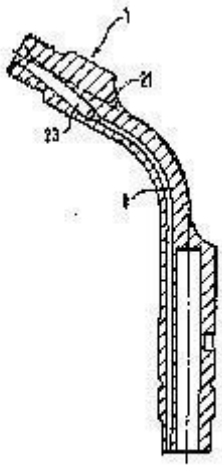


FIG. 3C

F02M 57/00

Fuel-injectors combined or associated with other devices

Definition statement

This subclass/group covers:

E.g.: pump-injectors; injectors combined with sensors;

injectors combined with engine valves and injectors having spark plugs.

Informative references

Attention is drawn to the following places, which may be of interest for search:

Electric drive of fuel pumps	F02M 51/04
Hydraulic drive of reciprocating piston in fuel pumps	F02M 59/105
Pneumatic drive of reciprocating piston in fuel pumps	F02M 59/107

F02M 59/00

Pumps specially adapted for fuel-injection and not provided for in groups F02M 39/00 to F02M 57/00, [N: e.g. rotary cylinder-block type pumps (general features of pumps F04)]

Definition statement

This subclass/group covers:

Details of the pumps of F02M 41/00, F02M 43/00, F02M 51/00.

Plunger sealing, valve structure, materials etc: F02M 59/44 to F02M 59/485.

The structure of this group is close to the general layout of the IPC classification, i.e. it comprises a constructional part (groups F02M 59/02-F02M 59/18), a functional part (groups F02M 59/20-F02M 59/42) and general part with details, manufacturing (F02M 59/44-F02M 59/485).

References relevant to classification in this group

This subclass/group does not cover:

Rotary distributor type pumps, dual fluid pumps and electrically driven	F02M 41/00, F02M 43/00, F02M 51/00

pumps	

F02M 59/06

with cylinders arranged radially to driving shaft, e.g. in V or star arrangement

Definition statement

This subclass/group covers:

Reciprocating piston type pumps with cylinders arranged radially to driving shaft, e.g. in V or star arrangement. "arranged radially" is interpreted to be understood as excluding in-line pumps.

F02M 59/32

fuel delivery being controlled by means of fuel-displaced auxiliary pistons, which effect injection [N: (combined with rotary distributor supporting pump pistons F02M 41/1422; low pressure fuel-injection F02M 69/12)]

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Auxiliary pistons	Pistons that do not provide pressure intensification but act as metering pistons effecting injection.

F02M 59/36

by variably-timed valves controlling fuel passages [N: to pumping elements or overflow passages]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Details of valves	F02M 63/0012

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Overflow passages	any draining passage wherever it is situated, even after (e.g. downstream of) the pump or the delivery valve. Generally, it is the pumping chamber that is drained.

F02M 59/362

[N: valves rotating (combined with rotary fuel distributor F02M 41/063)]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Rotary fuel distributor	F02M 41/063
Details of valves	F02M 63/0012

F02M 59/366

[N: Valves being actuated electrically]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Details of valves	F02M 63/0012

F02M 59/367

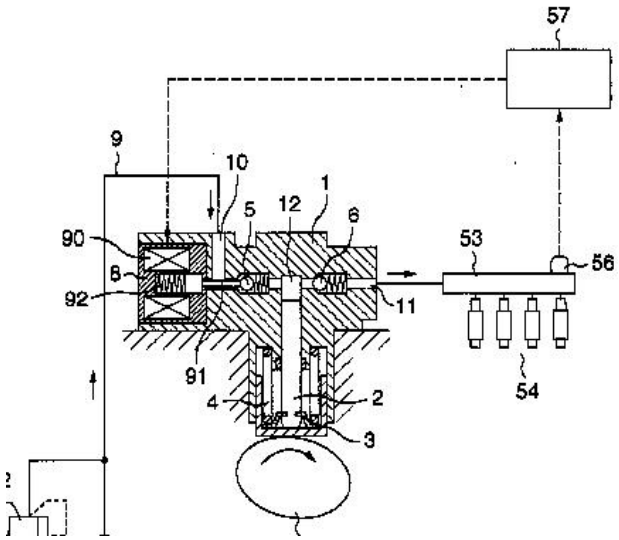
[N: Pump inlet valve of the check valve type being actuatable to open]

Definition statement

This subclass/group covers:

Illustrative example of subject matter classified in this group.

FIG.1



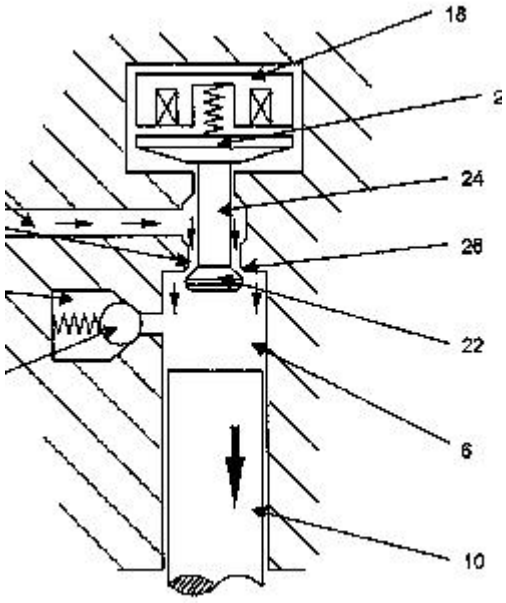
F02M 59/368

[N: Pump inlet valves being closed when actuated]

Definition statement

This subclass/group covers:

Illustrative example of subject matter classified in this group.



F02M 59/42

for starting of engines [N: (supply of excess fuel F02M 59/447)]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Supply of excess fuel	F02M 59/447

F02M 59/46

Valves (in general F16K)

Informative references

Attention is drawn to the following places, which may be of interest for search:

Details of valves	F02M 63/0012
Valves in general	F16K

F02M 59/466

[N: Electrically operated valves, e.g. using electromagnetic or piezo-electric operating means]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Solenoid valves that control fuel amount delivered	F02M 59/366
Valve details	F02M 63/0012

F02M 61/00

Fuel-injectors not provided for in groups F02M 39/00 to F02M 57/00 or F02M 67/00

Definition statement

This subclass/group covers:

Constructional parts (F02M 61/02-F02M 61/12) and a general, details part (F02M 61/16-F02M 61/205).

References relevant to classification in this group

This subclass/group does not cover:

Mounting of injectors with respect to engines	F02M 61/14

F02M 61/161

[N: Means for adjusting injection-valve lift]

Definition statement

This subclass/group covers:

Means for adjusting injection-valve lift during operation of the valve, in order to adjust it to the operating conditions and requirements of the moment.

F02M 61/165

[N: Filtering elements specially adapted in fuel inlets to injector]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Edge filtering elements	B01D 29/44
Filters adapted for location in special places, e.g. in pipe-lines, pumps	B01D 35/02
For fuel feed systems	F02M 37/22

F02M 61/168

[N: Assembling; Disassembling; Manufacturing; Adjusting]

Definition statement

This subclass/group covers:

Assembling; Disassembling; Manufacturing and Adjusting in the sense of calibrating during manufacture.

F02M 61/18

Injection nozzles, e.g. having valve seats; [N: Details of valve member seated ends, not otherwise provided for]

Informative references

Attention is drawn to the following places, which may be of interest for search:

The valves opening in direction of fuel flow	F02M 61/08

F02M 61/1813

[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]

Definition statement

This subclass/group covers:

Discharge orifices arranged so that the jets are flowing therethrough at an angle to the normal axis of the injector.

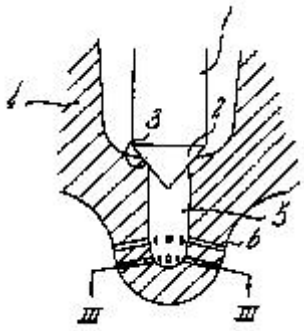
F02M 61/182

[N: Discharge orifices being situated in different transversal planes with respect to valve member direction of movement]

Definition statement

This subclass/group covers:

Illustrative example of subject matter classified in this group.



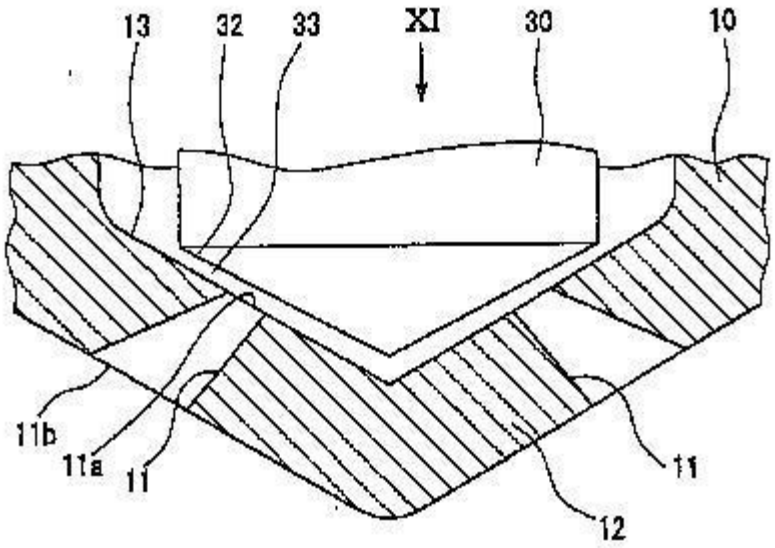
F02M 61/1833

Discharge orifices having changing cross sections, e.g. being divergent

Definition statement

This subclass/group covers:

Discharge orifices having variable cross section, e.g. divergent, convergent or stepwise changing cross section. E.g.:



F02M 61/1846

[N: Dimensional characteristics of discharge orifices]

Definition statement

This subclass/group covers:

E.g. the exact size, diameter is given, or a special relationship between a diameter and a length is given.

F02M 61/205

[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]

References relevant to classification in this group

This subclass/group does not cover:

Fuel injectors of the accumulator type having a spring whose force assists the hydraulic closing of the injection valve	F02M 47/02, F02M 2547/006

F02M 63/00

Other fuel-injection apparatus having pertinent characteristics not provided for in groups F02M 39/00 to F02M 57/00 or F02M 67/00; Details, component parts, or accessories of fuel-injection apparatus, not provided for in, or of interest apart from, the apparatus of groups F02M 39/00 to F02M 61/00 or F02M 67/00; [N: Combination of fuel pump with other devices, e.g. lubricating oil pump]

Definition statement

This subclass/group covers:

Most active subgroup in this group is F02M 63/0225 dealing with the common rails. The groups F02M 63/0003 - F02M 63/0008 include injection system having a fuel pressure source and an on/off valve in each fuel conduit to injector. These systems are different from accumulator type fuel injectors classified in F02M 47/02. Also these valves have different function than the control valves in the fuel injection pumps defined by the groups F02M 59/36-F02M 59/366.

F02M 63/0012

[N: Valves (for fuel metering see the relevant groups, e.g. F02M 59/34; inlet or outlet check valves for fuel injection pumps F02M 59/46; for fuel injectors see the relevant groups, e.g. F02M 61/00)]

Definition statement

This subclass/group covers:

Valves other than fuel injection valves, i.e. fuel injectors, whenever relevant.

References relevant to classification in this group

This subclass/group does not cover:

Valves in general	F16K
Metering fuel by means of valves in fuel-injection pumps	F02M 41/125, F02M 41/1427, F02M 59/36
Metering fuel by means of throttling valves in fuel-injection pumps	F02M 41/124, F02M 41/1427, F02M 59/34
Valves used in fuel-injection pumps only and not provided for in F02M 39/00 to F02M 57/00, e.g. inlet or outlet check valves for fuel-injection pumps	F02M 59/46

Informative references

Attention is drawn to the following places, which may be of interest for search:

Valves in general	F16K

Special rules of classification within this group

Not to be used to characterise fuel injection valves, i.e. fuel injectors, unless they have pertinent characteristics or have details, component parts or accessories not provided for in F02M 61/00, F02M 51/06, or Indexing Codes F02M 2063/0082.

The valves in F02M 63/0012 may be part of fuel injection apparatus for which there exist specific classes elsewhere, and which are thus classified both in that specific class and in F02M 63/0012, if the valve has a relevant feature per se.

F02M 63/0017

[N: using electromagnetic operating means]

References relevant to classification in this group

This subclass/group does not cover:

Electromagnetic valves per se	H01F 7/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Electromagnetic valves per se	H01F 7/00

F02M 63/0019

[N: characterised by the arrangement of electromagnets or fixed armatures]

Definition statement

This subclass/group covers:

The fixed armature is the magnetic core that does not move.

Synonyms and Keywords

In patent documents the following expressions/words "pole piece", "magnetkern" and "stator" are often used as synonyms.

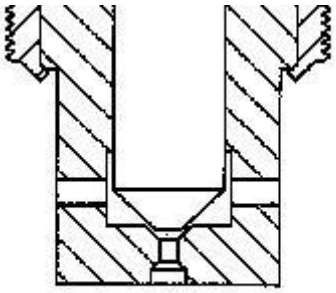
F02M 63/0033

[N: Lift valves, i.e. having a valve member that moves perpendicularly to the plane of the valve seat]

Definition statement

This subclass/group covers:

Illustrative example of subject matter classified in this group.



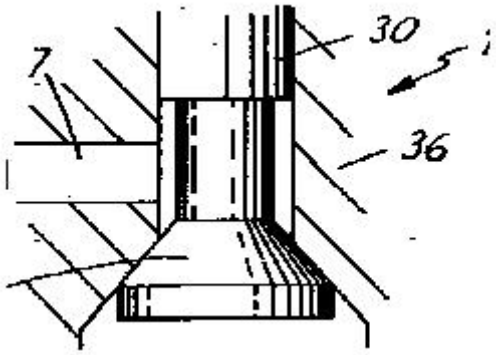
F02M 63/0035

[N: Poppet valves, i.e. having a mushroom-shaped valve member that moves perpendicularly to the plane of the valve seat]

Definition statement

This subclass/group covers:

Illustrative example of subject matter classified in this group.



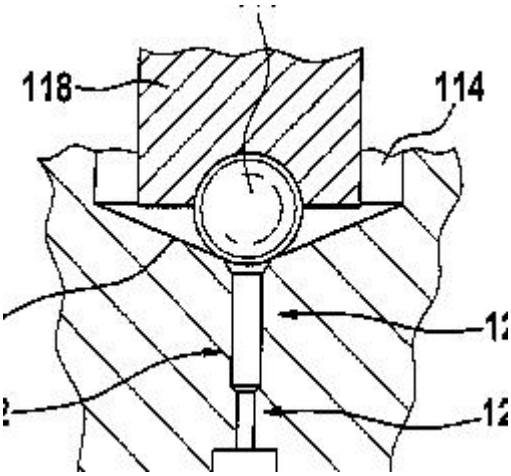
F02M 63/0036

[N: with spherical or partly spherical shaped valve member ends]

Definition statement

This subclass/group covers:

Illustrative example of subject matter classified in this group.



F02M 63/0049

[N: Combined valve units, e.g. for controlling pumping chamber and injection valve]

Definition statement

This subclass/group covers:
Valve unit controlling more than one function.

F02M 63/005

[N: Pressure relief valves]

Definition statement

This subclass/group covers:
Valves that open when a specific pressure has been reached.

References relevant to classification in this group

This subclass/group does not cover:

Pure check valves	F02M 63/0054

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pressure relief valves in general	F16K 17/00

Synonyms and Keywords

In patent documents the following expressions " pressure limiting valve", "pressure safety valves" and "overpressure safety valves" are often used as synonyms.

F02M 63/0054

[N: Check valves (F02M 59/462, F02M 59/464 take precedence)]

References relevant to classification in this group

This subclass/group does not cover:

Pressure relief valves	F02M 63/005
Fuel pump delivery valves	F02M 59/462
Fuel pump inlet valves of the check valve type	F02M 59/464

Informative references

Attention is drawn to the following places, which may be of interest for search:

Check valves in general	F16K 15/00

F02M 63/0056

[N: Throttling valves, e.g. having variable opening positions throttling the flow]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Varying fuel delivery of a fuel pump in quantity or timing by throttling of passages to pumping elements or of overflow passages	F02M 59/34

F02M 63/0205

[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 F01M 1/24); for cutting-out pumps for stopping the engine]

References relevant to classification in this group

This subclass/group does not cover:

Safety devices acting on engine fuel system upon lubricant pressure failure	F01M 1/24

F02M 63/0225

[N: Fuel-injection apparatus having a common rail feeding several injectors (F02M 63/0003 takes precedence); Means for varying pressure in common rails; Pumps feeding common rails]

Informative references

Attention is drawn to the following places, which may be of interest for search:

Constructional details of common rails	F02M 55/025

F02M 65/00

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

Definition statement

This subclass/group covers:

Testing of fuel injection apparatus.

Testing injection timing.

Measuring injector spray angle

Quality check of fuel-injection apparatus.

Monitoring the function of the fuel injection apparatus in situ, e.g. for monitoring injection timing or injection quantity, or malfunction detection.

References relevant to classification in this group

This subclass/group does not cover:

Testing of ignition	F02P 17/00
Measuring fuel consumption	G01F 9/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cleaning hollow articles by methods or apparatus specially adapted thereto	B08B 9/00.
Safety or indicating devices for abnormal conditions	F02D 41/22

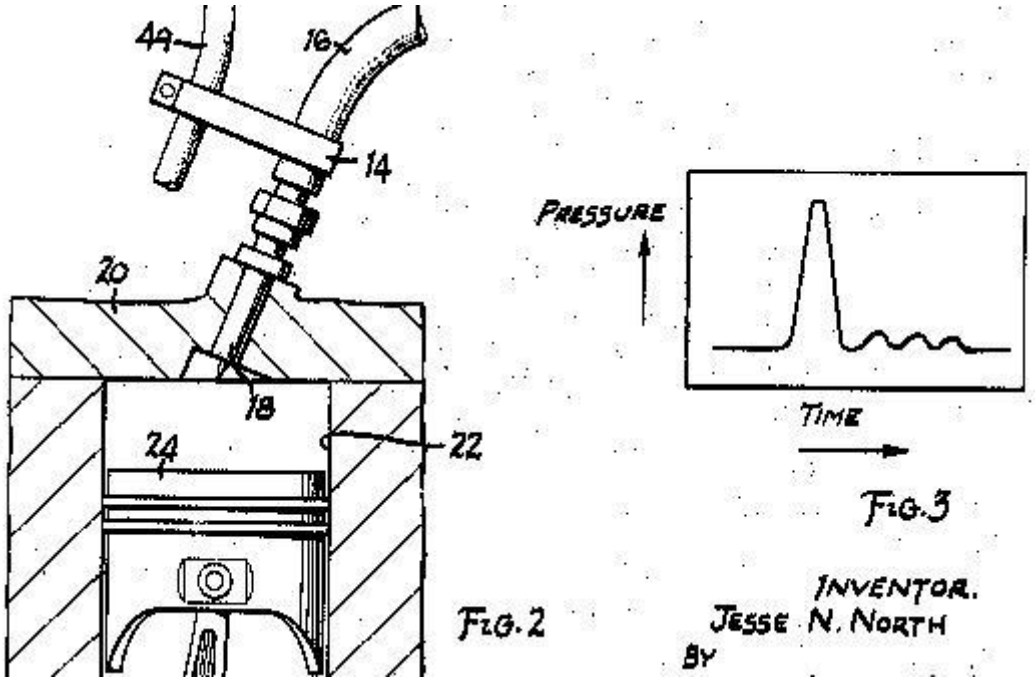
F02M 65/003

[N: Measuring variation of fuel pressure in high pressure line]

Definition statement

This subclass/group covers:

Illustrative example of subject matter classified in this group.



F02M 67/00

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

Informative references

Attention is drawn to the following places, which may be of interest for search:

Control aspects of fuel injection by means of high-pressure gas:	F02D 7/02
Using compressed air for low-pressure fuel-injection apparatus:	F02M 69/08

Special rules of classification within this group

These groups relate mostly to old technology, however there are some recent inventions. These groups can overlap with the group F02M 69/08. The classification can be made in both groups.

F02M 69/00

Low-pressure fuel-injection apparatus(electrically operated

F02M 51/00);Apparatus with both continuous and intermittent injection; Apparatus injecting different types of fuel

Definition statement

This subclass/group covers:

Low pressure fuel injection apparatuses. That normally means gasoline fuel injection. However in the recent years with common rail technology development the gap between diesel fuel injection and gasoline fuel injection has become very narrow. Therefore, it is more practical to classify the details of gasoline fuel injection apparatus just in the groups F02M 41/00-F02M 63/00. In specific cases and the injection of fuel in the air inlet manifold, the inventions are classified in the subgroups of F02M 69/00.

References relevant to classification in this group

This subclass/group does not cover:

High pressure gasoline common rail fuel injection systems	F02M 63/0225
Details of gasoline fuel injection apparatus	F02M 41/00 - F02M 63/00
Specific cases and the injection of fuel in the air inlet manifold	F02M 69/00

Special rules of classification within this group

Low pressure fuel injection apparatuses means normally gasoline fuel injection. However in the recent years with common rail technology development the gap between diesel fuel injection and gasoline fuel injection has become very narrow. Therefore, it is more practical to classify the details of gasoline fuel injection apparatus just in the groups F02M 41/00-F02M 63/00. In specific cases and the injection of fuel in the air inlet manifold, the inventions are classified in the subgroups of F02M 69/00.

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Low pressure fuel injection	fuel injection in which the fuel-air mixture containing fuel thus injected will be substantially compressed in the compression stroke of the engine. Traditionally, the concept of "low-pressure" fuel-injection is

	associated with spark ignition engines, where the mixture is compressed.
High-pressure fuel-injection	fuel-injection being associated with compression ignition engines, where fuel is injected after compression of the air.

F02M 69/002

[N: characterised by means for intermittently metering the portion of fuel injected (F02M 69/12, F02M 69/14 take precedence)]

References relevant to classification in this group

This subclass/group does not cover:

Low-pressure fuel-injection apparatus comprising a fuel-displaced free-piston for intermittently metering and supplying fuel to injection nozzles	F02M 69/12
Low-pressure fuel-injection apparatus having cyclically-operated valves connecting injection nozzles to a source of fuel	F02M 69/14

F02M 69/045

[N: for injecting into the combustion chamber (F02M 69/046 takes precedence)]

Definition statement

This subclass/group covers:

The injection nozzle opening into the engine cylinder for direct injection, i.e. in-cylinder injection.

F02M 69/046

[N: for injecting into both the combustion chamber and the intake conduit]

Definition statement

This subclass/group covers:

One injector injecting fuel in the intake plus one injector injecting directly into the combustion chamber.

F02M 69/12

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 F02M 59/32)]

References relevant to classification in this group

This subclass/group does not cover:

High-pressure fuel-injection with fuel-displaced auxiliary pistons	F02M 59/32

F02M 69/14

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

References relevant to classification in this group

This subclass/group does not cover:

High-pressure fuel injection apparatus	F02M 63/0003

F02M 69/145

[N: the valves being actuated electrically (electrically-operated injectors F02M 51/06)]

References relevant to classification in this group

This subclass/group does not cover:

Electrically-operated injectors	F02M 51/06

F02M 69/30

characterised by means for facilitating the starting-up or idling of engines or by means for enriching fuel charge, e.g. below operational temperatures or upon high power demand of engines (at acceleration F02M 69/44)

References relevant to classification in this group

This subclass/group does not cover:

At acceleration	F02M 69/44

F02M 69/32

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

References relevant to classification in this group

This subclass/group does not cover:

Constructional details of a throttle valve housing having a fluid by-pass	F02D 9/1055

Informative references

Attention is drawn to the following places, which may be of interest for search:

Controlling the bypass for idle speed control	F02D 31/005

F02M 71/00

Combinations of carburettors and low-pressure fuel-injection apparatus (means for enriching charge on sudden air throttle opening of carburettors F02M 7/06)

References relevant to classification in this group

This subclass/group does not cover:

Means for enriching charge on	F02M 7/06

sudden air throttle opening of carburettors	

F02M 99/00

Subject matter not provided for in other groups of this subclass