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COMBINED FUEL PUMP AND FILTER ASSEMBLY

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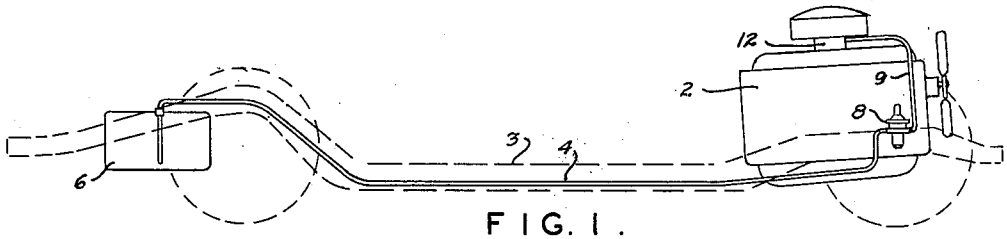


FIG. 1.

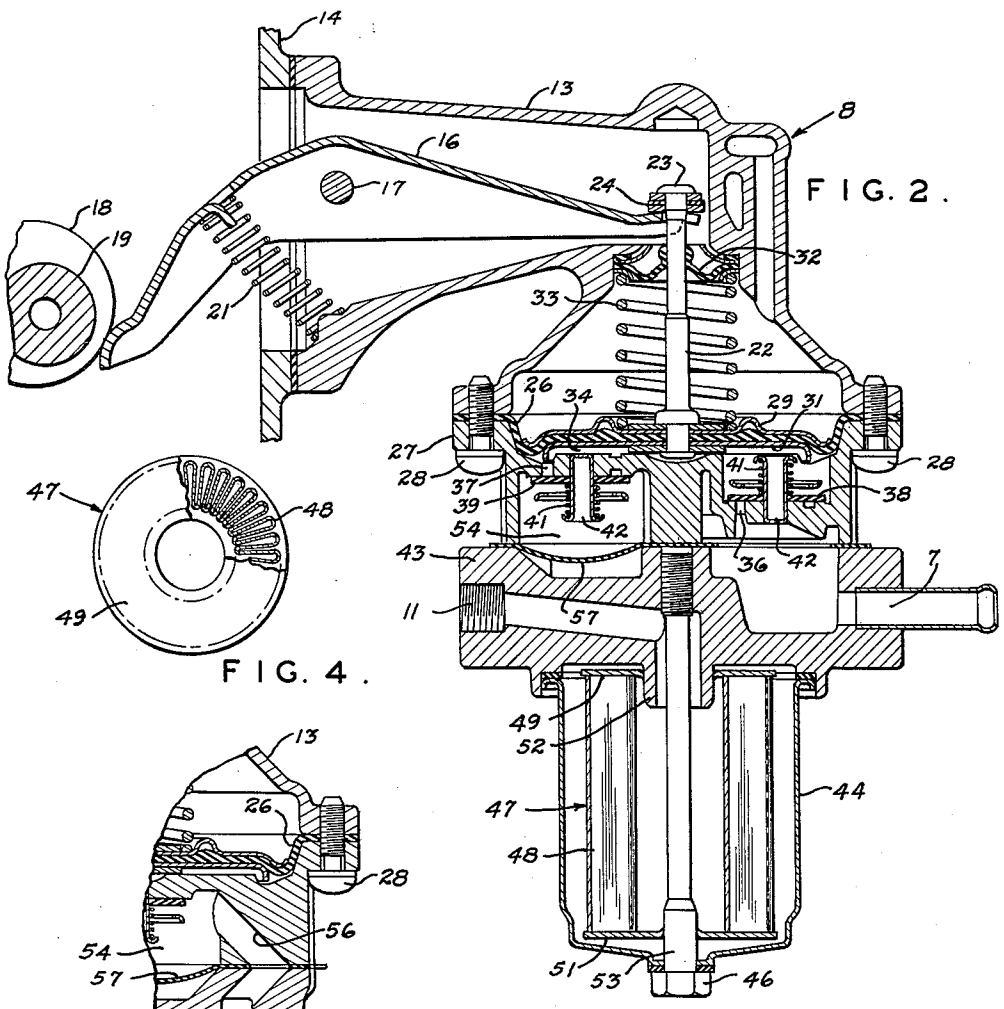


FIG. 2.

FIG. 4.

FIG. 3.

INVENTOR.
ALFRED C. KORTE
BY
Charles H. Bassett
ATTORNEY

United States Patent Office

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COMBINED FUEL PUMP AND FILTER ASSEMBLY

Alfred C. Korte, St. Louis, Mo., assignor to ACF Industries, Incorporated, New York, N.Y., a corporation of New Jersey

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This invention relates to a combined pump and filter unit for supplying fuel to a carburetor of an internal combustion engine.

As conventional carburetors are provided with float controlled needle valves adapted to maintain a constant fuel level within fuel bowls, it is necessary to remove from the fuel any particles of foreign material which might prevent proper closing of the needle valve or accurate metering of fuel from the fuel bowl to the fuel nozzles for discharge into the stream of air passing through the mixture conduit to the engine.

It is, therefore, an object of the invention to provide a filter device adapted to be interposed in a fuel line to separate foreign particles from the fuel.

Another object of the invention resides in the provision of a filter device adapted to be combined with a fuel pump to thereby reduce the cost of manufacture, assembly, and installation in a fuel system.

A further object of the invention is to provide a pump-filter device adapted to damp pressure pulsations from the pump to avoid unseating of the needle valve when the fuel is at its proper level within the fuel bowl.

Another object of the invention resides in the provision of an adaptor interconnecting the pump housing and filter bowl and provided with a fuel inlet and a fuel outlet interconnected by passages leading through the fuel pump and filter.

Another object of the invention resides in the provision of a pleated paper filter element and filter bowl adapted to be secured in assembled relationship on the adaptor by means of a single mounting screw.

Another object is to provide a filter device in which the paper filter element is supported for limited movement axially of the mounting screw to facilitate replacement of the filter element.

The invention embodies other novel features, details of construction and arrangement of parts which are hereinafter set forth in the specification and claim and illustrated in the accompanying drawing, forming part thereof, wherein:

FIG. 1 is a schematic side elevation illustrating a vehicle fuel system provided with a combined fuel pump and filter unit embodying features of the invention.

FIG. 2 is a vertical section illustrating the combined pump and filter unit.

FIG. 3 is a fragmentary section illustrating the passageway leading from the discharge side of the pump to the inlet side of the filter.

FIG. 4 is a detail end elevation, partly in section showing the filter element.

Referring now to the drawing for a better understanding of the invention, an internal combustion engine 2 is mounted on the chassis of a vehicle 3 and provided with a fuel system comprising a fuel line 4 leading from a fuel tank 6 to the inlet 7 of the pump-filter unit 8. A conduit 9 leads from the outlet 11 of the pump-filter unit 8 to a conventional carburetor 12 adapted to supply a fuel-air mixture to the engine.

The combined fuel pump and filter unit 8 is shown as comprising a pump lever housing 13 adapted to be bolted to the crankcase 14 of the engine 2. A rocker arm 16 is pivotally mounted intermediate its ends on a pin 17 provided on the housing. The arm is rocked in one direction by a cam 18 on the camshaft 19 of the engine

and in the opposite direction by a compression spring 21 engaged between the arm and the housing. The opposite end of the arm 16 is bifurcated to receive the upper end of a pump stem 22 having a head 23. If desired, one or more washers 24 may be mounted on the stem between the bifurcated end of the rocker arm and the head 23.

A flexible pump diaphragm 26 has its marginal portion clamped between the housing 13 and a valve casing 27 by means of cap screws 28. The central portion of the diaphragm is clamped between upper and lower backing plates 29 and 31 secured on the lower end of the pump stem 22. An oil seal gasket 32 formed of resilient rubber is provided with a central aperture to snugly receive the pump stem 22, the outer portion of the gasket being pressed against an annular seat in the housing 13 by a helical compression spring 33 surrounding the stem and seated against the upper plate 29.

The diaphragm 26 and valve casing 27 define a pump chamber 34 provided with inlet and outlet ports 36 and 37, respectively, and inlet and outlet check valves 38 and 39, respectively. The check valves are normally urged against their valve seats to close their respective ports by means of helical compression springs 41—41 mounted on stems 42—42.

An adaptor 43 is secured to the valve casing 27 by means of cap screws and provided with fuel inlet and outlet passages 7 and 11. A cup-shape filter bowl 44 has its rim portion engaged against a gasket in an annular seat formed on the lower side of the adaptor, the bowl being detachably connected to the adaptor by means of a screw 46 which extends upwardly through the bowl for threaded engagement in the adaptor.

A filter element 47 is mounted within the filter bowl 44 to separate particles of foreign material from the fuel. The element 47 is shown as comprising a body 48 of phenolic impregnated pleated paper adhesively united at its ends to paper end caps 49 and 51. The upper end cap 49 is formed with a central aperture to snugly receive a tubular boss 52 formed on the adaptor, and the lower end cap 51 is formed with a central aperture to snugly receive an enlarged cylindrical portion 53 of the screw 46.

During operation of the pump, the cam 18 acts through the rocker arm 16 to raise the stem 22 and diaphragm 26 to draw fuel from the tank 6 through the inlet 7 and inlet port 36 into the pump chamber 34. The spring 33 then acts to move the stem and diaphragm downwardly to discharge the fuel from the pump chamber 34 through the discharge port 37 into a chamber 54 and thence through a passage 56 into the filter bowl 44 around the outer side of the filter element 47. The fuel then passes through the filter element, the tubular boss 52 and the outlet passage 11 to the carburetor 12.

One wall of the chamber 54 may comprise a sheet 57 of resilient material clamped between the valve casing 27 and the adaptor 43 to damp pressure pulsations during operation of the pump.

During assembly of the filter, or replacement of a filter element, the upper cap 49 is sleeved over the boss 52, and the screw 46 is then inserted through the filter bowl and filter element for threaded engagement in the adaptor 43.

To provide leakproof joints, the central aperture of the upper cap 49 is of smaller diameter than the outer diameter of the tubular boss 52, and the central aperture of the lower cap 51 is of smaller diameter than the cylindrical portion 53 of the screw 46. It is contemplated that the end caps 49 and 51 may be formed of a resilient fibrous material, other than paper impregnated with phenolic, or may be formed of a resilient synthetic rubber-like material resistant to gasoline.

Certain structure have been described herein which will fulfill all the objects of the present invention, but it is contemplated that other modifications will be obvious to those skilled in the art which come within the scope of the invention as defined by the appended claim.

I claim:

In a combined pump and filter assembly for an internal combustion engine fuel system, an adaptor having an inlet and an outlet, said adaptor being formed with an annular recess in its bottom face, a boss depending from said adaptor and centrally positioned in said recess, said boss being provided with a central opening forming a part of said outlet, a screw socket formed in said adaptor and axially aligned with the opening in the depending boss, pump means fixed to one side of said adaptor for pumping fuel in through said inlet and out through said outlet responsive to operation of the engine, filter means fixed to the other side of said adaptor for separating foreign material from the fuel prior to discharge through said outlet, said filter means comprising a body of generally tubular form, and caps formed of resilient non-metallic sheet material resistant to gasoline fixed to the upper and lower ends of the body, the cap at the upper end of said tubular body seating in the annular recess in the bottom face of said adaptor and including a central aperture and a port, the central aperture in said upper cap being of less diameter than the diameter of the depending boss whereby said cap may grippingly engage the outer wall

of said boss for supporting the filter thereon and said port being spaced outwardly of said filter element for registration with the inlet opening in said adaptor, said lower cap having a central opening therein, a cup-shaped filter bowl for enclosing said filter element with its inner wall surface spaced therefrom, said filter bowl having a side wall and a bottom formed with a central aperture, the upper marginal edge of the side wall of said bowl being positioned in the annular recess in the bottom face of the adaptor and engaging the marginal edge of the upper cap seated therein, and a screw having a headed portion and a shank of greater diameter than the central opening in the lower cap, said screw being adapted to extend through the central aperture in the bottom of said filter bowl and through the central aperture in the lower cap with its terminal threadingly engaging in the screw socket in said adaptor for clamping the filter bowl into sealing engagement against the upper cap and said adaptor and sealingly engaging and supporting the lower cap.

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