

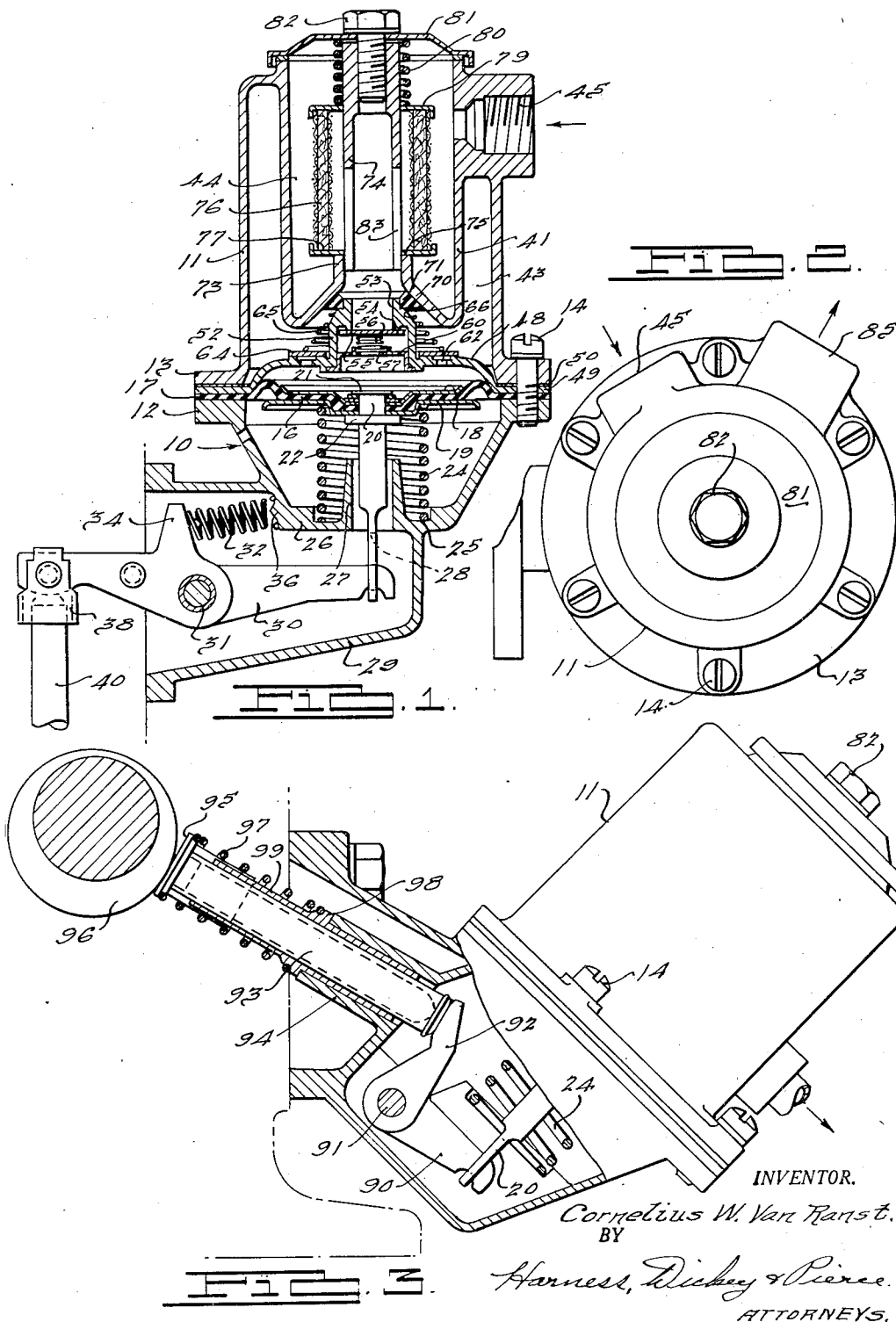
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FUEL PUMP

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FUEL PUMP

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1 The invention relates generally to internal combustion engines and it has particular relation to a fuel pump.

Fuel pumps employing pulsating diaphragms are generally used in motor vehicles for the purpose of supplying fuel to the carburetor. These pumps are operated, as a rule, by cam means on the engine cam shaft. The present invention is concerned with a fuel pump of this general character.

One object of the invention is to provide an improved type of fuel pump employing a pulsating diaphragm, wherein the inlet and outlet valves are arranged in a unitary subassembly which may be inexpensively manufactured and readily installed.

Another object of the invention is to provide an improved type of fuel pump wherein the valve assembly and diaphragm are held in position between two separable parts of the casing whereby assembly of the parts is simplified and facilitated.

Another object of the invention is to provide a fuel pump having an improved filtering means which may readily be inserted and removed.

Another object of the invention is to provide a fuel pump which is so constructed that vapor chambers are provided both at the inlet and outlet sides of the pump.

Other objects of the invention will become apparent from the following specification, from the drawings relating thereto, and from the claims hereinafter set forth.

For a better understanding of the invention reference may be had to the drawings wherein:

Figure 1 is a cross-sectional view illustrating a fuel pump constructed according to one form of the invention;

Fig. 2 is a plan view of the structure shown by Fig. 1; and,

Fig. 3 is a side elevational view partly in cross-section, showing a pump constructed according to another form of the invention.

Referring to Fig. 1, the pump comprises a casing having a lower part 10 and an upper part 11, and these parts of the casing have flanges 12 and 13 fastened together by screws 14. The casing thus provided is divided by a diaphragm 15 having a marginal portion 17 clamped between the flanges 12 and 13. This diaphragm is constructed of suitable material such as a synthetic rubber having a high resistance to the action of hydrocarbon fuels, and it is flexible so that it may be moved relative to its marginal portion. The diaphragm is held between two metal disks 18 and 19, and these are connected at their centers by a

2 pin 20 having collars 21 and 22 at opposite sides of the disks.

A spring 24 encircling the pin normally urges the diaphragm upwardly and such spring at its upper end engages the disk 19 and at its lower end it seats in a recess 25 in a lower wall 26 of the part 12 of the casing. Below the diaphragm, the pin 20 projects downwardly through a tubular boss 27 projecting upwardly from the wall 26 and the lower end of the pin is flattened and is provided with an elongated eye 28. The end of the pin is located within an auxiliary chamber 29 in part 12 of the casing and within this auxiliary chamber a bell crank 30 is located. This bell crank is pivoted on a pin 31 journaled in opposite walls of the auxiliary chamber 29 and one end of the bell crank projects through the eye 28 in the pin 20.

The bell crank is normally urged in a counter-clockwise direction by a spring 32 engaging at one end a leg 34 on the bell crank, and at its other end a seat 35 on the casing wall. A socket 38 is carried by the opposite end of the bell crank and such socket is adapted to be moved by a stem 40 operating from the cam shaft. From the construction so far described, it should be evident that if the pin 40 is reciprocated, the bell crank likewise will be reciprocated and in turn the diaphragm will be moved upwardly and downwardly. At the same time, it should be evident that if the diaphragm is held in a lower position by fuel pressure above the diaphragm, the bell crank can continue its movements due to the elongated opening 28, and if the pressure is sufficient the diaphragm may remain idle. It follows also that the stroke of the diaphragm may be progressively shortened as the pressure above the diaphragm increases.

The part 11 of the casing includes an inner wall 41 which forms an outer vapor and fuel chamber 43 and an inner vapor and fuel chamber 44. Fuel enters the inner chamber 44 by means of a fuel inlet 45 and then flows through the chamber 44 and then downwardly into the chamber 43.

Flow of the fuel from the one chamber into the other is controlled by a valve subassembly which comprises an upwardly bowed metal disk 48 having a marginal portion 49 clamped between the flanges 12 and 13, and if desired a gasket 50 may be provided between the marginal portion of the disk and the flange 13. It is evident that the edge of the diaphragm acts as a seal at the opposite side of the disk. At its center, the valve disk 48 has an upwardly projecting tubular projection 52 and this tubular projection terminates in a re-

duced bore 53 so as to provide a valve seat 54. The bore 53 is adapted to be closed by a valve plate 55 which is urged upwardly by a spring 56, and this spring in turn rests on the base of an inverted cup shaped element 57 press fitted into the lower part of the projection 52. The base of the cup is provided with a plurality of openings 60 so that fuel may flow through the cup. The valve plate 59 constitutes the inlet valve and when it is unseated, fuel flows downwardly past the plate and through the openings 60 to the space above the diaphragm.

Fuel is adapted to flow upwardly through the disk 48 and into the chamber 43 through a plurality of outlet openings 62 in the disk, and these openings are adapted normally to be closed by a ring plate 64 surrounding the tubular projection 52 on the disk. This ring plate is urged downwardly by a tapered coil spring 65 seating at its lower end against the ring plate and having its upper end coil contracted into an annular groove 66 in the wall of the tubular projection.

In order to seal the upper end of the tubular projection 52 to the inner wall 41 of the casing, the lower end of the latter has an upwardly and inturned conical wall portion 70 and a synthetic rubber sealing ring 71 is provided on the upper end of the tubular projection for engagement with the tapered wall. At its upper end the conical wall 70 joins a cylindrical wall 73 and the latter terminates in a smaller cylindrical portion 74 thereby providing a shoulder 75. This shoulder supports a cylindrical filter 76 having a lower end plate 77 resting on the shoulder and an upper end plate 79 which is pressed downwardly by a spring 80. The filter and spring are slidably mounted on the cylindrical portion of the upwardly projecting housing and the spring is normally urged downwardly by a cover 81 at the upper end of the chamber 44. This cover is secured in place by a screw 82 which is threaded downwardly into the upper end of the cylindrical portion 74. A plurality of slots 83 in the wall of portion 74 permit the fuel to flow from the chamber 44 into the cylindrical portion 74.

When the diaphragm moves downwardly, the valve plate 55 is drawn from its seat and fuel flows past this plate into the space above the diaphragm. All fuel entering the inlet 45, of course, passes through the filter 76 before it can flow downwardly past the valve plate 55. On the upward movement of the diaphragm, the valve plate closes and then the pressure of the diaphragm on the fuel forces the ring plate 64 upwardly to allow the fuel to flow into the chamber 43. From this chamber the fuel flows through an outlet 85 shown in Fig. 2 which communicates with the lower part of the chamber 43.

It is evident that the upper parts of the chambers 43 and 44 serve as vapor chambers so as to minimize vapor lock both at the inlet and outlet sides of the pump. It is also evident that the filter may easily be installed and replaced simply by removing the screw 82. Also it is evident that the valve assembly is carried entirely on the disk 48 and thus it may be easily installed and replaced. Assembly of all the parts may be affected by placing the valve assembly and diaphragm in position and then placing the upper casing part 11 in position and then securing the two parts of the casing together by the screws 14.

The construction shown by Fig. 3 has the same diaphragm and valve assembly and filter arrangement as that shown by Fig. 1. However, in this case the lower end of the pin 20 engages one arm

of a bell crank 90 pivoted as indicated at 91 in the lower part of the casing and the opposite end of this bell crank indicated at 92 is engaged by a pin 93 slidable in a tubular part 94 of the casing. The outer end of this pin has a head 95 engaged by a cam 96 on the cam shaft in the engine and the pin normally is urged against the cam by a coil spring 97 seating against the head 95 on the pin and against a collar 98 on a sleeve 99. This sleeve is mounted in the tubular portion 94 and serves as a bearing for the pin 93. In other respects the fuel pump functions the same as the construction disclosed in Fig. 1.

Although more than one form of the invention has been illustrated and described in detail, it will be apparent to those skilled in the art that various modifications may be made without departing from the scope of the claims.

What is claimed is:

1. A fuel pump comprising a casing having an annular outer wall and an annular inner wall forming chambers one within the other, the inner wall having a tapered wall portion at one end, a valve plate extending across the casing at one end of the chambers and connected to the outer wall, means sealing the plate to the tapered wall at the end of the inner chamber, and means for effecting a pump action to force fuel from one of the chambers to the other.

2. A fuel pump comprising a casing having an annular outer wall and an annular inner wall forming chambers one within the other, the inner wall having a tapered wall portion at one end, a valve plate extending across the casing at one end of the chambers and connected to the outer wall, means sealing the plate to the tapered wall at the end of the inner chamber and comprising a rubber sealing ring carried by the plate and engaging the tapered wall, and means for effecting a pump action to force fuel from one of said chambers to the other.

3. A fuel pump comprising a casing having an annular outer wall and an annular inner wall forming chambers one within the other, the inner wall having a tapered wall portion at one end, a valve plate extending across the casing at one end of the chamber and connected to the outer wall, means sealing the plate to the tapered wall, valve means for controlling the flow of fuel between the chambers and the space at the side of the plate opposite the chambers, and means for effecting a pump action to force fuel from one of said chambers to the other.

4. A fuel pump comprising a casing having an annular outer wall and an annular inner wall forming chambers one within the other, the inner wall having an inwardly turned, annular flange at one end, a tubular filter disposed in the inner chamber and seated on said flange, cover means closing the other end of the inner chamber, and means for effecting a pump action to force fuel from one of said chambers to the other.

5. A fuel pump comprising a casing having an annular outer wall and an annular inner wall forming chambers one within the other, the inner wall being reversely turned at one end to provide an inner tubular post and the post being apertured to allow fuel to flow through the wall thereof, a tubular filter disposed on said post within the inner chamber, and means for effecting a pump action to force fuel from one of said chambers to the other.

6. A fuel pump comprising a casing having an annular outer wall and an annular inner wall

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forming chambers one within the other, the inner wall being reversely turned at one end to provide an inner tubular post and the post being apertured to allow fuel to flow through the wall thereof, a tubular filter disposed on said post within the inner chamber, cover means closing the other end of the inner chamber and also acting to hold the filter in place, and means for effecting a pump action to force fuel from one of said chambers to the other.

7. A fuel pump comprising a casing including two parts having cooperating flanges, a diaphragm, a valve plate disposed adjacent to said diaphragm on one side thereof, both said diaphragm and said valve plate extending transversely of said casing and having their marginal portions secured between said cooperating flanges, said diaphragm and said valve plate cooperating to define a space therebetween, said casing defining inlet and outlet chambers at the side of said plate remote from said diaphragm, inlet and outlet valve means carried by said plate so that fuel may be drawn from said inlet chamber through said inlet valve means into said space when said diaphragm is moved in one direction and then forced out of said space through said outlet valve means into said outlet chamber when said diaphragm has moved in the opposite direction, and means for pulsating the diaphragm.

8. In a fuel pump a housing comprising an upper housing member and a lower housing member, a pumping diaphragm, a plate member, said diaphragm and said plate member being disposed within said housing and having peripheral portions supported between said housing members, said plate member being recessed to form a pumping chamber, said upper housing member defining an inlet chamber and an outlet chamber comprising a vapor dome extending upwardly from said pumping chamber, an inlet valve mounted on said plate member, and an outlet check valve removably secured to the upper side of said plate to separate the pumping chamber from the vapor dome.

9. A fuel pump comprising a housing including first and second housing members, one of said members having inlet and outlet chamber portions, a pumping diaphragm, an apertured plate member, said diaphragm and said plate member being disposed within said housing and supported between said housing members and defining a pumping chamber, and inlet and outlet valve means mounted on said plate member adapted to control communication between said inlet and outlet chamber portions and said pumping chamber.

10. A fuel pump comprising a housing including first and second housing members, one of said members having inlet and outlet chamber portions, a pumping diaphragm, an apertured plate member, said diaphragm and said plate member being disposed within said housing and supported between said housing members and defining a pumping chamber, and means carried by said plate and including inlet and outlet valve means adapted to control communication between said inlet and outlet chamber portions and said pumping chamber and means extending between said inlet and outlet valve means and sealingly engaging said one of said housing members and said plate member to prevent communication between said inlet and outlet chamber portions except through said pumping chamber.

11. A fuel pump comprising a housing including upper and lower housing members, said upper

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housing member having an inlet chamber portion and an outlet chamber portion, a pumping diaphragm, a plate member having an annular sealing engagement with said diaphragm and cooperating therewith inwardly of said engagement to define a pumping chamber, said plate and said diaphragm being disposed within said housing and supported between said housing members, and inlet and outlet valve means mounted on said plate member adapted to control communication between said inlet and outlet chamber portions and said pumping chamber.

12. A fuel pump comprising a housing including upper and lower housing members, said upper housing member having an inlet chamber portion and an outlet chamber portion, a pumping diaphragm, a plate member having an annular sealing engagement with said diaphragm, said plate member being disposed above said diaphragm and having a portion inwardly of said engagement offset upwardly to form a pumping chamber, said plate and said diaphragm being disposed within said housing and supported between said housing members, and inlet and outlet valve means mounted on said plate member adapted to control communication between said inlet and outlet chamber portions and said pumping chamber.

13. A fuel pump comprising a housing including upper and lower housing members, said upper housing member having an inlet chamber portion and an outlet chamber portion, a pumping diaphragm, a plate member having an annular sealing engagement with said diaphragm, said plate member being disposed above said diaphragm and having a portion inwardly of said engagement offset upwardly and cooperating with said diaphragm to define a pumping chamber, said plate and said diaphragm being disposed within said housing and supported between said housing members, inlet and outlet valve means mounted on said plate member adapted to control communication between said inlet and outlet chamber portions and said pumping chamber, said housing members having registering flange portions, said plate and said diaphragm having peripheral portions disposed between said flanges, and means for securing said flanges together to grip said peripheral portions.

14. A fuel pump comprising a housing including an upper housing member and a lower housing member, a pumping diaphragm, a plate member, said diaphragm and said plate member being disposed within said housing and interposed between said housing members, said plate member being recessed to form a pumping chamber and having a central opening therethrough and other openings therethrough in spaced relation to said central opening, valve means on said plate member disposed between said upper housing member and said pumping chamber, said valve means including means controlling communication between said chamber and said upper housing member through said central opening and means controlling communication between said chamber and said upper housing member through said other openings.

15. A fuel pump comprising a housing including an upper housing member having inlet and outlet chamber portions and a lower housing member, a pumping diaphragm, a plate member, said diaphragm and said plate member being disposed within said housing and interposed between said housing members, said plate member being recessed to form a pumping chamber and having

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a central opening therethrough adapted to communicate with one of said chamber portions and having other openings therethrough adjacent said central opening and adapted to communicate with the other of said chamber portions, valve means on said plate member disposed between said upper housing member and said pumping chamber, said valve means including means controlling communication between said pumping chamber and one of said chamber portions through said central opening and means controlling the flow of fluid between said pumping chamber and the other of said chamber portions through said other openings.

16. A fuel pump comprising a housing including an upper housing member and a lower housing member, a pumping diaphragm, a plate member, said diaphragm and said plate member being disposed within said housing and supported between said housing members, said plate member being of substantially uniform thickness and having a central opening therethrough and other openings therethrough in spaced relation to said central opening, said plate member having an offset portion forming a pumping chamber and terminating at its inner periphery in a cylindrical portion surrounding said central opening, valve means on said plate member including means mounted on said cylindrical portion for controlling the flow of fluid between said pumping chamber and said upper housing member through said central opening in one direction and means for controlling the flow of fluid between said pumping chamber and said upper housing member through said other openings in the opposite direction.

17. A fuel pump comprising a housing including an upper housing member having an inlet chamber portion and an outlet chamber portion and a lower housing member, a pumping diaphragm, a plate member, said diaphragm and said plate member being disposed within said housing and supported between said housing members, said plate member being of substantially uniform thickness and having a central opening therethrough and other openings therethrough in spaced relation to said central opening, said central opening being adapted to communicate with one of said chamber portions and said other openings being adapted to communicate with the other of said chamber portions, said plate member having an offset portion forming a pumping chamber and terminating at its inner periphery in a cylindrical portion surrounding said central opening, valve means on said plate member including means mounted on said cylindrical portion for controlling the flow of fluid between said pumping chamber and said one of said chamber portions through said central opening in one direction and means for controlling the flow of fluid between said pumping chamber and said other of said chamber portions through said other openings in the opposite direction.

18. A fuel pump comprising a casing including a pair of housing members and means for holding said housing members together, said casing having an outer annular wall and an inner annular wall forming chambers one within the other, a valve plate extending across the casing and having its marginal portion gripped between said housing members, spring pressed valve means on the plate for allowing fuel to flow through the plate in one direction from one chamber, spring pressed valve means on the plate for allowing fuel to flow through the plate in the other di-

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rection to the other chamber, annular means sealing said inner wall to said valve plate around one of the valve means, and means for effecting a pump action to force fuel from one of said chambers to the other.

19. A fuel pump comprising a casing including a pair of housing members and means for holding said housing members together, said casing having an outer annular wall and a concentric inner annular wall, said walls forming a central inlet chamber and an annular outlet chamber surrounding said inlet chamber, a valve plate extending across the casing and having its marginal portion gripped between said housing members, spring pressed valve means on the plate for allowing fuel to flow through the plate in one direction from said inlet chamber, spring pressed valve means on the plate for allowing fuel to flow through the plate in the other direction to said outlet chamber, annular means sealing said inner wall to said valve plate around one of the valve means, and means for effecting a pump action to force fuel from said inlet chamber to said outlet chamber.

20. A fuel pump comprising a casing including a pair of housing members and means for holding said housing members together, said casing having an outer annular wall and an inner annular wall forming chambers one within the other, the outer chamber having an upper annular portion affording a pressure dome, a valve plate extending across the casing and having its marginal portion gripped between said housing members, spring pressed valve means on the plate for allowing fuel to flow through the plate in one direction from one chamber, spring pressed valve means on the plate for allowing fuel to flow through the plate in the other direction to the other chamber, annular means sealing said inner wall to said valve plate around one of the valve means, and means for effecting a pump action to force fuel from one of said chambers to the other.

21. A fuel pump comprising a casing including a pair of housing members and means for holding said housing members together, said casing having an outer annular wall and an inner annular wall forming chambers one within the other, a valve plate extending across the casing and having its marginal portion gripped between said housing members, a diaphragm extending across said casing and having its marginal portion gripped between said housing members, said plate and said diaphragm cooperating to define a pumping space, spring pressed valve means on the plate for allowing fuel to flow through the plate in one direction from one chamber, spring pressed valve means on the plate for allowing fuel to flow through the plate in the other direction to the other chamber, annular means sealing said inner wall to said valve plate around one of the valve means, and means for effecting a pump action to force fuel from one of said chambers to the other.

22. A fuel pump comprising a pair of housing members having cooperating annular flanges and providing inner and outer concentric wall portions, the inner of said wall portions defining an inlet passage and said wall portions cooperating to define an annular outlet passage surrounding said inlet passage, a unitary valve subassembly adapted to control the flow of fluid through said passages and comprising a mounting plate extending transversely of said passages and having its peripheral portion gripped between said

flanges, said mounting plate having an inlet opening adapted to communicate with said inlet passage and a plurality of outlet openings adapted to communicate with said outlet passage, and inlet and outlet valve means adapted to open and close said openings, and means for effecting a pumping action to force fluid through said pump.

23. In a fuel pump having a pair of housing members having cooperating annular flanges and defining an inlet passage and an annular outlet passage surrounding said inlet passage, a unitary valve subassembly adapted to control the flow of fluid through said passages and comprising a mounting plate having a peripheral portion adapted to be gripped between said flanges and having an inlet opening adapted to communicate with said inlet passage and a plurality of outlet openings adapted to communicate with said outlet passage, and inlet and outlet valve means adapted to open and close said openings.

24. In a fuel pump having a pair of housing members having cooperating annular flanges and defining an inlet passage and an annular outlet passage surrounding said inlet passage, a unitary valve subassembly adapted to control the flow of fluid through said passages and comprising a mounting plate having a peripheral portion adapted to be gripped between said flanges and having an inlet opening adapted to communicate

with said inlet passage and a plurality of outlet openings adapted to communicate with said outlet passage, an inlet valve element adapted to seat on said plate to close said inlet opening, an outlet valve element adapted to seat on said plate to close said outlet openings, inlet and outlet spring abutments mounted on said plate, and inlet and outlet springs mounted on said abutments and engaging said elements to urge the latter toward their seated positions.

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