April 29, 1958 J. F. WALDHERR, JR 2,832,295

FUEL PUMP

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FIG. 1.

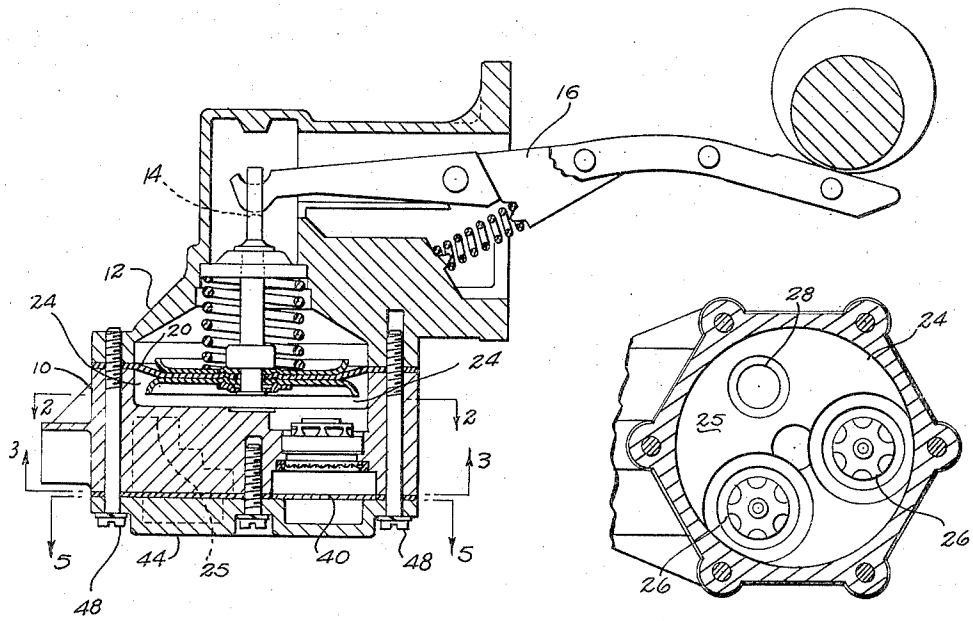


FIG. 2.

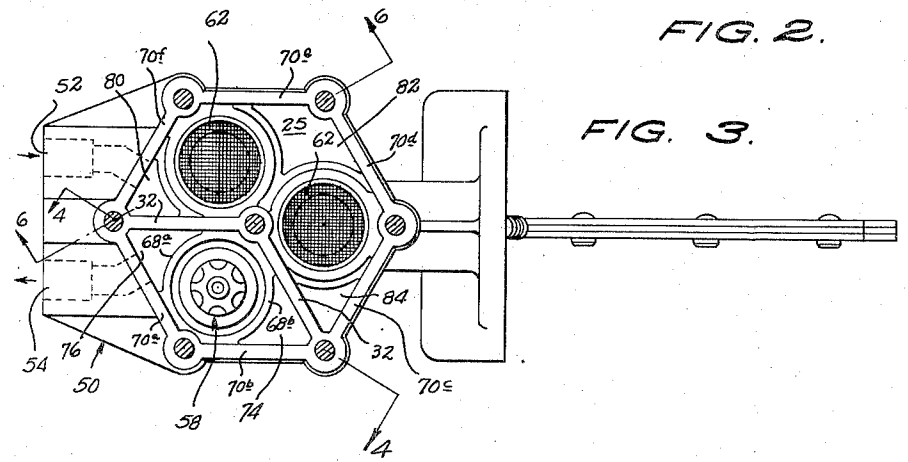


FIG. 3.

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FIG. 4

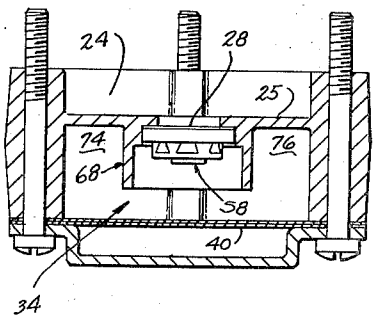


FIG. 5.

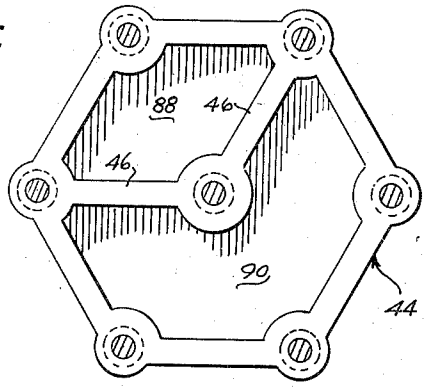
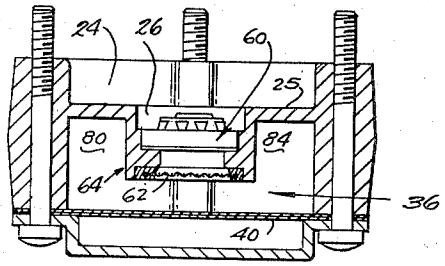


FIG. 6.



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FUEL PUMP

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Application February 17, 1954, Serial No. 410,759

7 Claims. (Cl. 103—150)

This invention relates to fuel pumps and more particularly to fuel pumps for internal combustion engines.

It is an object of the invention to provide a fuel pump which is highly efficient in operation with a minimum of parts.

It is another object of the invention to provide a fuel pump of such a nature and construction as to minimize vaporization of fuel both in the pipe line leading to the pump and in the pumping chamber thereof.

It is a still further object of the invention to provide a fuel pump having a large intake passage means without increasing the size of the pump nor unduly complicating the construction.

Other objects and features of the invention will be apparent from the description hereinafter given.

In brief my invention contemplates a fuel pump construction having a main body casting closed at one end by a conventional pump diaphragm and closed at the other end by an air dome pulsator diaphragm. Further, two intake valve passages are utilized, which I have found preferable for purpose of providing large intake flow with a minimum of passage restriction, as compared with a single enlarged passage. In addition, the casting is so made as to provide air dome means for both the intake and outlet sides of the pump.

A unique feature of the invention is the fact that a single pulsator diaphragm serves to close the air dome chambers for the inlet and outlet valve passages; the pulsations produced by the pump diaphragm serving to synchronously expand the pulsator diaphragm so as to effect a cyclicly varying size of air dome chambers for the valve passages, serving in effect as an accumulator.

A detailed description of my invention will now be given in conjunction with the appended drawing, in which:

Fig. 1 is a section in elevation through a fuel pump embodying my invention;

Fig. 2 is a section in plan through 2—2 of Fig. 1.

Fig. 3 is a section through 3—3 of Fig. 1 looking upwardly at the bottom of the pump.

Fig. 4 is a section in elevation through 4—4 of Fig. 3.

Fig. 5 is a section through 5—5 of Fig. 1 looking downwardly into the cover which closes the bottom of the pump.

Fig. 6 is a section through 6—6 of Fig. 3.

Referring to the drawing, my invention comprises a main casting **10** closed at the top by a hood **12** which carries the usual plunger **14** and lever **16** for reciprocating a pump diaphragm **20** clamped in a well known manner between body **10** and hood **12**. The actuation of the pump diaphragm is conventional and well understood and no further detailed description need herein be given.

The pump diaphragm **20** operates in a pump chamber **24** recessed in the casing having a horizontal wall **25** through which pass valve passages such as the inlet valve passages **26** and outlet valve passage **28**. The valve passages, on the under side of wall **25**, are isolated from each other by vertical wall formations such as the walls **32**,

as best seen on Fig. 3. The walls **32** radiate from the center of the construction and thus effect an outlet valve chamber **34**, as best seen on Fig. 4, and an inlet valve chamber **36**, as best seen on Fig. 6. It will be noted that the inlet valve passages **26** both terminate in the inlet valve chamber **36** and are of equal size.

The bottoms of the valve chambers are closed by a pulsator diaphragm **40** which is clamped to the bottom of the casing **10** by means of a bottom cover plate **44**. The cover plate is provided with ribs **46** which register with the walls **32** (Fig. 3) thus clamping the pulsator diaphragm in a sealing manner so as to effectively isolate the chambers **34** and **36**. Final assembly is effected by means of bolts **48** which pass through the bottom cover, the casing, the top hood, and through suitably provided apertures in the pump diaphragm and the pulsator diaphragm so as to form a tight integral construction for these several elements.

A flanged formation **50** having an inlet bore **52** and an outlet bore **54** leading to the respective valve chambers is provided as best shown on Fig. 3 in dotted lines.

Each of the valve passages is provided with a suitable check valve shown generally as an outlet valve **58** on Fig. 4 and an inlet valve **60** on Fig. 6. The inlet valves are provided with screening **62** as noted on Figs. 3 and 6. Each of the valves is partially surrounded by foreshortened collar elements in the respective chambers, such collar elements being designated for the inlet valve by reference character **64** on Fig. 6, and by **68** on Fig. 4. It will be noted that these collar elements are segmental only and merge into the exterior walls of the casing as best seen on Fig. 3. Thus, as viewed on Fig. 3, the outlet valve **58** is surrounded by collar segments **68***a*, and **68***b*, and portions of the interior walls **32** and exterior walls **70***a* and **70***b*. The hexagonal shape of the casing lends itself nicely to such construction and by virtue of the isolation of the valve **58** by the merging of these several collars and walls a built-in air dome is provided of substantially triangular shape on each side of the valve. Thus, the air dome **74** and the air dome **76** are diametrically disposed with respect to the outlet valve passage **28** below wall **25**, the shape and disposition of the air domes being clear by comparison of Figs. 3 and 4, wherein on Fig. 3 the outlet valve chamber is seen to be defined by walls **32**, **70***a* and **70***b*.

In a similar manner as shown on Fig. 3, the inlet valve chamber is provided with air dome pockets designated by reference characters **80**, **82**, and **84** on Fig. 3, this chamber being defined by walls **32** and **70***c*, *d*, *e* and *f*.

In addition to these air dome pockets I provide the pulsator diaphragm **40**, as hereinabove mentioned, which in conjunction with recesses **88** and **90** in cover **44** serves to further augment the accumulator effect of the air dome pockets. Thus, assuming the pump diaphragm to be in operation, on a suction stroke, that portion of the pulsator diaphragm which overlays the recess **90** will move inwardly to decrease the overall size of the inlet valve chamber. In the subsequent pressure stroke, when the inlet valves are automatically closed, the fuel flowing in the passageway or pipe leading to the pump will not be abruptly stopped, but will continue to flow, thus compressing the air in the air dome pockets of the inlet chamber **36** while at the same time flexing outwardly the portion of the pulsator diaphragm **40** which closes the bottom of this chamber. In other words, the pulsator diaphragm bows outwardly into the recess **90** at this time in order to provide for continued flow into the inlet chamber. I have discovered that this has a very marked effect in minimizing vaporization in the fuel line and also in the pump chamber **24**. Thus, by this construction and combination of elements continual flow of fuel is effected,

the flow not being abruptly interrupted on each force stroke of the pump diaphragm as is the case with conventional fuel pumps.

The pulsator diaphragm also acts as an accumulator chamber for the outlet side of the pump; that is, by expanding and contracting within the recess 88 so as to maintain continuous flow to the carburetor or, in any event, to prevent complete interruption of such flow. It will be understood that the flow to the pump and from the pump will increase and decrease with motion of the pump diaphragm but that flow will continue within any desired design limits without stopping. Thus, the momentum of the fuel in motion is taken advantage of to lessen the load on the pump diaphragm while at the same time a startling advantage is achieved by virtue of the great reduction in turbulence heretofore caused by abrupt starting and stopping of fuel flow in the inlet and outlet lines connected to the pump. I believe this abruptness of starting and stopping has in prior constructions lead to vaporization of the fuel in the various passages which is, of course, a highly undesirable condition.

I believe a distinct structural feature of my invention resides in the utilization of a single pulsator diaphragm to serve as a displaceable element for what is, in effect, an accumulator in a fuel pump for the inlet and outlet sides of the pump.

While I am aware that air domes are broadly old in fuel pumps, I believe that the novel construction and the advantages brought about by my present invention deviates from the prior art to an extent that the precise embodiment described hereinabove is subject to considerable variation within the spirit of my concept. Accordingly, I do not seek to be limited to the precise illustration except as set forth in the appended claims.

I claim:

1. In a fuel pump casing (**10**) having an exterior wall and an interior wall (**25**) transverse to said exterior wall so as to extend across said casing to transversely divide said casing; a pump chamber (**24**) in said casing on one side of said transverse wall; a pair of passages (**26**) and (**28**) through said transverse wall, an intake valve (**60**) in one of said passages and an outlet valve (**58**) in another of said passages, an interior wall (**32**) on the other side of said transverse wall, dividing said casing on said other side of said transverse wall into an intake chamber (**36**) and an outlet chamber (**34**), said passages leading from said pump chamber into respective intake and outlet chambers, collar means (*64*, *69*, *69a*, *68b*) disposed on said other side of said transverse wall so as to effect extensions of said passages and forming air domes in said intake and outlet chambers in conjunction with said transverse wall and said exterior and interior walls.

2. In a fuel pump, a casing comprising substantially vertical external wall means, a transverse wall within said casing merging into said external walls and dividing said casing into upper and lower portions, valve passages having openings in said transverse wall, said casing having interior walls below said transverse wall dividing said casing into inlet and outlet chambers corresponding to respective valve passages, collar means in each of said chambers extending from said transverse wall and surrounding respective valve passage openings in said wall and being disposed in respective chambers, said collar means merging into adjacent interior and external walls and having portions spaced therefrom to form air domes.

3. In a fuel pump, a casing comprising substantially

vertical external wall means, a transverse wall within said casing merging into said external walls and dividing said casing into upper and lower portions, valve passages having openings in said transverse wall, said casing having internal walls below said transverse wall dividing said casing into inlet and outlet chambers corresponding to respective valve passages, collar means in each of said chambers extending from said transverse wall and surrounding respective valve passage openings in said wall and being disposed in respective chambers.

4. In a fuel pump as set forth in claim 3, said external and internal walls extending further from said transverse wall than said collar means so as to provide flow passages in said chambers whereby fluid may pass axially through said collar means to respective valve pasages.

5. In a fuel pump casing having an exterior wall and an interior wall transverse to said exterior wall so as to extend across said casing to transversely divide said casing; a pump chamber in said casing on one side of said transverse wall; a pair of passages through said transverse wall, an intake valve in one of said passages and an outlet valve in another of said passages, an interior wall on the other side of said transverse wall, dividing said casing on said other side of said transverse wall into an intake chamber and an outlet chamber, said passages leading from said pump chamber into respective intake and outlet chambers, said passages facing into said pump chamber at one end of said casing, said casing having means forming respective air dome chambers at the opposite end of said casing surrounding said passages.

6. In a fuel pump as set forth in claim 5, each of said passages having a surrounding wall extending toward said opposite end of said casing, said surrounding walls having portions laterally spaced from said interior and outer walls to form pockets for effecting said air dome chambers.

7. In a fuel pump as set forth in claim 6, including a flexible pulsator diaphragm closing said opposite end of said casing and means for sealingly clamping said pulsator diaphragm to the outer edges of said outer and interior walls, thus effecting additional pulsating air dome spaces for said chambers.

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