April 20, 1948. M. KATCHER 2,440,175

FUEL PUMP

Filed June 21, 1945 2 Sheets-Sheet 1

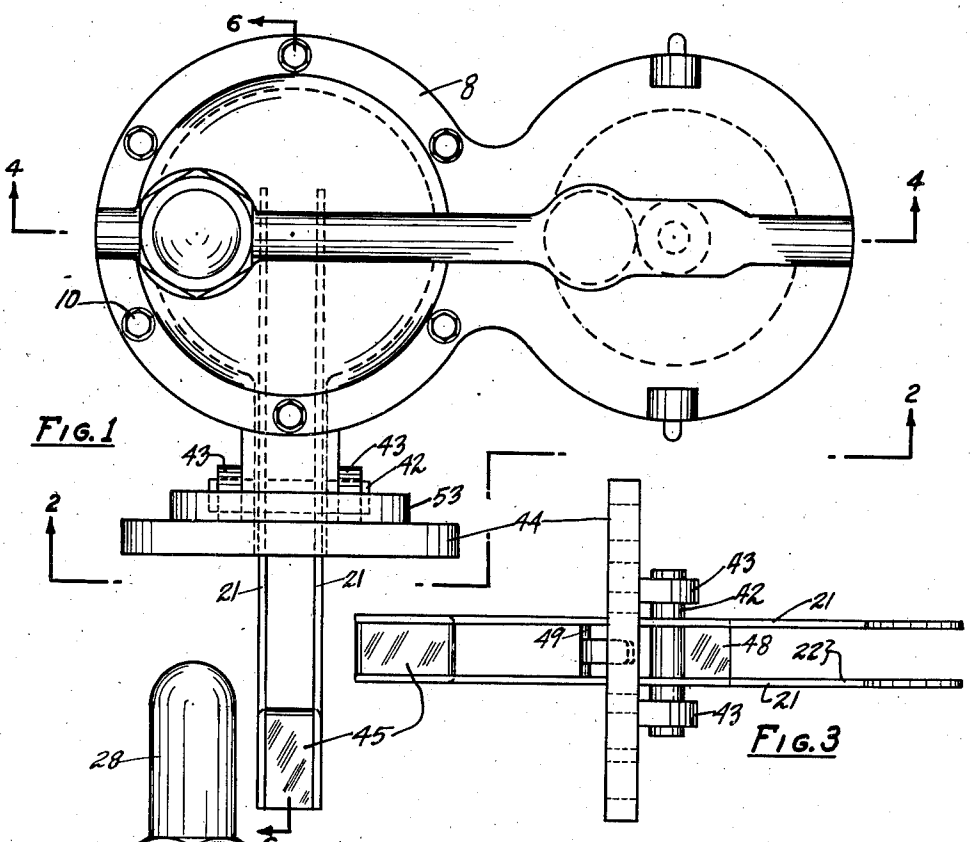


FIG. 1

FIG. 3

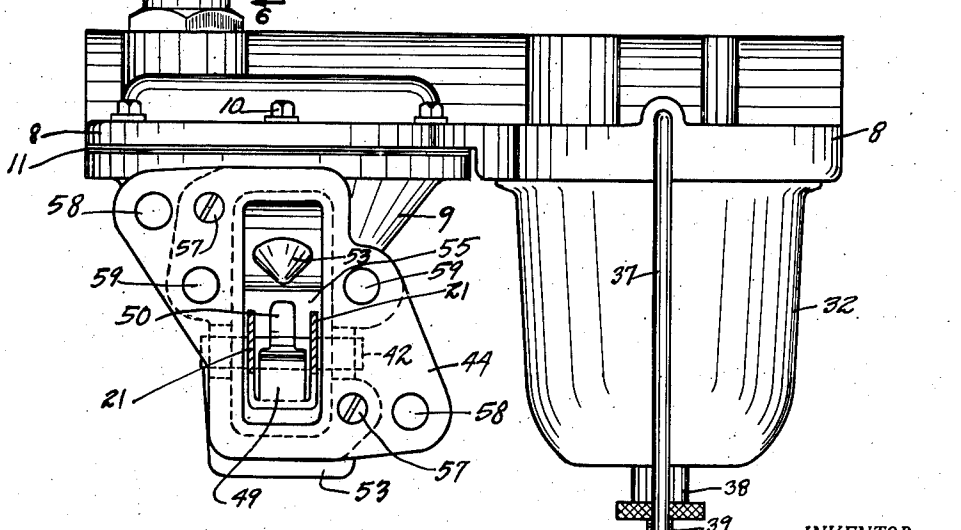


FIG. 2

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April 20, 1948. M. KATCHER 2,440,175

FUEL PUMP

Filed June 21, 1945 2 Sheets-Sheet 2

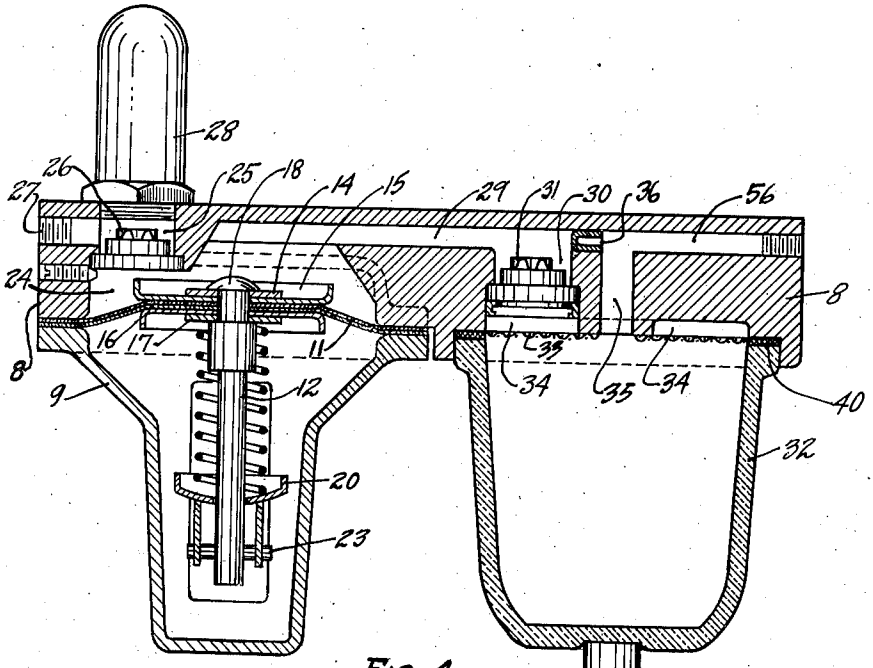


FIG. 4

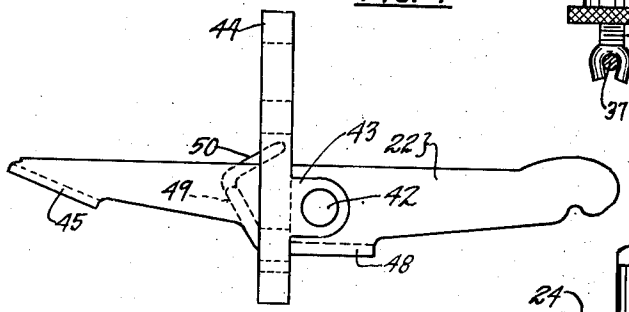


FIG. 5

FIG. 6

FIG. 7

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FUEL PUMP

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3 Claims. (Cl. 103—150)

1

This invention relates to a fuel pump such as are now employed upon automotive vehicles and elsewhere in connection with internal combustion engines. It is an object of the invention to provide a pump of such construction, that the suction stroke of the pump diaphragm is caused positively by an operating lever reciprocated by a driving means forming part of the engine. The operating lever is pivoted upon the pump at an intermediate portion, the outer end of the lever engaging the driving means of the engine while the inner end positively engages a diaphragm stem for the suction stroke of the diaphragm. Between the inner end of the lever and the diaphragm is located a compression spring so that the compression stroke of the diaphragm is limited by the strength of the compression spring. The spring is of such strength that it will not cause more than a predetermined pressure in the discharge of the fuel from the pump. It is to be noted that the spring reacts between the inner end of the lever and the diaphragm. In the prior art, a spring is used for the compression stroke, but it reacts between a fixed portion of the housing and the diaphragm.

A further object of the invention is the provision of a readily attachable bracket or annular flange for attaching the pump housing to the engine. The operating lever is pivotally mounted on the bracket with its outer end engaging the driving means of the engine and its inner end engaging the diaphragm stem with a lost motion connection. By the use of such a bracket or brackets with attached operating lever, a pump of standard design can be used with different makes of engines, the necessary variation to suit the difference in construction of the engines being provided in the brackets and operating levers. At that, the operating levers between their pivotal axis on the bracket and the diaphragm stem can be kept standard while all the variation is provided between said axis and the driving means.

A further object is the provision of an integral sheet metal operating lever so formed as to engage the springs of the pump, the driving means and the diaphragm stem.

Other objects and advantages will become apparent upon further study of the description and drawings, in which

Fig. 1 is top plan of the pump.

Fig. 2 is a side elevation of the pump, taken along the line 2—2 of Fig. 1, the forward lever spring and washer being omitted.

Fig. 3 is a plan view of the operating lever and

2

readily attachable means or bracket shown by themselves.

Fig. 4 is a longitudinal section of the pump taken along the line 4—4 of Fig. 1.

Fig. 5 is a side elevation of the operating lever and readily attachable means or bracket shown by themselves.

Fig. 6 is a cross section of the pump taken along the line 6—6 of Fig. 1 and

Fig. 7 is a partial section taken along the line 7—7 of Fig. 6.

Cover 8 is attached to pump casing 9, both together forming the pump housing by means of bolts 10, circular laminated diaphragm 11 being pinched between said cover and said casing. Diaphragm stem or plunger 12 is attached to diaphragm 11 by means of washers 14, 15, 16 and 17 and head 18 as is well known in the art. Coiled about stem 12 is spring 19 contacting washer 17 at its upper end and washer 20 at its lower end. Washer 20 is slidably mounted on stem or plunger 12 and rests on the top of side pieces 21 of operating lever 22. A pin 23 passes through stem 12 near its lower end and is held therein by a forced fit. The bottom of side pieces 21 is notched out to fit over pin 23.

Above diaphragm 11 is a chamber 24. Discharge port 25 leads from chamber 24 to outlet 27. Check valve 26 lies across port 25 permitting fluid to pass through it from chamber 24 but not to return. Such a valve is well known to the art. Above valve 26, in communication with port 25 is air dome 28. The function of an air dome is well known in the art. A passage 29 leads from chamber 24 to inlet port 30. A check valve 31 lies across port 30, permitting fluid from filter bowl 32 to enter passage 29 but not to leave it. Valve 31 is similar to valve 26. The liquid fuel in passing from bowl 32 to port 30 passes through screen 33 into annular shaped chanel 34, the latter being in communication with port 30. A stop 36 is provided between inlet passage 56 and passage 29 to keep the fluid from passing from one to the other. From inlet passage 56 the fluid passes down through passage 35 into filter bowl 32, screen 33 having an opening in it at the bottom of passage 35. Filter bowl 32 is attached to cover 8 by means of bail 37, thumb nut 38 and screw 39. A hook 41 extends over bail 37 from the bottom of screw 39. By turning nut 38 on screw 39, hook 41 can be made to press down on bail 37 while the top of nut 38 pushes up on bowl 32, pressing the upper rim thereof against gasket 40 making a liquid-tight joint.

Operating lever 22 is pivotally mounted on pin

42, the latter passing through side pieces 21 of said lever and entering holes provided in lugs 43. Lugs 43 are integral with mounting bracket 44. Pin 42 has a forced fit with the holes in lugs 43. The outside end of lever 22 is provided with a bridge 45 extending between the bottoms of side pieces 21. Bridge piece 45 rides on cam 46 carried by shaft 47, which is usually a part of the motor structure as, for example, the usual valve cam-shaft.

Another bridge 48 extends between the bottoms of side pieces 21 at about the middle of lever 22, that is in the region of its fulcrum. One end of bridge 48 is bent up at 49 to come between the inner sides of side pieces 21. A tongue 50 extends from end 49 substantially at right angles thereto. Washer 51 fits over tongue 50 and receives one end of spring 52. The other end of spring 52 fits over lug 53 formed on pump casing 9. Lugs 43 fit into complementary recesses provided in flange 54 at the outer edge of casing 9. Bracket 44, flange 54 and casing 9 are open at 55, Fig. 2, to provide space for lever 22, washer 51, tongue 50 and spring 52.

It is the usual practice to attach the pump unit directly by means of a flange, such as flange 54 on casing 9, to the side of a motor casing. Because of the great differences with different types and makes of motors in the distances and relative positions of the motor and cam shaft, many different shaped pump units are required. In order to reduce the number of different kinds of pump units, the present invention provides a standard pump unit or a few standard types of pump units, the types each having its own standard casing 9 and the operating mechanism within it. Lugs 43, pin 42 and lever 22 from pin 42 inward to its engagement with diaphragm stem 12 may be kept constant for a type. The variation required to suit different makes of engines for a type will occur in bracket 44 and in lever 22 between pin 42 and cam 46.

In the prior art it has been the practice to use two levers between cam 46 and diaphragm stem 12 for the purpose of producing a positive suction stroke downward on the stem and a pressure limited stroke upward for discharging the fuel from the pump. The upper limit of the pressure that can be developed is determined by the allowable pressure of the fuel arriving at the carburetor, not shown, it being understood that the inlet of a pump such as shown at 56 is connected to the fuel tank, not shown, and the outlet, such as shown at 27, is connected to the carburetor. In the present invention, a single operating lever 22 is used, one end of which rides the surface of cam 46 while the other end has a lost motion connection with the bottom of diaphragm stem 12.

As bridge piece 45 is raised by cam 46 from its lowest to its highest position, side pieces 21 press down on pin 23 pulling down diaphragm stem 12 and with it diaphragm 11 causing low pressure or suction in chamber 24 drawing in fuel from inlet passages 56, 35 and port 30 through valve 31. Now as bridge piece 45, under the influence of spring 52, follows the surface of cam 46 from its highest to its lowest position, side pieces 21 press up on washer 20 compressing spring 19 between washers 20 and 17, raising stem 12 and forcing diaphragm 11 to flex upwardly with resultant increase of pressure in chamber 24. Spring 19 is made of such strength that when the pressure in the carburetor and in chamber 24 reaches a predetermined value, the spring will yield upon further pressure being applied to it by lever 22

without appreciable motion of diaphragm 11. It is thus seen that on its downward stroke, the inner end of lever 22 positively engages stem or plunger 12 for effecting an increase in pressure in chamber 24. On its upward stroke, the inner end of lever 22 which operatively engages stem 12 by means of spring 19, yieldingly pushes up diaphragm 11. Stem 12 moves as a whole up and down for all practical purposes, along substantially a straight line, its slight deviation therefrom being in accordance with the swinging of the right end of lever 22, as seen in Fig. 6, about its pivot pin 42.

Bracket 44 is readily attached to flange 54 by means of screws 57. Said bracket is also readily attached to the engine casing, not shown by means of a pair of bolts, also not shown, which are passed through holes 58, or in the case of a different engine by a pair of bolts passed through holes 59. It is thus seen that bracket 44 may be made suitable for more than one make of engine.

I claim:

1. A fuel pump for internal combustion engines having pump driving means comprising a pump housing adapted to be mounted on an engine, a pumping chamber in the housing, a pumping diaphragm within said housing adapted to cooperate with the pumping chamber for effecting the pumping, a stem attached to the diaphragm, a lever pivotally mounted at an intermediate portion on the housing, the outer end of the lever adapted to engage said driving means to be given a stroke in one direction and a spring reacting at one end against the lever and at the other against the housing for giving the lever a stroke in the opposite direction, said lever being an integral piece of sheet metal formed into a pair of spaced substantially vertical side pieces, the outer end of said pieces being provided with a transverse bridge joining them and arranged to engage said driving means and a second bridge joining said pieces at a location inward of said former bridge, a tongue extending as an elongation of the second bridge for engaging the lever end of said spring, the inner end of the lever engaging the stem with a lost motion connection.

2. A fuel pump for internal combustion engines having pump driving means comprising a pump housing adapted to be mounted on an engine, a pumping chamber in the housing, a pumping diaphragm within the housing adapted to cooperate with the pumping chamber for effecting the pumping, a stem attached to the diaphragm, a lever pivotally mounted at an intermediate portion on the housing, the outer end of the lever adapted to engage said driving means provided in the engine to be given a stroke in one direction, a spring reacting at one end against the lever and at its other end against the housing for giving the lever a return stroke, said lever being an integral piece of sheet metal formed into a pair of substantially vertical side pieces, the outer end of said pieces being provided with a transverse bridge joining them and arranged to engage said driving means, a second transverse bridge engaging the lever end of the spring and joining said pieces at a location inward from said former bridge but on the same side of the pivotal mounting of the lever as said former bridge, the inner end of said pieces straddling the stem and positively engaging the lower portion thereof for the stroke of the lever in one direction, moving the stem and the diaphragm in one direction, and a spring reacting between said inner end and the diaphragm for moving the stem and dia-

phragm in the opposite direction from said latter direction during the opposite stroke of the lever.

3. A pump for internal combustion engines having pump driving means, comprising a pump housing adapted to be mounted on an engine, a pumping chamber in the housing, a pumping diaphragm within the housing adapted to cooperate with the pumping chamber for effecting the pumping, a stem attached to the diaphragm, a lever pivotally mounted at an intermediate portion on the housing, the outer end of the lever adapted to engage said driving means to be given a stroke in one direction, a spring reacting at one end against the lever and at its other end against the housing for giving the lever a return stroke in the opposite direction, said lever being an integral piece of sheet metal formed into a pair of substantially vertical side pieces, the outer portion of said pieces being provided with a transverse bridge joining them and arranged to engage

said driving means, a second transverse bridge engaging the lever end of the spring joining said pieces at a location inward of the former bridge, the inner end of said pieces engaging the stem, reciprocating the latter as the lever is given its successive strokes.

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