March 12, 1963 V. GUARNASCHELLI ET AL 3,080,825

FUEL PUMP ADJUSTERS

Original Filed Feb. 11, 1960 2 Sheets-Sheet 1

FIG. 1

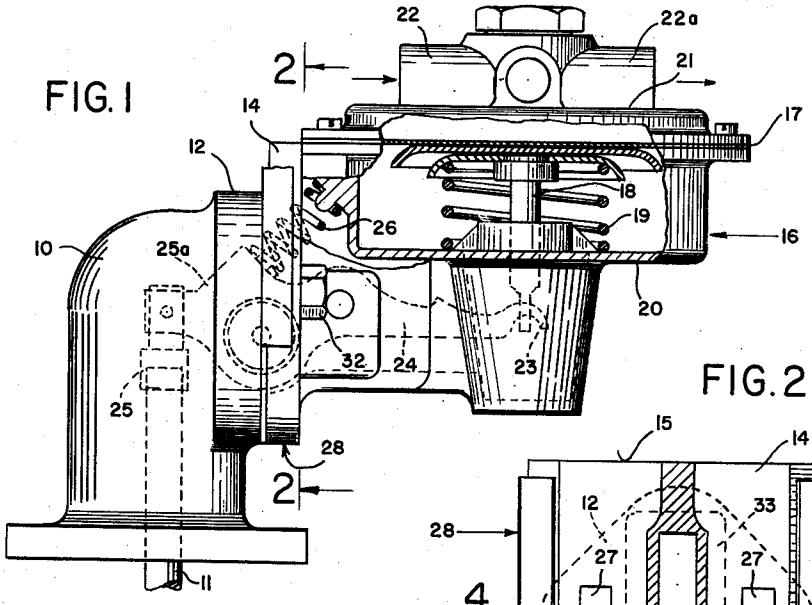


FIG. 2

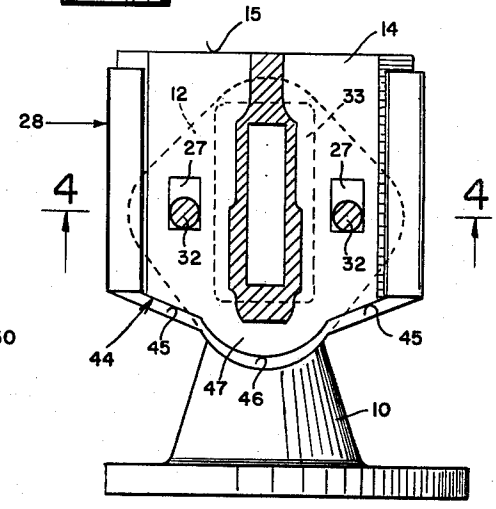


FIG. 3

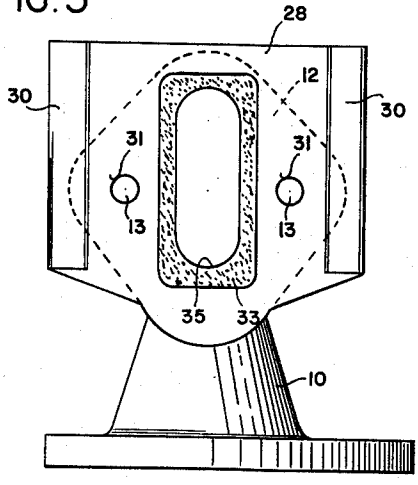
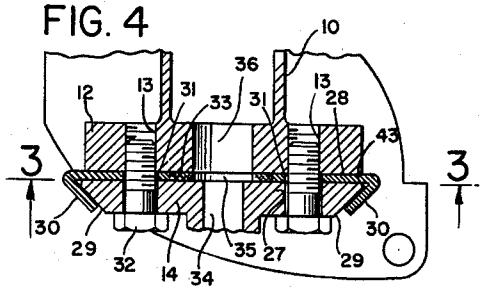


FIG. 4



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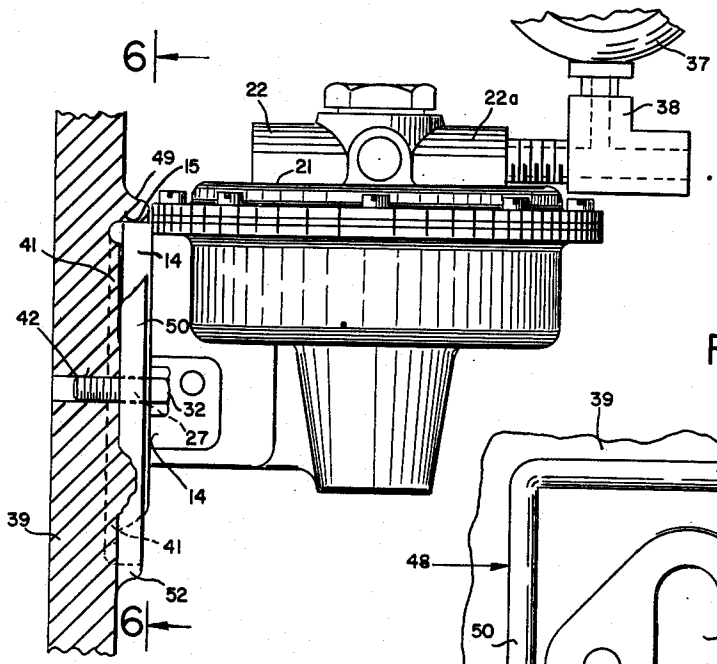


FIG. 5

FIG. 6

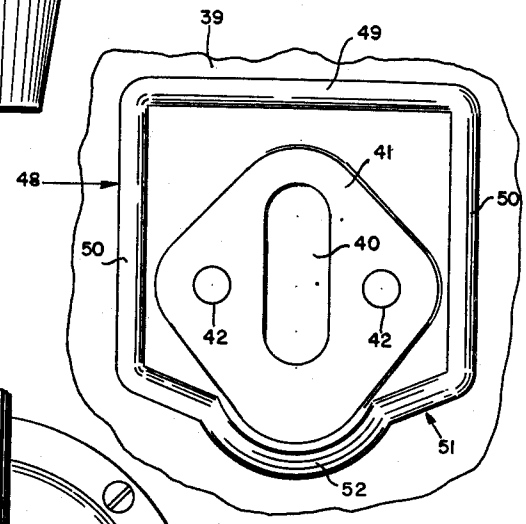


FIG. 7

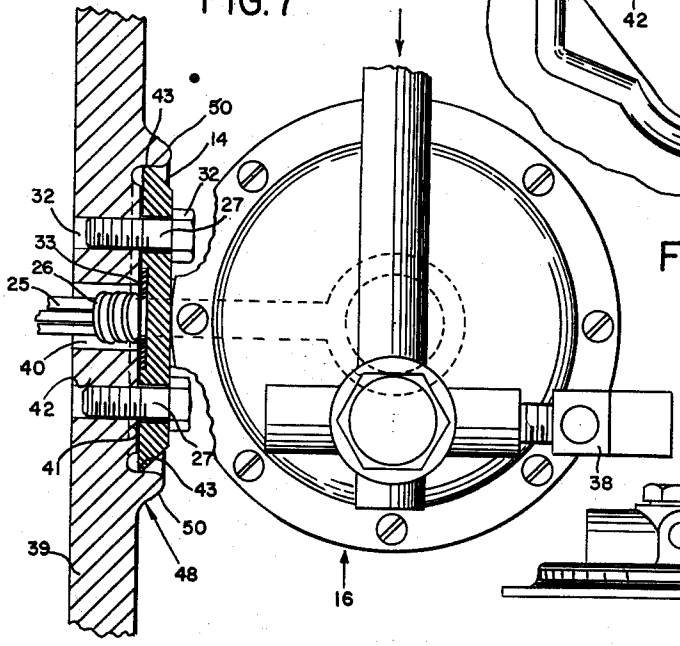
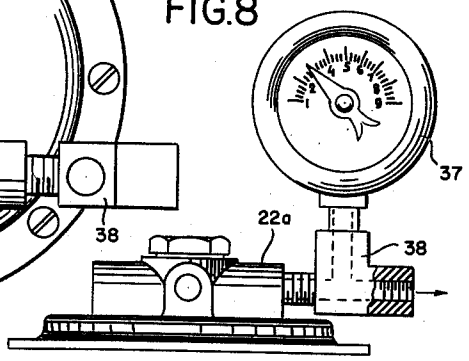


FIG. 8



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FUEL PUMP ADJUSTERS

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Original application Feb. 11, 1960, Ser. No. 8,007, now Patent No. 3,027,847, dated Apr. 3, 1962. Divided and this application Apr. 3, 1961, Ser. No. 112,142
5 Claims. (Cl. 103—150)

This application is a division of Serial No. 8,007, filed February 11, 1960, now Patent No. 3,027,847, granted April 3, 1962.

This invention relates to fuel pumps for internal combustion engines, particularly to fuel pumps such as are used in automobiles and trucks, and the primary object is the provision of certain new and useful improvements in fuel pumps of standard construction whereby upon failure of the pump or upon noticeable or substantial loss of efficiency caused by wear upon the pump diaphragm or in the actuating mechanism or linkage thereof, the pump may be quickly and easily restored to efficient operation.

Our United States Patent No. 2,764,942, dated October 2, 1956, discloses adjustable means for restoring a weakened fuel pump, wherein the diaphragm has lost its original flexibility owing to wear, to efficient working condition. The present invention embodies useful and practical improvements over the invention as disclosed in the said patent, whereby both the installation and the operability of the adjustable fuel pump are greatly simplified, with the elimination for the need of any special type or form of threaded bolts.

The above broad as well as additional and more specific objects will be clarified in the following description wherein reference numerals refer to like-numbered parts in the accompanying drawings. It is to be noted that the drawings are intended primarily for the purpose of illustration and that it is therefore neither desired nor intended to limit the invention necessarily to any or all of the exact details shown or described except insofar as they may be deemed essential to the invention.

Referring briefly to the drawings, FIG. 1 is a side elevational view, with parts broken away and partly in section, of a complete standard fuel pump for an automotive internal combustion engine, embodying the improvements provided by the present invention.

FIG. 2 is a sectional view taken on the line 2—2 of FIG. 1.

FIG. 3 is a sectional view taken on the line 3—3 of FIG. 4, with the pump housing flange and the screw bolts omitted.

FIG. 4 is a sectional view taken on the line 4—4 of FIG. 2.

FIG. 5 is a side elevational view of a modified form of the invention wherein the fuel pump housing is mounted directly against the motor casting, with parts broken away and partly in section.

FIG. 6 is a view of the motor casting to which the fuel pump housing is attached, per se, taken on the line 6—6 of FIG. 5.

FIG. 7 is in part a plan view of FIG. 5 and in part a horizontal section taken through the motor casting and the screw bolts for attaching the pump housing thereto.

FIG. 8 is a reduced side elevational view of the top portion of the pump housing of FIG. 5, including a pressure gage attached to the pump outlet, the addition of the gage also being applicable to the pump housing of FIG. 1.

Referring in detail to the drawings, the numeral 10 indicates the standard housing in some types of fuel pumps, which encloses the cam-actuated rod 11 operated by the engine in the well known manner. This housing is provided with the usual vertical flange 12 having two

horizontally spaced threaded holes 13 therethrough, so that by means of threaded bolts passed therethrough the flange of the pump housing may be attached to the flange 12. In place of the standard or usual pump housing flange, the instant invention utilizes a vertically elongated flange 14 having, preferably, a straight horizontal top edge 15.

The flange 14 is integral in a casting with the pump housing 16 which, except for the flange 14 is of standard construction. This housing includes the essential operating parts or members such as the diaphragm 17, the diaphragm stem 18, the spring 19 which surrounds the stem between the diaphragm and the base 20 of the compartment below the diaphragm. Above the diaphragm the housing 16 provides the fuel chamber enclosed by the housing top portion 21, and the usual fuel inlet is provided at 22 and the outlet at 22*a*. The stem 18, which is slidable through an opening in the base 20, has an opening in its lower end in which a hook 23 on the rocker arm 24 engages to reciprocate the stem vertically in response to the vertical reciprocation of the cam-actuated rod 11. The other end of the rocker arm is provided with a cap 25 adapted to have the rod 11 register therein for actuation of the pump, the spring 26 serving to urge the cap down upon the rod. All of this mechanism or linkage, except for the rod 11, is integral with the pump housing 16, or, rather, is all operatively mounted within the pump housing at the factory, as standard equipment.

The flange 14 is provided with two horizontally spaced longitudinal or, normally, vertical slots 27, having a width equal to the diameter of the holes 13 and alignable therewith.

An adapter plate 28 of substantially the same dimensions as the flange 14, is provided for the purpose made clear below. The opposed longitudinal edges 29 of the flange 14 are beveled, as is clear in FIG. 4. The plate 28 has both its longitudinal edges 30 doubled back at an angle equal to the angle of the bevels 29, and the plate is mounted against the flange 14 with the latter snugly slidable therein in, preferably, frictional engagement with the edges or flanges 30 of the plate. The plate is provided, at a suitable distance from its bottom edge, with holes 31 of the same diameter as the holes 13 and at the same distance apart. The flange 14 is attached to the flange 12, with the adapter plate 28 between the two and mounted on the flange 14 as described above, by means of screw bolts 32 passing through the flange 14, through the plate, and through the flange 12, with the holes 13, the holes 31, and the slots 27 all in alignment.

It is apparent that, since the plate 28 contains holes, 31, which are always aligned with the holes 13 in the flange 12, after installation the plate is not movable with respect to the flange 12. Owing to the slots 27 in the flange 14, however, the latter is vertically movable with respect to the flange 12. When it is necessary to lower the pump housing 16 with respect to the flange 12 after wear of the diaphragm and, generally, also of the pivots or other working parts of the mechanism between the rod 11 and the diaphragm, in order to tighten the pivots and the diaphragm to restore normal efficient operation of the pump, the pump housing is repositioned at a lower level in a simple manner. The bolts are loosened and the flange 14 is slid down a short distance, perhaps one-sixteenth of an inch, and the bolts are again tightened. Since the plate 28 is immovable with respect to the flange 12, and since the plate is also immovable with respect to the flange 14 in all directions except the vertical because the side flanges 30 provide vertical guide members which restrict the flange 14 to vertical movement, it is apparent that in its new position the diaphragm will remain untilted or twisted with respect to the rocker arm 24. In other words, it is impossible for the pump housing to be

twisted out of its proper position with respect to the housing **10** or any of the actuating mechanism of the pump during movement to, or in, its new position.

Another advantageous result of the novel improved structure recited above, is that the original assembling of the pump unit including both housings **10** and **16** is substantially simplified. When the bolts **32** are about to be tightened, the pump housing **16** is urged upward to its highest possible position as the original setting thereof, and all guessing or juggling of the housings, one with respect to the other, is eliminated by having the bolts engage, or having the housing **16** stopped in its upward movement of the bolts with, the bases of the slots.

In order to avoid the escape of air or fluid past the passage through the two flanges and the plate **28**, through which the rocker arm **24** and its associated parts extend, a countersink surrounding the passage through the flange **14** is provided, which is filled with a gasket **33**. These aligned passages through the flanges and the plate are indicated at **34** for the flange **14**, at **35** for the plate **28**, and at **36** for the flange **12**. Defining these passages as "aligned" obviously refers to their providing a continuous passage and does not imply that the surrounding edges of the three passages are or need be aligned.

The plate **28** including its side flanges **30** is preferably made of sheet metal for strength as well as for a degree of resiliency in the flanges **30** so that the flange **14** is firmly yet slidably held against the plate.

When a fuel pump loses its efficacy owing to long wear, say, for example, after twenty-five thousand miles, the pressure at the outlet of the fuel pump drops from an original pressure of, say, four pounds to a considerably smaller pressure. In order that the user may at all times be able to check this pressure, it is intended to install a pressure gage **37** in the outlet flow line through the provision of a tap connection **38**. Also, after the pump has been repositioned downward, its pressure can be read on the gage, and it can be moved downward until the pressure again reads that which it originally read.

It is the practice among some manufacturers of automotive vehicles to dispense with a separate housing of the type shown at **10**, external of the motor block or casting, to house the cam-actuated rod **11** or its equivalent, and instead to mount the latter within the motor block. Such type of installation is indicated in FIGS. 5, 6 and 7, wherein the motor casting is shown at **39**, and wherein a vertical relatively wide opening or slot **40**, equivalent to the passage **36**, FIGS. 2 and 4, is provided in the casting, surrounded by a raised generally diamond-shaped boss **41** similar to the flat surface of the flange **12**, FIGS. 1 and 2. Also, two horizontally spaced threaded holes **42** are drilled through the boss **41** and the casting, equivalent to the holes **13**, FIG. 3. The cam actuated rod equivalent to the rod **11**, FIG. 1, not shown in FIGS. 5, 6 and 7, is positioned with respect to the opening **40** in the same manner as the rod **11** is positioned with respect to the opening **36**. It is thus obvious that a standard fuel pump housing, or a housing such as the housing **16**, is readily attachable to the boss **41** by means of screw bolts **12**, with the protruding end **25***a* of the rocker arm **24** engaged and actuated by the rod **11**.

It is to be noted that the plate **28** has the same contour as the flange **14** of the improved pump housing **16**. The shape of the flange **14** is approximately rectangular, having the top edge **15**, the vertical side edges **43**, and the bottom edge **44**. The latter edge is composed of the two downwardly extending converging edge portions **45** which, at points equally spaced from the side edges **43**, meet and blend with a downwardly extending curved portion **47** of the flange, outlined by the curved edge **46**.

Cast integral with the motor block **39**, surrounding the boss **41**, is an embossed or raised ridge in the form of an open or unobstructed frame **48**, similar in outline to that of the flange **14**. The frame **48** consists of the top member **49**, the side members **50**, and the bottom edge **51**. The central curved portion **52** of the bottom edge **51** of the frame is complementary to the corresponding portion **47** of the flange **14**, and the side edges **50** are complementary to the sidge edges **43** of the flange **14**, or, in other words, the flange **14** is registrable within the frame **48** with the bottom portion **47** in engagement with the inner wall of the frame portion **52**. In FIGS. 6 and 7 the opposed inner walls of the frame members are all shown at right angles to the motor block wall. The overall length or height of the flange **14** is less than the overall length or height of the frame **48**; this is indicated in FIG. 5, showing the space between the top edge **15** of the flange **14** and the top frame member **49**. As shown in FIG. 7, the flange **14** has its side edges **43** registering against the side members **50** of the frame. This registration is relatively snug but sufficiently loose to permit of sliding the flange **14** up or down within the frame; the side members **50** of the frame prevent wobbling of the flange while permitting up or down movement thereof. The same bolts **32** serve to secure the housing **16** to the motor block.

By an "open" or "unobstructed" frame is meant a frame consisting solely of the raised ridges which define the frame so that an object such as the pump flange may be inserted into the frame by moving it in a direction at right angles to the motor block wall. And when considering the two side members **50** alone, it is obvious that the space between them is unobstructed. If these side members had their opposed inner walls undercut or beveled to slope at an acute angle to the wall in a direction toward each other, or if they had internal flanges thereon, the pump flange could not be inserted between the side members to nest snugly therebetween.

When a new pump is installed in a new or an old vehicle, the flange **14**, in the case illustrated, is positioned within the frame with the edge **15** thereof in contact with the frame member **49**; this is the original or starting position for a new pump. After the pump has deteriorated in efficiency through prolonged use and wear, the diaphragm and all of the associated functioning parts of the pump are restored to high efficiency by loosening the bolts **32**, lowering the entire pump housing **16** by sliding the flange **14** downward a short distance, and re-tightening the bolts, as before described. The outlet fuel pressure may, as before, be tested on the gage **37**, and further adjustment downward of the housing may be made until the desired increased pressure is obtained.

Among those manufacturers who attach the fuel pump housing directly to the motor block, there are some who mount the pump in a position which is upside down compared to that illustrated in the accompanying drawings. In such motor castings the frame **48** would likewise be positioned upside down compared with its position illustrated in FIG. 6, but the positioning of the pump housing with respect to the frame would be unaltered; that is, the starting or original position of the new pump would again be such that the edge **15** of the flange **14** contacts the member **49** of the frame.

As stated above, the flange **14** is insertible into the enclosure of the frame **48** directly by moving the flange at right angles to the plane of the frame. Thus, together with the fact that for its original position the flange is moved to engage its top edge **15** with the frame member **49**, it is obviously very easy to install the pump and there is no guess work involved in securing it in its proper original position.

Obviously the frame **48** need not be made as a continuous endless ridge, as illustrated, for portions thereof which are not essential to provide the guide means required for proper functioning of the adjustable pump as set forth above, may be broken away or omitted.

Also, it is not essential for all purposes that the exact configuration of the frame **48**, the flange **14**, or the plate **28**, FIG. 3, all have the configurations shown, except that

in all cases the opposed longitudinal sides or members must be parallel and, in use, vertical.

In the operation of thus changing the position of the fuel pump with respect to the actuating rod **11**, all wear between operating parts of the mechanism is also taken up, and tightened, in addition to stretching the diaphragm.

In the case of some fuel pumps, instead of having an actuating rod such as that shown at **11**, upon the top of which the end **25***a* of the rocker arm **24** is secured or mounted, the end **25***a* of the rocker is actuated by an arm or rod in horizontal position engaging the end **25***a* from above or below. In such cases the essential features of the improved fuel pump adjuster, or the adjustable fuel pump, remain unaltered.

The boss **41**, FIG. 6, is obviously the equivalent of, and serves the same purpose as, the flange **12** of the housing **10**. Therefore, for all practical purposes, the housing **10** may be considered as a portion of the motor block, not shown, to which it is attached; it is customary in installing fuel pumps in such cases by first securing the housing **10** to the motor block, and then attaching the pump housing thereto with the rocker arm cap **25** positioned on the rod **11**.

A further safety feature of the present invention is to be noted. That is, that if a bolt **32** should happen to loosen, or even if both bolts **32** should become loose to some extent, the diaphragm housing **16** is restrained from twisting or rotational movement by the flanged plate. FIGS. 1–4, or by the enclosure frame **48**, FIGS. 5–7.

The invention having thus been described, what is claimed and desired to be secured by Letters Patent, is as follows:

1. In a fuel pump structure for an internal combustion engine having a vertical wall provided with two horizontally spaced threaded holes therein and a passage therethrough positioned intermediate said holes, a fuel pump housing having a horizontal diaphragm therein, a vertically movable rocker arm and means connecting one end of the rocker arm with the diaphragm for reciprocating the diaphragm upon rocking of the rocker arm, an engine-cam-operated member positioned in the engine adjacent the said passage and operatively engaging the other end of said rocker arm to rock the rocker arm, a flange on one end of the pump housing at right angles to said diaphragm having two horizontally spaced vertical slots therethrough and a passage therethrough intermediate the slots, the slots having a width equal to the diameter of said holes, the distance between said slots being equal to the distance between said holes, said flange being adapted to be slidably mounted on said wall with said holes aligned with said slots and said passages mutually aligned at least in part and adapted to have screw bolts extending through said slots and threaded into said holes to secure the pump housing to said wall, said flange having vertical side edges, the improvement consisting in the provision on said wall of guide means for said flange in the form of at least two spaced vertical ridges projecting outward therefrom at right angles thereto and having the space between said ridges unobstructed, the opposed inner edges of said ridges being spaced apart at a distance equal to the width of said flange and being spaced equidistant from said first-named passage, said flange thereby being insertable into position against said wall between said ridges by moving the flange in a direction at right angles to the wall.

2. The device set forth in claim 1, said wall having an additional raised portion projecting outward therefrom at right angles thereto and positioned between said two vertical ridges, said flange having top and bottom edges said additional raised portion being additionally positioned in the path of slidable movement of said flange in one direction and providing a limit stop to the slidable movement of the flange in said direction.

3. The device set forth in claim 2, said wall having a fourth raised portion thereon at right angles thereto between said vertical ridges spaced from said additional raised portion a distance greater than the distance between the top and bottom edges of said flange providing a limit stop to the slidable movement of said flange in the opposite direction.

4. In a fuel pump structure for an internal combustion engine having a substantially upright wall provided with two horizontally spaced threaded holes therein and a passage therethrough positioned intermediate said holes, a fuel pump housing having a substantially horizontal diaphragm therein, a vertically movable rocker arm and means connecting one end of the rocker arm with the diaphragm for reciprocating the diaphragm upon rocking of the rocker arm, an engine-cam-operated member positioned in the engine adjacent said passage and operatively engaging the other end of said rocker arm to rock the rocker arm, a substantially upright flange on one end of the pump housing having longitudinal side edges lying in parallel planes at right angles to the flange and having two horizontally spaced longitudinal slots therethrough parallel to said side edges and a passage therethrough intermediate the slots, the slots having a width equal to the diameter of said holes, the distance between said slots being equal to the distance between said holes, said flange being adapted to be slidably mounted on said wall with said holes aligned with the slots and with said passages mutually aligned at least in part adapted to have screw bolts extending through said slots and threaded into said holes to secure the pump housing to said wall, the improvement consisting in the provision of guide means for said flange on said wall in the form of at least two spaced ridges lying in parallel planes at right angles to said wall, the opposed inner surfaces of said ridges extending at right angles to said wall and being spaced apart at a distance equal to the width of said flange and being spaced equidistantly from said first-named passage and having the space between said ridges unobstructed, whence, said flange thereby being insertable into position against said wall between said ridges by moving the flange in a direction at right angles to said wall, said flange when secured to the wall by said screw bolts nesting between said ridges and being constrained from rotational movement in the plane of the flange.

5. In a fuel pump structure for an internal combustion engine having a substantially upright wall provided with two horizontally spaced threaded holes therein and a passage therethrough positioned intermediate said holes, a fuel pump housing having a substantially horizontal diaphragm therein, a vertically movable rocker arm and means connecting one end of the rocker arm with the diaphragm for reciprocating the diaphragm upon rocking of the rocker arm, an engine-cam-operated member positioned in the engine adjacent said passage and operatively engaging the other end of said rocker arm to rock the rocker arm, a substantially upright flange on one end of the pump housing having longitudinal side edges lying in parallel vertical planes at right angles to the flange and having two horizontally spaced longitudinal slots therethrough parallel to said side edges and a passage therethrough intermediate the slots, the slots having a width equal to the diameter of said holes, the distance between said slots being equal to the distance between said holes, said flange being adapted to be slidably mounted on said wall with said holes aligned with the slots and with said passages mutually aligned at least in part and adapted to have screw bolts extending through said slots and threaded into said holes to secure the pump housing to said wall, said flange having top and bottom edges, the improvement consisting in the provision of guide means for said flange on said wall in the form of a substantially rectangular unobstructed frame formed integral with the wall and extending outward therefrom at right angles thereto, said frame including side members lying in parallel planes at right angles to said wall and having the opposed inner edges thereof spaced apart at a distance equal

to the width of said flange, said frame further including top and bottom members spaced apart at a distance greater than the distance between said top and bottom edges of the flange, said flange thereby being insertable into position against said wall within the confines of the frame by moving the flange in a direction at right angles to said wall, said flange when secured to the wall by said screws nesting between said ridges and being constrained from rotational movement in the plane of the flange while being vertically adjustable between said top and bottom members of the frame upon loosening of said screws.

References Cited in the file of this patent

UNITED STATES PATENTS

360,779	Moss	Apr. 5, 1887
655,298	Dressel	Aug. 7, 1900
656,956	Eibee	Aug. 28, 1900
823,346	Maxwell	June 12, 1906
1,881,939	Purdy	Oct. 11, 1932
2,195,013	Rastetter et al.	Mar. 26, 1940
2,357,755	Moll	Sept. 5, 1944
2,480,438	Bergman et al.	Aug. 30, 1949
2,496,688	Armstrong	Feb. 7, 1950
2,764,942	Guarnaschelli et al.	Oct. 2, 1956