June 1, 1965 D. R. COMPTON ETAL 3,186,349

FUEL PUMP

Filed July 13, 1962 2 Sheets-Sheet 1

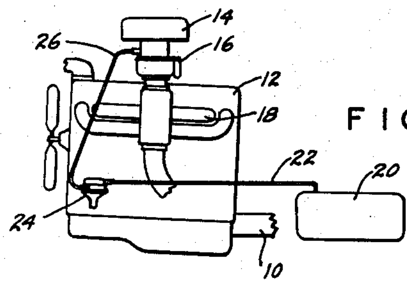

FIG. 1.

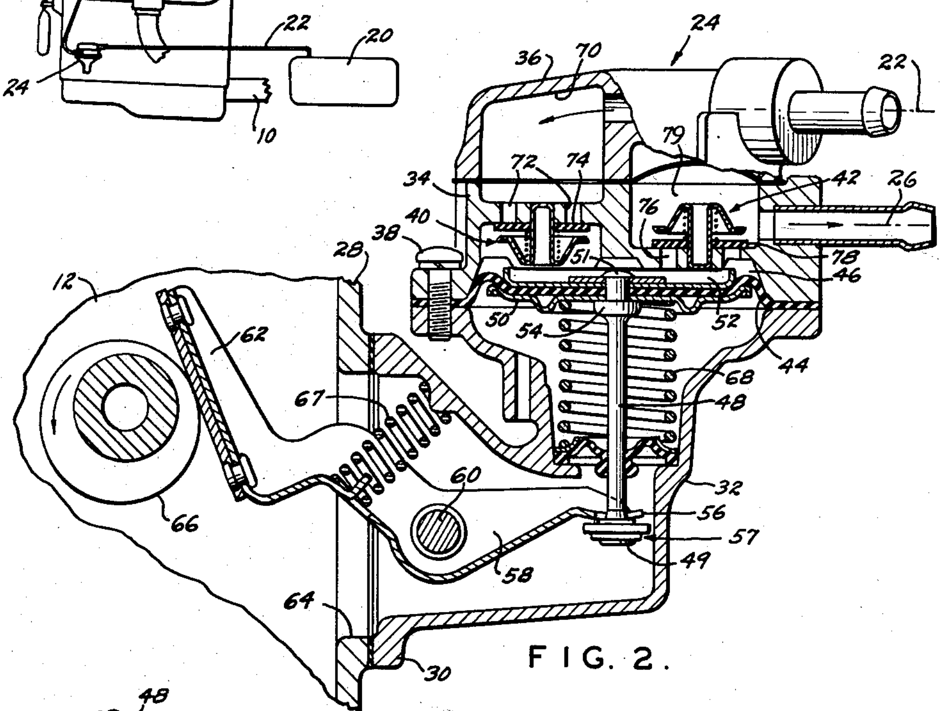

FIG. 2.

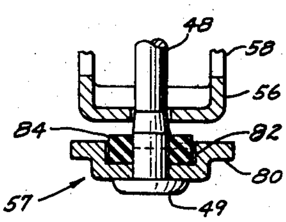

FIG. 3.

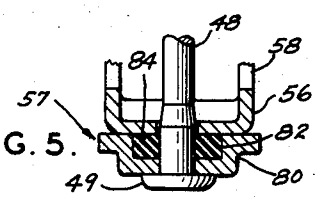

FIG. 5.

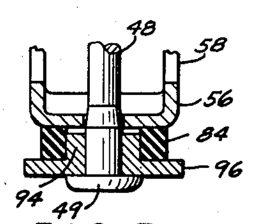

FIG. 7.

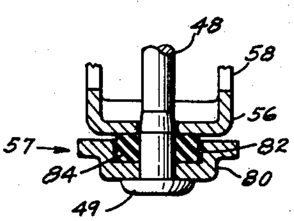

FIG. 4.

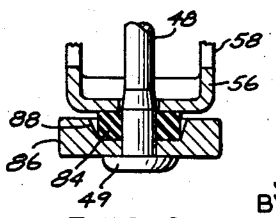

FIG. 6.

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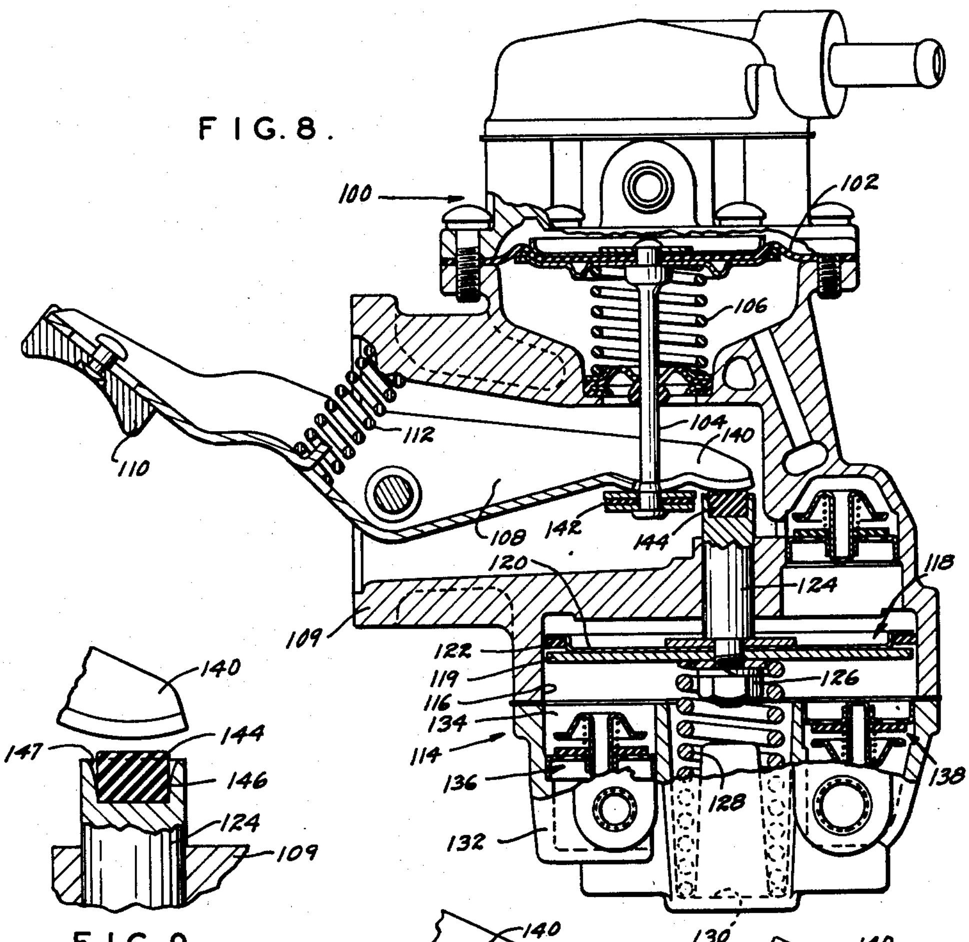

FIG. 8.

FIG. 9.

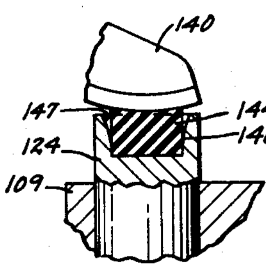

FIG. 10.

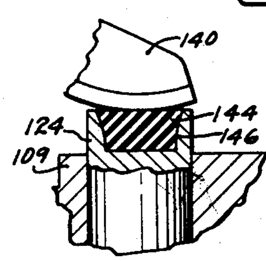

FIG. 11.

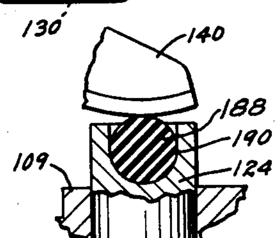

FIG. 12.

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FUEL PUMP

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Filed July 13, 1962, Ser. No. 210,611
7 Claims. (Cl. 103—150)

This invention is directed to automotive pumps and particularly to pumps used in automotive devices for pumping fuel or providing a vacuum source or both.

Automotive vehicles may utilize a mechanical fuel pump for providing a flow of fuel from the fuel tank to the carburetor of the automotive vehicle engine. Such mechanical pumps consist of a reciprocable member mounted in the pump housing and having one end in contact with an engine driven cam eccentric, the other end of the reciprocable member having a lost motion connection to the fuel pump rod for actuating the diaphragm of the fuel pump. The pump diaphragm provides a movable wall for the pumping chamber which is connected to the fuel tank by an inlet passage through the pump housing and to the carburetor by an outlet passage through the pump housing. The diaphragm is moved in a suction stroke by the reciprocable member for sucking fuel into the pump chamber. Simultaneously a spring is loaded in a manner such that when the reciprocable member moves in the opposite direction, the lost motion connection to the diaphragm rod disconnects it from the diaphragm and the spring biases the diaphragm in a pumping stroke to force fuel from the pumping chamber into the outlet passage of the pump.

Pumps of this type are operated by the reciprocable member during the intake stroke only and are operated in the pumping stroke by the biasing spring. The lost motion connection between the reciprocable member and the diaphragm rod is such that if the spring fails to bias the diaphragm in the pumping direction because of build-up of pressure in the outlet fuel line, the reciprocable member is free to oscillate back and forth with little or no operative contact with the diaphragm rod. Such a condition occurs when the engine is idling and the flow of fuel through the pump into the carburetor is at a minimum. Under these conditions the biasing spring slowly moves the pump diaphragm in the pumping motion to displace the fuel as it is used by the engine. However, as the reciprocable member oscillates back and forth, the pump rod moves into the path of the reciprocable member and is struck on each reciprocation by the reciprocable member. The contact of the reciprocable member with the pump rod provides a considerable slap which is very audible during idle conditions with low background noise. Furthermore, when the engine is idling, the pump rod is repetitiously struck by the reciprocating member when the pump diaphragm is moved to its fullest extent near or after the intake stroke and when the diaphragm is stretched and somewhat taut. Because of this situation, the slapping of the reciprocating member against the diaphragm rod produces a second drum noise effect on the taut diaphragm. Both the slapping and drum noise effects produce, during idle conditions, an unwanted amount of noise of the engine.

A second type of automotive pump used in some automotive vehicles utilizing vacuum operated accessories is a booster pump for providing an additional source of vacuum other than that provided by the intake manifold. This vacuum is utilized to operate vacuum operated accessories such as windshield wipers and windshield washer devices when the manifold vacuum is low and insufficient for effective operation of the vacuum accessories. Such booster pumps may be complete within themselves or, as is often the case, may be combined for operation with the automotive fuel pump, such that the booster pump piston and the fuel pump diaphragm may be operated from a single reciprocating lever or push rod. However, in such vacuum pump devices, there are times during idle or low speed operation of the engine when there is no utilization of the vacuum accessory. At such times the piston of the booster pump is held by manifold vacuum in an extreme position and substantially out of operative contact with the reciprocating driving member. However, the piston rod is never completely out of contact with the reciprocating member and because of a lost motion connection between the piston rod and the reciprocating member, the piston rod is only contacted by the reciprocating member at the end of its stroke. This contact provides a slapping noise similar to that present in the fuel pump operation. Similarly, the booster pump piston consisting normally of a thin metallic sheet provides a drumming or drum-noise effect when the piston rod is struck by the reciprocating member.

Because of the noise effect produced by the character of the pump designs described above, it is the object of this invention to produce means for eliminating such unwanted noise effects.

It is another object of this invention to provide a noise dampening means in automotive pumps which reduces the noise produced by the contact made between the pump driving member and the driven parts of the pump.

It is a further object of the invention to provide a noise suppressor means to eliminate noises provided by the slapping of reciprocating parts together as well as those produced by a drum effect due to the design of the pump parts.

It is a further object of the invention to provide a noise suppressor means for eliminating unwanted noises during low speed operation of automotive pumps.

The invention is in the use of a resilient bumper between the reciprocating driving means of an automotive pump and the driven pump rod such that the noise produced between the two is dampened. The resilient block is retained in a recess in which additional space is provided into which the resilient member is compressed and hard steel portions of the driving and driven members make contact to provide the full driving force for the pump. This result is established by providing a recess which encloses a large major part of the resilient member. The unenclosed portion of the resilient member provides a dampening means upon first contact of the driving member with the driven member. This absorbs the slapping noise between the two members. However, as greater force is applied the driving and driven members to load the pumping spring, the resilient member is compressed into the recess until steel surfaces of the driving member contact a hardened steel surface of the driven member to provide a solid positive connection between the two members, which eliminates wear to the resilient member.

FIGURE 1 is a schematic view of a vehicle having an engine utilizing a pump, in accordance with the invention.

FIGURE 2 is a sectional view in elevation of a fuel pump mounted on the crankcase of the engine of FIGURE 1 and incorporating the invention.

FIGURES 3, 4 and 5 are enlarged sectional views of the fuel pump rod in accordance with the invention.

FIGURES 6 and 7 are sectional views of modifications of the invention.

FIGURE 8 is a partial sectional view in elevation of a piston booster pump utilizing the invention.

FIGURES 9, 10 and 11 are sectional views of a portion of the piston rod and actuating lever of the pump of FIGURE 8 in different positions of operation.

FIGURE 12 is a view showing a modification of the invention of FIGURES 9 through 11.

FIGURE 1 schematically represents a vehicle 10 having mounted therein an engine 12 for providing automotive power to the vehicle. The engine 12 is of any well known design having an air filter 14 mounted on a carburetor 16, which in turn is mounted with its outlet connected to an intake manifold 18. Fuel is delivered to the carburetor 16 of the engine from a fuel tank 20 through a fuel line 22 by means of a fuel pump 24, whose outlet line 26 is connected to the inlet of the carburetor 16.

The invention is directed to the fuel pump 24, shown in FIGURE 1 and specifically in FIGURES 2 through 5. The pump 24, as shown in FIGURE 2, is mounted on the crankcase 28 of the engine 12. The mounting of the pump to the crankcase may be in any manner, such as by threaded studs extending from the crankcase 28 through the flange portion 30 of the pump. The pump consists of a lever and spring housing 32, to which is connected a valve housing structure 34, to the top of which is fixed an inlet housing 36. The housing portions 32, 34 and 36 are fixed to each other by machine screws, such as indicated at 38. The valve housing 34 consists of a cup-shaped structure in which is positioned a downwardly facing inlet valve 40 and an upwardly facing outlet valve 42. A pump diaphragm 44 is fixed around its periphery between flange portions of housings 34 and 32, respectively. The machine screws 38 are applied sufficiently tight as to press the peripheral edge of diaphragm 44 between the housing flanges with a force to form a fuel-tight seal. Diaphragm 44 forms with the bottom of the cup housing 34 a pumping chamber 46. To actuate the diaphragm 44 in its pumping function, there is fixed to the diaphragm a pump rod 48. The center portion of pump diaphragm 44 is held between a pair of metal plates 50 and 52, respectively, which are forced together between the spun-over end 51 of rod 48 and a shoulder portion 54 of the pump rod.

The other or lower end 49 of rod 48, as viewed in FIGURE 2, is positioned between the tines of a forked end 56 of a pump lever or rocker arm 58, which is pivotally mounted for rotational movement on a pivot pin 60 mounted in the housing 32. A bumper assembly 57 embodying the invention is fixed to rod end 49. The other end 62 of lever 58 extends through an aperture 64 in the crankcase wall and into contact with an engine driven eccentric cam 66. A spring 67 between a portion of housing 32 and a central portion of pump lever 58 biases the lever 58 against the surface of cam 66.

The forked end 56 of rod 58 provides a lost motion connection between the pump rod 48 and lever 58. The diaphragm assembly and rod 48 is biased upwardly, as shown in FIGURE 1, toward the bottom of the cup housing 34. Rotation of the eccentric cam 66 in a counterclockwise direction will cause the pump lever 58 to undergo an oscillating or reciprocating movement. The pump spring 68 will be loaded or compressed when the forked end 56 of lever 58 strikes the bumper assembly 57 as viewed in FIGURE 2 to move the pump rod and diaphragm downwardly in a suction stroke. As the pump lever 58 rotates counterclockwise due to the bias of lever spring 67, the pump spring 68 causes the bumper assembly 57 to follow the forked end 56 of lever 58, and the pump spring 68 moves the diaphragm in a pumping stroke.

As the diaphragm 44 is moved up and down, as viewed in FIGURE 2, toward and away from the bottom of the cup housing 34, a pumping action takes place such that fuel is sucked from inlet line 22 into an inlet chamber 70 in the inlet housing 36. Fuel from chamber 70 is forced through apertures 72 in the bottom of the cup housing 34, past the inlet valve washer 74 into the pumping chamber 46. Upon the upward movement of diaphragm 44, as viewed in FIGURE 2, under the bias of pump spring 68, the fuel in chamber 46 is forced through apertures 76 through the bottom of the cup housing 34 past the outlet valve washer 78 and into an outlet chamber 79, from which the fuel is forced through the outlet line 26 into the fuel bowl of carburetor 16.

In pumps of the type described in FIGURES 1 and 2, there is a problem of noise during low engine and idling speeds. One source of the noise is the contact between the forked end 56 of lever 58 and the bumper assembly 57 of the pump rod 48. During idle and low speed operations of the engine, the fuel demands of the engine 12 are small and accordingly the fuel flow through the outlet line 26 to the carburetor is at a minimum. However, the reciprocating lever 58 and the driving cam 66 continue to operate, but because of the small fuel flow from chamber 46, the diaphragm 44 and rod 48 will not closely follow the movement of the forked end 56. Because of its lost motion connection the forked end of lever 58 will leave the bumper assembly and move independently of the rod 48. On each oscillation of lever 58 in a clockwise direction as viewed in FIGURE 2, the forked end 56 of lever 58 will meet the bumper assembly 57 of rod 48 traveling upwardly and produce a bumping noise. A further noise source is also created at this time during small fuel consumption and low engine speed. When the forked end 56 of lever 58 strikes the bumper assembly 57, the diaphragm 44 is in its downward extended position. In this position, the diaphragm is stretched and the striking of lever end 56 against the bumper 57 is transmitted to the diaphragm to produce a dull drumming noise which is as objectionable as the bumping noise between the lever end 56 and the bumper assembly 57.

The provision of a resilient bumper between the driving member and the driven member is not sufficient. The driving reciprocating member is one which, through the pump rod, must load a spring which may require a force up to 40 pounds. In some booster pumps, however, where both the booster piston and the fuel pump diaphragm springs are loaded simultaneously, the total force required may be up close to 100 pounds. This force exerted on a resilient bumper quickly reduces the life of the bumper since the elastic limits of such resilient materials as rubber or suitable plastics are exceeded. Furthermore, the travel of the fuel pump diaphragm for the booster pump piston is rather critical, as it is necessary that the amount of compression of the resilient member be the same from pump to pump so that the full intake stroke of each pump can be realized to obtain optimum pumping efficiency. However, with the known rubbers and plastics which lend themselves to this use, the resiliency and compression of these materials is not constant.

Accordingly, there is a need to provide between the driving and driven members of an automotive pump, a means which will provide a noise dampener, which can withstand the high forces required for the pumping action and also provide a full displacement of the pumping member during the intake stroke.

One well known bumper assembly which has been used consists of a resilient rubber washer placed between a pair of phenolic washers, in which the rubber washer is used to absorb the impact of the lever end 56 striking the bumper assembly. The phenolic washers provide a wear life and resistance to the force exerted between the lever 58 and the bumper assembly. Over a period of time, this type of bumper assembly has not been completely satisfactory. The demands on such a bumper assembly is enormous, when it is considered that the lever end 56 strikes the bumper assembly millions of times during the life of the fuel pump. An assembly as described provides a fair amount of life and wear but does not solve the noise problem nor that of extended life.

In accordance with the invention then there is shown in FIGURES 3, 4 and 5 a bumper assembly which meets the requirements for successful operation. This novel bumper assembly consists of a hardened steel cup-shaped washer 80 tightly press-fitted onto the end of the pump rod 48 and in abutment with the rod end 49 which is in the form of a nail head. The washer 80, as shown in FIGURE 3, has a cupped central portion 82, into which there is positioned a fuel and oil resistant rubber washer or block 84. The washer 84 is also tightly pressed onto the end of rod 48 and held in position by this resilient press-fit. The outside diameter of the resilient washer 84 is slightly less than the inside diameter of cup 82 of the washer 80. In fact, in one operative bumper assembly of the type described, the difference between the diameters is in the order of 0.025". Also, the resilient washer 84 has a height slightly greater than the depth of cup 82 so that, as shown in FIGURE 3, the top surface of washer 84 extends above the top surface of the steel cup washer 80. In the operative pump model described above, the resilient washer 84 extends above the top surface of washer 80 by an amount in the order of 0.012". Washer 84 is made of a synthetic rubber material, such as neoprene which is resistant to any action of hydrocarbon fuels or oils and greases. Thus, it retains its dimensional shape during the operation of the pump.

In operation, the novel bumper assembly 57, shown in FIGURES 3, 4 and 5, is such that when the pump lever end 56 strikes the bumper assembly 57, it will strike the upper surface of the neoprene washer 84 first (FIGURE 4). During low speed or idle operation of the engine, when the lever end 56 continues to slap or bump the bumper assembly 57, the rubber washer will absorb any noise and prevent transmission of the contact to the diaphragm 44 to also eliminate the drum action noise. However, if pumping action is required by the diaphragm 44 and the rod 48 is to be moved against the bias of spring 68, the rubber washer 84 will be pressed by the additional force of lever end 56 into the cup recess 82 and the lever end 56 will contact the hard steel upper surface of washer 80 to transmit the required pumping force to the diaphragm 44, as represented in FIGURE 5. The spacing between washer 84 and the inner wall surface of the cup recess 82 provides space which permits the washer to expand as it is compressed by lever end 56.

At high speed operation of the engine and the fuel pump 24, the lever end 56 strikes the bumper assembly 57 often and with great force. At this time there is little chance for the rubber washer 84 to absorb all of the noise but because of the high speed operation of the engine, the noise level is great and the noise made by the lever 58 and bumper assembly 57 is lost. During operational speeds of the engine above low speed, fuel consumption is in amounts requiring a steady operation of the fuel pump. The steel surface of washer 80 take the greater amount of the force of lever 58 required to load spring 68. The compression of the rubber washer 84 into the cup recess 82 never extends the rubber beyond the elastic limit of the rubber material. Thus there is no fatiguing of the rubber which would cause it to harden and lose its resilience. Also, the full force of lever 58 is never applied to the rubber washer 84 which results in greater life for washer 84 than it would have if it did not have the protective recess 82.

FIGURE 6 discloses a modification in which the hard steel washer 86 has a different cross sectional configuration than that shown in FIGURES 3 through 5. The inner surface of the recess of washer 86 has a conical shape as indicated at 88, to provide space into which the resilient washer 84 can be compressed.

FIGURE 7 shows a further modification in which the resilient rubber washer 84 is mounted on a central stud 94 of a hard steel washer 96. In this modification there is no recess to confine the resilient washer 84 and it may expand freely. The stud 94 of washer 96 will make contact with the lever end 56 when the washer 84 has been compressed out of the way.

All of the modifications shown in FIGURES 3 through 7 are those in which the resilient washer provides at low speed operation of the engine, a noise absorbing cushion between the lever end 56 and the stem 48. The initial shock between these two parts of the pump is taken up by the resilient cushion and minimizes the objectionable noises experienced in pumps of this type as described. The invention also comprises means, such as the hard steel washers 80, 86, and 96, for applying required forces to the pump stem 48 without exposure of the resilient cushion to these forces. The resilient noise absorbing material is moved out of position and the greater forces for pump operation are directed onto the hard steel washers. This arrangement eliminates wear from the resilient cushion and provides long life. Furthermore, the resilient material is not stretched beyond its elastic limit and thus retains its resiliency over a greater period of life.

FIGURES 8 through 12 show the adaptation of the invention to a piston booster pump. FIGURE 8 shows the piston booster pump of a known design except for the novelty of the invention involved. The pump in FIGURE 8 is schematically shown and will be only briefly described to provide an understanding of the invention. The pump consists of a fuel pump portion indicated by the reference 100, which consists of a diaphragm 102 connected to a pump rod 104 and biased in a pumping direction by a pump spring 106. The operation of this fuel pump 100 is by means of a pump lever or rocker arm 108 and similar in operation to that of the fuel pump described in FIGURE 2. The actuating pump lever 108 is journaled in a housing 109 provided with a cam follower or shoe 110 at the end of the lever 108, which is adapted to extend into the engine crankcase. The shoe 110 is biased into contact with an engine driven cam by a lever spring 112 and in the manner described for the pump lever 58 of the structure of FIGURE 2.

The booster pump portion 114 is shown in FIGURE 8 as extending below the pump lever 108 and consists essentially of a piston cylinder 116 formed from an open recess in the lever housing 109 and in which there reciprocates a vacuum pump piston 118. Piston 118 consists of a metal plate 119, to which is fixed a second cup-shaped plate 120 having a peripheral flanged portion. Between the flange of plate 120 and the plate 119 there is positioned a resilient piston ring 122 forming a tight sliding fit with the inner wall of cylinder 116. An actuating piston rod 124 is attached at its lower threaded end, as viewed in FIGURE 8, by a nut and washer assembly 126 to the piston plates 120 and 119. A pump spring 128 is positioned between the adjacent surface of pump plate 119 and an inner cup formation 130 of a valve housing 132. The valve housing 132 and pump piston 118 provide between them and with cylinder 116 a vacuum pumping chamber 134. Within the housing 132 and leading into pumping chamber 134 is an inlet valve assembly 136 and an outlet valve assembly 138. In operation the engine driven eccentric cam provides clockwise and counterclockwise oscillation of the pump lever 108 in the manner described for the structure of FIGURE 2. The end 140 of pump lever 108 is bifurcated or forked so that it straddles the fuel pump rod 104. A bumper assembly 142 is positioned between the lever end 140 and the lower end of pump rod 104, as shown in FIGURE 8. The outer portion of lever end 140 abuts the upper end of piston rod 124 so as to actuate the piston 118 in its pumping operation. As viewed in FIGURE 8, the clockwise rotation of pump lever end 140 forces the fuel pump rod 104 and the piston rod 124 downwardly so as to load the fuel pump spring 106 and the booster pump spring 128. The bifurcated end 140 of lever 108 provides a lost motion connection between lever 108 and the rod 104. This permits the pump lever 108 to leave the bumper assembly 142 of rod 104 and permits the rod 104 and pump diaphragm 102 to independently follow the lever 108 under the bias of spring 106.

In a similar manner, the booster pump piston rod 124 is free to travel upwardly under the bias of spring 128 depending upon the conditions of operation of the booster pump. In operation, the booster pump is one which pumps air from a vacuum driven accessory of the vehicle when the accessory is placed in use. If, however, the accessory is not in use, there is no need for the action of the booster piston 118. The well known connection of such a booster pump into the vacuum system is such that the pumping chamber 134 is connected to the inlet manifold of the engine and is exposed to the vacuum conditions of the inlet manifold. During times when the vacuum operated accessory is not in use and there is no need for a pumping action of the booster pump, the manifold pressure in chamber 134 sucks the piston 118 downwardly against the bias of spring 128 and thus takes the piston rod 124 out of operative contact with the lever end 140. This, then, minimizes wear between the lever 140 and the end of rod 124. However, under most conditions of engine operation, spring 128 will bias the end of rod 124 into the path of lever end 140 at its furthest clockwise position and when the vacuum accessories are not in use. Thus, the lever end 140 will repeatedly contact the end of rod 124 at its extreme stroke. This provides again a slapping action of the lever end 140 against the end of rod 124, as well as a drum noise, since the contact between the lever and rod is transmitted to the piston plates 119 and 120. For these reasons, during idling and low speed operation, when the vacuum accessories are not in use, the booster pump section also provides unwanted slapping and drum noises.

In accordance with the invention then, a resilient block 144 is inserted within a recess 146 (FIGURE 9) in the upper end surface of the piston rod 124. The resilient rubber block 144 has a greater height than the depth of recess 146 so that the block 144 extends above the surface of the end of rod 124 and to an amount in the order of the dimension described above for block 84. The lower portion of recess 146 provides a tight fit around the lower portion of block 144 so as to retain the block within the end of piston rod 124. To provide space into which the block 144 may be compressed, the inner surface of recess 146 is flared outwardly at its upper portion and as indicated at 147. Thus, when the lever end 140 strikes the block 144, the noise of contact is deadened by the resilient block and as greater force is applied the rubber block 144 is compressed into the recess 146 and is allowed to occupy the flared space 147 of the recess. This is shown in FIGURE 11. At this point, the lever end 140 contacts the hardened steel upper surface of the rod 124 to provide a steel against steel contact. This allows the full force of the lever 108 to be applied against the rod without unduly compressing the rubber 144 which would otherwise be extended beyond its elastic limit with a resulting loss of life of the rubber. The use of the resilient block 144 in the upper end of piston 124 then eliminates the shock of first contact between the lever 140 and rod 124 and minimizes the slapping noise as well as the drum action of the contact on the piston plates 119 and 120. At high speed, however, where the action of lever arm 140 against the end of piston rod 124 is at a maximum, the engine noise level is so high that noise of this contact is lost or not critical.

FIGURE 12 shows a modification, in which the resilient washer or block is of a ball or spherical configuration, as indicated at 188. The recess 190 at the end of rod 124 is also spherical, but of a larger diameter than that of the spherical block 188 to allow space into which the resilient ball can be compressed. FIGURE 12 shows the ball 188 in recess 190 as the pump lever contacts the ball.

The invention as set forth above, provides a solid linkage between the reciprocable pump lever and the pump rod, when the resilient block is pressed out of the way. This results in a uniformity in pump stroke from pump to pump as the linkage depends on rigid metal structures which can be accurately reproduced and not on a resilient link of variable compressibility. This feature lends itself to mass production of fuel pumps, where an optimum length of pumping stroke can be maintained.

We claim:

1. An automotive pump comprising a housing including a pumping chamber, a movable element forming a wall of said pumping chamber, means forming inlet and outlet passages in fluid communication with said pumping chamber, check valve means in said passages, spring means biasing said movable element in one direction, and means for moving said movable element in an opposite direction against said spring means bias, said last means including a member mounted within said housing for reciprocable movement along a path, an actuating rod connected to said movable element and having a portion biased by said spring means into said path of said reciprocable member, a noise suppressor means fixed to said rod portion and including a mass of resilient plastic material between said rod portion and said reciprocable member to be compressed when said rod portion and said reciprocable member come together, and a generally rigid retainer for said resilient mass formed with a recess in which the resilient mass is seated with a portion of the mass extending from the recess when uncompressed, said recess having a volume greater than the volume of the portion of the resilient mass in the recess when uncompressed and being sufficient to receive the entire mass when compressed by the rod portion and said reciprocable member coming together, said retainer providing a solid connection between said rod portion and said reciprocable member when said resilient mass has been compressed within said recess.

2. An automotive pump comprising a housing including a pumping chamber, a movable element forming a wall of said pumping chamber, means forming inlet and outlet passages in fluid communication with said pumping chamber, check valve means in said passages, spring means biasing said movable element in one direction, and means for moving said movable element in an opposite direction against said spring means bias, said last means including a member mounted within said housing for reciprocable movement along a path, an actuating rod connected to said movable element and having an end biased by said spring means into said path of said reciprocable member to be driven thereby against said spring bias, a noise suppressor means including a block of resilient plastic material, a retainer fixed to said actuating rod end and mounting said resilient block between said rod end and said reciprocable member, said resilient block having a surface facing and extending into said path of said reciprocable member to be struck thereby when said rod end and said reciprocable member come together, said retainer having a circumferential portion spaced from said block surface in a direction away from said reciprocable member and along said path thereof, said circumferential portion extending about the outer periphery of said block with at least a portion of the circumferential portion spaced from the block in a lateral direction away from the longitudinal axis of said rod to provide a space into which said block is compressed when said rod end and said reciprocable member come together whereby said reciprocable member will strike said circumferential portion to drive said actuating rod upon compression of said block.

3. The invention of claim 2 wherein said retainer comprises a cup-shaped washer enclosing part of said resilient block and said retainer portion includes a flanged lip of said washer having a surface normal to said path of said reciprocable member to be struck thereby.

4. The invention of claim 1, wherein said retainer comprises the extremity of said rod end and said recess extends axially into said rod from the end surface of said rod end, said retainer portion includes said rod end surface, and said resilient block fitted within said recess with said resilient block surface extending beyond said rod end surface.

5. An automotive pump comprising a housing includ-

ing a pumping chamber, a movable element forming a wall of said pumping chamber, means forming inlet and outlet passages in fluid communication with said pumping chamber, check valve means in said passages, spring means biasing said movable element in one direction, and means for moving said movable element in an opposite direction against said spring means bias, said last means including a member mounted within said housing for reciprocable movement along a path, an actauting rod connected to said movable element and having an end biased by said spring means into said path of said reciprocable member to be driven thereby against said spring bias, a noise suppressor means including a block of resilient plastic material, a retainer fixed to said rod end and mounting said resilient block between said rod end and said reciprocable member, said resilient block having a surface normal to and extending into said path of said reciprocable member to be struck thereby when said rod end and said reciprocable member come together, said retainer having a circumferential portion with a hardened steel surface substantially parallel to said block surface and spaced therefrom in a direction away from said reciprocable member and along said path thereof, said circumferential portion extending about the outer periphery of said block with at least a part of the circumferential portion spaced from the block in a lateral direction away from the longitudinal axis of said rod to provide a space into which said block is compressed when said rod end and said reciprocable member come together whereby said reciprocable member will strike said circumferential portion to drive said actuating rod when said block is compressed.

6. An automotive pump comprising a housing including a pumping chamber, a movable element forming a wall of said pumping chamber, means forming inlet and outlet passages in fluid communication with said pumping chamber, check valve means in said passages, spring means biasing said movable element in one direction, and means for moving said movable element in an opposite direction against said spring means bias, said last means including a member mounted within said housing for reciprocable movement along a path, an actuating rod connected to said movable element and having an end biased by said spring means into said path of said reciprocable member to be driven thereby against said spring bias, a noise suppressor means including a block of resilient plastic material, a retainer fixed to said rod end and having a recess enclosing a part of said resilient block between said rod end and said reciprocable member, said retainer recess being larger than said enclosed block part, said resilient

block having a portion extending beyond said recess with a surface in the path of said reciprocable member to be struck thereby when said rod end and said reciprocable member come together, said retainer having a portion spaced from said block surface in a direction away from said reciprocable member and along said path thereof, whereby said reciprocating member will compress said resilient block into said recess and strike said retainer portion and drive said actuating rod.

7. An automotive pump comprising a housing including a pumping chamber, a movable element forming a wall of said pumping chamber, means forming inlet and outlet passages in fluid communication with said pumping chamber, check valve means in said passages, spring means biasing said movable element in one direction, and means for moving said movable element in an opposite direction against said spring means bias, said last means including a member mounted within said housing for reciprocable movement along a path, an actuating rod connected to said movable element and having an end biased by said spring means into said path of said reciprocable member to be driven thereby against said spring bias, a noise suppressor means including a block of resilient plastic material, a retainer fixed to said actuating rod end and mounting said resilient block between said rod end and said reciprocable member, said resilient block having a surface facing and extending into said path of said reciprocable member to be struck thereby when said rod end and said reciprocable member come together, said retainer having a circumferential portion spaced from said block surface in a direction away from said reciprocable member and along said path thereof and comprising a washer having a central stud press-fitted to said rod end and having a surface normal to said rod, said resilient block being fitted to and enclosing said stud and having a portion thereof extending beyond said stud surface, whereby said reciprocable member will strike said central stud to drive said actuating rod upon compression of said block.

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