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VACUUM PUMP

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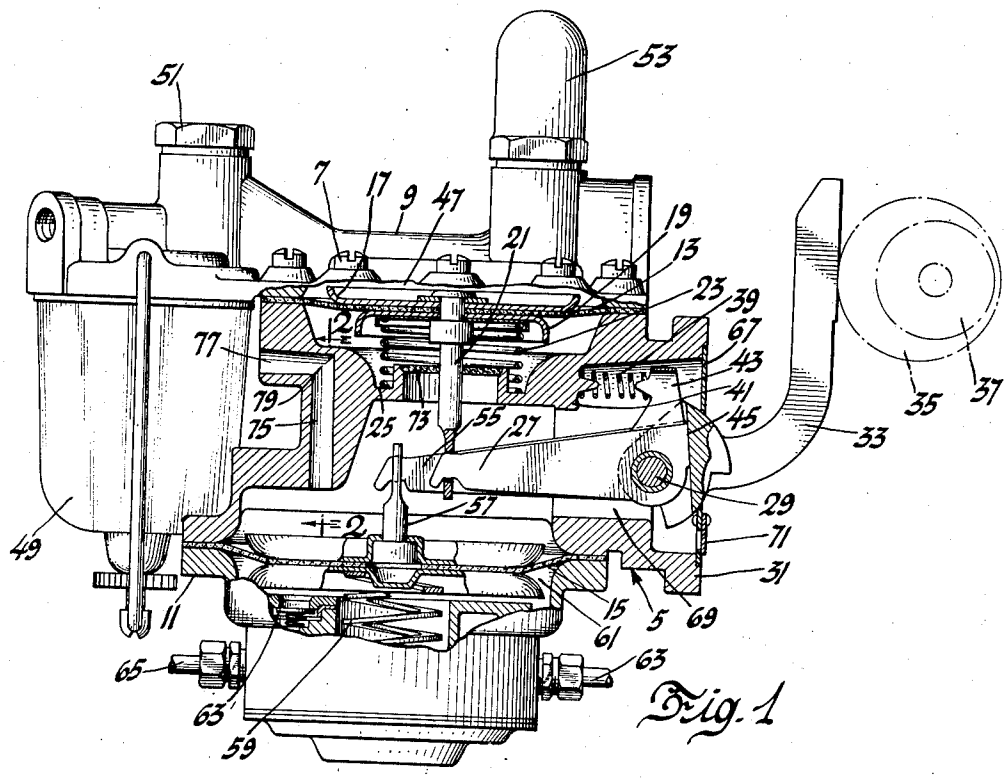


Fig. 1

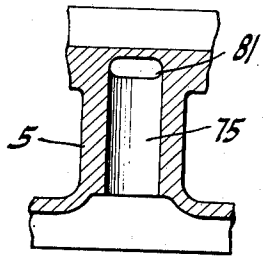


Fig. 2

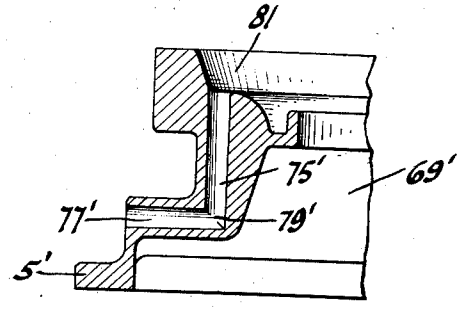


Fig. 3

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VACUUM PUMP

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6 Claims. (Cl. 230—170)

This invention relates to pumps, the novel characteristics being particularly useful in a pump intended to supplement the manifold suction of an engine of a motor vehicle used to operate the windshield wiper or other suction-operated accessory of the vehicle. In a preferred embodiment the pump is made a part of a pump assembly which includes the pumping mechanism for supplying fuel to the engine of the motor vehicle, a mechanism wherein movable parts are operated by means extending from an engine driven shaft requiring therefor an opening between the oil carrying engine casing and an operating cavity of the pump.

In such a pump, which may be described as of the vacuum booster type, the pump chamber is in the path of the air current from the windshield wiper motor, or other suction-operated accessory, and the engine manifold, and it is, therefore, important to prevent any oil, which may escape from the engine oil casing to the pump cavity, from entering the pumping chamber and being carried by the air current to the engine manifold. Any oil so carried will diminish the oil supply in the crank case and, when it reaches the engine cylinders, will foul the spark plugs and interfere with the engine operation. To avoid such undesirable action the reciprocable pumping member may be a diaphragm. A diaphragm makes an effective seal against leakage of oil. It is possible, however, that hot oil from the crank case may reach the diaphragm, damage it and cause leakage.

It is an object of this invention to prevent the carrying of oil through such a leaky diaphragm into the pump chamber and into the air stream. As another and more specific object, the structure of the casting forming a part of the pump assembly is provided with an air conduit or passage so as to insure that air and not oil may be carried to the vacuum pump chamber and into the air current in the event of diaphragm leakage. Other objects, such as the accomplishment of the major object without the creation of noise which may result from the movements of air in said conduit; and the accomplishment of the main object with no considerable increase in cost will be understood from the following description.

In the accompanying drawing:

Fig. 1 is a view in elevation and partly broken away and in section of my improved pump.

Fig. 2 is a detail in section substantially on line 2—2 of Fig. 1.

Fig. 3 is a transverse section through a modified form of pump casting.

Referring by reference characters to the drawing, numeral 5 is used to designate a die cast pump body to which is secured, by fastening means 7, a cover 9. To the bottom of casting 5 is secured a base 11. Clamped between parts 5 and 9 is the diaphragm 13 of a substantially conventional fuel pump. Clamped between parts 5 and 11 is the diaphragm 15 of a substantially conventional air pump.

Referring to the fuel pump, there are discs 17 and 19 and a stem 21 secured to diaphragm 13. A discharge producing spring 23 is seated in a pocket 25 of the casting and exerts pressure on the diaphragm. The pump stem is engaged by a link 27 pivoted on a pin 29 carried by the casting 5 adjacent a face 31 thereof intended to be clamped against the crank case of the engine, the said face and crank case having registering openings for the passage of a lever 33 also pivoted on pin 29 and rocked by a cam 35 on the cam shaft 37 of the engine. A spring 39 is in abutment at one end with casting 5 at 41 and its other end engages a member 43 mounted to rock on pin 29 and to constantly engage a shoulder or surface 45 of the lever and hold the lever against the cam in the idle part of the movement of the latter. Link 27 also is adapted to engage the surface 45 but may be prevented from doing so when the fluid pressure in the pump chamber 47 is high enough to overcome spring 23. Fuel from the reservoir, not shown, reaches the pump chamber after being freed from water and sediment in trap 49. The pump inlet valve is located beneath the cap 51 and the discharge valve is beneath the dome 53.

A second link 55 is supported for rocking on pin 29 and it, too, is adapted to engage at times the shoulder of lever 33 and be rocked positively in a counterclockwise direction to depress the diaphragm 15 of the air pump by means of a stem 57 connected to the link and diaphragm 15. The diaphragm is under the constant upward pressure of a spring 59. The air pump chamber 61 is intended to be connected to a windshield wiper motor by a conduit 63 and with the engine manifold by a pipe 65. Engine suction draws air from the wiper motor, through pipe 63, an inlet valve, not shown, the pump chamber 61, an outlet valve 63' and pipe 65. Normally with the engine in operation the engine suction is sufficient to maintain a degree of suction in chamber 61 sufficient to overcome spring 59 and to hold the diaphragm in a downward position. The link 55 is then out of contact with the lever 33 and the wiper is operated solely by engine suction. If, however, the suction is insufficient for the purpose of operating the wiper mechanism, the diaphragm is oscillated by the lever 33 and spring 59 to make suction and discharge strokes whereby the operation of the windshield wiper is assured.

In a mechanism as above, a protecting seal 67 may be used at the crank case opening of the casting 5 to prevent the passage of oil to the operating cavity 69 of the casting. If desired, a valve 71 may be provided to permit the return of any

oil which may pass by the seal 67. Also, it may be desired to employ a seal 73 to keep oil from splashing up to the fuel pump diaphragm.

It is possible that oil may reach the air pump diaphragm and possibly cause a leak through it. In that event the oil would tend to be carried by the air current from the windshield wiper to the manifold. It will be apparent that this oil will foul the spark plugs and interfere with the operation of the engine. It may even seriously drain oil from the crank case. To avoid this trouble provision is made such that, in the event of diaphragm failure, it will be air rather than oil which is carried into the air current. To that end the body 5 is cast with a passage 75 opening into cavity 69 just above diaphragm 15 and having an opening 77 to the outer air. By this provision, and since the seal 67 offers an obstruction to the passage of oil from the crank case to the cavity 69, the suction prevailing in the pump chamber will draw air through passage 75 rather than oil from the crank case.

Diaphragm vibrations may tend to cause oscillation of the air column in passage 75 and noise may result. To avoid the noise the passage is made as long as possibble and is given an abrupt angular bend at 79 to increase its length. The angle of the passage is made quite sharp whereby it is, of itself, effective in reducing noise. It has also been found that a passage of the oval shape as shown at 81 by Fig. 2 is more effective in avoiding noise. The length of passage necessary to obtain sufficient friction between the pulsating column and the walls to avoid noise might be secured by the use of a pipe of suitable length fastened to the pump, but the passage 75 formed of oval shape and given an angular bend to increase its length has been found to be satisfactory. It should be noted that the passage 75 must not be too small. If so, the suction will draw air but also will drain crank case oil from around the edge of the seal 67. The passage should be of such capacity as to fully satisfy the vacuum from the manifold.

In Fig. 3 there is illustrated a part of a pump body 5' having a different air passage 75'. In this case the passage extends inwardly from an air opening at 77', has an angular bend at 79' and an upwardly extended part leading to an opening beneath the fuel pump diaphragm. With this form of the invention the cavity 69' must not be separated from the region 81 beneath the fuel pump diaphragm as by a member like 73 of Fig. 1. This form is also more likely to be a source of noise. For these reasons the form shown by Fig. 1 is preferred.

The combined pump is well adapted for the embodiment of this invention for the reason that in the combined pump the body must be larger than would be the case in a single pump. It thus has the wall dimensions which makes possible a passage large enough in cross sectional area to accommodate the manifold vacuum and long enough to avoid noise from the oscillating air column.

We claim:

1. A booster pump having a reciprocable pumping member and a pump chamber therebelow, means adapted to connect said chamber with an engine manifold and with a suction-operated device, said pump having a cavity above the pumping member communicating with an oil carrying engine casing, means in said cavity and projecting to an engine-operated cam to be rotated thereby and operably connected to said reciprocable pumping member, conduit means connecting said cavity to the atmosphere, and means to seal the cavity from the engine casing.

2. For use with the engine of a motor vehicle, a pump having a pump body, a diaphragm, means securing said diaphragm to said body forming a pump chamber therebelow and a cavity thereabove, conduits adapted to connect said chamber to the engine manifold and to a suction operated accessory whereby suction normally prevails in said pump chamber, means extending from an engine operated member within the engine to said cavity and operable to reciprocate said diaphragm, sealing means to prevent passage of oil from the engine to said cavity, said cavity formed with a wall having a passage therein leading from the cavity to the atmosphere.

3. A vacuum booster pump adapted to be secured to an engine having an oil casing, said pump having a reciprocating member, body means forming a pump cavity above said reciprocating member, means forming, with said reciprocating member, a pump chamber on the opposite side thereof, operating means for said reciprocating member extending from the engine casing to said cavity, means to seal said cavity from said engine casing, and mechanism forming a passage affording communication between said cavity and the atmosphere.

4. The invention defined by claim 3, said passage being located in the wall of said body means.

5. A vacuum booster pump adapted to be secured to an engine having an oil casing, said pump having a reciprocating member, body means forming a pump cavity on one side of said reciprocating member, means forming, with said reciprocating member, a pump chamber on the opposite side thereof, operating means for said reciprocating member extending from the engine casing to said cavity, means to seal said cavity from said engine casing, and mechanism forming a passage affording communication between said cavity and the atmosphere, said passage being of oval shape in cross section and dimensioned to fully accommodate pump chamber suction to thereby prevent passage of oil into the air stream in the event of leakage between the cavity and pump chamber.

6. A vacuum booster pump adapted to be secured to an engine having an oil casing, said pump having a reciprocating member, body means forming a pump cavity on one side of said reciprocating member, means forming, with said reciprocating member, a pump chamber on the opposite side thereof, operating means for said reciprocating member extending from the engine casing to said cavity, means to seal said cavity from said engine casing, and mechanism forming a passage affording communication between said cavity and the atmosphere, said passage being formed in the wall of said body means, having angularly related portions, being of oval shape and of such a cross section area that leakage of the reciprocating member insures that the vacuum in the pump chamber shall draw air through said passage instead of oil from the engine casing, the shape and dimensions of the passage preventing noise which might be caused by an oscillating air column.

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