Oct. 22, 1935. A. M. BABITCH 2,018,111

VACUUM PUMP

Filed April 23, 1932 2 Sheets-Sheet 1

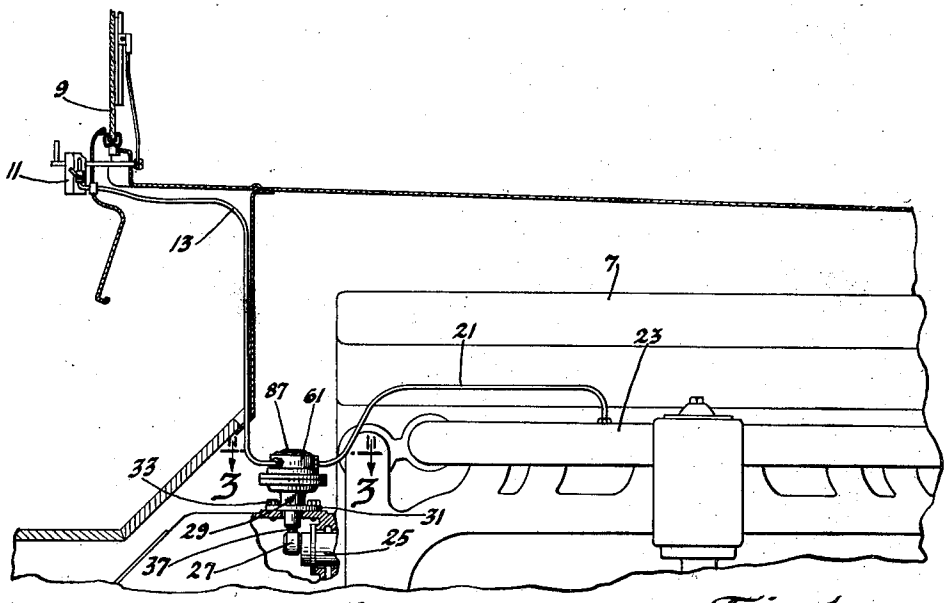

Fig. 1

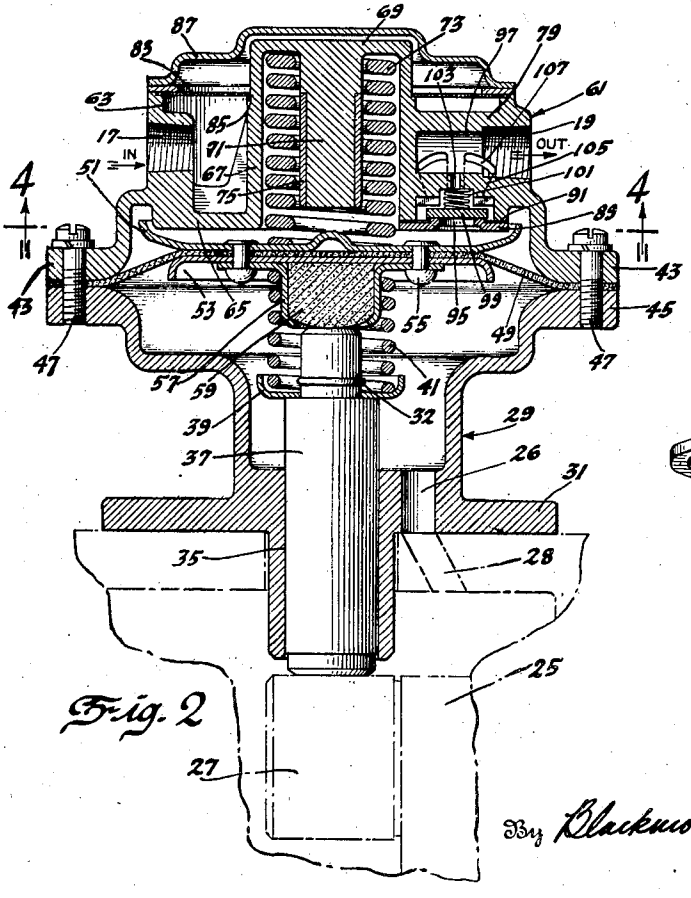

Fig. 2

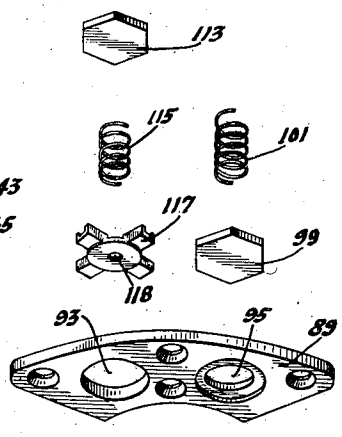

Fig. 6

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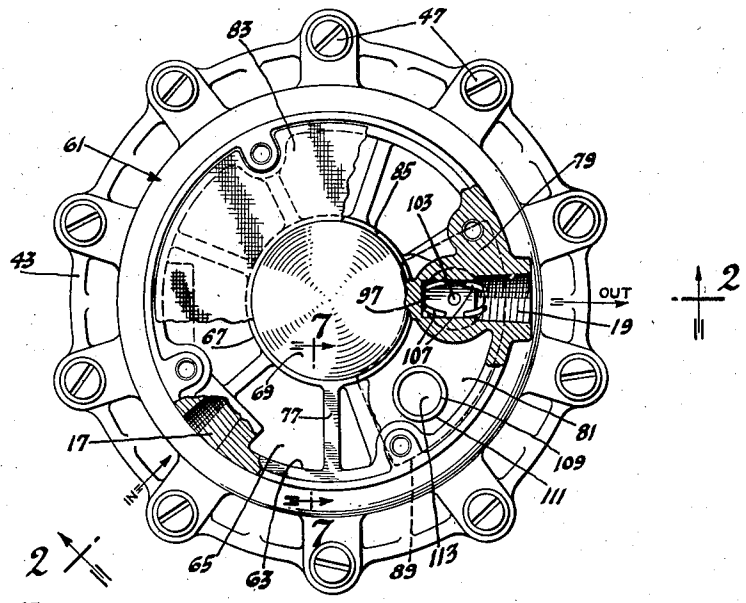

Fig. 3

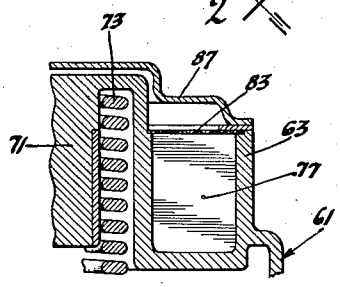

Fig. 7

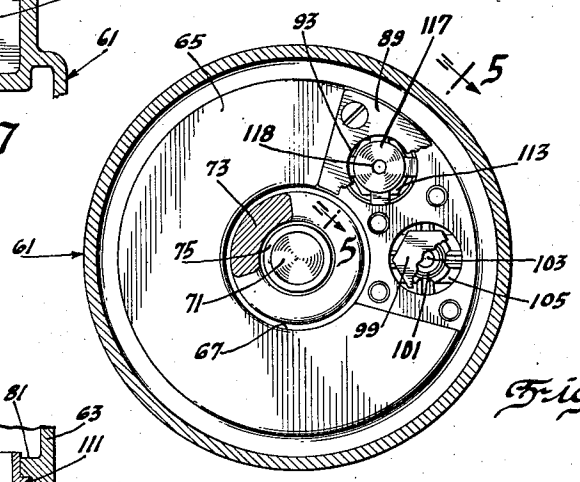

Fig. 4

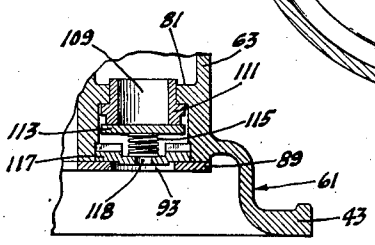

Fig. 5

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UNITED STATES PATENT OFFICE

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VACUUM PUMP

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Application April 23, 1932, Serial No. 607,130

2 Claims. (Cl. 230—170)

This invention relates to pumps and has been designed to serve as an air pump. More particularly it is intended to operate as a subatmospheric or vacuum pump for the purpose of actuating mechanism such as a windshield cleaner.

An object of the invention is to provide a simple form of pump mechanism which may be operated by an engine such, for example, as the engine of a motor vehicle, to withdraw air from any source such as the chamber of a windshield cleaner motor and to discharge the air to any region desired such as the intake manifold of the engine.

Another object of the invention is to introduce a cushioning bumper in the instrumentality by which the engine operated plunger reciprocates the pumping member.

Another object is to mount the reciprocating plunger relative to the pump mechanism in such a way that it may be retained when the pump is removed from the engine.

Other objects and advantages will be understood from the following description.

In the drawings accompanying the following description—

Fig. 1 is a view in side elevation partly in section of such a pump installed on a motor vehicle.

Fig. 2 is a vertical transverse section through the pump substantially on the lines designated as 2—2 of Fig. 3.

Fig. 3 is a view as seen from line 3—3 of Fig. 1, parts being broken away and shown in section.

Fig. 4 is a view as seen from line 4—4 of Fig. 2 with parts broken away.

Fig. 5 is a section on line 5—5 of Fig. 4 on a larger scale.

Fig. 6 shows in perspective parts of the pump mechanism in disassembled relation.

Fig. 7 is a view as seen from line 7—7 of Fig. 3.

Referring by reference characters to the drawings, numeral 7 represents the engine of a motor vehicle, the vehicle being equipped with a conventional windshield as shown at 9. At 11 is illustrated the motor for a vacuum-operated windshield cleaner equipped with an oscillating cleaner blade. Communicating with the chamber of the motor 11 is a pipe 13 which is to be connected with the pump at its opening 17 as shown on Fig. 2. From the outlet 19 of the pump a pipe 21 may be connected to a suitable discharge chamber, such a chamber being the inlet manifold 23 in the embodiment of the invention illustrated in the drawings.

The engine is equipped with a shaft 25 which may be a shaft constituting an operative part of the engine such, for example, as the camshaft. This shaft 25 may project from the end of the engine block and be provided with an eccentric operating means 27, this eccentric being designed to reciprocate the movable member of the pump.

The pump preferably includes two major parts one or both of which may be conveniently formed by die casting. Part 29 constitutes the base portion of the pump and is formed with a flange 31 which is to be secured to a suitable support constituting a part of the engine, the support being positioned adjacent the end of shaft 25. The flange 31 is fastened by suitable fastening means 33. This first-mentioned part 29 is formed with a tubular projection 35 for the reciprocation of a plunger 37, the lower end of which is to be engaged by the eccentric 27. The upper end of the plunger 37 is reduced in diameter and on the shoulder formed by such reduction is received a shallow cup or spring retainer 39. A suitable spring 41 engages within this cup 39. On the reduced portion of the plunger 37 and slightly above the spring abutment 39 is a ring 32. This ring may engage the cup 39 to prevent the passage of the plunger through the cup. Furthermore, the diameter of the cup is greater than the diameter of the opening 35 so that by means of the construction described the pump plunger may not fall from the pump when the pump is removed from its support. Also, in the base of the member 29 there is provided an opening 26 which opening communicates with a passage 28 through the pump support and permits the return of any oil to the crankcase which may have passed the plunger 37.

The second die cast member is designated 61 and is the major part of the pump. It has an annular flange 43 which is clamped to flange 45 of the member 29 by fastening means 47. Between the flanges 43 and 45 and secured by the fastening means 47 is a diaphragm 49. This diaphragm is preferably non-metallic and to its central portion there are secured upper and lower metal discs 51 and 53. These discs are secured by rivets 55. On the underside of the diaphragm and disc 53 and also secured by the rivets 55 is an open cup 57 housing but exposing a cushion or bumper 59 of resilient material, such as rubber. Surrounding the cup 57 and in abutment with the retainer 39 and the flange of cup 57 is the spring 41 referred to above.

From the flange 43 of the upper pump member 61 rises a side wall 63 in which are the oppositely located openings 17 and 19. At the base of the wall 63 is a transverse partition 65. The cavity between the underside of the partition and the

upper side of the diaphragm 49 constitutes the pump chamber. Rising from the bottom of the partition and centrally of the wall 63 is a hollow cup-shaped part having a peripheral wall 67, a top closure 69, and a central depending stem 71. A spring 73 is located in the annular space defined by parts 67 and 71 and engages the inner side or the top 69. This spring surrounds the stem 71 and engages the disc 51 at its lower end. A suitable sound-deadening sleeve 75 surrounds the stem within the spring.

Above the partition is a radial wall 77 extending between the walls 67 and 63. This wall is, in height, substantially equal to the height of wall 63, but of less height than the inner wall 67 whereby the latter with the closure 69 rises above the top of wall 63.

From the radial wall 77 the space between the walls 63 and 67 is unoccupied for the greater part of the annular region between these walls. This open segmental chamber terminates at 79 where the casting is made solid above the partition 65 substantially equal to the height of wall 63. The opening 17 communicates with this segmental annular chamber. Just beyond the region 79 the casting, in the annular region between the walls, is of less height than portion 79 as shown by numeral 81. A screen 83 covers the region between the walls 63 and 67, resting on a ledge at the top of wall 63, on the top of the radial wall 77, and on a ledge formed by making a shoulder as at 85 on the wall 67. A cap 87 overlies the top of member 61 and is secured to the top of wall 63 by suitable fastening means, the screen being held in position as stated since its marginal portion lies between the flange of the cap and the top of wall 63. The cap is of dome shape so that it covers the closure portion 69 above the wall 67 and provides a chamber above the screen.

On its underside the partition 65 is recessed to receive a brass segmental plate 89 and a gasket 91. The plate 89 has two openings 93 and 95 of which the latter lies opposite a pocket 97 in the solid portion 79 of the casting 61. This pocket is in combination with the outlet 19 as clearly shown in Fig. 2. The metal of the plate 89 around the opening 95 is turned up to form a seat for a valve 99 and above the valve is a spring 101 which engages a cast-in member 105. Member 105 has a central opening 103 and in addition thereto are other openings 107 affording communication between the pocket 97 and the region above the valve 99. In the region 81 there is an opening 109. Seated in this opening is a valve seat 111. Engaging the valve seat is a valve 113 held by a spring 115 against its seat. The opposite end of the spring 115 is in abutment with the central portion of a disc member 117 which engages the plate 89 and has an opening 118 concentric with the opening 93. By the construction described a valve communication is provided for the inlet of gas from the region above the portion 81 to the pump chamber.

It will be understood that the spring 73 is operable to depress the diaphragm and increase the capacity of the pump chamber thereby making a suction stroke. It will also be seen that the plunger 37 operated by the eccentric 27 raises the diaphragm through its engagement with the resilient block 59 and thereby makes a discharge stroke. It will also be seen that the parts designated by numerals 32 and 39 prevent the escape of the pump plunger 37 when the pump is removed from its support. When the pump is used in the relation shown with its intake pipe 13 connected with a windshield wiper motor and its discharge pipe 21 connected to the manifold of the engine, it will be appreciated that if the manifold suction is high it will be possible that the suction in the pump may be sufficient to overcome the spring 73 and hold the diaphragm in an uppermost position. Under such circumstances the plunger 37 is free to reciprocate downwardly when the eccentric 27 makes its idle stroke. The spring 41 functions then to hold the plunger 37 in contact with the eccentric and prevents the subsequent noise which would occur when the eccentric again engaged the plunger. When now the plunger is upwardly reciprocated by the eccentric to produce an upward reciprocation of the diaphragm, the engagement of the reduced end of the plunger with the resilient bumper 59 permits such action to take place without noise.

It will be observed that the screen, engaging the top of parts 77 and 79, prevents air from entering the region above the inlet valve prior to the removal of foreign matter.

I claim:

1. In a pump, a flexible diaphragm, means forming with said diaphragm, a pump chamber, a block of resilient material secured to said diaphragm on its side remote from said chamber, and a reciprocable plunger to operate said diaphragm through the instrumentality of said resilient block, additional means to deliver to said diaphragm strokes of varying amplitude in the opposite direction whereby there occurs a varying space relation between the plunger and the resilient block together with a coil spring surrounding said block and engaging said diaphragm and reciprocating plunger.

2. In a pump, a flexible diaphragm, means forming with said diaphragm a pumping chamber, mechanism on the side of the diaphragm remote from the pumping chamber to reciprocate the same, said means having a transverse partition provided with inlet and outlet valves, said means also having a restricted chamber above the outlet valve and an outlet passage from the restricted chamber, said means having also an annular segmental chamber communicating with an external inlet opening and the inlet valve, said means also having a central annular portion communicating with the pump chamber and a suction producing spring within said annular portion and engaging said diaphragm.

ABRAHAM M. BABITCH.