

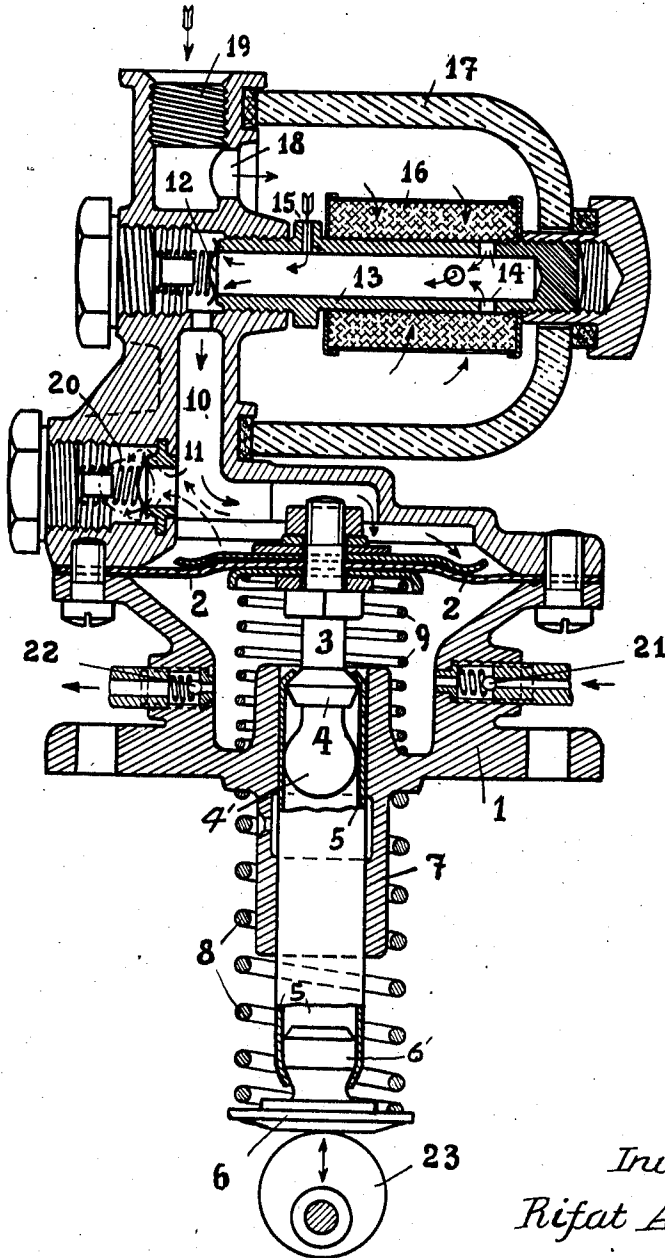
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DELIVERY PUMP FOR LIQUIDS.

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UNITED STATES PATENT OFFICE

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DELIVERY-PUMP FOR LIQUIDS

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This invention relates to a diaphragm type pump for the delivery of fluids. The particular application described is that of moving fuel from a main tank to a carburetor. However, I do not propose to limit the application of the pump to this particular function as there are many other uses to which it may be put.

Most diaphragm pumps exhibit fatigue phenomena after a short period of use, begin to leak, and finally fail altogether. The membrane is flexed by a series of sharp impacts delivered by the driving system, and under these successive shocks the membrane finally weakens. The pump as here disclosed employs a resilient drive which eliminates all shock in the system.

Another disadvantage has been that considerable time elapses while the liquid column is moving from the main tank to the point of delivery. In the case of a vehicle so equipped there is a prolonged drain on the starting battery which continues until fuel has reached the motor. The present invention provides a secondary fuel reservoir and filter adjacent the pump structure to insure immediate supply of fuel to the motor during the period when fuel is being drawn from the main tank. An intake pipe is introduced into the secondary reservoir and is provided with one or a plurality of suction openings at its lower end. The fuel therefore is immediately drawn from the secondary reservoir without the delay of having to transfer the fuel from the main tank. For the purpose of insuring easier movement of the liquid from the main tank, the upper end of the intake pipe is provided with one or a plurality of small openings. By means of these openings the air will be drawn from the secondary reservoir, rendering the formation of an air chamber unnecessary.

Owing to the constructional arrangement of the pump drive in accordance with the present invention, the pump may be utilized for work other than the delivery of liquids. The pump may be used for delivering compressed air from the air-chamber or for creating a vacuum and for this reason it may be employed in actuating instruments and

the like in aeroplanes, ships and the like as well as in stationary plants. It is possible to connect with the delivery pump pneumatic liquid, oil and gasoline pressure meters, remote revolution indicators, trochometers and the like. The current of air which may be produced by the delivery pump can be conducted past heating points or warm air may be directly employed for heating the nozzles of dynamic pressure gauges or similar instruments used on aeroplanes and air-ships. This warm air will prevent the blocking of the nozzles, and of the measuring instruments, by ice as well as the possibility of the delivery device and of the pump itself becoming blocked with ice.

The arrangement of the delivery pump for the purpose of delivering compressed air or for the purpose of creating a vacuum consists as follows:

In the air chamber, which is separated from the liquid chamber by the diaphragm, each cycle of the pump produces a compressing and rarefying effect alternately. By the provision of suitable inlet and outlet valves an exact regulation of the delivery of compressed air or of the vacuum is insured.

The invention is described more in detail in the portion of the specification which follows, with reference to the accompanying drawing in which the pump is shown in cross section:

In the drawing is shown a casing 1 which contains a flexible diaphragm 2. This diaphragm is clamped by means of a screw joint between two rigid disks and is attached to a bolt 3 having a shoulder 4 and a rounded head or guide portion 4'. A tubular shaft 5 encloses the shoulder and head, the other end of the shaft contacting a shoulder 6' formed on a projection of the cam plate 6. A socket member 7 of the casing surrounds the tubular shaft, forming an air-tight joint. The cam plate 6 is driven by an eccentric cam 23 which is attached to the motor shaft. A strong spiral spring 8 holds the cam plate in engagement with the eccentric cam, while a weaker spring 9, when the cam plate 6 is raised and the spring 8 compressed, drives the diaphragm in the opposite cycle of the stroke.

By this pressure stroke of the diaphragm, a liquid is forced through a pressure valve 11 out of the pump chamber while the other portion of the cycle draws the liquid through a suction valve 12. The suction valve 12 is placed upon an intake pipe, number 13 which is screwed into the casing 1, said pipe being made to project into the combined filter bell and the secondary reservoir 17 and is provided at its lower end with suction openings 14 of a comparatively large diameter and at the upper end with ventilation openings 15 of a smaller diameter. The intake pipe is enclosed by a filter 16. The liquid path is from the socket connection 19 through inlet opening 18 and the intake pipe, downwardly through tube 10 and out through discharge port 20 which may lead to an intake manifold or other suitable device.

It will be seen that the diaphragm is actuated through the medium of two differential springs adjusted in relation to each other. The weaker spring actuates the diaphragm or the compression cycle while the stronger effects the withdrawal of the diaphragm or the suction cycle. If an excess pressure is built-up in the pump chamber which exceeds that for which the weaker spring has been adjusted, the stroke of this weaker spring will be reduced according to the existing excess, causing a proportionally lesser bending of the diaphragm for the pressure cycle. If the pump outlet becomes completely blocked, the bending of the diaphragm will cease altogether and thus the pump regulates itself automatically in accordance with fuel consumption.

In order to utilize the other side of the diaphragm, an inlet valve 21 and an outlet valve 22 has been provided in a space at the lower side of the diaphragm chamber. This makes it possible for the pump to perform a dual function. In addition to the pumping of liquids or fuels another pumping chamber is made available and may be used for pumping gases and the like from the air chamber of the secondary reservoir 17, or for ventilation, or to deliver compressed air or gas to any kind of control device applied to the action of the pump. Many other applications of this dual purpose pump may be readily defined. Owing to the fact that the quantity of air or gas conveyed through the chamber upon the reverse side of the membrane is dependent upon the size and number of diaphragm strokes, the quantity of air conveyed would always be in a precise ratio to the quantity of liquid conveyed and therefore it may be used in the measuring of the volume of liquid delivered.

What I claim is:

1. In a fuel pump including a flexible diaphragm, a bolt secured to the diaphragm having a shoulder and a rounded head comprising a guide, a cam plate having a projecting

portion carrying a shoulder, a driving eccentric cam in contact with said cam plate, a tubular shaft engaging said shoulders and establishing a loose driving connection therewith, and resilient means cooperating with said cam plate and said diaphragm for effecting a resilient drive.

2. In a fuel pump including a flexible diaphragm, a bolt secured to the diaphragm having a shoulder and a rounded head comprising a guide, a cam plate having a projecting portion carrying a shoulder, a driving eccentric cam in contact with said cam plate, a tubular shaft having a constricted portion engaging said shoulders and establishing a loose driving connection therewith, and resilient means cooperating with said cam plate and said diaphragm for effecting a resilient drive.

3. In a diaphragm pump having two chambers separated by said diaphragm, outlet and inlet valves for each chamber, a bolt secured to said diaphragm, having a shoulder and a rounded head comprising a guide, a cam plate having a projecting portion carrying a shoulder, a driving eccentric cam in contact with said cam plate, a tubular shaft engaging said shoulders and establishing a loose driving connection therewith, and resilient means cooperating with said cam plate and said diaphragm for effecting a resilient drive.

In testimony whereof I affix my signature.
RIFAT AVIGDOR.

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