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S. JENCICK

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FIG. 1.

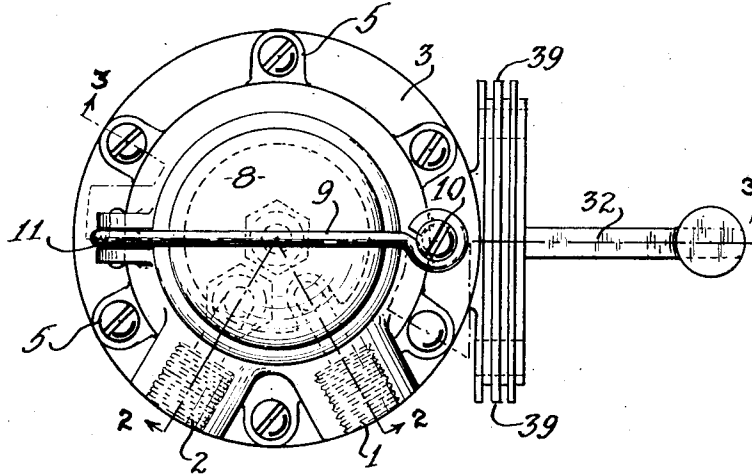


FIG. 2.

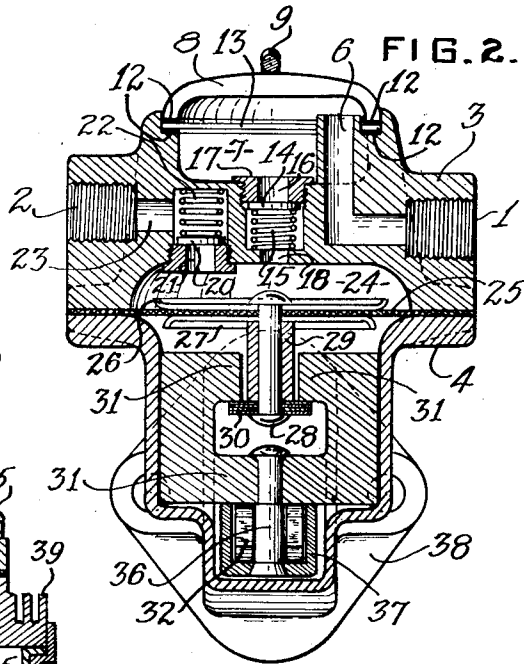
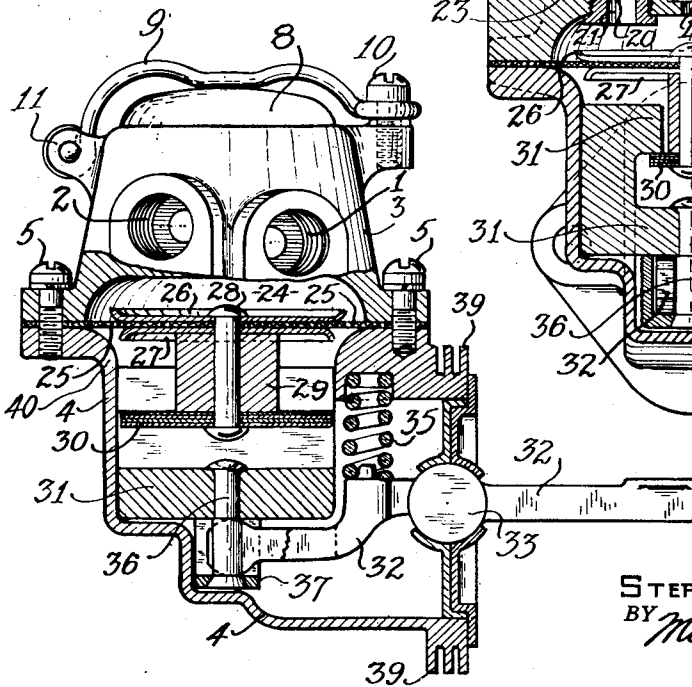


FIG. 3.



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6 Claims. (Cl. 103—150)

This invention relates to the art of devices for pumping liquid, and the present embodiment of my invention, as herein illustrated, is intended for use in pumping the liquid gasoline to the carburetor of an internal combustion engine.

The object of this invention is to devise such a pump that will supply the liquid only at the rate required.

More specifically, the object is to provide such a pump with means for automatically varying the effective stroke of the same in accordance with the rate of consumption, as for instance, by the carburetor of an internal combustion engine.

A still more specific object is to devise such a pump in which a permanent magnet and armature are employed as a means for operating a flexible diaphragm for pumping the liquid at a variable rate according to the rate required.

Another object is to provide an improved form of flexible liquid-proof diaphragm for use in connection with the pumping of liquid.

Other objects will appear from the following description and claims when considered together with the accompanying drawing.

Fig. 1 is a top plan view of my improved pump;

Fig. 2 is a vertical sectional view corresponding with line 2—2 of Fig. 1; and

Fig. 3 is a view corresponding to line 3—3 of Fig. 1, the upper part being in elevation and the lower part being in section.

It is to be understood that the present form of disclosure is merely for purposes of illustration and that there may be devised other forms of construction without departing from the spirit of the present invention as herein set forth and claimed.

As above indicated, my present improved form of pump may be employed in connection with an internal combustion engine; in which case, the pump is inserted in the gasoline supply line so as to pump the gasoline to the carburetor, as will be readily understood. Since this general arrangement is quite familiar to those who are skilled in this art, it is deemed unnecessary to illustrate the same.

In the case of an automobile internal combustion engine, the gasoline feed pipe is connected to the inlet opening 1 of the present form of pump, and the outlet opening 2 is connected to the gasoline feed pipe which leads to the carburetor. The inlet 1 and outlet 2 are provided in the upper part 3 of the casing, the lower part of which is indicated by reference numeral

4. The upper and lower parts of the casing are bolted together, as indicated at the points 5.

The passage 6 from the inlet 1 opens upwardly into a chamber 7 within which the gasoline flow can be viewed through the glass closure 8 as it is being supplied through the pump. The closure 8 is secured in place by means of the bail clamp 9 which can be freed by removing the screw 10, whereupon the bail can be swung upwardly about its pivot point 11. The glass closure 8 rests within a seat provided in the casing member and its edge engages and maintains in place the ring washers 12 of cork or the like, between which the wire mesh screen 13 is held in position. Thus the gasoline passes through the screen 13 as it is forced through the pump.

The inlet disk valve 14 has the coil spring 15 which holds it normally in closed position over the port 16 through the screw plug 17. This valve, when open, permits communication through the port 16 and its companion port 18 which opens into the chamber 24.

The outlet valve disk 20 is normally held in closed position over the outlet port 21 by the spring 22, this port 21 having communication with its companion port 23 when the valve 20 is open.

The disk valves 14 and 20 may both be of polygonal form so as to facilitate the passage of the liquid about the edge thereof when opened, the port openings being of circular form.

It will be observed from the drawing that the upper and lower parts of the casing 3 and 4 are so formed as to enclose the operating parts to be further explained, and also to afford a chamber 24.

Within the chamber 24 there is provided the diaphragm 25 which is flexible and which is clamped about its edge portion between the upper and lower parts 3 and 4 of the casing. The composition and process of making the membrane of the diaphragm will be explained below.

The cupped metal disks 26 and 27 are secured to opposite sides of the diaphragm 25 by means of the rivet pin 28 and the spacer block 29 which is arranged between the disk 27 and the armature 30 for the magnet 31.

The magnet 31 is a permanent magnet of U-shape and with portions extending inwardly from the upper ends of the arms or sides thereof, as clearly seen in Fig. 2 of the drawing. There is a space left between these inwardly extending portions so as to accommodate the spacer block 29 for free relative movement with respect there-

to, as will be explained. The armature 30 is wider than the space just referred to and is adapted for operative engagement with the under surfaces of the inwardly extending arm portions of the magnet 31.

The magnet 31 is adapted for up and down movement within the casing, this movement being effected by means of the lever 32 with its cylindrical bearing portion 33 mounted for rocking movement in the wall of the casing. This lever is operated by means of the cam 34 on the cam shaft which is connected with the engine of the automobile. As will be seen, the effect of the cam 34 is to raise the inner end 15 of the lever 32 which will be returned to lower position by the coil spring 35 suitably mounted within the casing.

The inner end of the lever 32 has a forked portion which extends beneath the magnet 31 and about the rivet pin 36 which in turn connects the saddle member 37 to the under-side of the magnet. This arrangement permits raising of the magnet by the action of the cam 34 and lowering of the same by the action of the spring 35.

This pump, as a unit, is adapted to be mounted upon the automobile engine block by means of the attaching plate 38, and the lever 32 will extend to the inside of the engine for operation in the manner explained.

The lower part 4 of the casing is formed with the heat-radiating fins 39 in the region where the casing is mounted upon the engine block, this provision being for the purpose of dissipating the heat from the engine so as not to affect the magnet and also to preclude the formation of vapor lock in the supply line of the gasoline. There is provided also an opening 40 in the wall of the lower part of the casing so that air will be drawn into and discharged from the magnet chamber, this being also for cooling purposes.

The membrane of the diaphragm 25 consists of duck cloth impregnated with a combination of tung oil and soya bean oil, as will be now more fully explained. This oil combination is made up of about 47½ per cent of tung oil, about 47½ per cent of soya bean oil and about 5 per cent of vegetable pigment, as for instance vermilion; and these ingredients are mixed together so as to form a paste. The duck is impregnated with this paste and is then baked in any suitable manner, as for instance by passing the same between heated rollers under pressure so as to cause the paste to become fixed in the duck.

Thus there is obtained a liquid-proof membrane that will be found to possess a marked flexibility even when made comparatively thick. That is, the increase in the thickness of the membrane does not defeat its flexibility to the same proportion as has been found to be true in other such membranes.

Also, my improved form of membrane will retain its flexibility throughout a wide range of temperature,—from approximately 30 degrees below zero to approximately 335 degrees above zero, Fahrenheit.

Furthermore, in my new membrane there is no appreciable contraction or expansion under varying conditions, and thus it remains constant with respect to tautness and its action is likewise always constant and dependable.

The operation of my pump will now be explained. The parts are so constructed and arranged that downward movement of the diaphragm will open inlet valve 14 and maintain

outlet valve 20 closed so as to draw gasoline into the chamber above the diaphragm; and when the diaphragm is moved upwardly, the inlet valve will be closed and held closed and the gasoline will be forced out through the outlet valve 20.

The magnet and other parts, as indicated in the present drawing, are in lowered position, and it is assumed that gasoline has been drawn into the chamber above the diaphragm. Then upon operation of the lever 32 by the cam shaft, the magnet will be raised and it will carry the armature with it by virtue of the magnetic field. This upward movement of the armature 30 causes actuation of the diaphragm upwardly so as to force the gasoline out through the valve 20 to the carburetor.

The length of stroke of the magnet is constant but the length of stroke of the armature and diaphragm is a variable dependent upon the degree of resistance offered by the gasoline, which in turn is determined by the rate at which the gasoline is used by the carburetor at any given time. In case of the comparatively low rate of gasoline consumption by the carburetor, that is less than the capacity of the pump for a given rate of operation of the cam shaft, then there will be more or less backing up of the gasoline in the supply line from the pump to the carburetor.

In my device, the parts are so constructed and arranged that such pressure resistance may overcome the force of the magnetic field and the magnet will continue the latter part of its upward stroke without the armature. The point at which this separation of the armature from the magnet takes place, will be determined by the amount of pressure offered to the further upward movement of the diaphragm; in other words, it is determined by the ratio between the rate of supply and the rate of consumption of the gasoline at any given time.

As the magnet is lowered by the action of the spring 35, the diaphragm will be lowered thereby by virtue of the engagement of the inwardly extending magnet arms with the armature, and the parts will again assume the position indicated in the present drawing. The length of the return stroke of the diaphragm, as just described, will also determine the quantity of gasoline that is drawn into the chamber above the diaphragm. Thus, the return stroke as well as the up stroke will be a variable.

Thus, with my device the gasoline will be pumped at the rate required according to the demand upon the carburetor at any given time. This means that there will be a most efficient and dependable pumping of the gasoline since it will be supplied to the carburetor only as required; and this means also as increased economy.

Another advantage relates to the character of the flexible material provided for use in connection with the diaphragm. By virtue of the flexible character of my treated membrane 25, it is possible to have a much thicker membrane than would otherwise be possible. Other less efficient membranes do not possess the very desirable flexibility except when made comparatively thin, but such a thin membrane is likely to be collapsed upwardly by the force of the suction which draws the gasoline in through the valve 14. Also, the same thin form of membrane will likely be collapsed in the opposite direction by the resistance of the gasoline when it is being expelled from the pump to the carburetor. As a result, the effectiveness and dependability of such a thin form of membrane are reduced to a substantial extent

and thus the rate of supply of the gasoline by the pump can not be relied upon with any degree of assurance.

In my device, however, the membrane is of such a character that it can be made thicker so as to preclude the danger of collapsing; while at the same time, this comparatively thick membrane possesses sufficient flexibility to ensure proper functioning of the diaphragm in the manner herein set forth.

While, for the sake of a clear understanding of my present invention, I have herein described it as being used in connection with an automobile engine, it is to be understood that this pump may be employed in connection with other liquids and as part of other devices.

What I claim is:

1. A liquid pump comprising a casing adapted for connection in the liquid supply line, means operatable back and forth within the casing for pumping the liquid therethrough, a permanent magnet operatable back and forth, an armature carried by said pumping means and adapted for actuation by said magnet, and means for operating said magnet.

2. A liquid pump comprising a casing adapted for connection in the liquid supply line, means operatable back and forth within the casing for pumping the liquid therethrough, a permanent magnet operable back and forth, an armature carried by said pumping means and adapted for actuation by said magnet, and means for operating said magnet, there being a predetermined magnetic force between the magnet and armature adapted to permit separation of the same upon encountering a predetermined liquid pressure resistance by the pumping means.

3. A liquid pump comprising a casing adapted for connection in the liquid supply line, a reciprocable diaphragm within the casing for pumping the liquid therethrough, a reciprocable permanent magnet within the casing, an armature carried by said diaphragm and adapted for actuation by said magnet, and means for operating said

magnet, there being a predetermined magnetic force between the magnet and armature adapted to permit separation of the same upon encountering a predetermined liquid pressure resistance by the pumping means.

4. A liquid pump comprising a casing adapted for connection in the liquid supply line, inlet and outlet one-way valves in said casing for controlling the flow of liquid into and out of the same, a reciprocable diaphragm within the casing for pumping the liquid into and out of the same through the valves, a reciprocable permanent magnet within the casing, an armature carried by said diaphragm and adapted for actuation by said magnet, and means for operating said magnet, there being a predetermined magnetic force between the magnet and armature adapted to permit separation of the same upon encountering a predetermined liquid pressure resistance by the pumping means.

5. A liquid pump comprising a casing adapted for connection in the liquid supply line, a reciprocable diaphragm within the casing for pumping the liquid therethrough, a reciprocable permanent magnet within the casing, an armature carried by said diaphragm and adapted for actuation by said magnet, means for operating said magnet, and said casing having an opening in the wall thereof so as to permit the entrance and exit of air therethrough into and from the interior of the casing for cooling the same.

6. A liquid pump comprising a casing adapted for connection in the liquid supply line, a reciprocable diaphragm within the casing for pumping the liquid therethrough, a reciprocable permanent magnet within the casing, an armature carried by said diaphragm and adapted for actuation by said magnet, means mounted in the wall of the casing for operating said magnet, and heat-radiating means provided upon the casing in the region of said operating means for the purpose of preventing over-heating of the same.

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