Jan. 3, 1933. H. HUEBER ET AL 1,893,473

FUEL PUMP

Filed May 15, 1930

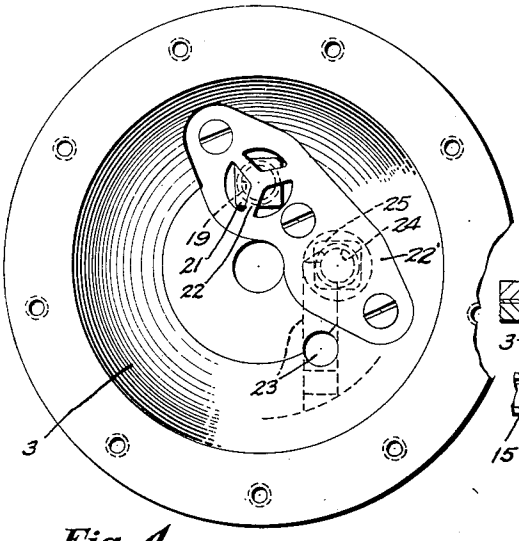

Fig. 4

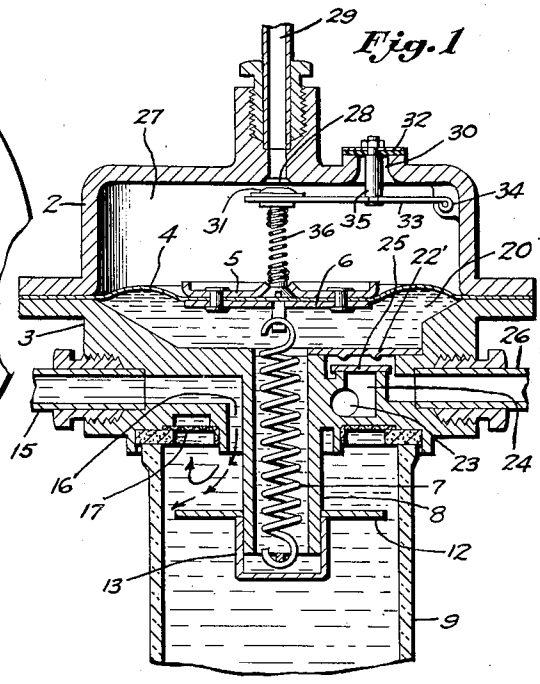

Fig. 1

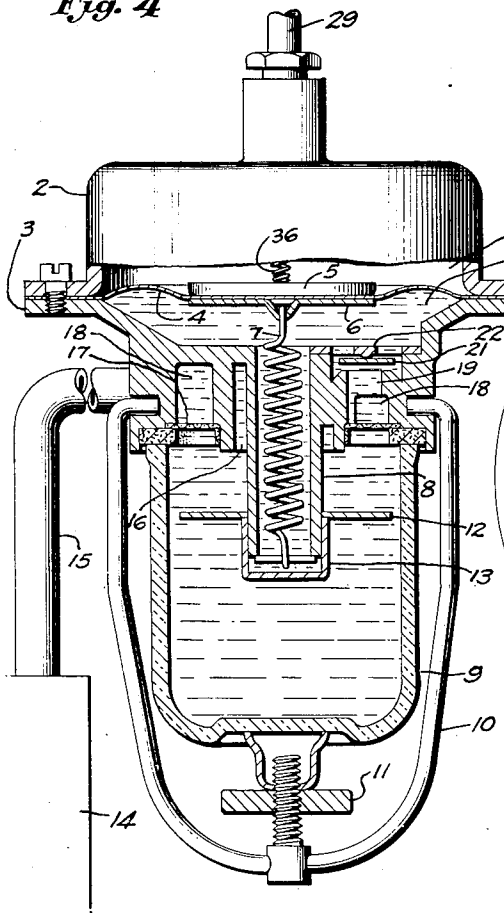

Fig. 2

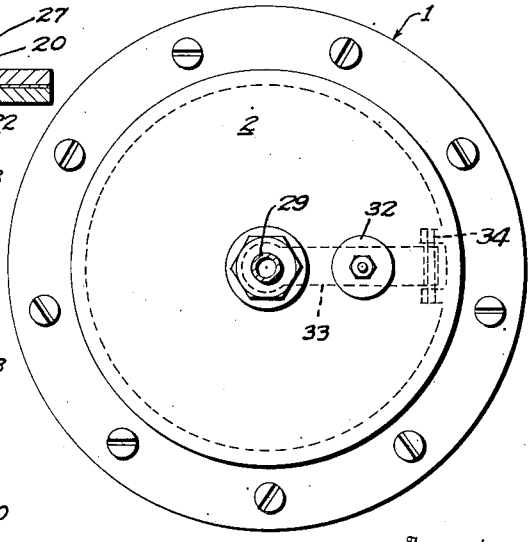

Fig. 3

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Patented Jan. 3, 1933

1,893,473

UNITED STATES PATENT OFFICE

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FUEL PUMP

Application filed May 15, 1930. Serial No. 452,742.

This invention relates to pumps and has particular reference to pumps for feeding fuel to internal combustion engines.

It is among the objects of this invention to provide a modified fuel lift device for fuel feeding systems of the type disclosed in copending application Serial No. 431,587, filed February 26, 1930, wherein a fuel pump or lift unit is placed in the fuel line between a fuel container and an internal combustion engine, the pump being operated by suction or sub-atmospheric pressure created by the engine.

The invention resides in the details of construction and the arrangement of parts which will be specifically pointed out and described hereinafter, reference being made to the accompanying drawing wherein:—

Fig. 1 is a vertical section taken through the fuel lift mechanism.

Fig. 2 is a vertical section taken at right angles to Fig. 1.

Fig. 3 is a plan view of the device.

Fig. 4 is a plan view of the lower portion of the casing, showing the fuel inlet and outlet valves.

Referring more particularly to the drawing, wherein like parts are designated by like reference numerals, 1 indicates a casing comprising upper and lower portions 2 and 3, respectively, between which is clamped a flexible diaphragm 4. At the center of the diaphragm are rigid plates 5 and 6, the latter attached to a coiled tension spring 7 which is disposed longitudinally of and secured to the lower end of a tubular extension 8 of the lower casing member 3.

Disposed below the casing 3 is a sediment bowl 9, removably clamped to the casing by any suitable means as by the retaining bail 10 and adjusting means 11, the bowl being preferably formed of glass or other transparent material. The tubular extension depends into the sediment bowl and serves as a support for a baffle plate 12. The baffle is spaced slightly from the side walls of the bowl and is retained in position by a removable cup 13 which may be a part of the baffle, and which closes the lower end of the tubular extension 8.

Liquid fuel may be drawn into the casing from a container 14 through a supply line 15, and thence through an annular passage 16 into the sediment bowl. The fuel then passes upwardly through a screen 17 into an annular chamber 18 and through a valve port 19 into pumping chamber 20 beneath the flexible diaphragm 4.

A valve 21 normally seating over port 19 is adapted to be opened by upward movement of the fuel into chamber 20 and closed by receding movement of the fuel, being held against total displacement by a spider 22.

The fuel may be expelled from chamber 20 through a passage 23, which terminates in a port 24 adapted to be closed by a valve 25, into a carburetor feed line 26. The valve 25 is raised to open position by movement of the fuel from the pump chamber and is retained in operative position by an extension 22′ of spider 22.

The casing 2 above the diaphragm has a motor chamber 27 which opens through a port 28 into a sub-atmospheric pressure line 29 which may lead to the intake manifold or other part of the internal combustion engine. The casing is also provided with a valved port 30 which provides communication between chamber 27 and the outside atmosphere. The ports 28 and 30 are adapted to be closed by valves 31 and 32 respectively attached to a valve operating lever 33 pivoted at 34 to casing 2.

The outlet valve 31 is disposed inside of the casing 2 and the inlet valve 32 outside so that they may be alternately opened and closed by rocking of lever 33 about its pivot 34, valve 32 being attached to the rocking lever by means of the valve stem 35.

A snap action for the valves is provided by a coiled spring 36, adapted to act both in tension and in compression, which is secured between the flexible diaphragm and the lever. The spring has its major axis disposed longitudinally of the path of flexure of the diaphragm and may be attached at its upper and lower extremities in any suitable manner as for example by engagement with threaded projections on the plate 5 of the diaphragm and lever as illustrated in Fig. 1.

In operation, it may be first assumed that the parts are in the relative positions shown in Figs. 1 and 2. Inlet valve 32 is closed and outlet valve 31 is opened, permitting the air in chamber 27 to escape into the sub-atmospheric pressure line 29, thus producing a partial vacuum above the diaphragm. Fuel is lifted by atmospheric pressure from container 14 into chamber 20, pressing the diaphragm 4 upwardly against the tension of spring 7. During this movement the fuel inlet valve 21 is opened and the fluid outlet valve 25 is forced to closed position by movement of the fuel. As the diaphragm 4 is flexed upwardly the spring 36, under tension at the beginning of the cycle, is allowed to become untensioned, the lever 33 being held fixed in its lower position by the valve 32 which is held against its seat by pressure of the outside atmosphere. When the diaphragm reaches substantially its extreme upwardly flexed position, the compression of the spring will be sufficient to overcome the opening resistance of valve 32 and the lever 33 will be snapped upwardly closing valve 31 and opening valve 32.

Air will now pass through port 30 into chamber 27 under atmospheric pressure permitting spring 7 to pull the diaphragm downwardly, thus forcing fuel from chamber 20 into the carburetor feed line 26. During initial downward movement of the diaphragm, the movement of the fuel will cause the valve 21 to seat, preventing a recession of the fuel into chamber 18, and will cause outlet valve 25 to open, thus affording a free passage between chamber 20 and feed line 26.

As the diaphragm moves downwardly the compression in spring 36 is relieved and the spring is placed under tension. The parts of the device are so proportioned that when the diaphragm is flexed to substantially extreme downward position the tension of spring 36 is sufficient to overcome opening of valve 31, which is held closed by atmospheric pressure, causing the valve to be snapped downwardly to full open position, the lever 33 simultaneously closing inlet valve 32.

The parts will now be again in the position shown in Fig. 1 ready to resume another cycle of operation.

During the upward flexing movement of the diaphragm, fuel is drawn or lifted by atmospheric pressure from container 14, through supply line 15 and passage 16 into sediment bowl 9 and thence upwardly through screen 17 into chamber 18 as indicated by the upper arrow in Fig. 1. Particles of foreign matter in the fuel may pass downwardly as indicated by the lower arrow in Fig. 1 over the baffle plate 12 into the bottom of the sediment bowl. Other particles of foreign matter may be carried against the screen 17 and thence, when movement of the fuel into chamber 18 temporarily abates as during downward flexing of the diaphragm, also may settle to the bottom of the bowl.

The baffle plate 12 will substantially decrease movement of the fluid in the bottom of the sediment bowl due to movement of the fuel into and out of the upper portion of the bowl and will therefore largely prevent stirring up and intermixture of sediment beneath the baffle with the fuel passing above it.

What is claimed is:—

1. In a suction operated, fuel lifting device including a casing portion having inlet and outlet ports, a flexible diaphragm associated with said casing, a valve lever pivoted in said casing, valves adapted to cover said ports and connected for movement with said lever, and a valve actuating spring member secured to said lever and said diaphragm, said spring member being adapted to be placed under compression by flexing of said diaphragm in one direction and under tension by flexing of the diaphragm in the opposite direction.

2. In a suction operated fuel lifting device, a casing portion provided with inlet and outlet valves, a diaphragm flexible inwardly and outwardly of said casing portion, a lever pivoted to said casing portion for rocking movement in a direction toward and away from said valves and operably secured thereto, whereby said inlet valve is opened and said outlet valve is closed when said lever is rocked to extreme position toward said valves and said inlet valve is closed and said outlet valve opened when said lever is rocked to extreme position away from said valves, and spring means connecting said diaphragm and said lever, whereby extreme inward flexure of said diaphragm will place said spring means under compression to rock said lever to a position closing said outlet valve and extreme outward flexure of said diaphragm will place said spring means under tension to rock said lever to a position closing said inlet valve.

3. In a suction operated fuel lifting device, a casing having an inlet port and an outlet port, a flexible diaphragm, a lever pivoted in said casing, outlet and inlet valves attached to said lever for movement therewith, and spring means secured to said lever at a point adjacent to said outlet valve and to said diaphragm, whereby upon inward flexure of said diaphragm said spring means will act in compression to seat said outlet valve and upon outward flexure of said diaphragm said spring means will act in tension to unseat said outlet valve.

4. In a lifting device, a casing, a piston dividing said casing into pumping and motor chambers, inlet and outlet valves for said motor chamber, and means associated with said valves and with said piston, said means being alternately tensioned and compressed by said piston to operate said valves.

5. In a fuel lifting device having a casing

with a motor chamber, a diaphragm for flexure inwardly and outwardly of said chamber, inlet and outlet valves for said chamber, means for alternately opening and closing said valves, said means including a combined tension and compression member connected to said diaphragm, said member being compressed for opening said inlet valve by inward flexure of said diaphragm and being tensioned for opening said outlet valve by outward flexure of said diaphragm.

6. In a suction operated fuel lifting device, a casing having inlet and outlet ports, a flexible diaphragm mounted for flexure inwardly and outwardly of said casing, a lever pivoted in said casing, an inlet valve external of said casing, a stem on said inlet valve connected with said lever, an outlet valve in said casing attached to said lever, a coiled spring secured to said lever and diaphragm and adapted for longitudinal compression or extension upon flexure of said diaphragm.

7. In a fuel lifting device, a casing having a pump chamber, a sediment bowl for said pump chamber, a tubular extension on said casing depending from said pump chamber into said sediment bowl, a fuel inlet from said casing into said sediment bowl and a fuel passage from said sediment bowl to said pump chamber, a baffle plate on said tubular extension beneath said passages, fuel displacing means in the casing for causing fuel to flow from the fuel inlet, through the sediment bowl past the baffle plate, and thence into the pump chamber, and means in the tubular extension to actuate the fuel displacing means.

8. In a fuel lifting device, a casing, a sediment bowl, said casing having a fuel inlet channel opening downwardly into said sediment bowl and a fuel chamber opening downwardly into said bowl, and a baffle plate spaced from the bottom and sides of said bowl and beneath said inlet channel and fuel chamber openings, and means in the casing for causing fuel to flow from the fuel inlet channel into and through the sediment bowl adjacent the baffle plate, and thence through the fuel chamber opening into the casing.

9. In a fuel lifting device, a casing having fuel displacing means therein, a sediment bowl, passages in said casing for admitting fuel to the interior of the casing, said passages opening into said sediment bowl, an extension of said casing depending into said bowl, means in said extension for actuating said fuel displacing means, and a baffle plate mounted on said extension adjacent to said passages opening into said sediment bowl, said baffle plate lying adjacent the path of fuel passing through the sediment bowl into the casing through said passages.

10. In a fuel lifting device, a casing, a sediment bowl, a tubular portion of said casing depending into said sediment bowl, a baffle plate in said sediment bowl and mounted on said tubular portion, and a cap closing said tubular portion and associated with said baffle plate, and means in said casing for causing fuel to flow through the sediment bowl and thence into the casing in a path adjacent said baffle plate.

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