Sept. 4, 1945. G. C. MEREDEW 2,384,254

MOTOR-DRIVEN CENTRIFUGAL PUMP FOR LIQUID

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Fig. 1.

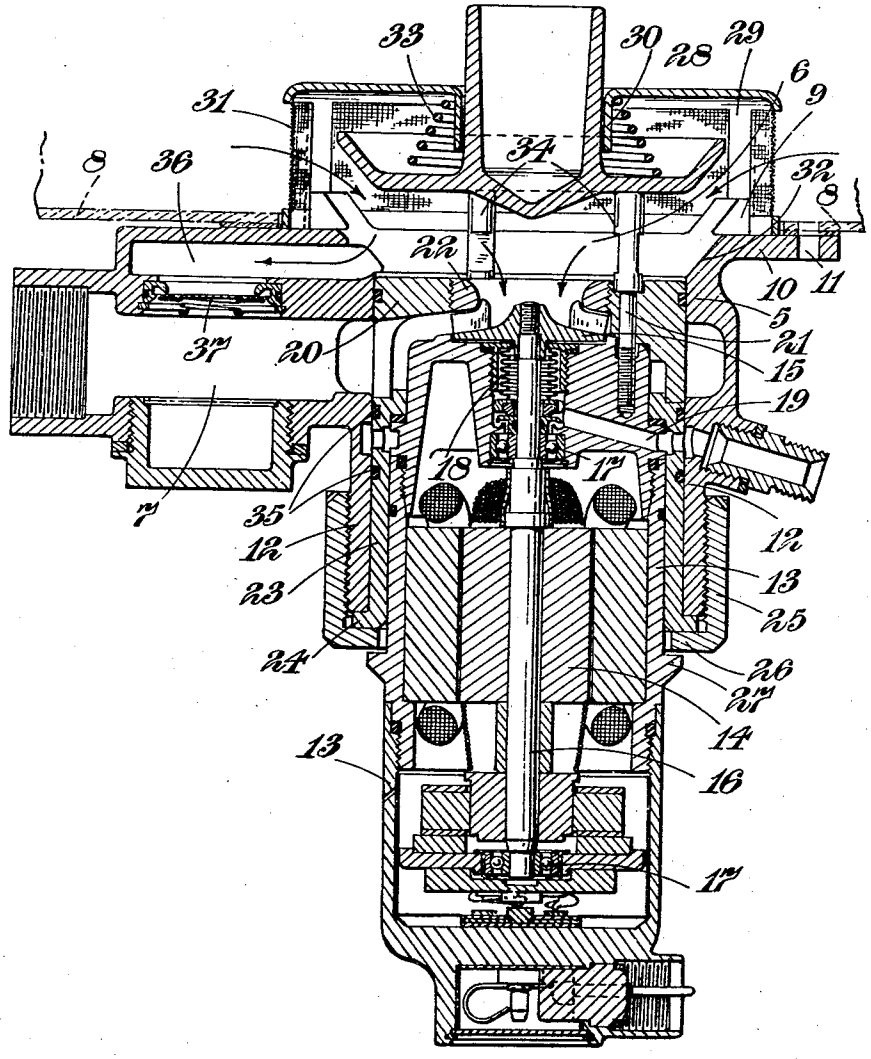

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Fig. 2.

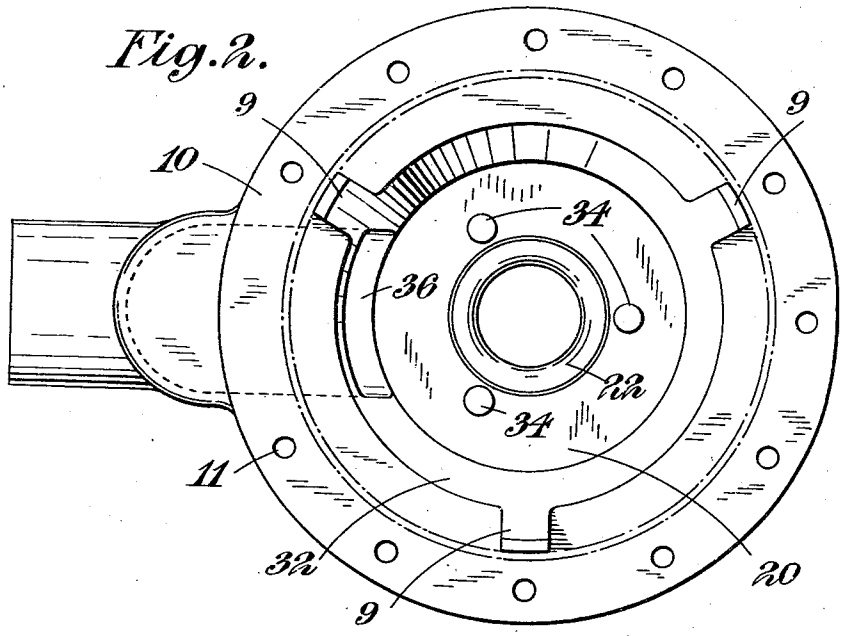
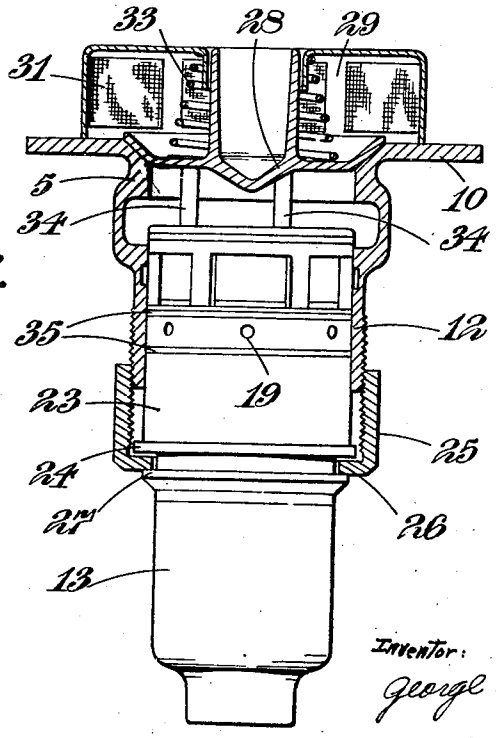


Fig. 3.



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UNITED STATES PATENT OFFICE

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MOTOR-DRIVEN CENTRIFUGAL PUMP FOR LIQUID

George Charles Meredew, London, England, assignor to Self-Priming Pump & Engineering Co. Limited, London, England, a British company

Application June 17, 1943, Serial No. 491,183
In Great Britain April 20, 1942

2 Claims. (Cl. 103—87)

This invention relates to motor-driven centrifugal pumps for pumping liquids and of the type in which the driving motor, usually an electric motor, the motor housing and the pump impeller, usually direct-coupled to the motor shaft, are arranged to form a unit removably mounted in a base (hereinafter referred to as the base casting) which provides inlet and outlet flow conduits for the liquid, and a trunk-like portion for the reception of the motor-impeller unit.

This invention is particularly, although not exclusively, concerned with the pressure feeding, by means of pumps of the above type, of petrol or other liquid fuel to internal-combustion engines, especially aircraft engines. In such cases the inlet conduit of the base casting is coupled directly to, or otherwise put in communication with, the lower end of the petrol storage tank and the outlet conduit is arranged to deliver to the carburettor system of the engine.

Whether the pump is employed for the above purpose or for other applications, the petrol or other liquid to be pumped will normally be supplied under a head to the inlet conduit of the base casting and, unless provision were made to prevent it, the liquid would escape through the base casting on withdrawal of the removable motor-impeller unit, e. g. for inspection, repair or for the purpose of interchanging units.

This invention provides, in a motor-driven centrifugal pump of the type described, a valve or equivalent device associated with the base casting to control the inlet conduit thereof, and movable by or through the intermediary of the motor-impeller unit during its insertion in, or withdrawal from, the base casting in such manner that on withdrawal or insertion of the unit the valve will be automatically closed or opened respectively.

In one arrangement according to the invention the sealing means comprises a valve mounted in the base casting and guided for movement in alignment with the motor-impeller unit, spring means tending to move the valve in the direction of withdrawal of the motor unit and against a seating to close the inlet conduit of the base casing against entry of liquid, and an abutment or abutments carried by the impeller end of the motor unit and located to engage the valve and move it to the open position on insertion of the unit and on withdrawal of the unit to release the valve for return movement under its control spring to the closed position.

One construction embodying the foregoing and other features of the invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a central longitudinal section of the pump;

Figure 2 is a plan of the pump, and

Figure 3 is a sketch (partly in section) showing the disposition of the parts on withdrawal of the motor-impeller unit.

Like reference numerals indicate like parts in the three figures.

The pump is designed for the pressure feeding of petrol or other liquid fuel from a storage tank to the carburettor system of an internal-combustion engine installation for use in aircraft, or for the transference of fuel from one storage tank to another on an aircraft. The pump comprises a base casting 5 which provides an inlet conduit 6 and an outlet conduit 7 for the liquid fuel. The base casting 5 is adapted to be coupled directly to the bottom wall 8 of the storage tank and for this purpose is formed with a spigot portion 9 adapted to enter an aperture in the tank wall and with a flange 10 to surround the aperture and to be bolted, through bolt holes 11, to the tank wall.

The base casting 5 is formed with an integral trunk portion 12 arranged to receive the removable motor-impeller unit. The removable unit comprises a housing 13 containing a driving motor 14 and an impeller 15 direct-coupled to the motor shaft 16 which is suitably journalled in end bearings 17. The inner end of the motor shaft extends through a liquid sealing gland 18 of any suitable type arranged to be drained through a conduit 19.

The removable motor-impeller unit in this example embodies the invention described in the specification of British patent application No. 5279/42, in that the whole of the impeller casing, including the annular wall which defines the inlet throat of the impeller chamber, is formed as part of the removable unit. The impeller chamber is formed in a block 20 which is secured by bolts 21 to the impeller end of the motor housing. The annular inlet wall of the impeller chamber which defines the inlet throat is formed as a removable insert 22 screwthreaded into the block 20. With this arrangement the insert 22 may be accurately adjusted, by rotation relative to the block 20, to give the desired throat clearance.

The block 20 is formed with a barrel extension 23 adapted to nest within the trunk-like portion 12 of the base casting, the outer end of the extension 23 being formed with a flange 24 to engage over the corresponding end of the base cast-

ing trunk. The removable unit is held in place by means of a nut 25 screwthreaded on to the exterior of the trunk 12 and formed with a bezel ring 26 to engage over the flange 24 on the barrel extension 23 of the impeller chamber block. Beyond the bezel ring 26 the motor housing is formed on the outside with a peripheral rib 27 (which may, if desired, be interrupted) arranged to overlie the inner edge of the bezel ring. The effect of this arrangement is that when the securing nut 25 is turned in a direction to release the motor unit, the bezel ring 26 will bear on the projecting rib 27 of the motor housing and will force the motor unit outwardly from the base casting. It will also be understood that with this arrangement the securing nut 25 with its bezel ring forms part of the removable motor unit.

The self-sealing means for the inlet conduit 6 of the base casting comprises a mushroom valve 28 accommodated in a housing 29 which forms part of the spigot portion 9 of the base casting. The valve 28 is positioned in alignment with the central axis of the motor-impeller unit and is guided for rectilinear movement in the direction of the longitudinal axis of the motor unit by a guiding sleeve 30 forming part of the housing 29. The housing 29 also provides a filter 31. The valve 28 is arranged to co-operate with a seating 32 in the base casting and it is under the control of a compression spring 33 which tends to force the valve towards the seating 32, i. e. towards the closed position in which the inlet conduit 6 is sealed against the entry of liquid from the storage tank. The bolts 21 which secure the impeller casing block 20 to the motor housing are formed with extensions 34 adapted to act as abutments for co-operation with the valve 28. The abutments 34 are so located as to engage the valve 28 and move it to the open position (against the action of the spring 33) on insertion of the motor unit, and on withdrawal of the unit gradually to release the valve for return movement under its control spring to the closed position, shown in Figure 3.

The motor unit is sealed in the assembled position by means of packing rings 35 inset in the barrel extension 23 of the impeller casing block. The rings 35 are so positioned in relation to the travel of the valve 28, i. e. in relation to the effective projection of the abutments 34 so as to ensure that, on removal of the motor unit, an effective seal between it and the trunk portion 12 of the base casting will not be broken until the mushroom valve is properly seated in the closed position.

The base casting also embodies a by-pass 36 between the inlet and outlet conduits 6, 7, controlled by a suction valve 37 so arranged that in the event of a failure of the motor-impeller unit or in any circumstances in which that unit may be inoperative, the induction pull of the engine will open the valve 37, thus short-circuiting the flow through the impeller chamber and eliminating the resistance which would thereby be imposed when the impeller is stationary.

It is to be understood that while normally an electric motor will be used as the driving means in the motor-impeller unit, the invention may equally well be embodied in pumps of the type described in which other motors, for example pneumatically driven motors are employed. It is also to be understood that the term "base casting" is employed in a broad sense to cover the trunk-like unit which receives the motor-impeller irrespective of the position in which the unit is disposed. In the particular example described above the base casting is arranged vertically in relation to the bottom of the petrol storage tank; it may equally well be arranged horizontally or at any suitable angle between the vertical and horizontal positions. It is also to be understood that various modifications may be made in the construction described with reference to the drawings without departing from the essential features of the invention. For example, a valve, other than one of the mushroom type, may be used as the self-sealing device for the inlet conduit of the base casting, and means, other than those described, may be employed for securing the removable motor-impeller unit in the trunk portion of the base casting.

I claim:

1. A motor-driven centrifugal pump for liquid comprising a base casting providing a hollow trunk portion and inlet and outlet flow conduits for the liquid, a motor impeller unit removably received in the hollow trunk portion of the base casting and including a driving motor, a housing therefor, a direct-coupled pump impeller, and an impeller chamber formed on a block secured by bolts to the impeller end of the motor housing, a valve mounted in the base casting and guided for movement in alignment with the motor-impeller unit, spring means tending to move the valve in the direction of withdrawal of the motor unit and against a seating to close the inlet conduit of the base casting against entry of liquid, and an abutment formed by an extension of at least one of the bolts by which the aforesaid block is secured to the motor housing and located to engage the valve and move it to the open position on insertion of the unit, and on withdrawal of the unit to release the valve for return movement under its control spring.

2. A centrifugal pump according to claim 1 in which the aforesaid impeller-chamber block is formed with an extended annular wall which is fitted within the base casting trunk and has an out-turned flange adapted to bear on the outer end of the trunk, combined with a nut screw-threaded to the trunk and provided with an inwardly extending bezel ring engaging over the aforesaid flange on the extended annular wall of the impeller chamber block, and beyond the bezel ring a peripheral rib on the outside of the motor housing and overlapping the inner edge of the bezel ring.

GEORGE CHARLES MEREDEW.