Jan. 29, 1957 J. W. DICKEY 2,779,513

SUBMERGED ROTARY TYPE FUEL PUMP

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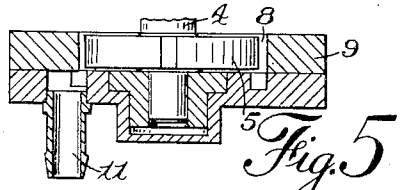


Fig. 5

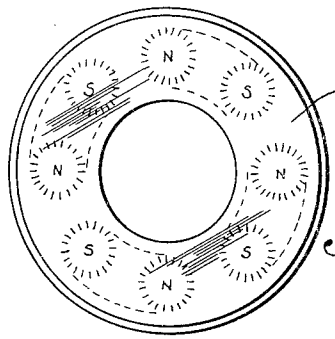


Fig. 6

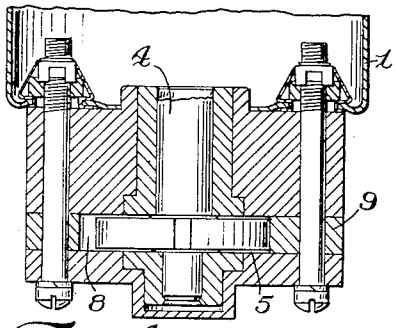


Fig. 4

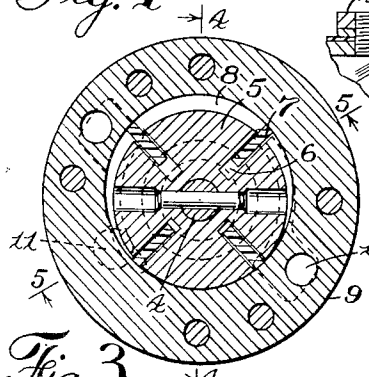


Fig. 3

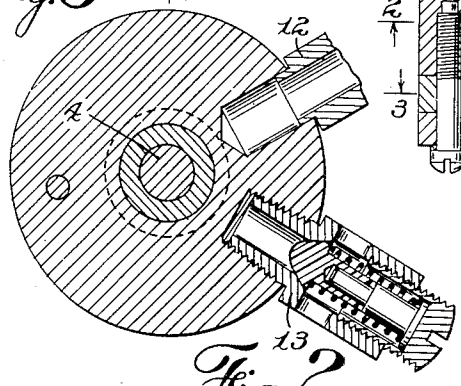


Fig. 2

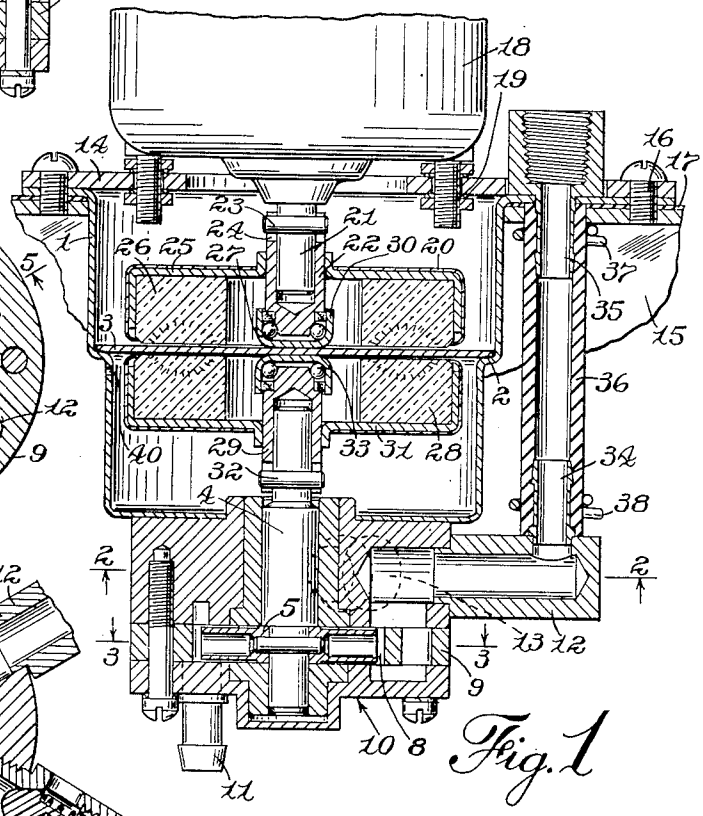


Fig. 1

WITNESS:

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SUBMERGED ROTARY TYPE FUEL PUMP

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Application May 7, 1956, Serial No. 583,185

4 Claims. (Cl. 222—333)

The present invention relates to a submerged rotary type fuel pump, and more particularly to an externally driven tank mounted pump.

It is an object of the present invention to provide a novel pump of this type which is a rigid unitary structure, efficient in operation and not requiring fine adjustment.

It is another object to provide such a device which is adapted for continuous reliable operation over long periods of time without requiring service or adjustment.

It is another object to provide such a device in which a permanent impervious closure seals the pump from the motor.

It is another object to provide such a device in which the motor is connected to the pump by a magnetic coupling in which the spacing and aligning of the magnets is maintained in a simple and effective manner.

Further objects and advantages will be apparent from the following description taken in connection with the accompanying drawing in which:

Fig. 1 is a vertical substantially mid-sectional view of a preferred embodiment of the invention;

Fig. 2 is a section taken on the line 2—2 of Fig. 1;

Fig. 3 is a section taken substantially on the line 3—3 of Fig. 1;

Fig. 4 is a vertical section of the pump structure taken substantially on the line 4—4 of Fig. 3;

Fig. 5 is a further detail section of the pump structure taken on the line 5—5 of Fig. 3; and

Fig. 6 is a detail of one of the magnetic coupling discs, the magnetic poles being indicated pictorially.

In Fig. 1 of the drawing there is illustrated a cup shaped casing 1 of cylindrical form having an intermediate shoulder 2 on which an impervious non-magnetic diaphragm 3 is mounted and hermetically sealed as by means of a soldering operation.

A rotary vane type of pump indicated generally at 10 is mounted in any suitable manner on the bottom of the casing 1 with its shaft 4 protruding concentrically into the casing. The shaft 4 carries a disc-shaped rotor 5 (Fig. 3) having radial slots 6 in which rectangular vanes 7 are slidably mounted for cooperation with the interior of an eccentric pump chamber 8 formed in the pump casing 9. The pump 10 is provided with an inlet 11 (Fig. 5), an outlet 12 (Fig. 2) and a spring loaded by-pass valve connection 13, together with suitable ports and passages as indicated more particularly in Figs. 1, 3 and 5, whereby rotation of the pump shaft 4 causes liquid in which the pump is immersed to enter the inlet 11, and be forced out of the outlet 12.

The upper end of the casing 1 is closed by a mounting plate 14 arranged to be bolted to the top of a fuel tank 15 as indicated at 16, a gasket 17 being interposed to prevent leakage from the tank. A driving motor 18 is carried by the mounting plate 14 and attached thereto by bolts and nuts as indicated at 19. The motor shaft

21 extends into the upper chamber of the cup-shaped housing 1 in alignment with the pump shaft 4.

Magnetic means for coupling the motor shaft 21 to the pump shaft 4 is provided comprising a hollow stub shaft 22 slidably journalled on the motor shaft 21 and connected for rotation therewith by a cross pin 23 engaging in slots 24 in the stub shaft 22. A mounting cup 25 is fixedly mounted on the stub shaft 22 and has seated therein a flat ring magnet member 26 having a series of alternating magnetic poles formed on its surface as best shown in Fig. 6. It is preferred that this magnet be formed of a material having very high permanent coercive force such as the materials now available formed of sintered ceramic material, one form of which is known to the trade by the name of "Indox."

The ring magnet 26 is held in the cup 25 by any suitable means as by an outer cup member 20 of non-magnetic material having its rim bent inwardly against a beveled surface of the magnet as shown in Fig. 1. The magnet is maintained in closely spaced relation to the diaphragm 3 by means of a thrust bearing 27 for the stub shaft 22, the stationary cup 30 of which thrust bearing rests directly on said diaphragm.

A similar permanent magnet 28 is mounted on a hollow stub shaft 29 by means of a mounting cup 31. The stub shaft 29 is slidably journalled on the end of the pump shaft 4 and is connected to rotate with the pump shaft by a cross pin 32. Magnet 28 is spaced from the diaphragm 3 by means of a thrust bearing 33 the stationary cup of which rests against the under side of the diaphragm 3. Both the stub shafts 22 and 29 are drawn toward the diaphragm 3 by the mutual attraction of the two face-polarized ring magnets 26 and 28.

An outlet fitting comprising a nipple 35 is located in the mounting plate 14 and extends downward through the rim of the casing 1, the joint being sealed by the gasket 17. A similar nipple 34 extends upwardly from the pump outlet 12 in alignment with the nipple 35 and a hose 36 is arranged to be clamped on the nipples as by means of spring clamps 37 and 38.

In the assembly of the device, the assembled pump is first attached to the bottom of the housing 1, and the driven coupling member including the magnet 28 and shaft 29 is placed on the pump shaft 4. The diaphragm 3 is then inserted in the casing and soldered to the shoulder 2 of the casing to form a permanent fluid-tight partition between the upper and lower chambers of the casing.

The motor 18 is then attached to the mounting plate 14, the driving coupling member including the magnet 26 and shaft 22 is slid on the motor shaft 21, the outlet hose 36 is attached to the nipples 34 and 35 of the pump and outlet fitting, and the assembly is then inserted in the tank and attached thereto by means of the bolts 16.

Energization of the motor is transmitted through the magnetic coupling to the pump which operates in conventional manner to draw liquid in the inlet 11 of the pump and develop pressure in the outlet 12. The output of the pump which is in excess of the fuel consumed by the device, such as an internal combustion engine, to be supplied thereby is permitted to escape back into the fuel tank through the spring pressed relief valve 13.

It will be appreciated that since the ring magnets 26 and 28 are merely maintained in alignment by the motor shaft 21 and pump shaft 4 respectively, while their spacing from the diaphragm 3 is maintained by the thrust bearings 27 and 33 resting directly thereon, the magnets will be kept in the desired close proximity to each other without the necessity for close adjustment of either the motor or the pump.

In order to permit circulation of liquid through the

lower chamber it is preferably vented to the fuel tank as indicated at 40. The upper chamber is also preferably vented to the atmosphere by means of slots for the bolts 19 in the mounting plate 14.

Although but one embodiment of the invention has been shown and described in detail it will be understood that other forms are possible and changes may be made in the design and arrangement of the parts without departing from the spirit of the invention.

I claim:

1. In a tank-mounted rotary fuel pump, a cup-shaped casing, an impervious non-magnetic diaphragm dividing the casing into upper and lower chambers, a pump mounted on the bottom of the casing having a shaft extending into the lower chamber toward said diaphragm normal thereto, a stub shaft mounted on the pump shaft and slidably but non-rotatably connected thereto, a face-polarized disc magnet rigidly mounted on the stub shaft in parallel relation and in proximity to the diaphragm, and a thrust bearing for the stub shaft resting on said diaphragm and controlling the spacing of the disc magnet from the diaphragm; a mounting plate fixed to and closing the upper chamber of the casing, a motor mounted

thereon having a shaft extending into said upper chamber in alinement with the pump shaft, and a face-polarized disc magnet mounted on the motor shaft to rotate therewith parallel to and in close proximity to the diaphragm.

2. A tank-mounted fuel pump as set forth in claim 1 including further a hollow stub shaft telescopically splined on the motor shaft, the latter-mentioned disc magnet being mounted rigidly on said hollow stub shaft; and a thrust bearing for said stub shaft resting on the diaphragm and controlling the spacing of the latter-mentioned disc magnet therefrom.

3. A tank-mounted fuel pump as set forth in claim 1 in which the motor mounting plate serves also as a closure for the tank in which the pump is mounted, and said diaphragm is tightly sealed in the casing to prevent passage of liquid from one chamber to the other.

4. A tank-mounted pump as set forth in claim 3 in which the lower chamber is vented into the tank, while the upper chamber is vented to the outside of the tank.

No references cited.