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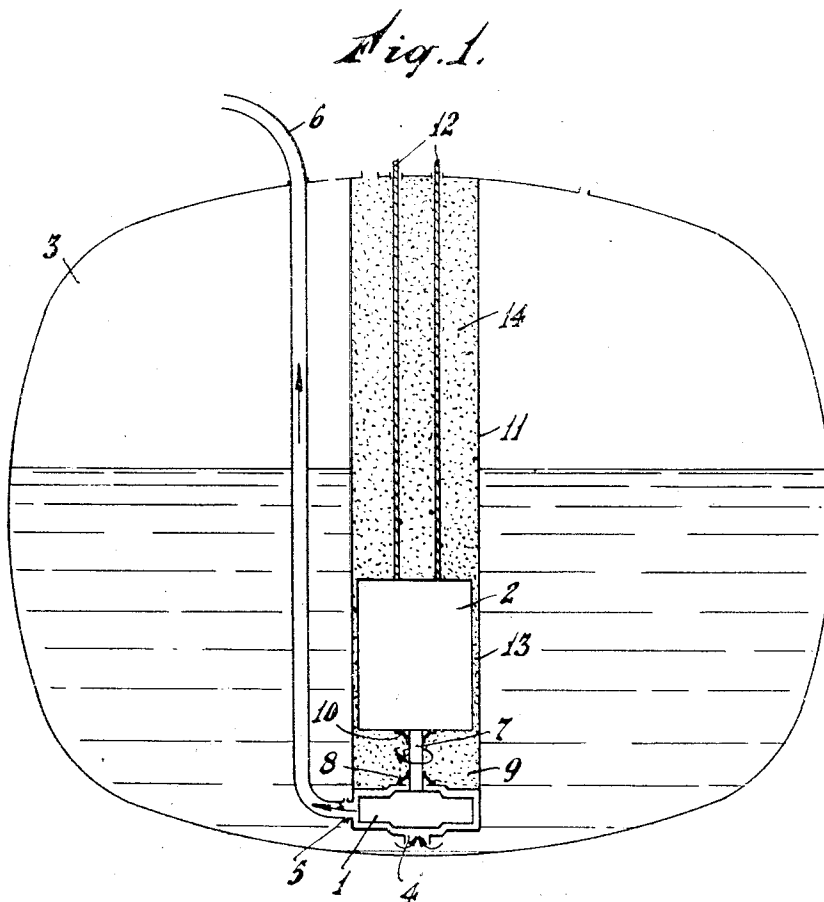
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2,325,930

SUBMERSIBLE ELECTRIC MOTOR

Filed Oct. 17, 1938

3 Sheets-Sheet 1



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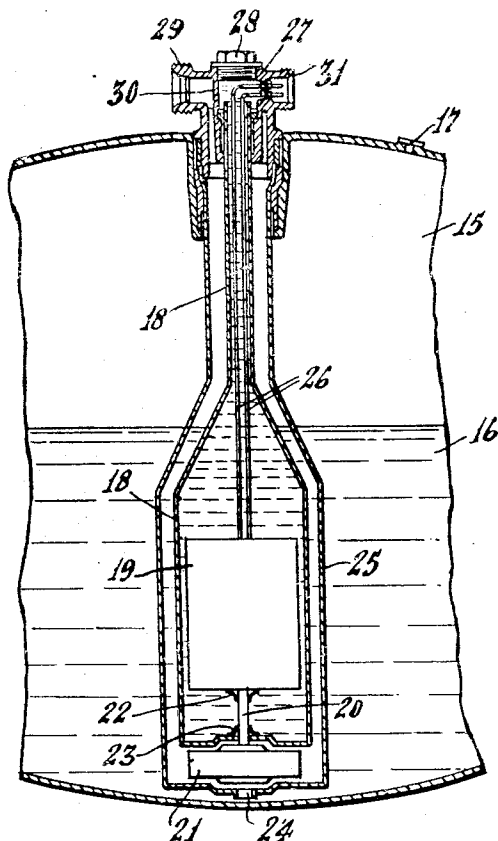
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Fig. 2.



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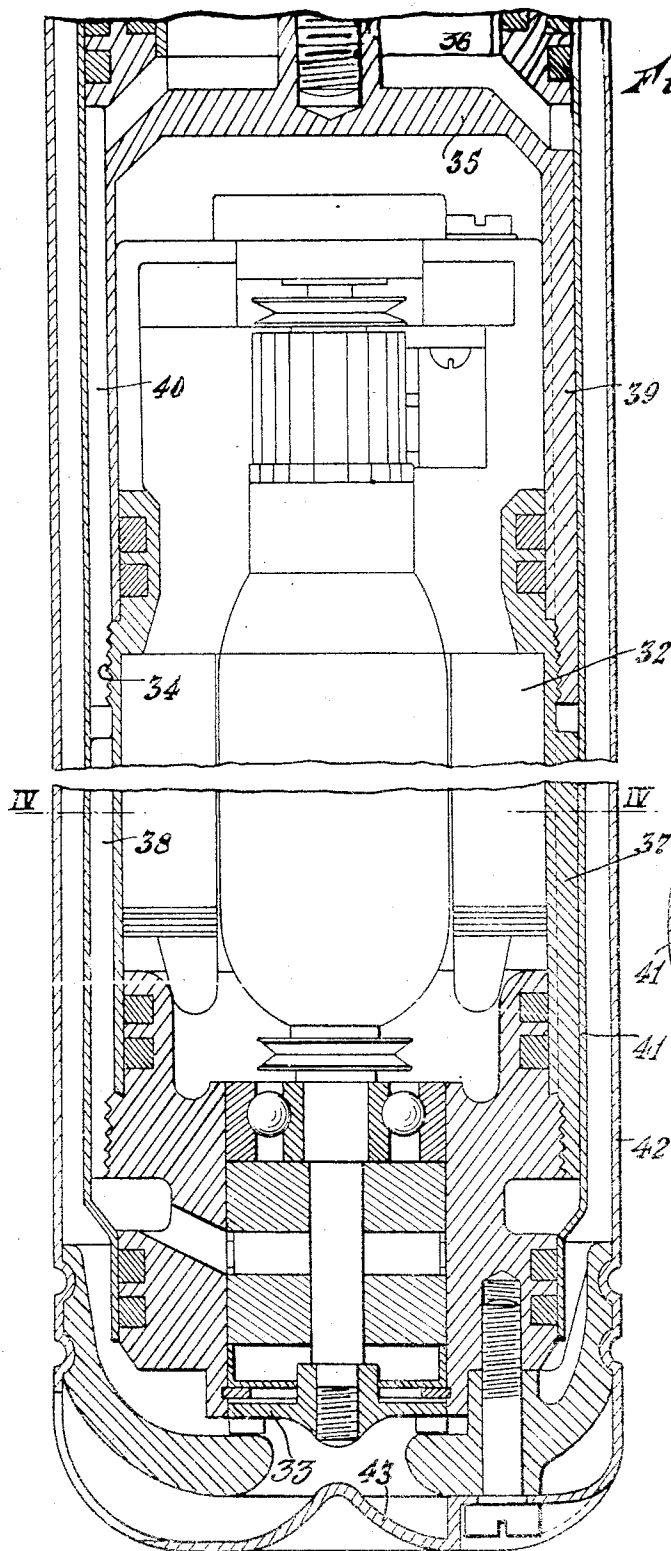
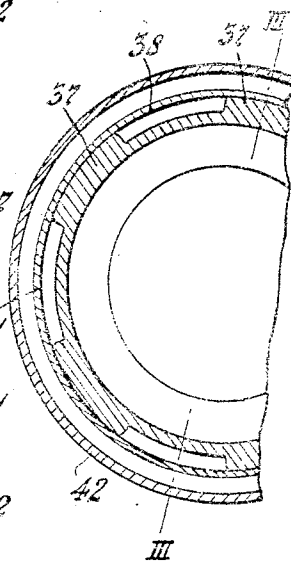


Fig. 3.

Fig. 4.



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UNITED STATES PATENT OFFICE

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SUBMERSIBLE ELECTRIC MOTOR

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In Germany December 28, 1937

3 Claims. (Cl. 172—36)

This invention relates to a submersible electric motor preferably used in conjunction with a pump in inflammable and explosive liquids such as gasoline and the like.

It is an object of the invention to provide a construction whereby the medium in which the motor and pump combination is submerged is absolutely prevented from contact with any portion of the electric motor.

It is a further object of the invention to surround the electric motor pump combination with a medium preferably a liquid which is at a higher pressure than the surrounding inflammable medium in which the invention is submerged. It is a further object of the invention to provide a construction which will avoid the formation of bubbles of air in the dispensed medium so that the calibration thereof is rendered more exact.

It is a still further object to provide a construction wherein extended driving connections between the motor and the pump are avoided and thereby permit the use of motors of less power for accomplishing the same results.

It is also an object of the invention to provide a construction whereby the current supply lines for the motor are insulated from the inflammable or explosive medium.

A further object of the invention is to provide means for dissipating the heat generated by the motor.

With the above and other objects in view which will become apparent from the detailed description below the invention is shown in the drawings in which:

Fig. 1 is a schematical section of a power medium feed device according to the invention.

Fig. 2 is a section of an electromotor according to the invention arranged in an inflammable or explosive substance.

Fig. 3 is a longitudinal sectional view of a modified construction showing an electromotor with cooling means and a pump operated thereby according to the invention.

Fig. 4 is a cross section on the line IV—IV in Fig. 3.

The power medium feed device shown in Fig. 1 comprises a pump 1, directly connected to an electromotor 2 and located in the tank 3 filled with the power medium. The feed device is thus embedded in the power medium. The pump 1 is located at the deepest point of the tank 3. The power medium enters through the suction branch 4 of the pump 1 and is fed through the pressure branch 5 with pressure conduit 6 connected thereto to the desired delivery place. The pump shaft 7 is sealed outside the pump casing by a lip- or sleeve-shaped seal 8 in an intermediate chamber 9. The pump construction is such that the place where the pump shaft is passed through is always located at the suction side of the pump

when the latter is in operation, so that a suction is exerted on the seal 8, whereby the sealing effect is still improved.

The electromotor 2 is located above the pump 1 and is encased as tightly as possible. The motor shaft, which in the embodiment illustrated is at the same time the pump shaft, is at the place where it passes through the motor casing outside the casing sealed by the lip- or sleeve-shaped seal 10. This seal 10 is also located in the intermediate chamber 9, wherein the lip- or sleeve-shaped seal 8 is located. The intermediate chamber 9 is formed by the pump casing 1, the motor 2 and the connecting conduit 11. The pump casing 1 is screwed to the connecting tube 11. The electromotor 2 is guided by the connecting tube 11. The connecting tube 11 is tightly screwed to the cover of the tank 3. The electric current supply lines 12 for the electromotor 2 pass tightly through the motor casing and through the tube 11 outwards through openings provided for this purpose. Between the inner wall of the connecting tube 11 and the outer wall of the electromotor 2 are passages 13 for the communication between the intermediate chamber 9 and the upper space 14 in the connecting tube 11. This tube is filled to the top with a fat or oil, which is insoluble in the power medium, so that through the passages 13 the intermediate chamber 9 will also be filled with the fat or oil. The fat or oil for the filling of the connecting tube is, as regards its composition, chosen so that the specific weight thereof is higher than that of the power medium used. Since the height of the connecting tube is approximately equal to the depth of the tank, the static pressure at the lip- or sleeve-shaped seal 8 at the place where the pump shaft is passed through, is directed from the connecting tube 11 towards the pump even if the tank is completely filled with the power medium and the pump is not operating.

On account of the use of the lip- or sleeve-shaped seal and the fat or oil filling of the intermediate chamber, power medium vapours cannot penetrate into the electromotor since a gas-tight seal with respect to the pump or motor shaft is obtained.

By extending the electric current lines 12 for the electromotor 2 through the fat or oil filling in the connecting tube 11, danger of explosion or ignition in the case of intervening violence, e. g. by projectiles, is, moreover, avoided or considerably reduced.

The connecting tube 11 is at the top provided with a filling opening through which the momentary fat or oil level may be controlled and fat or oil may be supplied. It is also possible to apply to other arts the inventive idea, consisting in this that by the arrangement of the motor within an

oil bath the ignition of gases and fuels by collector sparks is ruled out. It is e. g. possible to use the motors embedded in oil not only for feed pumps of petroleum boring plants, tanking plants, etc., but also in the case of any generation of energy in any kind of spaces subjected to danger of explosion.

In Fig. 2 a storage tank for the power medium 16 is denoted by 15. 17 is the filling opening. From the tank, at a suitable point, e. g. the centre, a shaft 18 is suspended, wherein in the proximity of the lower end an electromotor is arranged, driving a centrifugal pump 21 by means of a shaft 20. A lip- or sleeve-shaped seal 22 serves to seal the casing containing the electromotor. A lip- or sleeve-shaped seal 23 also encompassing the shaft 20 seals the shaft space with respect to the centrifugal pump 21, consequently with respect to the power medium 16 in the tank 15. The shaft 18 is oil-filled as indicated schematically. The electromotor 19 with its casing is guided by ribs relatively to the shaft wall, so that the oil can freely pass through the space between the fuel pump and the electromotor 19. The inlet opening for the power medium to the centrifugal pump 21 is denoted by 24.

The pressure conduit 25 through which the power medium is fed annularly surrounds the shaft 18. The current for the electromotor is supplied by the lines 26. In the mouth of the shaft a head 27 is arranged adapted to be closed by a screw 28. The quality of the oil and the oil level in the shaft may be controlled after screwing off the screw 28. The annular pressure conduit 25 enters into an outlet branch 29 of the head 27. A partition 30 in the head 27 closes the interior space of the branch 29 and consequently the pressure conduit 25 with respect to the remaining interior space of the head 27, which head at the opposite side has a branch 31 through which the electric current supply lines 26 to the motor are passed.

As appears from the drawings the head 27 with the shaft 18, the electromotor 19 and the pump 21 may be removed as a unit from the tank 15, e. g. for repair or replacement by another unit.

In the modification of Figs. 3 and 4 the electromotor is denoted by 32 and serves to drive the pump 33. The casing of the electromotor 32 is at 34 provided with screw thread so that the electromotor is adapted to be screwed into the motor receiving casing 35. This casing is connected to a tube suspension 36, e. g. secured to the upper wall of the casing. The plunging pump set is located in a liquid filled tank and has for its purpose to feed the liquid to the delivery place. The casing of the electromotor 32 is provided with ribs 37 of relatively large width. Between these ribs are passages 38. The motor receiving casing 35 is similarly provided with ribs 39 between which are passages 40. The ribs 37 and 39 and the passages 38 and 40 correspond with each other, i. e. are in alignment with each other when the casing of the electromotor has been screwed into the motor receiving casing, as appears from Fig. 3.

A metal sleeve 41 has been slid over the casing of the electromotor 32. This sleeve is in engagement with all of the ribs and is of such a length that it also covers the motor receiving casing 35, i. e. is also in close engagement with the ribs 39. Moreover, the uppermost portion of the

sleeve is in metal engagement with the uppermost portion of the motor receiving casing, as appears from Fig. 3.

The heat generated by the electromotor is transmitted by the ribs 39 to the sleeve 41 and is discharged from the sleeve to the motor receiving casing and distributed thereover. In this manner the electromotor is cooled very effectively.

In the passages 38 which are confined by the ribs 37 on the one hand and by the casing 41 on the other hand, the protecting oil under pressure is contained. The whole plunging pump set is surrounded by a tube 42, at its lower end merging into a guard or suction basket 43 for the pump 33. The tube 42 is spaced from the sleeve 41 so that an annular space 44 is formed, constituting the pressure conduit of the feeding liquid.

As the non-explosive liquid which is under a pressure, which is higher than the pressure of the medium to be dispensed, oil or fat is preferably used. Generally as indicated above oils of that type are used which do not, or only with difficulty, mix with the particular medium which is being dispensed. For instance, with a power medium such as gasoline, ricinus oil is particularly suitable. Such oil as indicated above is maintained under pressure by a liquid column which is generally the same height or greater than the height of the medium being dispensed. The specific gravity of the surrounding non-explosive liquid is always higher than that of the liquid being dispensed so that there is no necessity for any special pumping devices or the like in order to maintain the requisite pressure.

I claim:

1. An electromotor for use in an inflammable or explosive medium comprising an electric motor, a shaft extending into said medium in which said motor is placed, a non-explosive liquid non-soluble with respect to said medium in said shaft surrounding said motor, said shaft being sealed about said motor with respect to said medium and means for placing said liquid under a higher pressure than the pressure of said medium.

2. An electromotor pump combination for use in an inflammable or an explosive medium, comprising an electric motor, a shaft extending into said medium in which said motor is placed, a non-explosive liquid non-soluble with respect to said medium in said shaft surrounding said motor, said shaft being sealed about said motor with respect to said medium, said liquid having a higher specific gravity than said medium so that said liquid is under a higher pressure than the pressure of said medium, a head provided on the upper portion of said shaft, an inlet branch on said head for said medium said head also having an opening through which said liquid may be supplied to said shaft and a second branch upon said head through which the feed lines for said motor may extend.

3. An electromotor pump combination for use in an inflammable or explosive medium, comprising an electric motor, a tube extending into said medium in the lower end of which said motor is located, a non-explosive liquid non-soluble with respect to said medium in said tube surrounding said motor and said liquid having a higher specific gravity than said medium so that said liquid is under a greater pressure than the pressure of the medium surrounding said tube.

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