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H. H. INGERSOLL

2,326,360

PUMPING UNIT

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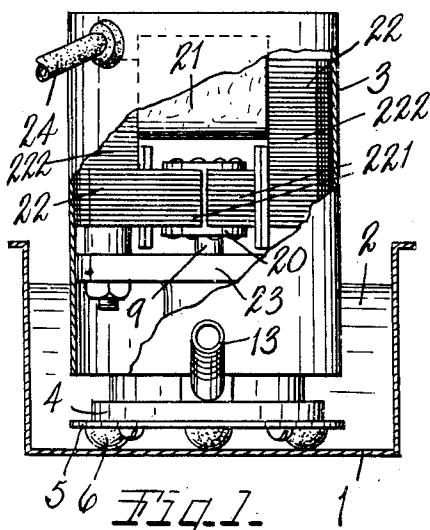


Fig. 1.

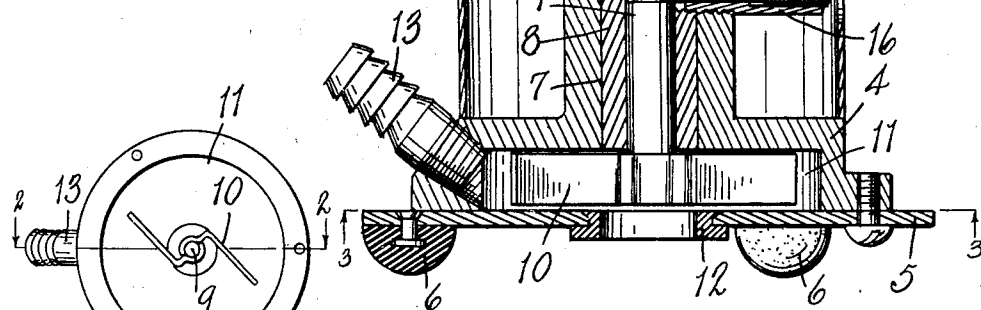


Fig. 2.

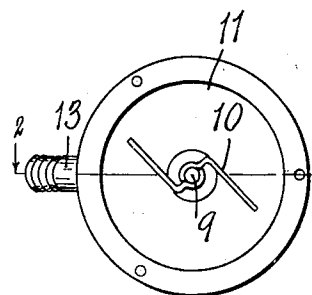


Fig. 3.

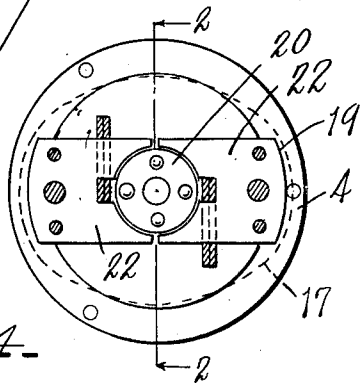


Fig. 4.

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PUMPING UNIT

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3 Claims. (Cl. 103—87)

This invention relates to improvements in pumping units.

The main objects of my invention are:

First, to provide a motor driven pumping unit suitable for pumping liquids in which the unit is immersed.

Second, to provide a unit of the type described especially adapted for fountain purposes and the like, having novel provisions for dissipating the heat evolved in the operation of the motor drive therefor.

Third, to provide a motor of novel construction which is particularly adaptable for use with a fountain pumping or like unit.

Fourth, to provide a novel and improved encased motor pumping unit.

Fifth, to provide an improved motor which is characterized by increased torque, quicker magnetization and demagnetization, a decreased flux lag, and which has less tendency to heat up than present motors, hence is well adapted for the foregoing purposes.

Further objects relating to details and economies of my invention will appear from the description to follow. The invention is defined in the claims.

A structure embodying the features of my invention is illustrated in the accompanying drawing, wherein:

Fig. 1 is a fragmentary view in elevation partially broken away and in section illustrating the pumping unit of my invention in operative relation to a reservoir or other container from which liquid is to be pumped and in which the unit is immersed.

Fig. 2 is an enlarged view in vertical section on line 2—2 of Figs. 3 and 4, illustrating structural details of the pump and encased motor drive therefor.

Figs. 3 and 4 are views in section on lines 3—3, 4—4 respectively of Fig. 2, further illustrating details of construction and arrangement of the parts of the unit.

This invention relates in general to a pumping unit adapted for the pumping of liquids for various purposes. Though originally devised as a pumping unit for fountains and the like, it will be apparent to those skilled in the art that its field of adaptation is not unduly limited. It is, on the contrary, well suited for the pumping of any type liquid from a reservoir in which the unit is partially or wholly immersed in the liquid. In particular, the present unit involves a novel and improved arrangement of a motor drive for a pumping impeller and a motor drive casing

whereby to dissipate heat generated in the motor in its operation, which heat would ordinarily be destructive were provision not made to dissipate the same.

Referring to the drawing, the reference numeral 1 designates a suitable conventionally illustrated reservoir, fountain or the like in which a quantity of liquid 2 is contained, said liquid to be pumped by the pumping unit of my invention which is generally indicated by the reference numeral 3.

Referring to Fig. 2, wherein details of the construction are illustrated, the unit consists of a base casting 4 secured to a mounting and support plate 5 provided with rubber or other suitable feet 6 for supporting the unit in the reservoir. Casting 4 is cored out to provide a central vertical aperture 7 receiving a bearing 8 in which the pump impeller shaft 9 is rotatably mounted, the impeller 10 attached to and driven by the shaft being disposed in a pumping chamber 11, defined by a further cored-out recess in casting 4 above the bottom plate 5. This latter plate is provided with a central opening receiving the apertured inlet member 12 for the entry of liquid into the pump chamber 11, the liquid being discharged through a discharge fitting 13 tapped into the base in communication with the chamber and adapted to receive a suitable hose or other liquid transmission line.

The shaft 9 is vertically sustained by the adjustable end thrust bearing member 14 engageable in a groove 15 in the shaft and carried by a sleeve-like support 16 tapped into the side of the base and shaft bearing.

A cylindrical copper shell or sheath 17, preferably though not necessarily closed at its upper end, is mounted on and secured to the base 4 in any suitable fashion to enclose the shaft and motor drive therefor, to be described, this shell or sheath being provided with a side aperture 18 permitting access to the adjustable thrust or sustaining member 14. This shell of highly heat conductive material is in direct contact with the motor to serve to transmit heat therefrom to the liquid in which the unit is partially immersed to thereby assure cool operation of the motor. This arrangement makes it possible to use a very small motor and to load it to capacity without danger of overheating and burning out of the motor.

The motor for driving the shaft 9, generally indicated by the reference numeral 19, is of the squirrel cage, shaded pole type having a rotor 20 rotatable on a vertical axis and driving shaft 9. It will be noted that the motor departs sharply

from conventional practice in that the field coil 21 is mounted directly above the axis of the rotor and not to one or both sides thereof as in the ordinary construction. By using this arrangement, it is possible to keep the coil at the top of the unit and out of the liquid in which the unit is partially immersed without making the unit unduly large. The laminated iron field 22, including the poles 221, is disposed on either side of the rotor, being bolted on lateral wings or flanges 23 of the cast base. As illustrated in Figs. 1 and 2, field winding or coil 21 is wound on the laminated field directly above the rotor 20.

It will be particularly noted that the laminated field 22 including both the poles 221 and the connecting legs 222 thereof adjoining the coil has the laminae thereof disposed in planes normal to and transverse the axis of the rotor. This, so far as the legs 222 are concerned, is a 90° change from the usual construction and I have found that it results in quicker magnetizing and demagnetizing of the field, a decreased flux lag, and increased torque. The motor operates cooler than other motors of this type and is, all in all, rendered much more suitable for the intended purposes mentioned above and to be hereinafter more fully described.

An insulated electrical cable 24 extends through the copper sheath 17 at an elevated point thereon and is connected with winding 21 to energize the latter and operate motor 19 in the usual fashion.

By reference to Figs. 1 and 4, it will be seen that the laminated iron field 22 extends radially outward into contact with the copper shell and maintains this contact for a substantial distance vertically of the shell, thereby placing the field in intimate and effective heat conducting relation to the shell. This latter extends down into the supply of liquid 2 in the reservoir 1, whereby to be continuously cooled thereby and thus dissipate the heat generated in the operation of the motor, which heat if not appropriately led away, would soon result in burning out of the field winding.

The extent to which the shell or sheath is immersed in the water may vary and it will be appreciated that by providing a sheath which is closed at its top an air seal results which prevents the liquid from rising sufficiently above the side opening 19 to reach the rotor of the pump actuating motor, however if desired a positive liquid seal and suitable shaft packing for the pump impeller may be employed to prevent any liquid whatsoever entering the casing or sheath. The invention is not particularly concerned with such other alternative modifications. However, I consider it novel with me to provide an enclosed motor drive for a pump wherein the field winding of the motor is disposed coaxially of its shaft and the laminated plates of the field are arranged in planes normal to the line of the rotor axis and in direct heat conducting relation to a copper or other metallic conducting sheath immersed at least in part in the liquid to be pumped, whereby to quickly and effectively dissipate heat generated in the operation of the motor. The latter has improved operating characteristics, as discussed above, and runs at a decreased temperature, which is especially desirable in an installation as described.

The terms and expressions which have been

herein employed are used as terms of description and not of limitation, and there is no intention, in the use of such terms and expressions, of excluding any equivalents of the features shown and described. It is recognized that various modifications are possible within the scope of the invention claimed.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a pumping unit of the type described comprising a supporting base having a pumping chamber therein provided with a liquid inlet and a liquid outlet and adapted to be immersed at least in part in a supply of liquid to be pumped and a vertical impeller shaft rotatably mounted on said support having an impeller on its lower end rotatable in said chamber the combination of a motor for driving said shaft comprising a rotor connected to the latter, a stator having poles adjacent the rotor and a central portion extending over the upper end of the rotor axis, and a winding on said central portion in axially spaced relation to the rotor, and a casing of heat conducting material closed at its top and fitting over and encircling said motor with the stator of the latter in direct contact with the sides of the casing, said casing extending below the normal level of liquid in said liquid supply whereby to provide a direct conductive path for dissipation of heat generated in the winding and coil in operation of the motor.

2. In a pumping unit of the type described comprising a supporting base having a pumping chamber therein provided with a liquid inlet and a liquid outlet and adapted to be immersed at least in part in a supply of liquid to be pumped and a vertical impeller shaft rotatably mounted on said support having an impeller on its lower end rotatable in said chamber the combination of a motor for driving said shaft comprising a rotor connected to the latter, a stator having poles adjacent the rotor and a central portion extending over the upper end of the rotor axis, and a winding on said central portion in axially spaced relation to the rotor, and a casing of heat conducting material fitting over and encircling said motor with the stator of the latter in direct contact with the sides of the casing, said casing extending below the normal level of liquid in said liquid supply whereby to provide a direct conductive path for dissipation of heat generated in the winding and coil in operation of the motor.

3. In a pumping unit of the type described comprising a supporting base having a pumping chamber therein provided with a liquid inlet and a liquid outlet and adapted to be immersed at least in part in a supply of liquid to be pumped and a vertical impeller shaft rotatably mounted on said support having an impeller on its lower end rotatable in said chamber the combination of a motor for driving said shaft comprising a rotor connected to the latter, a field adjacent the rotor, and a casing of heat conducting metal fitting over and encircling said motor with the field of the latter in direct contact with the sides of the casing, said casing extending below the normal level of liquid in said liquid supply whereby to provide a direct conductive path for dissipation of heat generated in the winding and coil in operation of the motor.

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