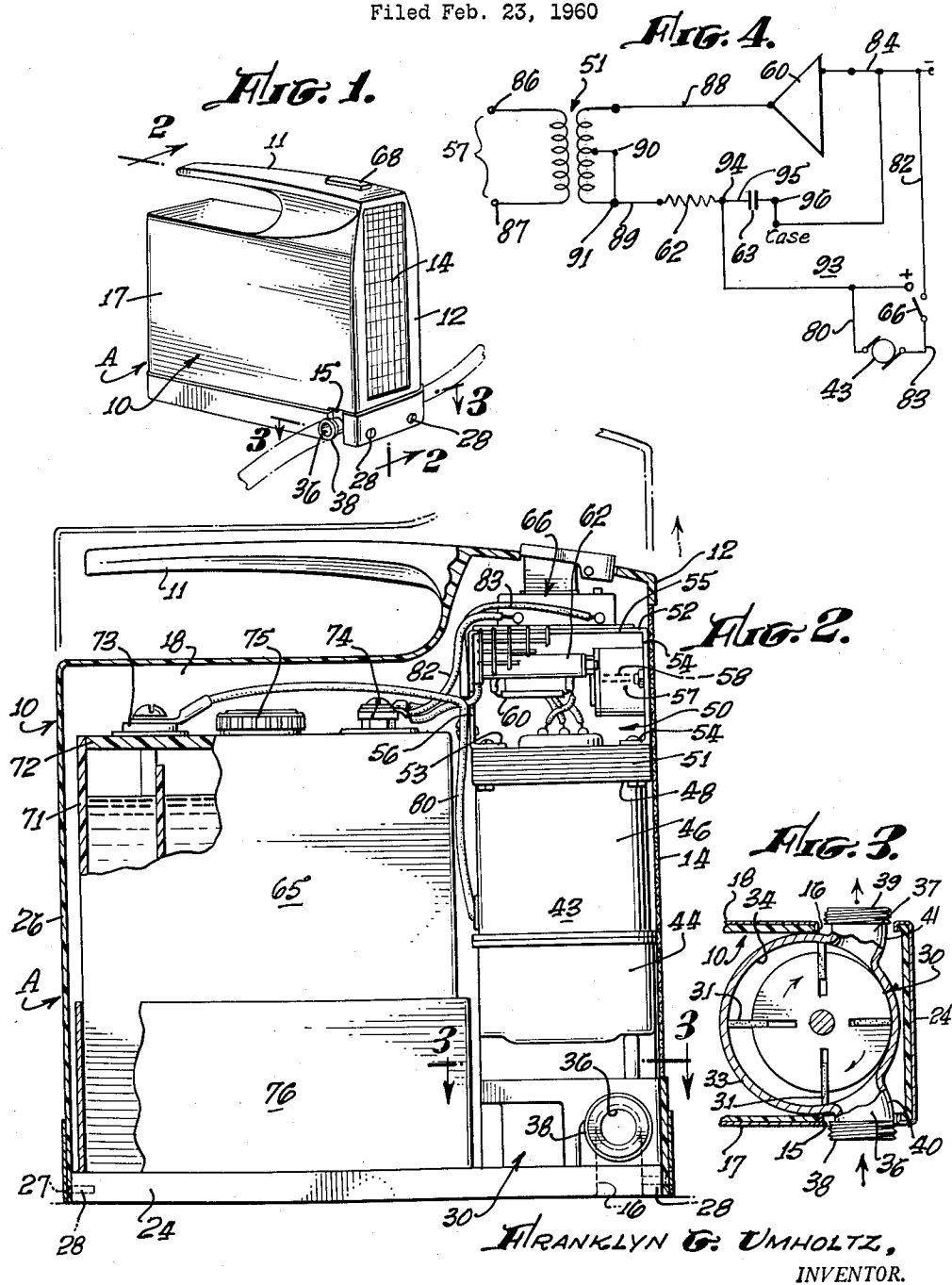


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PORTABLE LIQUID PUMP
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PORTABLE LIQUID PUMP

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This invention relates to liquid pumps and more particularly to a portable self-contained liquid pumping unit.

In many applications, particularly in the fields of boating and camping, a self-contained lightweight liquid pumping unit is highly desirable. For example, in connection with boating it is often necessary to pump water from the lower portions of the boat and from the bilges over the side of the boat. In addition it is often necessary to fill tanks and reservoirs above the water level with either fresh or salt water. When large amounts of water have accumulated in the bilges of a small boat due to any one of many causes, it is imperative that the water be removed quickly and efficiently. In the state of the prior art no high-capacity self-contained pumping unit has been available. In connection with camping and living in remote areas the utility of a small portable liquid pump will be apparent for many purposes. Such a pump can be used, for example, to transmit water from a source of supply to a location at which it is to be used when the source of supply is remote therefrom. It may also be used for many other purposes such as for use to provide a shower or other bathing facilities.

Accordingly, it is a purpose of the present invention to provide a small self-contained portable pumping unit which is efficient and economical in operation.

It is another object of the present invention to provide a portable liquid pump which is electrically operated from batteries contained within the pumping unit.

It is further object of the present invention to provide a self-contained portable liquid pumping unit which is battery operated, and includes a charging unit for recharging the storage battery thereof.

Yet another object of the present invention is to provide a self-contained portable liquid pumping unit which is light in weight but which has a high pumping capacity.

It is a still further object of the present invention to provide a portable self-contained electrically driven pumping unit which is adapted for various uses by the attachment of fittings thereto.

The present invention provides a self-contained portable liquid pump and includes a case comprising a housing having a carrying handle defined at the upper surface thereof and a base plate with which the housing is mateable. The housing for the pump is generally rectangular in cross-section and decorative in appearance. Positioned within the case is a wet cell battery comprised of a single 2-volt cell. A rotary suction pump is positioned at the base of the housing with an inlet extending from one side of the housing and an outlet extending from the opposite side thereof. The rotary pump is oriented such that its axis of rotation is substantially vertical and a drive motor is positioned vertically above the pump with the axis of the motor vertically oriented coextensive with the axis of rotation of the pump. A battery charging unit including a rectifier and a transformer is positioned above the motor with a 110-volt receptacle positioned at the forward wall of the housing. The charging unit and motor are electrically connected to the battery through a switch which is operable from the exterior of the housing.

The novel features which are believed to be characteristic of the present invention both as to its organization and method of operation, together with further objects and advantages thereof, will be better understood from the

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following description considered in connection with the accompanying drawing in which a presently preferred embodiment of the invention is illustrated by way of example. It is to be expressly understood, however, that the drawing is for the purpose of illustration and description only and is not intended as a definition of the limits of the invention.

In the drawing:

FIGURE 1 is a view in perspective of the presently preferred embodiment of the present invention;

FIGURE 2 is a view in elevation of the presently preferred invention with the housing shown in cross-section;

FIGURE 3 is a view taken along line 3-3 of FIGURE 2 showing the suction pump utilized in the presently preferred embodiment; and

FIGURE 4 is a partially schematic diagram of the electrical connections between the components of the present invention.

Referring now to the drawings there is shown in FIGURE 1 a view in perspective of the present invention in its presently preferred embodiment. A case which includes a housing 10 and base plate 24 is provided for the apparatus which case A is substantially rectangular in horizontal cross-section. The housing 10 is formed of a lightweight metal such as aluminum and is decoratively finished by enameling or anodizing. The housing is formed with an open bottom and at the upper surface thereof a carrying means such as the handle 11 is formed as an integral part of the housing. The forward surface 12 of the housing is partially open and is fitted with an articulated grill 14 to allow the circulation of air for cooling through the apparatus. The articulated grill 14 covers substantially the complete forward face of the housing. Opposed slotted openings 15 and 16 are provided in the side walls 17 and 18 of the housing proximate the forward wall thereof. The slotted openings are adapted to pass over the inlet and outlet from the pump as described more fully hereinafter.

A base plate 24 is provided which is substantially equal in outside dimensions to the inside dimensions of the housing 10 at the bottom thereof and is mateable with the housing to form a closed unit. The base plate in the presently preferred embodiment is a plate formed of aluminum which is sufficient in thickness to accommodate the various components which are mounted thereon and to allow the fastening of the housing 10 to the base plate. In the presently preferred embodiment such fastening is accomplished by providing openings at the front wall 12 and the rear wall 26 of the housing proximate the bottom edge thereof. Mateable openings are provided in the forward and rearward edges of the base plate 24 and screws 28 are inserted through the openings 27 of the housing and into the base plate to fasten the housing to the base plate to form a closed unit.

A rotary pump 30 is affixed to the base plate proximate the forward edge thereof and is vertically oriented with the axis of rotation of the pump extending vertically with respect to the base plate. The pump is of the positive displacement type and is a guided vane pump in the presently preferred embodiment. Thus, referring to FIGURES 2 and 3, the pump includes multiple blades 31 sliding in slots in the rotor to form the impeller of the pump. The impeller and case 33 are eccentric as shown in FIGURE 3. The centrifugal force created by the rotation of the rotor maintains the outer ends of the blades 31 in contact with the bore 34 of the pump casing 33. A liquid inlet 36 is provided at one side of the casing substantially tangential to the bore of the casing while a liquid outlet 37 is provided at the opposed point of the casing substantially tangential to the bore of the casing and opposed to the inlet. The liquid inlet and outlet ex-

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tend outwardly from the pump casing 33 beyond the edge surfaces of the base plate 24.

Male threaded fittings 38 and 39 are provided at the outer end of the liquid inlets and outlets and are adapted to be mated with female threaded fittings of hoses or the like through which the liquid being pumped will be drawn to the pump and transferred away therefrom. The fittings 38 and 39 have a diameter which is substantially greater than the transverse cross-section of the inlet and outlet 36 and 37. The shoulder surfaces 40 and 41 of the fittings are spaced slightly from the edge surface of the base plate. Accordingly, the housing is adapted to be slipped over the components contained therein such that the slots 15 and 16 at the lower edge of the housing 10 are mated with the inlet 36 and outlet 37. Thus, as shown in FIGURES 1 and 2, when the housing 10 is placed on the base plate, the liquid inlet and outlet are mated with the slots 15 and 16 and the fittings 38 and 39 will prevent any outward movement of the sides of the housing.

Positioned upon the upper surface of the pump casing 33 is a 2-volt motor with the axis of the rotor vertically oriented and aligned with the axis of rotation of the pump rotor 31. The motor 43 is contained within a motor housing 44 which abuts the upper surface of the pump casing and is connected thereto. The motor 43 is wound to be operated at a potential of two volts. A sleeve 46 is positioned surrounding the upper portion of the motor 43 and extends above the upper end of the motor to furnish a horizontal mounting surface 48 upon which the battery charging and switching unit 50 is positioned. The battery charging and switching unit 50 comprises a transformer 51 which is positioned upon the mounting surface 48 with the terminal connections of the transformer extending upwardly into a space defined by the upper surface of the transformer 51 and a mounting plate 52. The mounting plate is a sheet of rigid metal which has been bent as shown in FIGURE 2 to an inverted U-shaped configuration with flanges 53 and 54 inwardly disposed to connect the plate 52 to the upper surface of the transformer. Thus, the mounting plate provides a forward wall 54, an upper wall 55, and a rearward wall 56 upon which the various electrical components are mounted. At the forward wall 54 a 110-volt receptacle 57 is provided with a two-prong male fitting adapted to receive the female fitting of a 110-volt line, positioned such that the outer ends of the prongs 58 are substantially flush with the forward wall of the mounting plate. Thus, the receptacle is recessed inwardly from the forward surface of the mounting plate. A metallic oxide rectifier as shown in FIGURES 2 and 4 is affixed to the rearward wall of the mounting plate at the inner surface thereof. The rectifier 60 is of the type well known to the art and the charging unit positioned within the mounting plate 52 is of the full-wave rectifying type adapted to charge the 2-volt single-cell battery of the present invention. In addition to the metallic oxide rectifier 60 a resistor 62 and a capacitor 63 are mounted within the confines of the mounting plate by affixing the resistor 62 and capacitor 63 to the inner surface of the upper wall of the mounting plate. Suitable connections are made between the components of the rectifying unit to provide a smoothed wave rectifier. That is, since the battery 65 to be charged is of 2-volt capacity the transformer 51 is of the type which will step down the voltage of the 110-volt charging line to the peak voltage of the battery. For example, the transformer will step down the 110-volt input to approximately 2.5 volts which will be used as the charging input to the battery as described more fully hereinafter.

A switch 66 is mounted upon the upper surface of the upper wall 55 of the mounting plate and is positioned such that the actuating button 68 of the switch extends through the upper surface of the housing 10. In the embodiment shown in the figures, the switch 66 is of the

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push-to-on, push-to-off type in which the switch can be depressed by the operator to turn "on" the unit which will remain on until the switch is again depressed by the operator. The switching connections as well as the electrical connections between the various components of the charging unit are discussed hereinafter in connection with FIGURE 4.

As shown particularly in FIGURE 2, a battery 65 is vertically oriented within the housing 10 and extends from a forward position proximate the motor and charging unit to a position proximate the rearwall of the housing. The battery utilized in the presently preferred embodiment is a 2-volt single-cell lead-acid battery which includes a positive plate group and a negative plate group with appropriate separators between the positive and negative plates in the cell. The battery thus comprises a single cell positioned within a battery case 71 formed of insulating material with a cell cover 72 at the upper surface of the battery. Positive and negative terminals 73 and 74 respectively extend through the cell cover of the battery at opposite sides of a filler cap 75. A non-leaking or fluid-tight filler cap is utilized in order that acids will not escape from the battery when the pumping unit is not maintained in a vertical position. The battery is positioned within a battery holder 76 of rectangular configuration with an open upper end which is attached to the upper surface of the base plate 24. The battery holder extends partially upward along the height of the battery 65 and is preferably formed of aluminum. It should be noted that the over-all height of the battery is less than the height of the pump motor and charging unit. Accordingly, the housing is formed as shown in FIGURE 1 such that the rearward portion of the housing is of a lesser height than the forward portion and the housing maintains the battery in proper position within the battery holder 76.

Suitable connections are made between the positive and negative terminals of the battery and the motor through the switch 66 in order that the battery will energize the motor and drive the pump when the switch 66 is actuated. Referring to FIGURE 4, a partially schematic diagram of the electrical connections of the present invention is shown. For operating the motor and pump a first electrical lead 80 is connected between the positive terminal of the battery and one terminal of the motor. A second electrical lead 82 is connected between the negative terminal of the battery and one side of the switch 66. Electrical lead 83 extends from the second side of the switch to the second terminal of the motor. Thus when the switch is closed, current flows through the motor and drives the pump. To charge the battery, an input lead 84 is connected between the output of the rectifier and the negative terminal of the battery. The 110-volt charging current is connected through the receptacle 57 to the transformer 51 by means of lead lines 86 and 87 connected between the receptacle prongs and the primary terminals of the transformer. The secondary terminals of the transformer are connected by lead line 88 to the rectifier and by electrical connectors 89 to one side of the resistor 62. The electrical connector 89 is connected to the center tap of the transformer as well as the outer tap 91. The positive terminal of the battery is connected by the electrical connector 93 to the second terminal 94 of the resistor and to the first side 95 of the capacitor. The capacitor and resistor are connected in series with the second side 96 of the capacitor being connected to the case as ground.

Thus, in operation the present invention with the battery in a charged condition is operated by actuating the switch 66 to the "on" position to cause energization of the motor and rotation of the pump. Rotation of the pump draws water into the inlet side of the unit and out from the outlet side thereof. The capacity of the pumping unit of the present invention is such that approximately 700 gallons of liquid can be pumped during a

6-hour period with a single charge of the 2-volt battery. The pumping unit has a suction lift of approximately four feet and weighs approximately fifteen pounds when completely assembled and ready for operation. Various fittings can be attached, as for example a hose fitting leading to a shower head from the outlet side of the pump. When the battery has become discharged it can be recharged by removing the housing from the base plate 24 and connecting a 110-volt line to the charging receptacle.

Thus, the present invention provides a compact lightweight self-contained pumping unit which is efficient in operation and economical of manufacture.

What is claimed is:

1. A portable liquid pumping unit comprising: a vertically oriented case including a housing and a base plate, a single-cell 2-volt battery positioned within said housing and mounted vertically upon said base plate; a rotary pump positioned upon said base plate proximate the forward edge thereof, a pump inlet extending through one side wall of said housing to the exterior thereof, a pump outlet extending through the opposite side wall of said housing; a 2-volt electric motor positioned above said pump and connected thereto with the shaft of said motor vertically aligned with and connected to said pump such that said pump is rotated about a vertical axis; a battery charging unit positioned within said housing above said motor and including a 110-volt receptacle, a rectifier and a transformer, said receptacle being electrically connected to said transformer, said transformer being electrically connected to said rectifier, said rectifier being electrically connected to the negative terminal of said battery; a switch extending through said housing and operable from the exterior thereof, electrical connectors connecting the terminals of said battery through said switch to the terminals of said motor.

2. A portable liquid pumping unit comprising: a vertically oriented case including a housing and a base plate, a single-cell 2-volt rechargeable lead-acid-lead battery positioned within said housing and mounted vertically upon said base plate; a rotary pump positioned upon said base plate proximate the forward edge thereof, a pump inlet extending through one side wall of said housing to the exterior thereof, a pump outlet extending through the opposite side wall of said housing; a 2-volt electrical motor positioned above said pump and connected thereto with the shaft of said motor vertically aligned with and connected to said pump such that said pump is rotated about a vertical axis; a battery charging unit positioned within said housing above said motor and including a 110-volt receptacle, a rectifier and a transformer, said receptacle being electrically connected to said transformer, said transformer being electrically connected to said rectifier, said rectifier being electrically connected to the negative terminal of said battery; a switch extending through said housing and operable from the exterior thereof, electrical connectors connecting the terminal of said battery through said switch to the terminals of said motor.

3. The apparatus as defined in claim 2 in which said housing is vertically mateable with and removable from said base plate with an integral handle formed at the upper surface thereof extending rearwardly from said switch.

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