Jan. 8, 1963 J. M. CRALLE ETAL 3,072,062

LIQUID PUMP

Filed April 17, 1961

Fig. 1

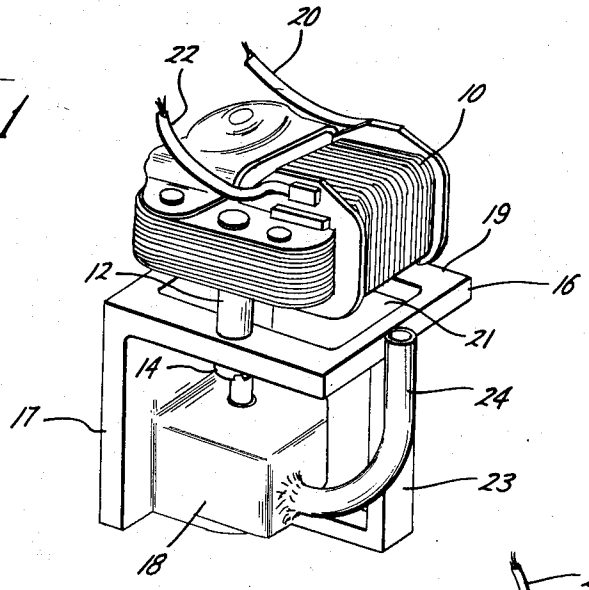


Fig. 2

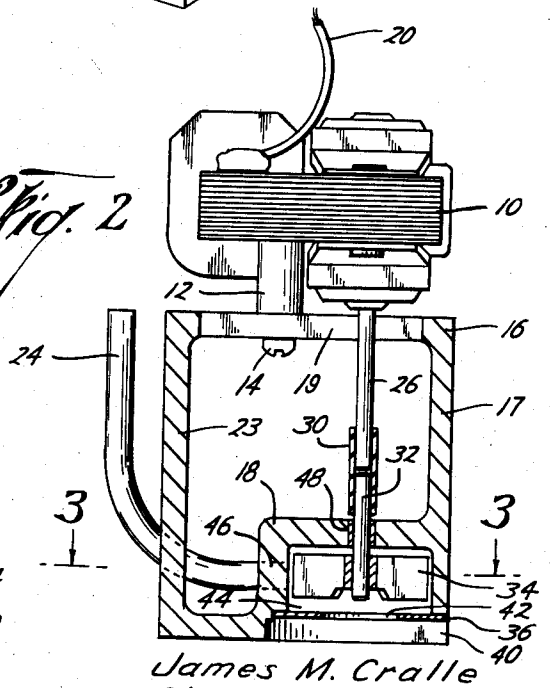
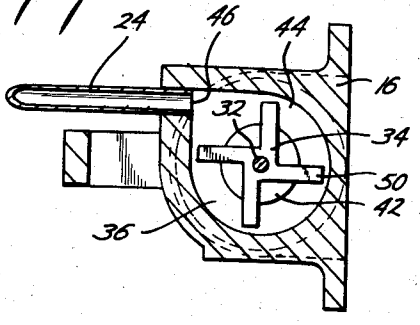


Fig. 3



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LIQUID PUMP

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This invention pertains generally to pumps and particularly to liquid pumps utilized in conjunction with decorative devices which may have shallow or small liquid reservoirs.

During recent years, there has been a marked increase in the use of liquid, particularly water, for decorations and ornamentations. Such decorations and ornamentations generally utilize a constant flow of liquid such as water with various innovations including lighting effects on the liquid as the liquid flows or remains stationary in containers. With the increasing use of water for such decorations and ornamentations, a need has become apparent for a liquid pump which is small, reliable, economical in initial cost, and easy to maintain.

Known pumps which have been used to the present time have been heavy, with most of the weight being located near the top of the pump structure with the pump structure having many pieces which are susceptible to misalignment thereby reducing the efficiency and effectiveness of the pump. Such known pumps also have had excessive weight and the fans and impellers of the pumps have created disturbing noises.

Thus, it is an object of the present invention to provide a pump which is small in overall dimensions relative to the pumping capacity of the pump.

Another object of the present invention is to provide a pump having an open impeller which is positioned slightly above the base of the pump thereby allowing the pump to be partially submerged.

Still another object of the present invention is to provide a pump having a high pumping capacity in regard to its overall dimensions while being simple in construction and economical in cost.

Yet another object of the present invention is to provide a small liquid pump structure which has a unitary frame and which has a low center of gravity.

A further object of the present invention is to provide a small liquid pump which is sturdy and quiet, with the pump efficiency being maintained at a high level due to the positive alignment of the pump motor shaft with the pump impeller.

Briefly described, the pump comprises a unitary frame construction having a small electric motor mounted thereon. The electric motor has a shaft which is positioned vertically in the frame for alignment with a lower recess in such frame. The lower recess provides a housing for the pump impeller. On the end of the motor shaft is coupled a tube which may be made of plastic material. The tube acts as a coupling between the motor shaft and the pump impeller which rotates as the motor shaft rotates. Coupled to the impeller housing is an orifice or tube through which liquid is pumped as the impeller is rotated. The impeller is positioned slightly above the lowermost portion of the frame thereby allowing the impeller to be rotated without subjecting the impeller to damage from foreign objects in the liquid being pumped. Also normal sedimentation in the container does not interfere with operation of the pump. However, the impeller is positioned near enough to the lowermost portion of the frame so that effective pumping may be maintained even though the liquid level in the container becomes relatively low.

In the drawing,

FIGURE 1 is a perspective side view of the pump;

FIGURE 2 is a cross-sectional elevational view of the pump; and

FIGURE 3 is a plan view of the pump taken along line 3—3 of FIGURE 2.

Referring now in more detail to the drawing figures, unitary construction is used to provide a combined frame **16** for supporting a motor and to provide a chamber wherein the liquid which is to be pumped is agitated through centrifugal force provided by a pump impeller.

Frame **16** comprises an upper member **19**, also called a motor mounting plate, with solid member **17** which is a support plate, extending downwardly from the upper member. Member **23** which may also be referred to as a support leg extends downwardly from the motor mounting plate to impeller housing **18**. Impeller housing **18** may be designated as an inverted cup-shaped housing and is positioned at the juncture of the support leg **23** and support plate **17**. Tube **24** is connected to impeller housing **18** near support leg **23**. Tube **24** extends upwardly to the top of motor support plate **19**.

As may be seen in FIGURES 2 and 3, impeller housing **18** includes a recess **40** wherein is positioned intake washer **36**. Intake washer **36** is disposed between recess **40** and impeller chamber **44**. Washer **36** may be held in position through a press fit or it may be held in position by crimping portions of the outer edge. A central aperture or orifice **42** provides an intake for liquid into the impeller chamber **44**.

Positioned in the impeller chamber **44** is impeller **34** having a shaft **32** extending through bearing **48**. Impeller **34** is comprised of a plurality of projections **50** which protrude from the central portion of the impeller. Orifice **46** extends through the impeller housing **18** and may be threaded to provide a threaded connection for tube **24**.

Disposed on member **19** of pump frame **16** is an electric motor **10** which is energized through leads **20** and **22**. Motor **10** is mounted to member **19** with connecting means such as a screw **14**. A bushing **12** provides support between the motor **10** and member **19**. The apertures for the connecting means are positioned to provide axial alignment of motor shaft **26** with impeller shaft **32**. Coupling means such as a flexible plastic tube **30** is used for coupling motor shaft **26** and impeller shaft **32**. The proper alignment of the shafts provides maximum pump efficiency.

Rectangular opening **21** allows air convection currents to pass over motor **10** thereby eliminating the need for a cooling fan to cool the motor.

Thus, as motor **10** is energized to rotate shaft **26**, impeller shaft **32** and impeller **34** are also rotated. Liquid within impeller chamber **44** is agitated and discharged through centrifugal force through orifice **46** and tube **24**.

Thus, the invention provides a small, compact pump which is comprised of a minimum number of component parts because of the unitary construction of the frame and impeller chamber. The pump has an integrally contained power source and the pump is adapted for operation in open, closed, stationary or portable liquid reservoirs.

Although a preferred embodiment of the invention has been shown and described, it is to be understood that all forms and embodiments of the invention falling within the scope of the following claims are sought to be protected by Letters Patent.

We claim:

1. A liquid pump comprising a motor mounting plate, a support plate extending downwardly from one side of said mounting plate, a support leg extending downwardly from an opposite side of said mounting plate, a housing providing a pump chamber having an inlet and an outlet, a vertical impeller shaft rotatably mounted in said housing, an impeller fixed on said impeller shaft within said

chamber, said housing being spaced below said motor mounting plate and between said support plate and support leg and connected thereto, said motor mounting plate having a vertical hole therein a predetermined horizontal distance from said impeller shaft, a motor including a stator and a shaft rotatably mounted therein, said stator having a vertical hole therein a certain horizontal distance from said shaft equal to said predetermined horizontal distance between said hole and said impeller shaft, means engaging the motor mounting plate and stator at said holes connecting said motor to said motor mounting plate, said motor being positioned with its shaft in alignment with said impeller shaft, means coupling said impeller shaft to said motor shaft, said motor mounting plate and said support plate and said support leg and said housing being integral whereby said predetermined horizontal distance is accurately determined and maintained equal to said certain distance to provide accurate alignment of said shafts.

2. Combination of claim 1 wherein said means connecting said motor to said motor mounting plate is a threaded screw allowing said motor to rotate thereabout until the screw is tightened and said coupling means for said shafts is a flexible plastic tube.

3. A combination of claim 1 wherein the horizontal extent of the periphery of said mounting plate exceeds that of said motor in every direction providing a buffer to protect said motor and the inner portion of the plate is cut out providing for free circulation of air upwardly therethrough past said motor to cool the same by convection.

4. Combination of claim 1 wherein said housing is of smaller horizontal extent than said motor mounting plate and is disposed immediately adjacent said support plate and said support leg including a vertically extending portion and a portion at the lower end thereof extending horizontally from said vertical portion to the side of said housing.

5. The combination of claim 1 wherein said housing is in the form of an inverted cup and is provided with a washer closing the bottom of the housing, said washer being centrally apertured to provide an inlet to said housing and said housing having an orifice in the side thereof providing an outlet from said housing.

6. Combination of claim 4 with a tube having a lower horizontal portion connected to said orifice and a vertical portion extending upwardly to the level of said motor mounting plate.

7. A unitary frame for a liquid pump, said frame including a solid rectangular vertical plate member having an upper and lower edge, an open rectangular horizontal plate member having a rectangular aperture, said open member extending integrally at right angles from the upper edge of said solid member, a chamber positioned on the lower edge of said solid member integral therewith, said aperture overlying said chamber, said chamber having a recess in the lower portion for receiving a washer, a support member having a right angle therein and extending at right angles from said chamber integrally therewith to said open member integrally therewith and making a right angle therewith, and a curved tube connected to said chamber and extending upwardly and away from said solid member, said frame being open at the sides thereof between said support member and said solid rectangular member.

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