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IMPELLER

Filed March 8, 1957

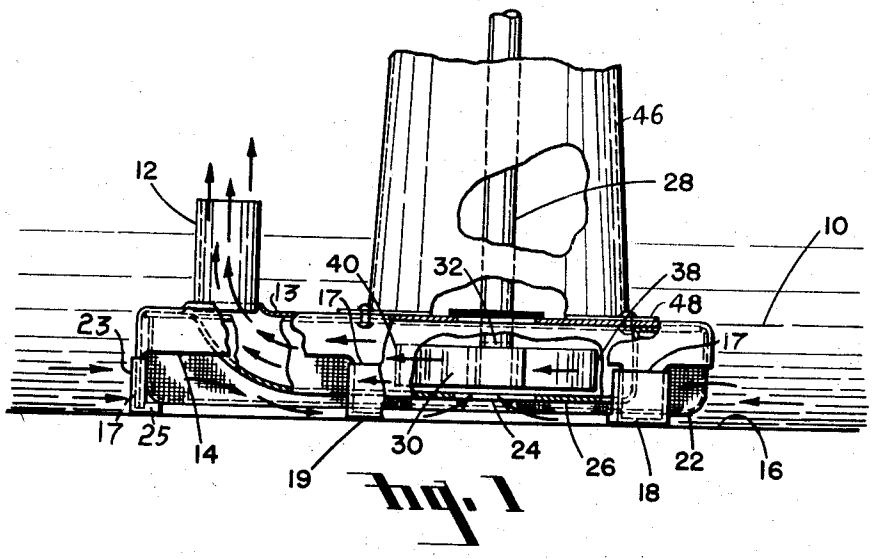


Fig. 1

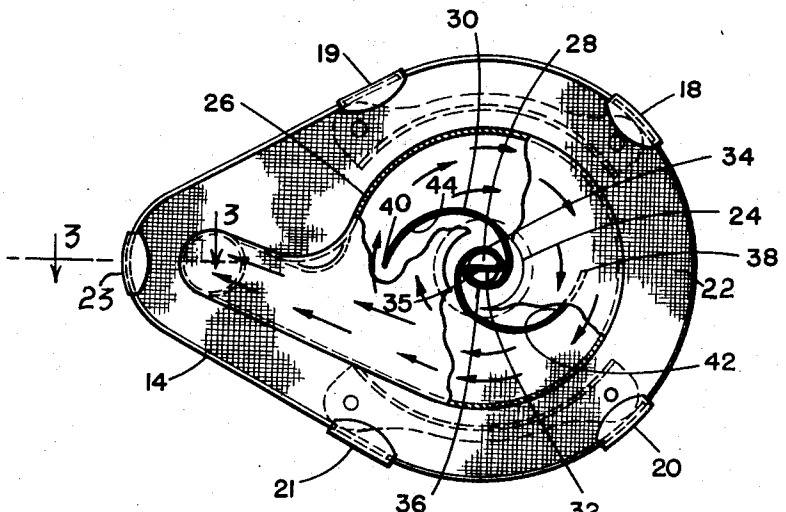


Fig. 2

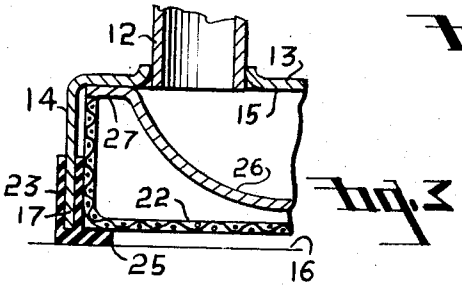


Fig. 3

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6 Claims. (Cl. 103—103)

The present invention relates to an impeller and more particularly to an impeller operable in connection with small fractional horsepower electric motors for pumping liquid.

It has been a problem to pump liquid with a small fractional horsepower, high speed electric motor when an impeller, immersed in liquid, is directly connected with the shaft thereof. It has been found that conventional radial impellers tend to load such a motor and require reduction gear mechanism. Further, it has been recognized that small liquid pumps when used on highly competitive equipment must be simple, economical to manufacture and very reliable.

In the manufacture of evaporative coolers, pumps are used to force water from the sump in the bottom of the cooler to manifolds or distributors which direct the water into troughs at the upper edges of the evaporative cooler pads. In these coolers small high speed electric motors are used and it is desirable to operate pump impellers in direct connection with the shafts of such motors in order to provide for the construction of a very economical pump.

Accordingly, it is an object of the present invention to provide a very simple impeller which may be directly connected to the shaft of a small fractional horsepower high speed motor and which will operate in a manner compatible to the pumping of liquid by means of said motor.

Another object of the invention is to provide an impeller having a substantially flat spiral configuration and which is made of a single piece of metal fitted in a diametrically disposed slot in the shaft of an electric motor thereby providing a very simple and economical construction for use in highly competitive liquid pumps.

Another object of the invention is to provide an impeller having a flat spiral configuration which permits the shaft on which the impeller is supported to rotate at relatively high speed in proportion to the amount of liquid which is pumped by the impeller thereby acting to take the place of reduction gearing which is normally required to interconnect a small high speed motor shaft and a liquid pumping impeller driven thereby.

Another object of the invention is to provide a very simple impeller construction comprising a single flat piece of metal having its middle portion fitted in a slot in the end of a motor shaft around which opposite ends of the flat impeller member are formed into a flat spiral configuration which firmly and securely holds the one piece impeller on the shaft and provides for extreme simplicity and economy of manufacture and assembly in the production of the pump.

Another object of the invention is to provide a pump having a very simple housing, pump inlet, screen and supporting structure which is very simple and economical to produce, assemble and maintain.

Another object of the invention is to provide a pump housing and inlet screen wherein resilient shoes are frictionally engaged with legs on the housing and the shoes retain the screen in position relative to the housing and also support the entire assembly in spaced relation from the bottom of a liquid sump.

Other objects and advantages of the invention may be apparent from the following specification, appended claims and accompanying drawing in which.

Fig. 1 of the drawing is a fragmentary side elevational view of a pump having the impeller of the present invention mounted therein and showing portions of the pump housing in section; Fig. 2 is a bottom plan view of a pump showing the impeller of the present invention mounted therein and showing portions of the pump housing broken away to permit a full view of the impeller in connection with the end of a motor shaft; and Fig. 3 is an enlarged fragmentary sectional view taken from the line 3—3 of Fig. 2.

As shown in Fig. 1 of the drawing the pump which houses the impeller of the present invention is located in a sump wherein liquid **10** is being transferred from a sump through a conduit **12** to a use location.

The conduit **12** extends from a centrifugal pump housing **14**. The conduit **12** serves as an outlet which communicates internally of the housing **14** and with the interior of a cooperating housing member **26** as will be hereinafter described in detail. The housing member **14** is an inverted cup shaped structure having downwardly extending legs **17** on which are frictionally engaged shoes **18**, **19**, **20** and **23**. These shoes are provided with an envelope portion which fits over the legs **17** and grips them frictionally due to the resilient character of the shoes which may be made of any suitable material such as plastic, rubber, or any other synthetic material. Each of the shoes is provided with an inwardly extending toe portion such as the toe portion **25** of the shoe **17** and these toe portions extend under a cup shaped screen which covers the lower side of the pump housing member **26** wherein a central opening **24** thereof communicates with the inlet of the pump impeller **30**.

As shown in Fig. 3 of the drawings the pump housing member **26** is provided with a flange which is fixed to the lower inner side **15** of the pump housing **14** while a housing support **46** is provided with a flange **48** secured to the upper side **13** of the housing **14**. The flanges **27** and **48** may be secured to the housing **14** by rivets or any other suitable means as desired. The support **46** may be secured to the supporting frame structure or may be mounted on a motor which drives the shaft **28** in connection with the impeller **30**.

The opening **24** of the housing **26** is concentric with a motor shaft **28** which supports the impeller **30** of the present invention. As shown in Fig. 2 of the drawings the motor shaft is provided with a diametrically disposed slot **32** which is open at the end of the shaft and extends axially thereof. Positioned in this slot **32** is the middle portion of a flat piece of sheet metal which forms the impeller **30**. Opposite sides of this flat piece of sheet metal are parallel to the axis of the shaft **28**. This flat piece of sheet metal at opposite ends of the slot **32** is wound tightly around the shaft for substantially 180 degrees and each end of the flat piece of sheet metal extends in a flat spiral directed around the shaft and outwardly thereof in progressively curved configuration.

It will be noted that when the impeller **30** is formed, portions **34** and **36** which are contiguous with the shaft **28** for substantially 180 degrees are formed slightly closer together than the over all diameter of the shaft. Thus, the middle portion **38** of the impeller is fitted in the slot **32**, the arcuate portions **34** and **36** frictionally engage the outer sides of the shaft **28** and tend to force the bifurcated portions of the shaft toward the middle portion

38 of the impeller whereby it is held securely in the slot 32 and around the periphery of the shaft near the end thereof, all as shown best in Fig. 2 of the drawings.

The shaft 28 and impeller 30 rotate in the direction as indicated by the arrows in Fig. 2 of the drawings whereby the spiral configuration of the impeller tends to wind tightly about the shaft when loaded. The load of fluid on the outwardly directed flat spiral portions of the impeller tend to tighten the arcuate portions 34 and 36 against the sides of the shaft and to squeeze the bifurcated portions of the shaft toward the middle portion 38 of the impeller which is fitted in the slot 32.

In operation, rotation of the impeller by the shaft 28 causes centrifugal action of liquid in the housing 26 whereby water enters the opening 24 in the housing and is dispelled outwardly through the conduit 12.

Due to the spiral configuration of the impeller centrifugal displacement of liquid from the shaft to the outer ends 38 and 40 of the impeller requires a greater amount of revolution on the part of the shaft than would be required for a straight radial vane type impeller. It will be seen that as the shaft 28 rotates the impeller forces water centrifugally but only permits the water to move outwardly within the limits of the spiral configuration at sides 42 and 44 of the outwardly extending spiral portions of the impeller. Thus, the impeller, due to its flat spiral configuration tends to act as a centrifugal impeller and at the same time has the effect of a reduction gear between the high speed fractional horsepower motor and the liquid being pumped thereby.

In operation the shoes 18, 19, 20, 21, and 23 are frictionally retained upon the legs 17 of the housing 14 and firmly hold the screen 22 in position. However, when the screen 22 becomes encrusted with minerals the shoes may readily be removed from the legs 17 to permit cleaning of the screen and replacement thereof. The toes 25 of the shoes support the screen in spaced relationship relative to the sump bottom 16.

It will be obvious to those skilled in the art that various modifications of the present invention may be resorted to in a manner limited only by a just interpretation of the following claims.

I claim:

1. In an impeller the combination of: a shaft having a slot diametrically therethrough and open at one end of said shaft; and a flat sheet metal impeller member having its middle portion extending through said slot and having its opposite ends wound around said shaft in the same direction and extending outwardly therefrom in a flat spiral configuration, said flat sheet metal impeller member having its opposite sides substantially parallel with the axis of said shaft and opposed arcuate sections of said impeller member extending from opposite sides of said slot at opposite ends thereof and around said shaft in the same rotational direction and tending to force portions of said shaft together toward the middle portion of said impeller which is retained in said slot.

2. In an impeller the combination of: a shaft having a slot extending diametrically therethrough and an impeller member disposed in said slot and having its middle portion retained therein and having opposed portions adjacent to said middle portion extending around and engaging said shaft and extending outwardly therefrom in a flat spiral configuration.

3. In an impeller the combination of: a shaft having a slot extending diametrically therethrough and a one piece flat sheet metal impeller member disposed in said slot and having its middle portion retained therein and having opposed portions adjacent to said middle portion extending around and engaging said shaft and extending outwardly therefrom and in a flat spiral configuration.

4. In an impeller the combination of: a shaft having a slot open in one end thereof and disposed diametrically therethrough; a flat sheet metal impeller member disposed in said slot; and opposed arcuate sections of said impeller member extending from opposite sides of said slot at opposite ends thereof and around said shaft in same rotational direction; said arcuate sections normally spaced apart a lesser distance than the diameter of said shaft whereby said arcuate sections resiliently grip said shaft in opposition to each other; opposite ends of said impeller member extending outwardly of said arcuate sections in a flat spiral configuration.

5. In an impeller the combination of; a shaft having a slot open in one end thereof and disposed diametrically therethrough; a flat sheet metal impeller member disposed in said slot; and opposed arcuate sections of said impeller member extending from opposite sides of said slot at opposite ends thereof and around said shaft in the same rotational direction; said arcuate sections extending almost 180 degrees contiguously around said shaft and normally spaced apart a lesser distance than the diameter of said shaft whereby said arcuate sections resiliently grip said shaft in opposition to each other; opposite ends of said impeller member extending outwardly of said arcuate sections in a flat spiral configuration.

6. In an impeller the combination of: a shaft having a slot open in one end thereof and disposed diametrically therethrough; a flat sheet metal impeller member disposed in said slot; and opposed arcuate sections of said impeller member extending from opposite sides of said slot at opposite ends thereof and around said shaft in the same rotational direction; said arcuate sections normally spaced apart a lesser distance than the diameter of said shaft whereby said arcuate sections resiliently grip said shaft in opposition to each other; opposite ends of said impeller member extending outwardly of said arcuate sections in a flat spiral configuration; and an impeller housing surrounding said impeller and having a fluid inlet opening near one end of said impeller axially of said shaft, said opening being smaller than the outside diameter of an area traversed by said impeller.

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