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IMPELLER PUMP WITH NOISE SUPPRESSING MEANS

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Fig.1

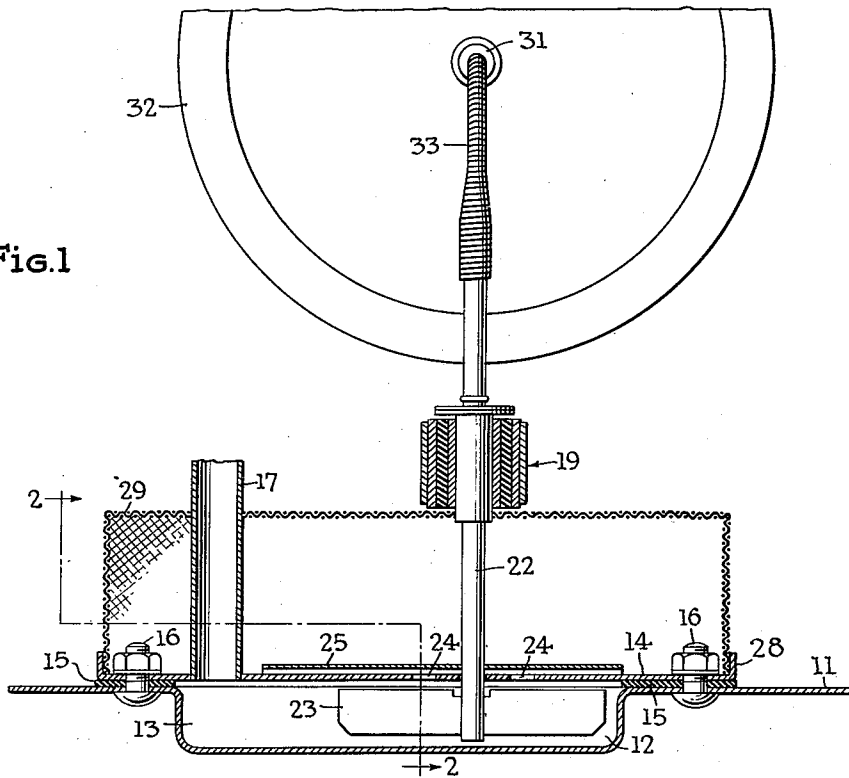


Fig.2

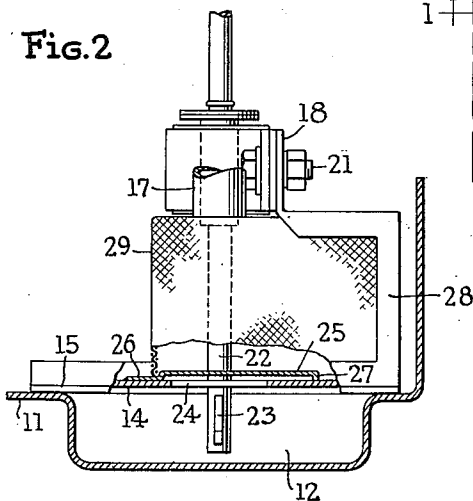
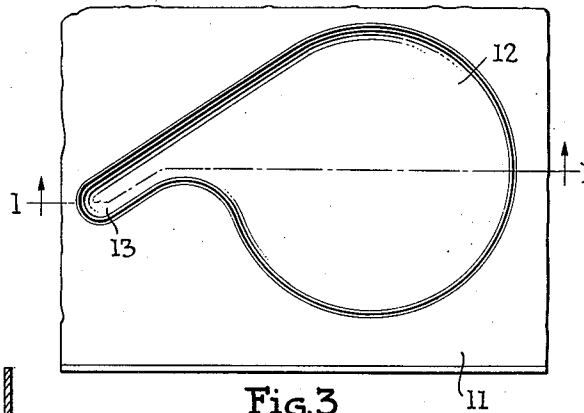


Fig.3

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IMPELLER PUMP WITH NOISE
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4 Claims. (Cl. 103—103)

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This invention relates to centrifugal pumps, and particularly to silencing devices therefor.

Installations are known in which a pump running more or less continuously removes liquid from a sump. It sometimes happens that the rates at which liquid accumulates, and the rate at which the pump operates are independent, so that the sump is occasionally pumped dry, or nearly so. Continued operation of such a pump when empty causes a loud and disagreeable chirping noise.

An example may be taken from the room cooler art. The evaporator in the room circuit of the conditioner is operated at temperatures which from time to time are below the dew point of the air, so that moisture condenses on the evaporator from the air and runs off the evaporator as "drip." This drip in certain types of coolers is drained to a sump in which a pump operates. Even if the machine runs constantly, the rate of accumulation varies with the humidity of the air. The pump in the sump propels the drip to means which cause its re-evaporation by heat from the condenser, and the connections are such that the re-evaporated drip is delivered to, and discharged out of doors with, the condenser-cooling air-stream.

Silent operation of the machine is obviously important. The invention is based on the discovery that a constantly running centrifugal pump can be silenced when the pump is empty or nearly so, by providing means which retain by capillarity a body of water which blinds the pump inlet ports. Whether the chirping noises heretofore encountered are prevented from occurring or are merely muffled (and either or both effects may be present) the noise can be suppressed to the point of inaudibility.

All that is required is a configuration such that the approach to the pump inlet ports is through a passage of capillary thinness between plates, and of such extent that the suction of the pump when empty of water or substantially so, is insufficient to overcome capillary retention of water in the approach path to the inlet ports. The result can readily be secured because the suction effect of a water-free pump is small, and the area of capillary retention can be made quite large without seriously throttling inlet flow to the pump when the sump fills with water. The term "capillary thinness" is used in the familiar sense to indicate an interplate interval small enough to assure capillary retention of water.

The invention will now be described in a form

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in which it has been incorporated in a room cooler, reference being made to the accompanying drawing, in which:

Fig. 1 is a vertical section on the line 1—1 of Fig. 3.

Fig. 2 is a vertical section on the line 2—2 of Fig. 1.

Fig. 3 is a fragmentary plan view showing the configuration of the pump chamber.

A drip collecting pan 11 is mounted in the bottom of the conditioner, or in any position where it will collect drip water. A portion of the bottom of the pan is pressed downward to form a circular pump chamber 12 with discharge passage 13 at its periphery (see Fig. 3).

A cap plate 14 is seated on gasket 15 and held by bolts 16, so that it forms the upper wall of pump chamber 12 and passage 13. The plate 14 carries a discharge tube connection 17 which leads from passage 13.

A bracket 18 fixed to plate 14 supports bearing 19 which is bolted to it at 21. Bearing 19 supports impeller shaft 22, which extends vertically downward through a central opening in plate 14 and carries impeller 23 which in the form illustrated is a flexible strip of rubber in chamber 12. Near shaft 22 inlet ports 24 (two of which are visible in the drawing) are formed in plate 14. The approach path to ports 24 is through an interval of capillary width between plate 14 and an overlying plate 25. Plate 25 has an offset flange 26 which is welded to plate 14, and a spacing flange 27 which can, but need not be welded to plate 14.

A peripheral flange 28 serves as means to attach a screen 29 which protects the approach path to ports 24, i. e., the path between plates 14 and 25.

Shaft 22 may be driven by any preferred means. In Fig. 1 the shaft 31 of one of the fans 32 is connected by a flexible shaft 33 (constructed of helically wound wire) to the upper end of impeller shaft 22.

The impeller runs continually. The plate 25 is submerged when there is water enough in pan 11 to supply water to chamber 12. Hence, the capillary entrance path is supplied with water as a necessary incident to operation of the pump. When the pump has cleared itself of water the capillary retention of water between plates 14 and 25 is strong enough to resist any suction developed by the impeller. Hence, the entrance ports are blinded by water. Whatever the precise cause may be, the effect is to

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silence the chirping noise which develops under these conditions if plate 25 is absent.

Obviously the concept may be embodied in various specifically different forms. It offers a simple and effective solution of a troublesome problem.

What is claimed is:

1. In a liquid pump of the impeller type, the combination of a rotary impeller; a housing having a chamber in which the impeller is mounted to rotate, said chamber having an inlet near its center and a discharge connection near its periphery; and means affording closely spaced surfaces defining an approach passage to said inlet, the spacing and extent of the defining surfaces being such as to assure capillary retention of water in said approach passage.

2. The combination defined in claim 1 in which the surfaces which define the approach passage are substantially horizontal.

3. In a liquid pump of the impeller type, the combination of a rotary impeller; a housing having a chamber in which the impeller is mounted to rotate, said chamber having an inlet near its center and a discharge connection near its periphery; means affording closely spaced surfaces defining an approach passage to said inlet, the spacing and extent of the defining surfaces being

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such as to assure capillary retention of water in said approach passage; and means forming a water-retaining sump in which the pump housing is mounted, the sump being of depth sufficient to assure submergence of the pump chamber and the approach passage when the sump is water filled.

4. The combination defined in claim 3 in which the impeller rotates on a vertical axis, the housing has a diameter which is several times its axial extent, and the approach passage is defined by a plate spaced from the upper wall of the housing.

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