Jan. 6, 1959 K. R. LUNG 2,867,173

PUMP

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FIG-1

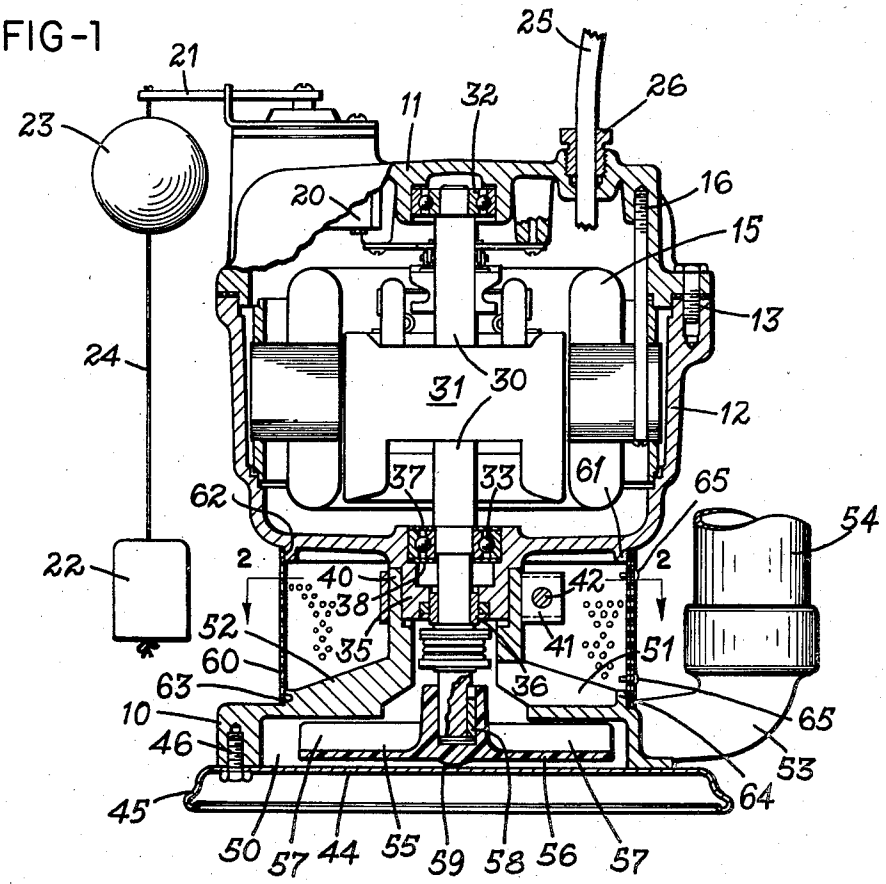
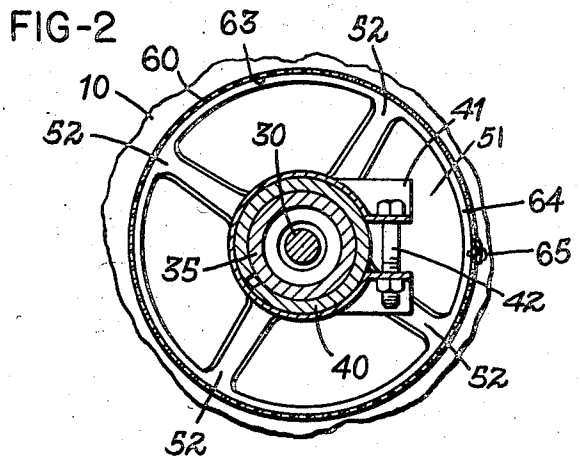


FIG-2



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2 Claims. (Cl. 103—87)

This invention relates to sump or drain pumps, and more particularly to such pumps of the submersible type wherein the motor is mounted in close relation with the impeller housing for submergence in the liquid in the space to be drained.

It is a primary object of the invention to provide a submersible sump pump of the type embodying a centrifugal impeller driven on a vertical axis by a motor located above the impeller housing wherein the motor casing and the impeller housing are releasably coupled together by a simple and effective mechanism facilitating their disconnection for servicing, and wherein special provision is made for screening solid material from access to this connection between the motor casing and impeller housing as well as from access to the pumping chamber itself.

It is also an object of the invention to provide a submersible sump pump as outlined above wherein a screen member is mounted in engagement with both the motor casing and the impeller housing to screen solid material from access to the connection therebetween as well as to the inlet to the pumping chamber in the impeller housing, and wherein this screen member is constructed and arranged to minimize the development of forces tending to cause solid material from collecting on and/or penetrating through the screen.

Additional objects and advantages of the invention will be apparent from the following description, the accompanying drawing and the appended claims.

In the drawing—

Fig. 1 is a view generally in vertical section through the motor casing and impeller housing of a submersible sump pump constructed in accordance with the present invention; and

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

Referring to the drawing, which illustrates a preferred embodiment of the invention, the pump includes an impeller housing **10** and a motor casing comprising upper and lower sections **11** and **12** bolted together in sealed relation at **13**. The upper casing section **11** supports the motor stator **15**, which is suspended therein by means of bolts **16**, and this casing section also supports the control switch **20** for the motor, which is actuated by a lever arm **21** mounted on the outside of the casing and by its associated weight **22** and floata **23** on a cord **24**, reference being made in this connection to my copending application Serial No. 504,782 filed of even date herewith and assigned to the same assignee as this application now Patent No. 2,748,220 issued May 29, 1956. The electrical supply conduit **25** to the motor enters the casing section **11** through a sealed plug **26**, and thus the stator **15** and its entire associated electrical parts and connections are independent of the lower casing section **12** and may be removed therefrom as a unit for any necessary service.

The drive shaft **30** of the motor supports the rotor **31** and is in turn supported by a pair of bearings **32** and **33** in the housing sections **11** and **12** respectively.

The lower end of shaft **30** projects through a boss **35** depending from housing section **12** and cooperating with the shaft to mount a rotary seal **36** sealing the interior of the motor housing against access of liquid along the shaft. This seal is supplemented by the bearing **33**, which includes sealing disks **37** and **38** carried by the outer race thereof and overlying the ball-receiving space therethrough to minimize pressure leakage in either direction through bearing **33**.

The impeller housing **10** includes a split boss portion **40** at its upper end which fits over the motor housing boss **35** and is secured thereto by a strap type clamp **41** and clamp bolt **42**. The bottom wall of the impeller housing is provided by a removable metal plate **44** which also may conveniently include a downwardly extending flange portion **45** forming the base of the unit, the plate **44** being bolted directly to housing **10** at **46**. The interior of housing **10** forms a pumping chamber **50** having inlet passages **51** through the upper portion of the housing between the ribs **52** connecting boss **40** with the lower part of housing **10**. A generally tangentially arranged outlet passage **53** leads from chamber **50** for connection with a discharge pipe **54**.

Within the pumping chamber **50** is the impeller **55**, which is shown as cast or molded from a suitable plastic material such as a phenolic resin and which includes a shroud portion **56** forming the bottom of the impeller and a plurality of upwardly extending curved vanes **57**. The impeller is splined on the lower end of shaft **30** by means of a key **58** to provide for limited axial movement of the impeller with respect to the shaft, reference being made in this connection to my copending application Serial No. 504,781 filed of even date herewith and assigned to the same assignee as this application. A curved abutment **59** on the under side of the impeller supports it on the bottom plate **44** when the pump is at rest, and in operation, the pressure developed between the shroud **56** and plate **44** causes the impeller to rise out of engagement with plate **44** for free rotation in the pumping chamber.

Screening means are provided in accordance with the invention for screening solid material from access both to the inlet passages **51** and also to the clamped connection between the motor casing and the impeller housing. This screening means comprises a cylindrical perforate screen **60** which encircles the space between the impeller housing and the motor casing. The lower casing section **12** is formed with a depending annular shoulder **61** having a cylindrical outer surface **62** forming a seat for the upper end of screen **60**, and a similar cylindrical seat **63** is provided by an upstanding boss portion **64** on the impeller housing **10** outside and below the inlet passages **51**. Thus the screen **60** engages both of these seats and is releasably secured in engagement therewith by simple detachable means such as a pair of sheet metal screws **65** connecting the overlapping ends of the perforate sheet which forms the screen **60**.

It will be seen that this screen construction offers important practical advantages in use. Since the screening area is large in comparison with the flow area through the inlet passages **51**, the average suction effective at each point along the face of the screen is correspondingly lower than the suction through the inlet passages, thus having a reduced tendency to draw solid sediment through this screen. In addition, with the screening surface essentially vertical, solid particles in the liquid being pumped are unlikely to stick to the screen surface but will more naturally be drawn by gravity to the bottom of the space being pumped, namely below the level of the inlet passages to the pumping chamber. At the same time, this screening unit is of simple construction and is also simple

to remove and replace in connection with any servicing requirements.

While the form of apparatus herein described, constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A submersible pump of the character described comprising an impeller housing including a pumping chamber having an inlet in the upper portion of said housing, a substantially water-tight motor casing having motor parts therein including a drive shaft projecting downwardly therefrom, a tubular boss depending from said casing in surrounding relation with said shaft and of substantially smaller diameter than said casing, said impeller housing including a tubular boss extending upwardly therefrom above and radially inwardly of said inlet, said housing boss being split and proportioned to telescope over the lower end of said casing boss, means for releasably clamping said bosses together in telescoped relation to form the entire support for said casing on said housing with said drive shaft extending therethrough into said pumping chamber, said casing having an annular shoulder on the lower end thereof substantially concentric with and of substantially greater diameter than said boss thereon, means forming on said housing a peripheral surface located radially outwardly of said inlet and matching the radially outer peripheral surface of said shoulder in aligned relation therewith, and a tubular perforate screen encircling and seating on said peripheral surfaces to screen solid particles from access to said bosses and to said pumping chamber inlet.

2. A submersible pump of the character described comprising an impeller housing including a pumping chamber having an inlet in the upper portion of said housing, a substantially water-tight motor casing including a cup-shaped lower casing section, an upper casing section proportioned to seat on the upper end of said lower casing

section, a motor stator located within said casing, means securing said stator directly to said upper casing section independently of said lower section, a control switch for said motor also supported entirely within said upper casing section, a rotor positioned within said stator and including a drive shaft journaled in both said casing sections and projecting downwardly from said lower section, said lower section including a tubular boss depending therefrom in surrounding relation with said shaft and of substantially smaller diameter than said section, said impeller housing including a tubular boss extending upwardly therefrom above and radially inwardly of said inlet, said housing boss being split and proportioned to telescope over the lower end of said casing boss, means for releasably clamping said bosses together in telescoped relation with said drive shaft extending therethrough into said pumping chamber, said lower casing section having an annular shoulder on the lower end thereof substantially concentric with and of substantially greater diameter than said boss thereon, means forming on said housing a peripheral surface matching the radially outer peripheral surface of said shoulder and located in aligned relation therewith, and a tubular perforate screen encircling and seating on said peripheral surfaces to screen solid particles from access to said bosses and to said pumping chamber.

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