

[54] **CONDENSATE PUMP**

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[52] U.S. Cl. **417/360, 222/385, 417/40, 417/424**

[51] Int. Cl. **F04b 35/00**

[58] Field of Search **417/360, 424, 40; 222/385; 415/219 C**

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[57]

ABSTRACT

A condensate pump unit for use with air-conditioning equipment and the like. A reservoir or sump is molded from plastics material with a pump chamber well formed as an integral part of the bottom wall. A pump motor is carried on a cover plate for the sump and has a shaft descending to the well to rotate an impeller therein. The pumping chamber is completed by a closure formation which is an integral part of an elongated pillar construction attaching to, and also lending support to the sump cover plate, in such manner that the motor and impeller are removable with the cover as a subassembly.

13 Claims, 8 Drawing Figures

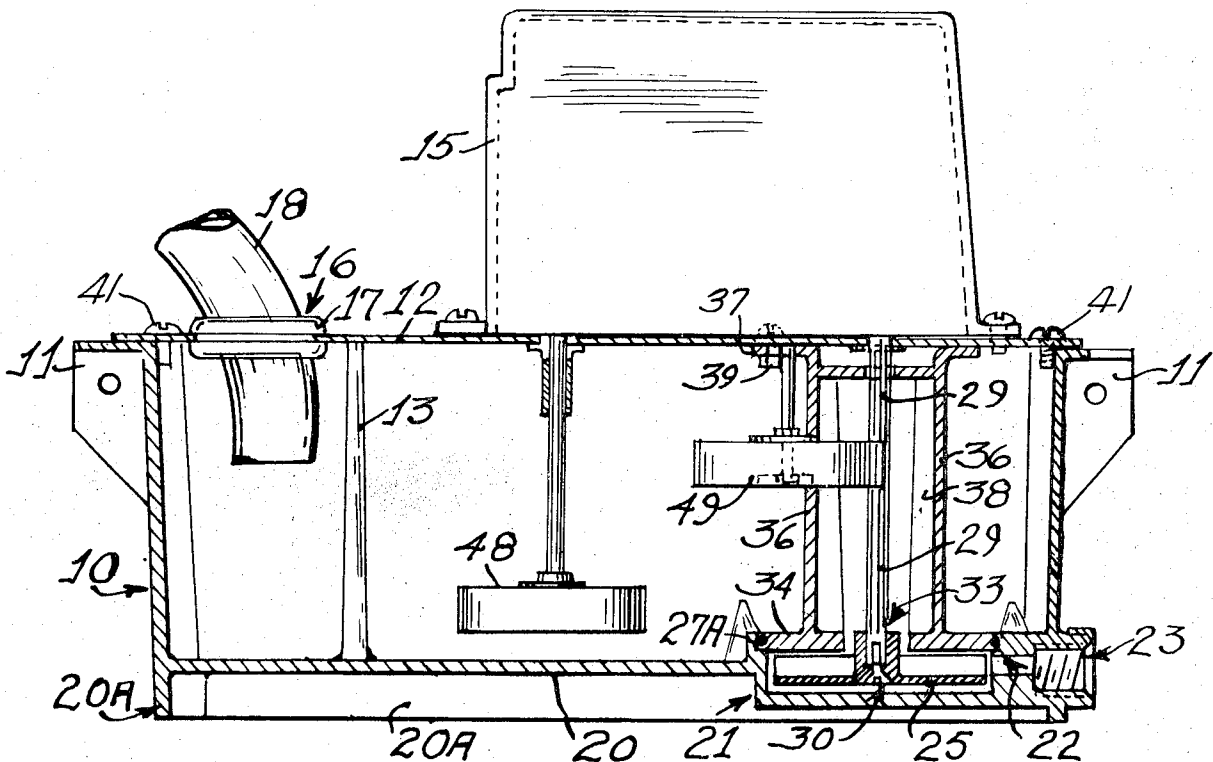


FIG. 1

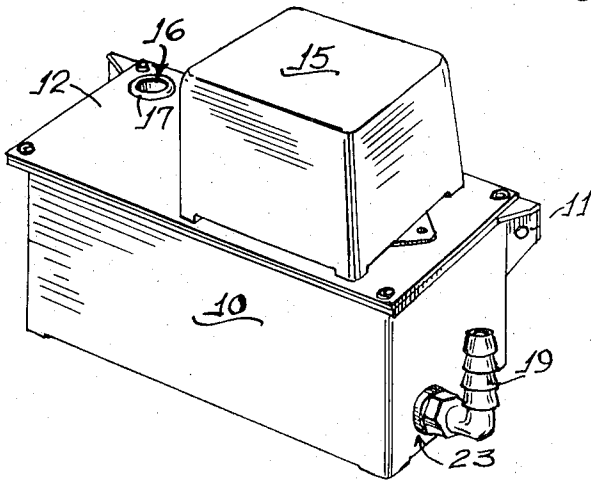


FIG. 3

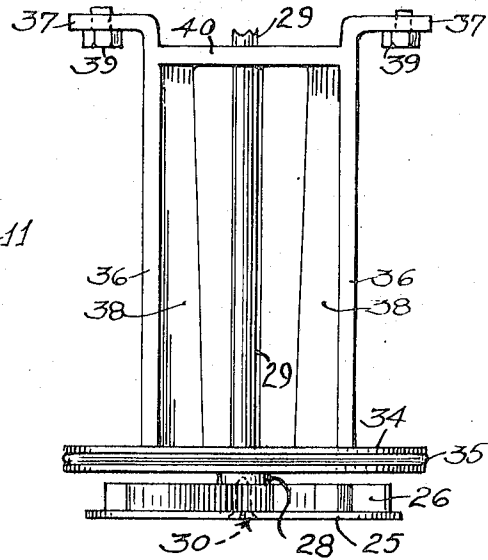


FIG. 2

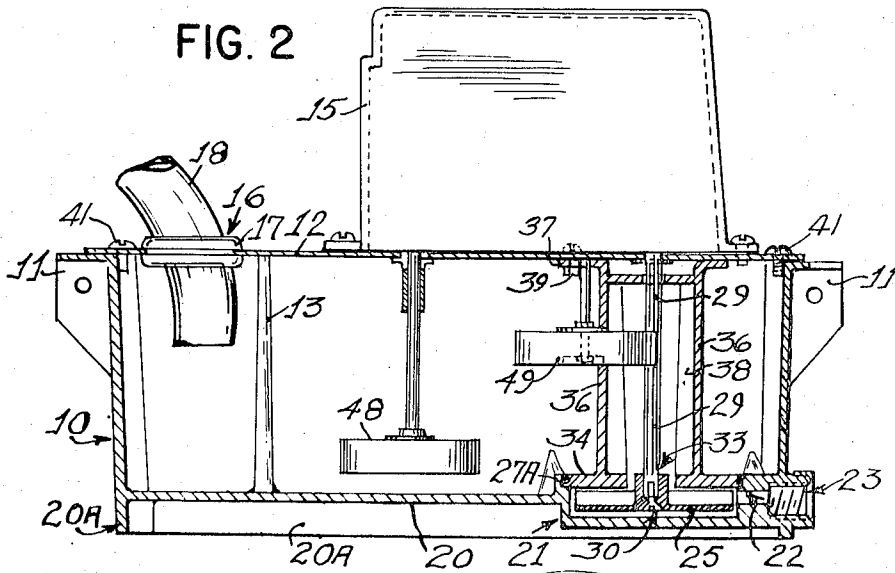


FIG. 6

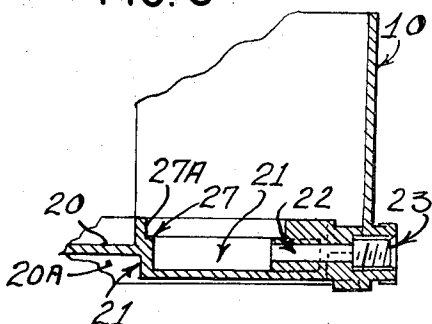
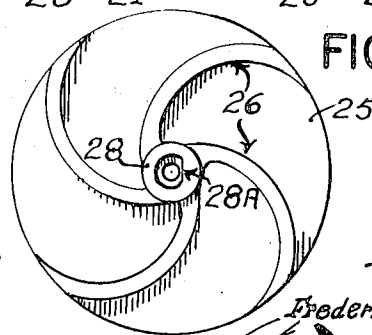


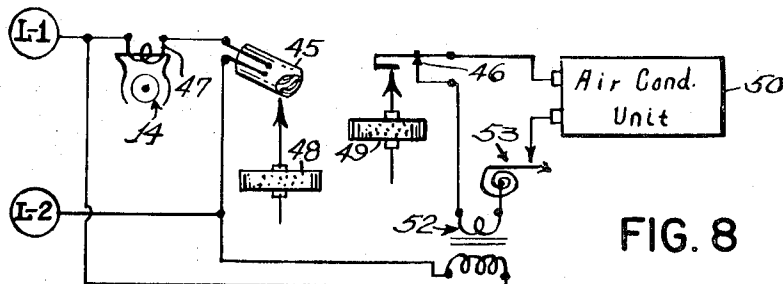
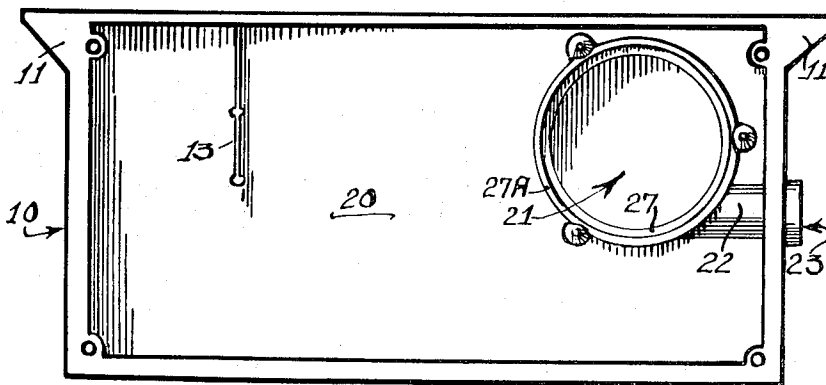
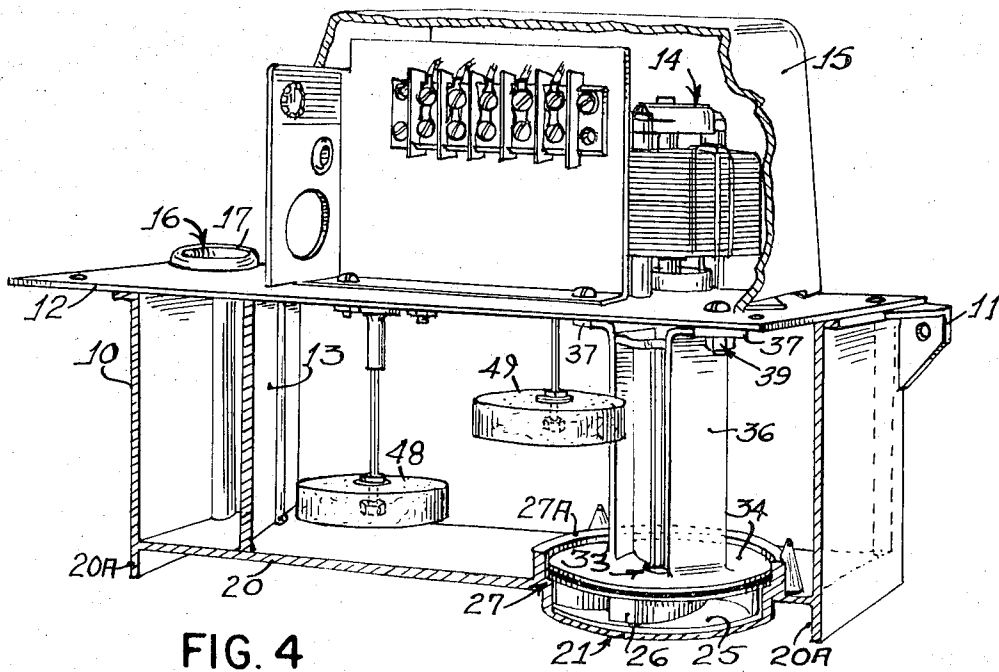
FIG. 7



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CONDENSATE PUMP

The improvements relate to sump pump assemblies particularly suited to disposal of condensation water received from air-conditioning equipment and the like.

Such devices comprise a receptacle or sump to receive the condensate, and a centrifugal pump driven by a motor controlled by liquid level in the sump to force the condensate through a discharge line to some available waste outlet or drain.

A feature of the disclosed construction is the provision of a sump receptacle molded from plastics material with an open top adapted to be closed by a cover plate, and a bottom wall in which a well is formed to define the pumping chamber in which the centrifugal impeller rotates to force the condensate water through an integrally-formed discharge passage from the well through an adjacent sump wall for passage through a suitable hose or pipe line to a drain which will commonly be located at some distance from the source of the condensation water.

A pump motor and level-sensing control switches are mounted on the exterior of the sump cover plate as an easily accessible and serviceable subassembly which is further characterized by the inclusion of a molded pendantly-supported and supporting column structure aligning the pump impeller and having integrally conformed closure member for the pump well which is automatically seated and sealed as the consequence of seating the cover plate on the sump, thus affording an economically manufactured, readily-serviced pump unit as a subassembly with the sump itself providing the impeller well, which becomes a closed pumping chamber as the result of installing the motor, impeller, and well closure subassembly.

The described arrangement differs from the previous construction of this type of device wherein the pump is a complete unit attached to the lower end of a tubular column traversed integrally by the motor shaft, in consequence of which the pump must be separated from the column or otherwise made accessible to open the pump chamber in order to expose the drive shaft, impeller, seals, and other pump parts, whereas according to the disclosed construction the sump bottom forms a part of the pump housing and removal of the sump closure plate subassembly renders the entire pumping and control system immediately accessible to inspection and servicing.

Other features of novelty and utility relate to details of the construction of the sump in respect to certain baffle and bottom-wall spacing formations, and details of the chamber closing column means, as will appear more fully from the following specification taken in view of the annexed drawing in which:

FIG. 1 is a perspective view of the complete condensate pumping unit;

FIG. 2 is a vertical cross-section of the unit taken to enlarged scale;

FIG. 3 is an enlarged elevational view of the pump closure bracket;

FIG. 4 is a perspective view with parts shown in section and similar to FIG. 2;

FIG. 5 is a view looking down into the reservoir or sump showing the bottom structure in plan;

FIG. 6 is a sectional fragmentary detail of the impeller well similar to part of FIG. 2 but with the impeller removed;

FIG. 7 is a top plan view of the impeller;

FIG. 8 is a circuit diagram.

As viewed in FIG. 1, the condensate pump comprises a rectangularly shaped reservoir or sump 10 preferably formed of molded plastics material so as to have an open top portion closed by a cover panel or plate 12 upon which are seated a pump motor 14 (FIG. 4) and associated control components, such as a terminal block and motor control switch means (not seen), these components being concealed beneath a dome-shaped hood 15 easily removable for servicing. A passage 16 provided with a rubber grommet 17 affords entrance for a delivery tube 18 through which the condensate will be received from the associated air-conditioning or like equipment. At the lower margin at an end of the sump opposite from the inlet is an outlet nozzle or nipple 19 to which a discharge tube can be connected to lead the effluent condensate to a suitable drain pipe, which in many installations may be located at a considerable distance from the equipment served by the unit including elevations to ceiling levels or commonly as high as 10 feet in order to reach the available drain, by reason of which it is necessary to provide a pump capable of forcing the condensate to at least the maximum elevation for which the unit is designed.

As depicted in FIGS. 2 and 5 particularly, the molded sump receptacle has a bottom wall 20 in which is formed a circular well 21 from one side of which extends a discharge passage 22 communicating outwardly into an enlarged threaded socket portion 23 adapted to receive the hose nipple 19 referred to in FIG. 1 but omitted from FIGS. 2, 3 and 6, the latter view showing to advantage the elevational configuration of the impeller well and a seating ledge 24 for the closure means to be described.

The condensate pump comprises a circular molded impeller 25, FIGS. 3, 4 and 7, including a circular bottom disc upon which are formed integrally a plurality of impelling vanes 26, FIG. 7, and a hub 28 having a shaft socket with a keying flat 28A to receive the keyed end of a motor shaft 29, which may be a continuation or coupling to the shaft of motor 14, as in FIG. 4. A screw 30 threading into the end of said shaft retains the impeller in assembly therewith, so that when the cover plate 12 is removed, the entire pump impeller assembly comes with it.

Means providing a sealing closure for the impeller well and contrived to be removable along with the rest of the assembly, comprises a circular closure plate 34, FIGS. 2 and 3, having a circumferential groove to seat a sealing ring 35 engageable with a circular lip 27A about the mouth of the well when the lowermost side of the closure disc is seated upon the well ledge 27, as in FIGS. 2 and 4. A central hole 33 affords entry for the motor shaft and condensate.

Extending upwardly from the well closure disc as an integrally conformed part thereof are spaced pillars or legs 36 having lateral offsets 37 disposed near their upper ends at a level to meet the underside of the sump cover plate 12 and afford attachment and support thereto in the exact region thereof loaded by the weight of the pump motor, as in FIG. 4, there being integral vertical webs 38 as well as a cross web 40 integrally joining the upper end regions of these pillar members to rigidify the impeller supporting assembly for maintenance of alignment, there being further an opening through this web for the motor shaft 29, and the pump

assembly being removably attached to the cover plate by means 39

As seen particularly in FIG. 2, the impeller shaft hole 33 is oversized to provide entry for the condensate into the pump chamber at the low-pressure hub region.

In accordance with the schematic control circuit shown in FIG. 8, the winding 47 of the pump motor 14 is energized from utility line terminals L-1 and L-2 serving the air conditioner to start the pump as the result of closure of a master switch 45 by elevation of a primary float means 48 responsive to rise of the water to a predetermined starting level, this switch being of the mercury type having a predetermined range of angular movement between open and closed circuit conditions so that the pump will continue to operate under normal conditions for an interval sufficient to effect a considerable lowering of the sump level before the pump is stopped again, thus maintaining the level within safe limits. However, should the condensate be delivered from the air-conditioner source 50 under abnormal conditions at a rate faster than the capability of the pump to prevent overflow, a normally closed safety switch 46 will be opened by elevation of a secondary upper-limit float means 49 to break the power supply for the usual thermostatic control circuit means 53 for the air-conditioning unit 50 from the output of the usual low-voltage transformer 52 and thereby stop further delivery of condensate while the pump motor continues to run until the proper level is restored in the sump under control of the primary level-sensing switch means 45, 48, as aforesaid.

In order to protect the level-sensing float means from accidental injury by insertion and manipulation of the inlet hose 18, a guard means in the form of a baffle 13 is integrally conformed with the sump structure and situated near a corner formation of the molded receptacle subjacent to the hose opening 16 in the cover plate to keep the end of the hose from wandering lengthwise of the sump toward the floats.

Such condensate pumps may be set on the floor adjacent the air-conditioner or mounted on a sidewall thereof, and to facilitate the latter type of installation, the molded sump structure is provided (FIGS. 1, 2, 4 and 5) with integrally conformed mounting wings 11 pierced for mounting screws, while the bottom wall or floor 20 is recessed to provide a circumambient stand-off flange 20A elevating the bottom and the underside of the pump well from the floor surface for the floor-mounting type of installation.

It will be apparent that the entire pump and control assembly may be removed by unseating the cover plate of the sump, so that nothing further is required in order to open the pump chamber and withdraw the impeller — or rescat it, the sealing means being carried with the pendent impeller unit and closure in a manner to be separable upon withdrawal, and the rigidity of the pendant pillar means 36 and seating of the closure element 34 upon the circular land or ledge 24 being independent of any moderate flexing of the top cover plate, which may in fact preferably be of sufficiently thin gauge metal to permit the margins thereof to be pulled down tight against the rim of the sump as by the bolt means 39.

I claim:

1. In a condensate pump having a sump with inlet and outlet passages, an impeller for pumping condensate from the interior of the sump through the outlet pas-

sage and motor means for driving the pump, a pump structure comprising: a circular impeller well constituting an integrally conformed portion of a bottom wall of the sump, a circular impeller disposed in said well, a closure structure for said well comprising a circular disc means fitting into the well to close off the same and form a pumping chamber for the impeller; vertically extending pillar means attached to said disc means and extending up substantially to the level of said top opening of the sump; a driving shaft extending from coupling engagement with the impeller upwardly into driving engagement with said motor; and a cover means for the sump supporting said motor and having at least partial supporting engagement with said pillar means.

2. A construction according to claim 1 further characterized in that said well includes a circular lip and a circular ledge subjoining said lip and said closure disc seats upon said ledge and is provided with circumambient sealing means sealingly engaging the inner periphery of said circular lip so as to be sealingly engageable therewith or separable therefrom as a function of insertion or withdrawal of the closure disc from seated condition on said ledge.

3. A construction according to claim 2 wherein said closure disc is provided with an over-sized hole for said shaft and affords the sole condensate inlet to the pump and the pump has a discharge passage through a sidewall portion of the well and a wall portion of the sump which is integrally conformed with said well.

4. A pump construction according to claim 1 wherein said cover plate is attached to said pillar means and said motor is mounted on said cover plate, together with means for removably attaching the cover plate to the sump with said impeller assembly in aligned disposition in said well.

5. The construction of claim 4 further characterized in that said cover plate has an opening for a condensate receiving hose which can be entered into the sump, and said sump structure includes a vertical baffle formed on the interior of the sump in the region subjoining a corner of the sump adjacent said hose opening and of a width to deflect the end of the entered hose from working beyond the baffle in at least one direction toward said pump well.

6. The construction defined in claim 1 wherein said pillar means comprises at least two upright post elements integrally conformed with said closure disc at one end on opposite sides of said motor shaft and extending upwardly substantially to the level of said top opening of the sump for supporting engagement as aforesaid with the underside of said cover means.

7. The construction of claim 6 further characterized in that the upper end regions of said post elements are provided with enlarged lands upon which said cover means has seating engagement, and said post elements are joined adjacent said upper end regions by an integral cross member including a passage for said motor shaft.

8. The construction of claim 7 wherein said cover means comprises a plate fitting upon the margins of the sump to close off the open top thereof and also having seating engagement with the post elements as aforesaid and the cover plate is attached to said enlarged lands.

9. In condensate pumps and the like, an integrally molded sump structure including a bottom wall, sidewall formations upstanding therefrom and subjoining a top opening; a cover member closing said top opening;

a pump motor carried on the upper side of said cover member and having shaft means extending there-through vertically downward into the sump; a circular impeller well formed as an integral configuration of said bottom wall concentrically of said shaft means; a circular impeller disposed in said well and having driving connection with said shaft means; a circular sealing closure for closing said well to provide a pumping chamber in which said impeller can operate in pumping action; means affording passage for liquid into said chamber, means for guiding the pumped liquid from said well and through a wall portion of the sump structure; and means attaching said sealing closure to said cover member comprising integrally conformed portions of the closure member flanking said shaft means and extending vertically into supporting engagement with said cover member for the sump.

10. The construction defined in claim 9 further characterized in that said attaching means comprises at least two post elements spaced apart to flank the shaft means as aforesaid and having integral attachment with the sealing closure at one end and integrally conjoined at opposite ends subjacent to portions thereof engaging with said cover member.

11. A combination sump and pump construction wherein the sump is a reservoir molded from plastics material with a bottom wall bordered by upstanding side walls terminating in a top opening overlying said bottom wall and adapted to be closed by a top cover plate, and wherein the pump comprises a pendent well portion integrally formed in said bottom wall with an open top facing the top opening of the sump and having a discharge passage leading therefrom through a side wall portion of the sump; a removable closure member for the open top of the well closing the latter to define a pump chamber, said closure member including integral conformations extending upwardly therefrom into attachment with the underside of said top cover plate so as to fit in closing relation with the well in the sump-closing condition of the top cover plate; motor means carried on the exterior side of said top cover plate above said well; and impeller means rotatable in the pump chamber defined by said well and closure member; shaft means depending from driving connection with said motor and freely penetrating said closure member into driving engagement with the impeller.

12. The construction set forth in claim 11 further

characterized in that said sump has an integrally-conformed pendent skirt formation operative to space said bottom wall and the bottom of said well from a supporting surface, and said well has internal ledge means subjoining said open top thereof and upon which said closure member seats in the top-closing condition of the top cover plate on the sump.

13. In condensate pumps and the like having a sump body to receive liquid and a motor driven pump for exhausting said liquid situated close to a bottom part thereof, a sump and pump structure comprising a body of molded synthetic plastics material defining a liquid-receiving tank having a bottom wall with side wall portions upstanding therefrom and terminating in an open top portion adapted to be closed; said bottom wall having as an integrally-conformed part thereof a shallow pump impeller chamber lying close to the plane of said bottom wall and consisting in a well recessed downwardly from said bottom wall with a top opening disposed close to the upper surface of the bottom wall, said chamber well being adapted to receive an impeller rotatable about an axis substantially normal to the plane of the bottom wall; further integrally-conformed portions of the material of said bottom wall and sump body defining a discharge duct for the pump communicating through one of said side wall portions; a pump impeller rotatable in said chamber well; first closure means for closing said open top portion of the sump body; second closure means operative to close said top opening of the chamber well; drive shaft means extending upwardly from said impeller through said second closure means; means providing for inlet of liquid from within said tank to said chamber well; support means comprising an integrally-conformed part of said second closure means extending upwardly therefrom in approximate parallelism with said shaft means to an upper end portion lying substantially at the level of said first closure means for attachment to the latter; a driving motor having support on said first closure means and driving connection with said shaft means; and means attaching said upper end portion of the support means to said first closure means such that removal of the latter from closing relation with the sump body will carry with it said second closure means, said shaft means and said impeller.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,758,236 Dated September 11, 1973

Inventor(s) FREDERICK N. ZIMMERMANN

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

The inventor's name, now reading "Zimmerman" should read
--ZIMMERMANN-- - the name in its entirety is:
--FREDERICK N. ZIMMERMANN--;

Column 1, line 26, insert --an-- after "having"; column 2, line 12, insert --(FIG. 2)-- after "18"; column 2, line 26, "5" should read --4--; column 2, line 32, "3" should read --5--; column 2, line 54, "FIGS. 2 and 4" should read --FIGS. 2, 4 and 6--; column 3, line 58, "24" should read --27--; and at column 3, line 63, "39" should read --41--.

Signed and sealed this 31st day of December 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents