Oct. 10, 1944. L. P. LANSING 2,360,145

LIQUID HANDLING APPARATUS

Filed Oct. 19, 1942 2 Sheets-Sheet 1

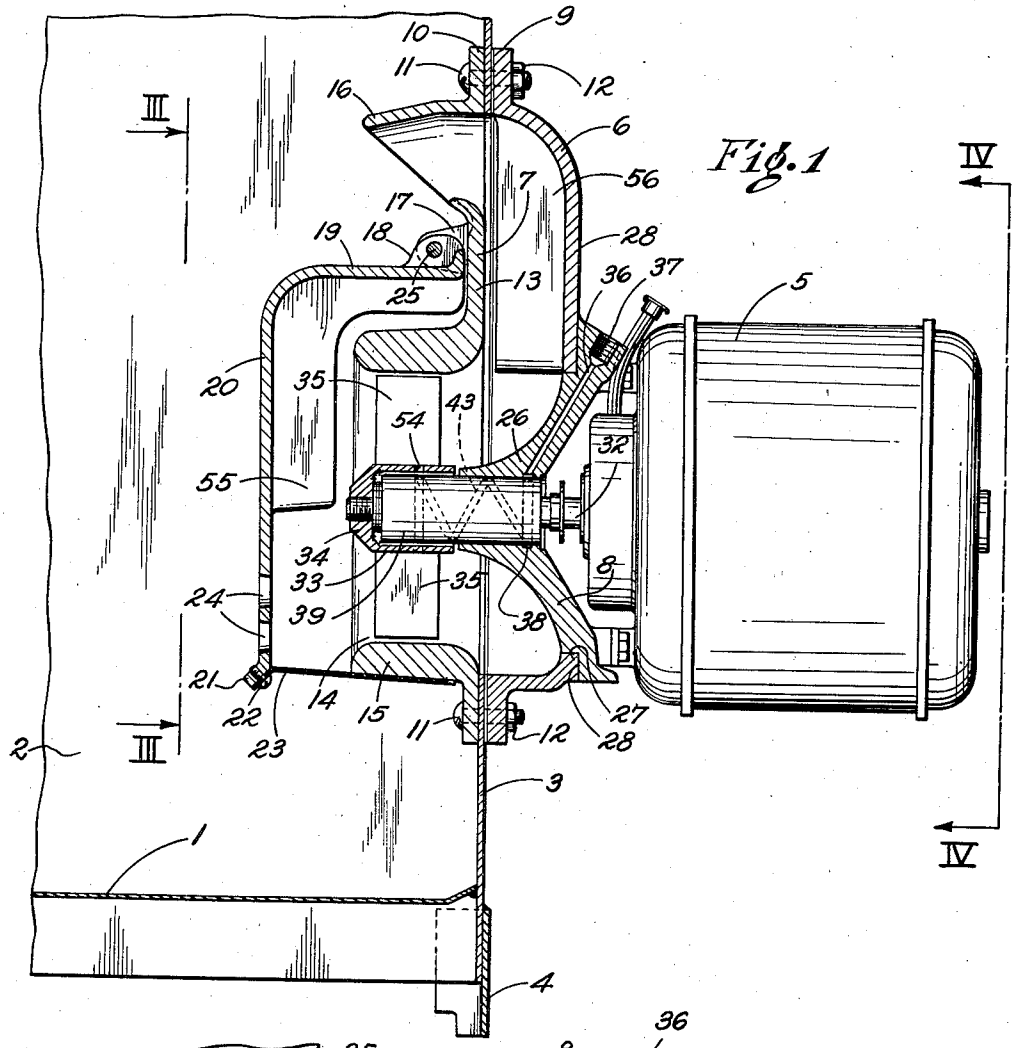


Fig. 1

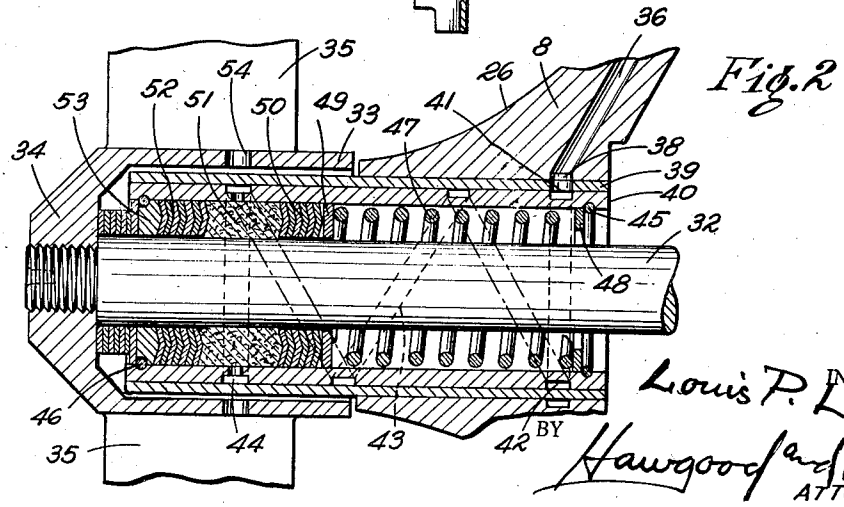


Fig. 2

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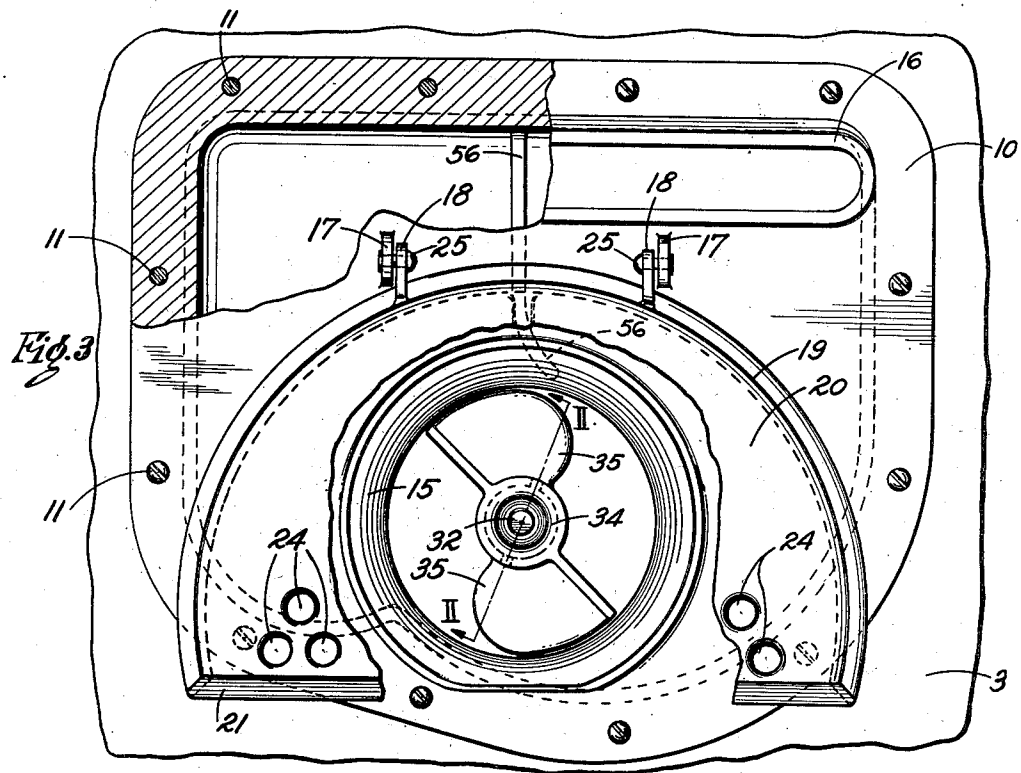


Fig. 3

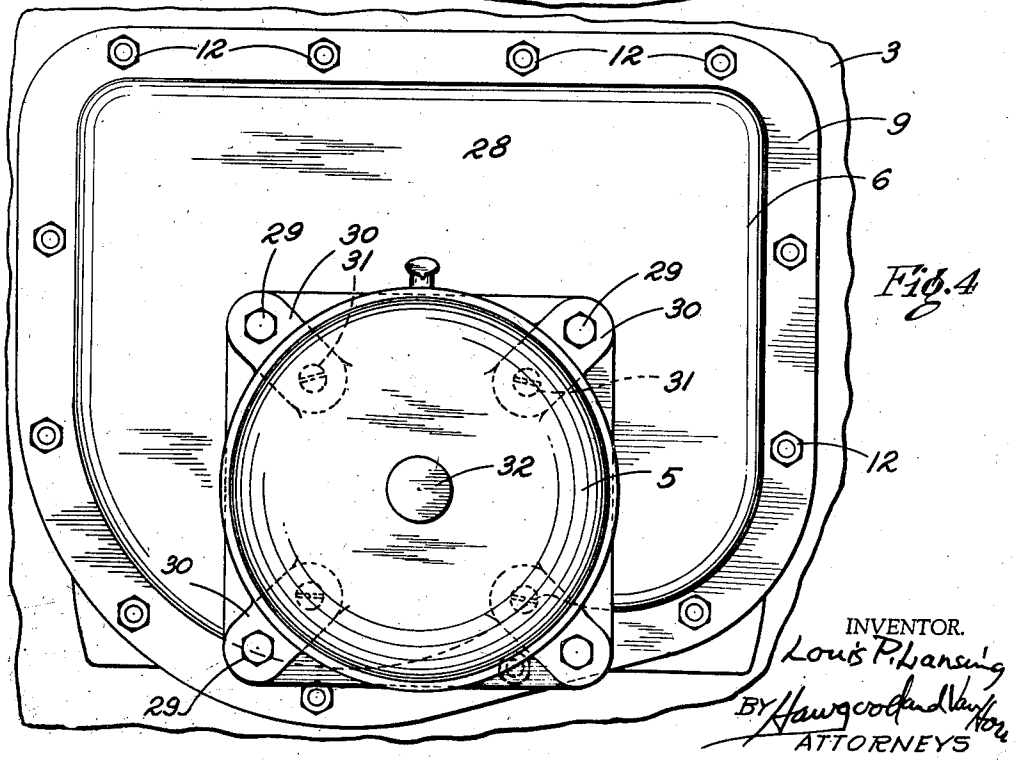


Fig. 4

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UNITED STATES PATENT OFFICE

2,360,145

LIQUID HANDLING APPARATUS

Louis P. Lansing, East Cleveland, Ohio

Application October 19, 1942, Serial No. 462,498

7 Claims. (Cl. 259—95)

This invention relates to liquid handling apparatus and to a means for effectively handling liquids and protecting parts of the handling apparatus from the action of the liquids themselves.

An object of the invention is to provide an improved liquid handling apparatus in which parts may be submerged in liquid and other parts associated therewith may be easily and effectively protected from any deleterious action thereof.

Another object of the invention is to provide an improved liquid handling apparatus which will be extremely efficient in operation.

Another object is to provide an improved liquid handling apparatus which may be easily made and assembled.

Another object is to provide an improved liquid handling apparatus which will consist of few and rugged parts.

Another object is to provide an improved liquid handling apparatus in which the parts will require little and simple machining.

Another object is to provide an improved liquid handling apparatus in which lubricant will be protected from the liquids capable of dissolving or emulsifying the same.

Other objects will hereinafter appear.

The invention will be better understood from the description of one practical embodiment thereof, illustrated in the accompanying drawings, in which:

Figure 1 is a vertical sectional view through a part of a washing machine embodying the invention, parts being shown in section and others in elevation;

Figure 2 is an enlarged sectional view of the hub and packing mechanism of Figure 1, taken on the line II—II of Figure 3;

Figure 3 is a fragmentary elevational view taken on the line III—III of Figure 1; and

Figure 4 is a similar view in an opposite direction, taken on the line IV—IV of Figure 1.

The invention is illustrated in conjunction with a dish washing machine consisting of a rectangular sheet metal tank having a bottom 1, sides 2, and ends 3 supported upon legs such as pieces of angle-shaped steel 4.

These parts are generally conventional, and do not, per se, constitute any part of the present invention.

Mounted at and extending through one end of the tank is a liquid circulating device consisting of a pump mechanism driven by a source of power such as an electric motor 5 arranged exteriorly of the tank, and so designed and situated that it draws liquid from adjacent the bottom of the tank and returns it in a wide flat, generally horizontal discharge jet at a higher level, thus causing the washing liquid to circulate around and between the articles which are placed in the tank for washing to accomplish this operation.

The circulating mechanism is supported by a frame consisting of three main pieces, namely: a main body portion 6 positioned exteriorly of the tank, a complementary body portion or closure 7 positioned interiorly of the tank, and a carrier or adaptor 8 by which the moving parts of the mechanism are supported and which is secured to the main body 6.

It will be noted that the main body 6 and closure 7 are each provided with a peripheral flange 9 and 10 respectively, between which flanges is clamped the edge of the end wall 3 which is cut away to provide an opening substantially co-extensive with the inner edges of the flanges, these flanges being tightly clamped upon opposed sides of this tank wall, as by bolts 11 and nuts 12.

Due to the manner in which the framework is formed, neither the main body nor the closure have any parts extending toward the other beyond the planes of the flanges which abut the tank end wall. Consequently, these flanges may be quickly and easily machined to accurate plane surfaces, as by surface grinding, and with the end wall formed with fairly heavy gage galvanized material, which is held to quite close tolerances, a tight seal may be effected without the need for inconvenient packing materials, gaskets or the like.

In order to insure against any leakage around the bolts, it has been found advantageous, after these bolts have been passed through the closure and tank wall, to take a piece of string and stretch it from bolt to bolt, giving it a single turn around each bolt, and it is found that after this has been clamped between the main body and tank wall a very satisfactory seal is produced.

The interior of the closure consists, in addition to the flange around its margin, of a vertical plane wall 13 having in its lower part a circular aperture 14 surrounded by a horizontally extending flange 15 of substantial thickness, provided with rounded corners, which defines a streamlined passage for the intake of liquid into the space within the casing.

Above this flange the vertical wall 13 has an elongated horizontal slot bounded by laterally

extending flanges 16 which define a discharge nozzle adjacent the top of the casing.

The closure also has two lugs 17 formed unitarily therewith to which are pivoted corresponding lugs 18 of an inlet guard having a substantially semi-circular flange 19 and a substantially plane vertical end 20. The lower edge of this guard has a flaring flange 21 to which is secured, as by machine screws 22, a screen 23 which overlies the entire open space at the bottom of the guard. Perforations 24 are provided along the lower edge of the vertical end of the guard, which also admit liquid to the circulating mechanism.

The guard is, of course, secured to the lugs by means of pivot pins or rivets 25, so that it may be readily raised to provide access to the interior of the apparatus.

The adaptor 8 consists of a generally frusto-conical part having a generally toroidal inner surface 26 which terminates at a cylindrical surface 27 fitting closely within the cylindrical aperture through the main body 6, and beyond this cylindrical surface it extends outwardly to abut the vertical outer surface 28 of the body. It is secured to the body as by screws 29 and on its outer surface has a plurality of bosses 30 which are threaded to receive bolts 31 by which the motor 5 is secured to the adaptor.

The motor shaft 32 passes through a central perforation in the adaptor to the interior of the tank or reservoir defined by walls 1, 2, and 3, and carries on its inner end an impeller which is arranged to rotate within the circular flange 15 of the closure.

This impeller is shown as consisting of a cup-shaped hub 33 having an end 34 threaded upon the outer end of the motor shaft and the peripheral wall spaced a substantial distance beyond the motor shaft, for a purpose to be hereinafter described.

On the exterior of this cylindrical surface are shown two helically disposed propeller blades 35 by which liquid is drawn to the interior of the casing to be projected at its top.

An inclined oil hole 36 extends through the adaptor, terminating in a counterbored and tapped recess 37 at which may be secured an oil cup or the like, its inner end discharging into an annular groove 38.

Within the aperture through the adaptor is positioned a double sleeve consisting of two telescopically arranged tubular pieces 39 and 40, the outer 39 of which has a perforation 41 placed in alignment with the oil hole 36, while the inner tube 40 has an annular groove 52 cut into its external surface adapted to be aligned with this perforation and a helical groove 43 extending from the groove 42 to another annular groove 44 near the end of the sleeves.

The inner surface of the inner tubular sleeve has two annular grooves arranged to receive resilient locking rings 45 and 46.

The locking ring 45 adjacent the motor serves as an abutment for the end of a helical spring 47 surrounding the shaft, and a washer 48 is shown as interposed between the end of the spring and the locking ring.

The other end of the spring bears upon a washer 49 which, in turn, bears upon a series of rings 50 of packing material such as pump leathers, having convex surfaces toward the washer and concave surfaces facing the end of the motor shaft.

Bearing upon this series of packing rings are a plurality of substantially flat rings 51 of some such material as felt, and these, in turn, bear upon the first of another series of concave-convex packing rings or leathers 52 positioned in the same direction as those of the first series.

Beyond this second series of concave rings is a washer 53 having a convex or V-shaped surface which is in contact with the packing rings and engaging and held in place by the other locking ring 46.

The cylindrical portion 33 of the hub of the impeller is provided with a perforation or duct 54 which is located immediately behind one of the propeller blades, and so is situated in an area in which a vacuum will be created upon rotation of the impeller.

The outer end of this duct 54, it will be noted, is axially in alignment with an intermediate part of the blades 35, that is, a plane normal to the axis of the shaft through the duct also passes through the blades.

The impeller hub is spaced substantially from the outer sleeve 39 by a distance which may be as much as 1/100 inch, so that when the parts are standing idle and the tank full, liquid may penetrate into the space between the sleeve and hub and within the end of the hub beyound the packing.

As soon, however, as the rotation of the impeller starts, all such liquid is drained from within the hub by a combination of the action of centrifugal force and the suction created at the outer end of the perforation 54, so that at no time, with the parts in motion, is there any possibility of liquid penetrating into the packing or leaking out around the shaft.

The perforation through the hub may be placed at any desired point where sufficient vacuum may be obtained, and it has been found in practice that it has been very satisfactory when located in the position shown in the drawings, slightly nearer the trailing edge of the impeller blades than their leading edge, with one hole behind each blade.

A rib 55 is formed on the interior of the guard to prevent circulation of the liquid and to direct it straight into the blades of the impeller, and a similar rib 56 is provided within the outer casing section, having a curved lower end as seen in Figure 3.

It will be apparent that the parts require little machining, as the two casing parts may have their tank wall engaging surfaces easily and accurately brought into planes, as above indicated, by surface grinding or the like, and the only other operation required on the closure 7 would be the drilling of the lugs for the pivot pins and the drilling of holes for the bolts.

The guard 20 requires only the drilling of the lugs for the pivot pins and drilling and tapping for the reception of the screws which hold the screen.

The main body 6, in addition to the surfacing of its flange, requires drilling of the bolt holes in its outer flange, drilling and tapping of the holes for the screws which secure the adaptor to it, and a turning or boring operation which will simultaneously bore the perforation for the reception of the adaptor and face the outer surface against which this adaptor will bear.

The adaptor 8 may be entirely finished on a single boring operation, excepting for the drilling of the screw holes and the oil hole, together with tapping the latter.

The casing sections, adaptor, guard, and impeller can all be castings and all surfaces other

than those above mentioned will require no especial finish.

The adaptor, impeller, and all the parts carried by them and by the motor shaft may easily be assembled upon the motor, after which the whole assembly is quickly secured to the casing by the screws 29, as illustrated.

While I have described the illustrated embodiment of my invention in some particularity, obviously many others will readily occur to those skilled in this art, and I do not, therefore, limit myself to the precise details shown and described, but claim as my invention all embodiments, variations, and modifications thereof coming within the scope of the appended claims.

I claim:

1. Liquid handling apparatus comprising a reservoir having a wall, a rotatable impeller within the reservoir, a shaft connected therewith, and extending through said wall, driving means connected to said shaft on the opposite side of said wall, there being a space formed between the impeller and the shaft, the impeller having a duct extending from said space to a point where a vacuum is created upon rotation of the impeller.

2. Liquid handling apparatus comprising a reservoir having a wall, a rotatable impeller having peripherally disposed blades within the reservoir, a shaft connected therewith and extending through said wall, driving means connected to said shaft on the opposite side of said wall, there being a space formed between the impeller and the shaft, the impeller having a duct extending from said space to the space behind a blade the outer end of said duct being in axial alignment with a part of said blade in which a vacuum is created upon rotation of the impeller.

3. Liquid handling apparatus comprising a reservoir having a wall provided with a tubular extension, a shaft extending through said wall and extension, an impeller secured to said shaft comprising a hollow hub overlying the end of said extension and spaced therefrom and outwardly extending impelling blades, the hub having a duct extending from its interior adjacent the end of said extension to a point behind one of said blades the outer end of said duct being in axial alignment with a part of said blade where a vacuum is created upon rotation of the impeller.

4. Liquid handling apparatus comprising a reservoir having a wall provided with a tubular extension, a shaft extending through said wall and extension, an impeller secured to said shaft comprising a hollow hub overlying the end of said extension and spaced therefrom and outwardly extending impelling blades, the hub having a duct extending from its interior adjacent the end of said extension to a point behind one of said blades the outer end of said duct being in axial alignment with a part of said blade where a vacuum is created upon rotation of the impeller, and packing between the extension and the shaft.

5. A liquid circulating device for use in conjunction with a liquid reservoir having a wall, comprising a shaft extending through said wall, driving means connected to said shaft exteriorly of said wall, a sleeve sealed to said wall surrounding said shaft, an impeller carried by said shaft interiorly of said wall having a hollow hub telescopically surrounding the sleeve and outwardly extending blades, packing between the shaft and sleeve, the impeller hub having a duct communicating with its interior and opening outwardly in axial alignment with said blades in a zone in which a vacuum is created when the impeller is in motion.

6. A liquid handling apparatus comprising a wall forming a part of a side of a liquid reservoir and extending below the normal water line of liquid in the reservoir, a shaft extending through said wall, an impeller fixed to said shaft within the reservoir and comprising a cup-shaped hub and helically disposed blades, there being a perforation within the hub in axial alignment with and behind one of said blades, a sleeve sealed to the wall and extending within the hollow of the hub beyond said perforation, an abutment carried by the sleeve adjacent its end within the hub, a rigid ring engaging the abutment within the sleeve, flexible packing within the sleeve bearing upon the ring and upon the shaft, a second rigid ring slidable on the shaft engaging the packing, a spring surrounding the shaft within the sleeve and bearing upon the second ring, and a second abutment fixed to the sleeve and engaged by said spring.

7. A liquid handling apparatus comprising a wall forming a part of a side of a liquid reservoir and extending below the normal water line of liquid in the reservoir, a shaft extending through said wall, an impeller fixed to said shaft within the reservoir and comprising a cup-shaped hub and helically disposed blades, there being a perforation within the hub in axial alignment with and behind one of said blades, a sleeve sealed to the wall and extending within the hollow of the hub beyond said perforation, an abutment carried by the sleeve adjacent its end within the hub, a rigid ring engaging the abutment within the sleeve, flexible packing within the sleeve bearing upon the ring and upon the shaft, a second rigid ring slidable on the shaft engaging the packing, a spring surrounding the shaft within the sleeve and bearing upon the second ring, and a second abutment fixed to the sleeve and engaged by said spring, an oil duct through a portion of said wall to said sleeve, there being a continuation of said duct extending within said sleeve and discharging into said packing.

LOUIS P. LANSING.