July 22, 1941. W. ROCKE 2,250,315

LIQUID CIRCULATOR

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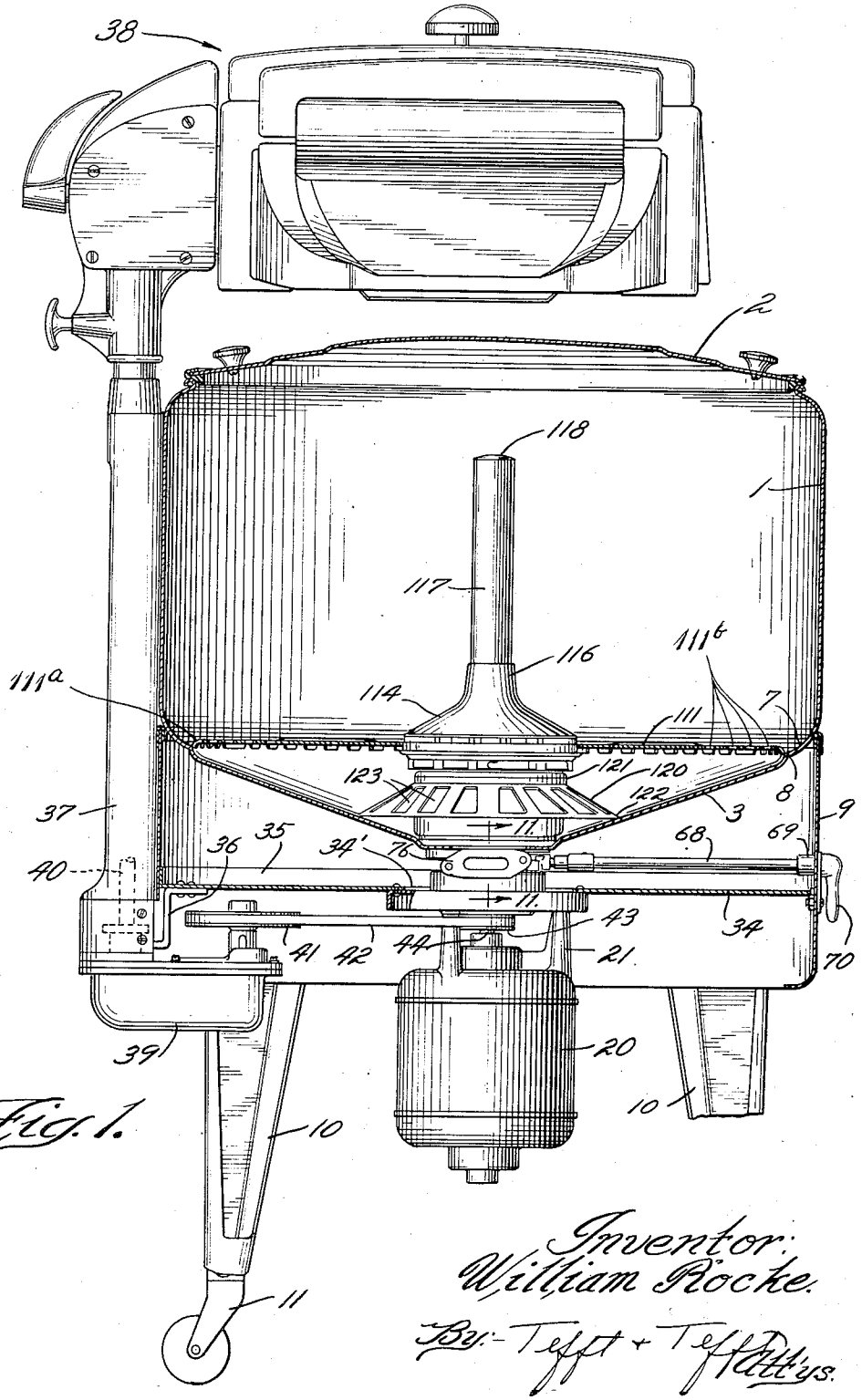


Fig. 1.

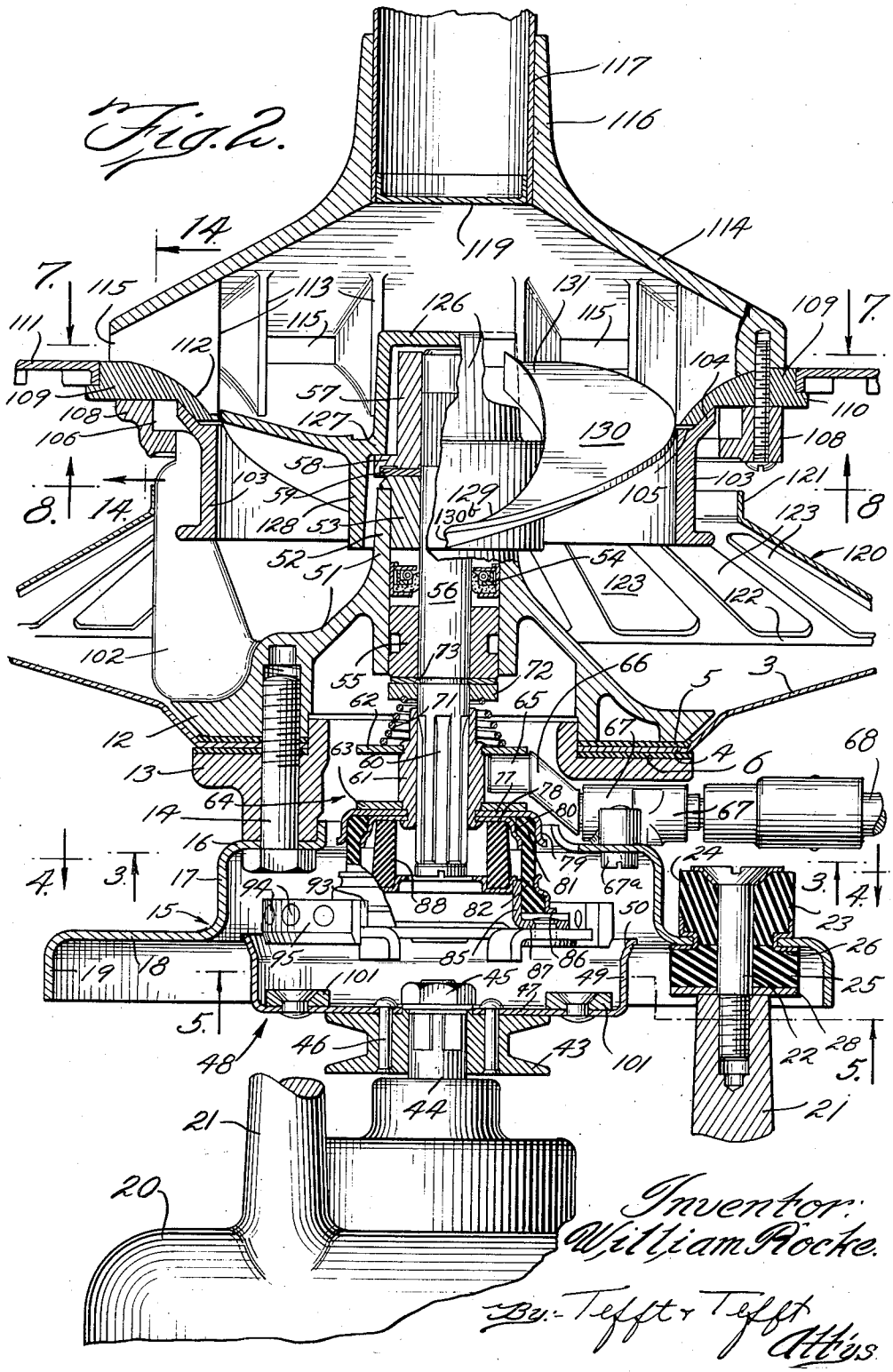
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Fig. 2.



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Fig. 3.

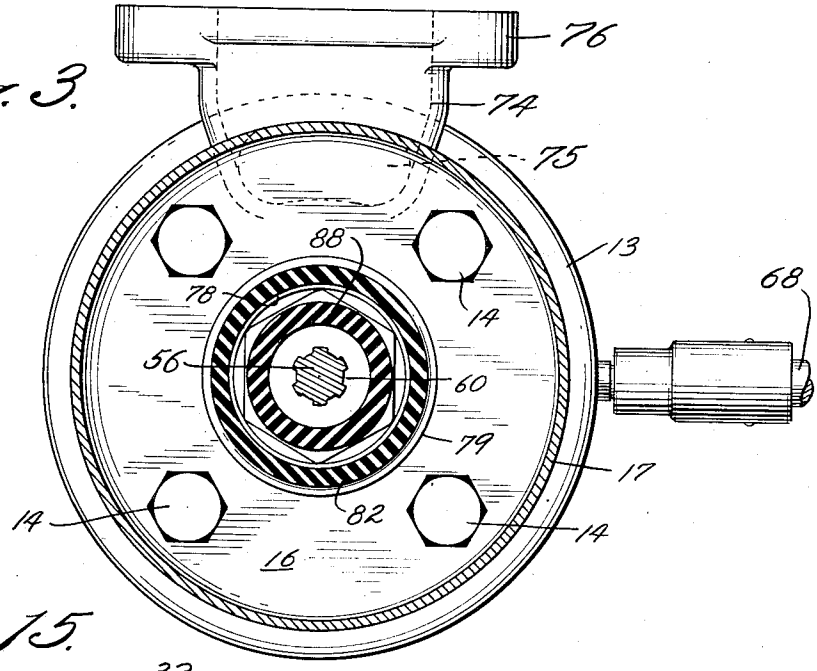


Fig. 15.

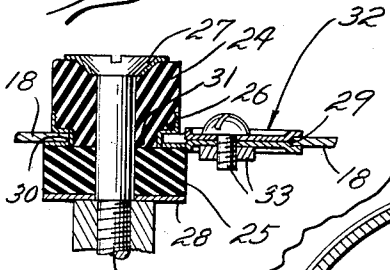


Fig. 4.

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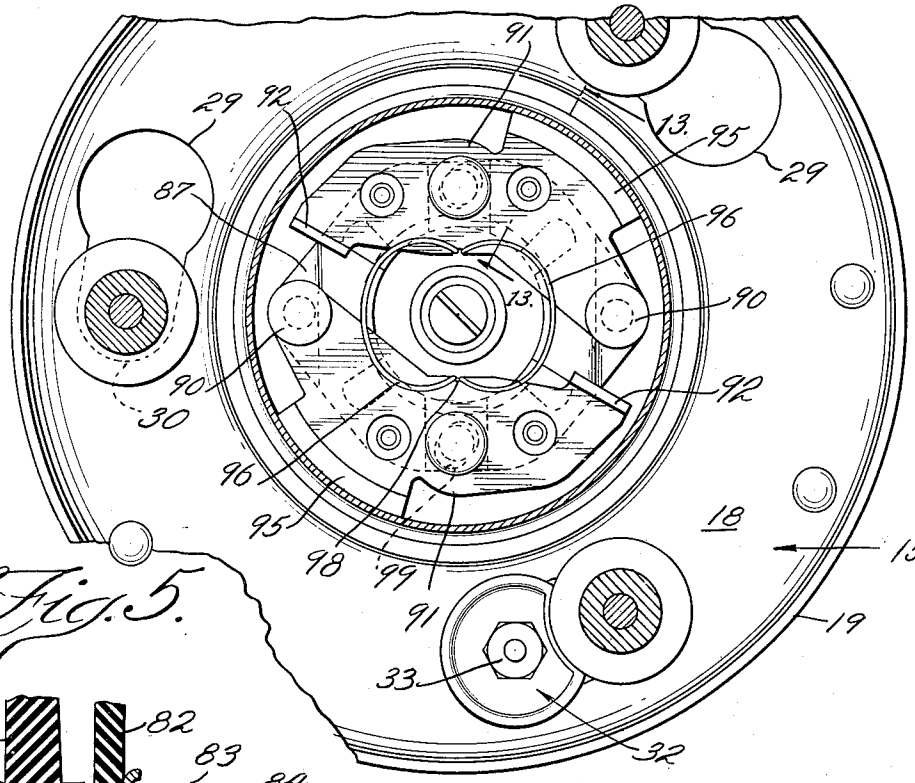


Fig. 5.

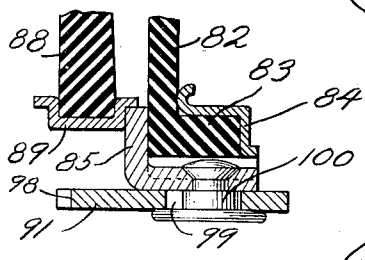


Fig. 7.

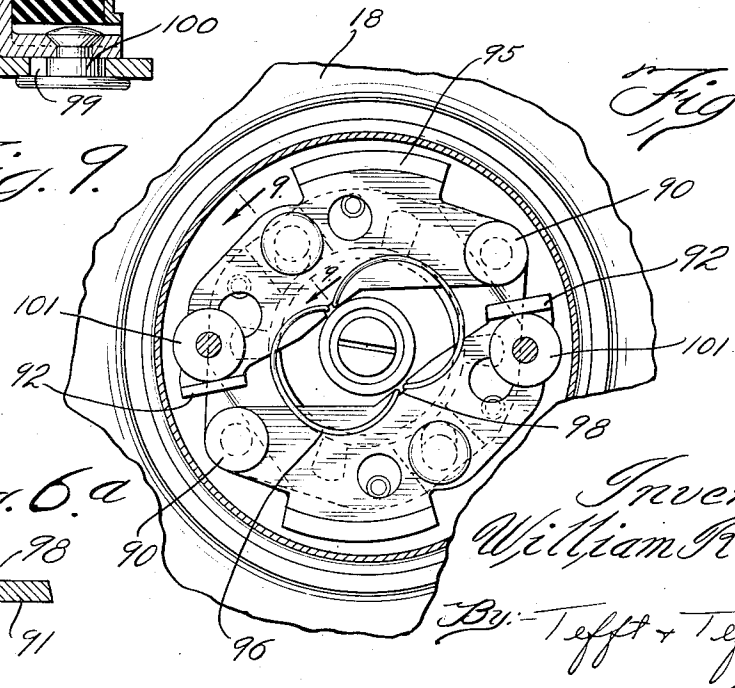
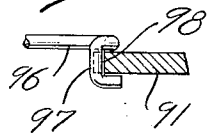


Fig. 6.

Fig. 6a



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LIQUID CIRCULATOR

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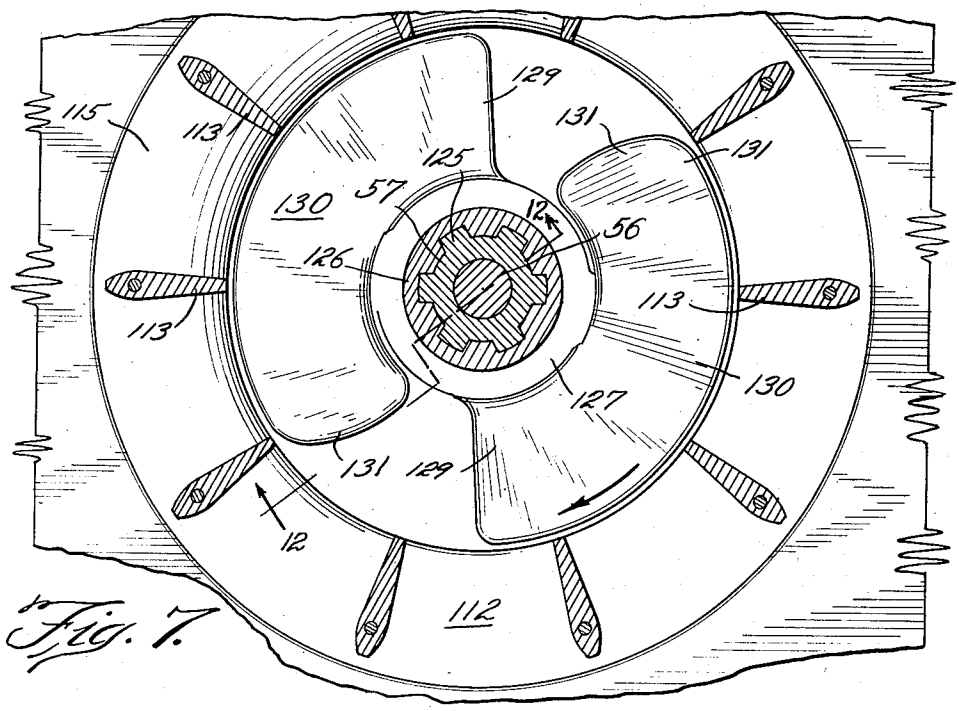


Fig. 7.

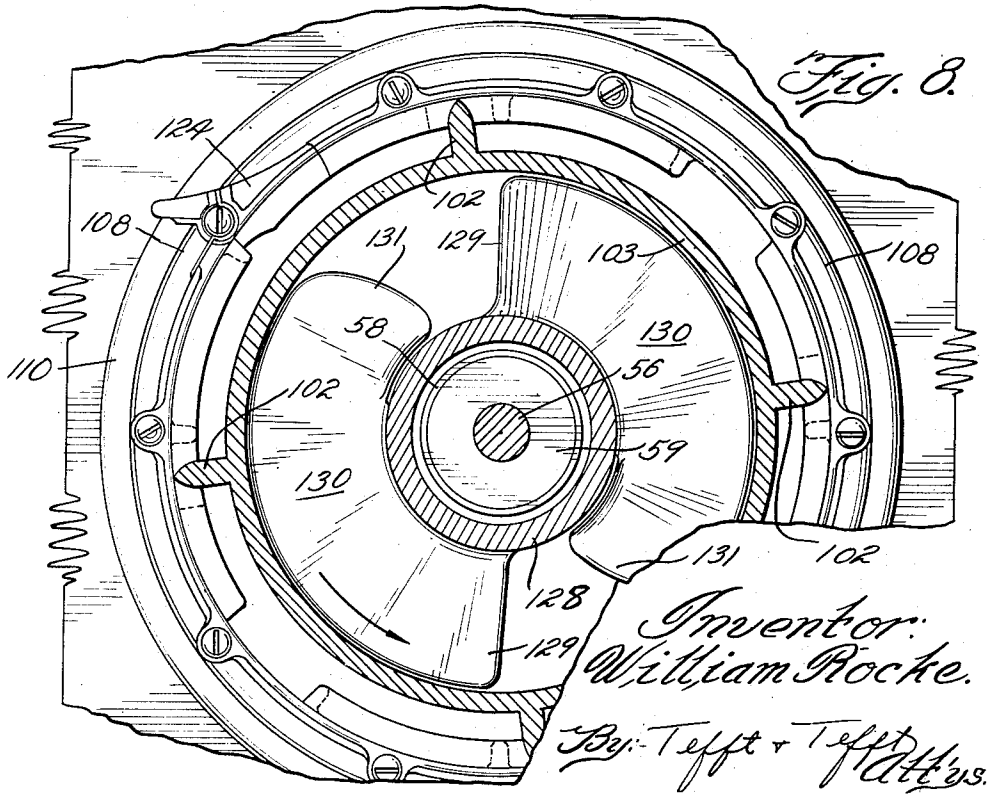


Fig. 8.

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LIQUID CIRCULATOR

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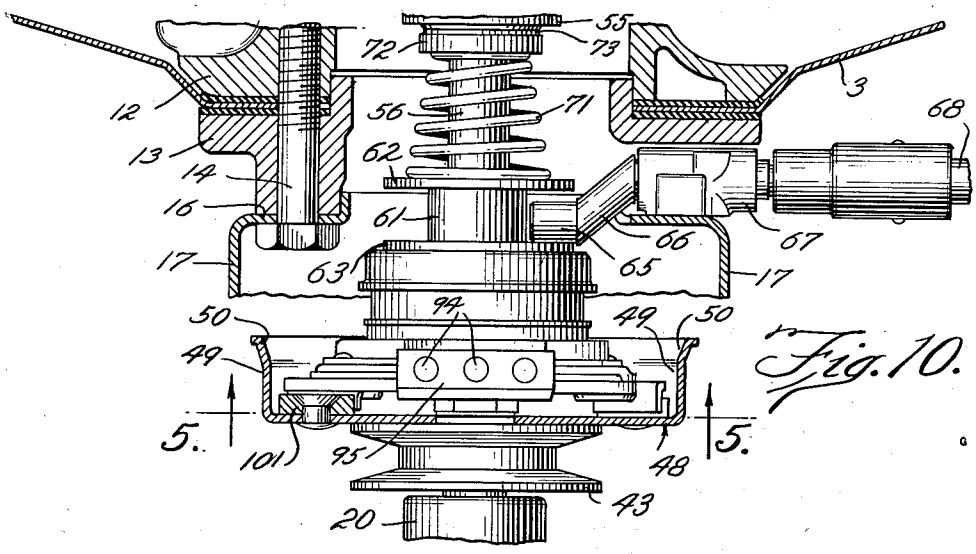


Fig. 10.

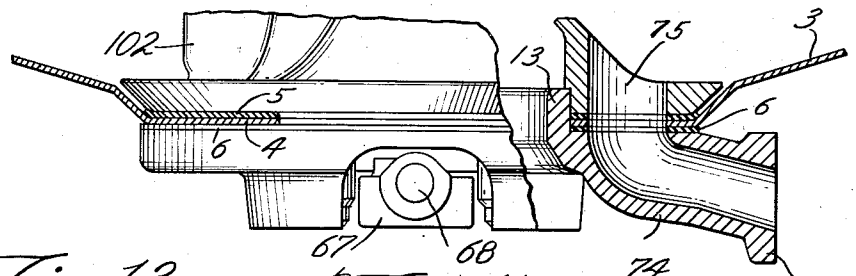


Fig. 13.

Fig. 11.

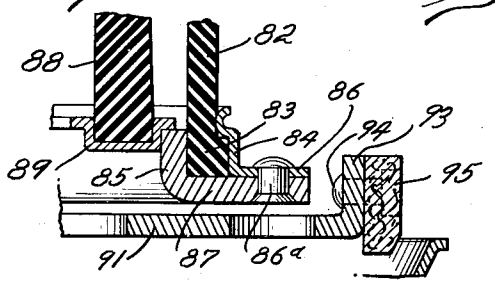
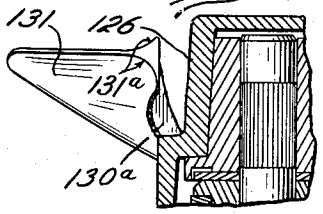


Fig. 12.



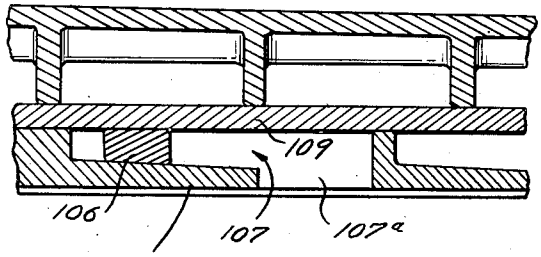


Fig. 14.

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Patented July 22, 1941

2,250,315

UNITED STATES PATENT OFFICE

2,250,315

LIQUID CIRCULATOR

William Rocke, South Bend, Ind.

Application November 8, 1937, Serial No. 173,396

20 Claims. (Cl. 68—184)

The present invention relates to machines of the type disclosed in my co-pending application Serial No. 50,413 and in my Patent No. 2,021,466 (Reissue No. 20,424) wherein liquid is circulated in a compartment for washing clothes or other articles or for mixing purposes, and has reference more particularly to improvements which seek to simplify and improve the construction of machines of that type, facilitate manufacture, minimize cost and increase the efficiency thereof.

More particularly an object of this invention is to simplify and increase the efficiency of the primary circulating system by which a predetermined cyclic flow is imparted to the main body of the liquid. Another object is to facilitate diversion of liquid in the compartment upwardly along the surrounding wall of the compartment at the zone where the liquid supply is obtained for the primary circulating system. Another object is to provide a clutch which is better adapted to establish a driving connection of the liquid impeller with a power unit while the latter is operating at high speed. Other objects include an effective seal to prevent leakage of liquid along the impeller shaft and bearings, an improved form and arrangement of impeller, improved mounting and convenient interchangeability of the power unit, improved driving facilities for an auxiliary mechanism such as a wringer at the top of the tub, an improved bottom wall for the main compartment arranged to insure uniform withdrawal around the margin thereof of the supply of liquid for the primary circulating system, and simple and convenient assembly, as well as removability and accessibility of the various parts of the structure, all of the foregoing objects as well as others, being accomplished as will appear from the following description of the exemplary form of the invention illustrated in the accompanying drawings in which:

Fig. 1 is a view partly in vertical section and partly in elevation of a machine constructed in accordance with the invention;

Fig. 2 is a fragmentary vertical sectional view on a larger scale of the water circulating structure and driving connections;

Fig. 3 is a horizontal part sectional and part bottom plan view taken in a plane represented by line 3—3 in Fig. 2 of the drawings;

Fig. 4 is a fragmentary horizontal part sectional and part top plan view taken in a plane represented by line 4—4 in Fig. 2 of the drawings;

Fig. 5 is a fragmentary horizontal part section and part bottom plan view taken in a plane represented by line 5—5 in Figs. 2 and 10 of the drawings, showing a stage of operation of the clutch means;

Fig. 6 is a similar view showing another stage of operation of the clutch means;

Fig. 6a is a fragmentary detail view showing the hooking of the springs over the edges of the clutch levers;

Fig. 7 is a fragmentary horizontal part sectional and part top plan view taken in a plane represented by line 7—7 in Fig. 2 of the drawings, showing the impelling and jet forming part of the machine;

Fig. 8 is a bottom view taken in a plane represented by line 8—8 in Fig. 2 of the drawings;

Fig. 9 is a fragmentary vertical sectional view of a detail on an enlarged scale of part of the mounting means for the clutch, and taken in a plane represented by line 9—9 in Fig. 6 of the drawings;

Fig. 10 is a vertical part sectional and part elevational view, of part of the mechanism shown in Fig. 2;

Fig. 11 is a fragmentary part elevational and part sectional view showing the drainage outlet of the machine;

Fig. 12 is a fragmentary vertical sectional view of a detail, showing a part of the fluid impelling means, and taken in a plane represented by line 12—12 in Fig. 7 of the drawings;

Fig. 13 is a similar view of a detail, of part of the mounting for the clutch means, and taken in a plane represented by line 13—13 in Fig. 5 of the drawings;

Fig. 14 is a similar view of a detail, of part of the locking means, and taken in a plane represented by line 14—14 in Fig. 2 of the drawings; and,

Fig. 15 is a similar view of a detail, of part of the mounting means for the power transmission, taken in a plane represented by line 15—15 in Fig. 4 of the drawings.

Referring more in detail to the drawings, the embodiment chosen to illustrate the invention is shown as comprising a hollow generally cylindrical receptacle 1 having an open upper end normally closed by a cover 2 of any suitable type, and enclosing a chamber for containing fluid and other materials in accordance with the use for which the machine is to be employed. The lower end of the receptacle 1 is provided with a generally conical bottom 3 at the apex of which is an opening with an inwardly directed annular flange 4 therearound clamped in fluid sealing condition (Fig. 2) between a pair of gaskets 5 and 6. The bottom 3 preferably is an integral

extension of the side wall of the receptacle 1 and has a smooth curved portion 7 (Fig. 1) and an annular shoulder 8. The lower end portion of the receptacle is fixed or otherwise rigid with a hollow cylindrical skirt or the like 9 the lower open end of which is fixed to or rigid with supporting legs 10 having suitable casters 11, the side wall of the receptacle 1 and the skirt 9 being preferably in line and presenting a smooth continuous surface.

To the flanged portion 4 of the bottom 3 are clamped annular mounting members 12 and 13 (Fig. 2) by means of clamping screws 14 passing through suitable apertures provided in the mounting member 13, the gaskets 5 and 6, the flange 4 of the bottom 3, and threaded into suitable sockets provided in the mounting member 12, as are clearly shown in Fig. 2, so as to tightly clamp together the parts mentioned. The screws also serve to rigidly secure to the lower part of the annular mounting member 13, an annular mounting plate 15 having an inwardly directed flange 16 clamped to member 13 by the screws 14, an annular body portion 17, an annular supporting wall portion 18, and a depending flange 19.

The machine is operated by a motor 20 which has rigid hanger struts 21 (Figs. 1 and 2) secured at their upper ends to screws 22 threaded into suitable sockets provided in the upper ends of the struts 21 and carried by cushion bosses 23 being both resilient and composed of electrically and heat insulating material, such as rubber, composition, etc.

Referring to Figs. 2, 4, 5 and 15, each of these bosses comprises a head 24 and a base 25 of larger diameter than the head 24, and is provided between said head and body with an annular channel in which is located a metal grommet 26 for engagement of the wall 18 of the mounting plate 15, later described. The head 24 carries a countersunk washer 27 for engagement therewith of the head of the screw 22, and the base 25 has a washer 28 clamped between the base 25 and the upper end of the strut 21. The head 24 is of smaller diameter than the base 25 for the purpose of assembling. The wall 18 of the mounting plate 15 is provided with pairs of holes 29 and 30 of which the hole 29 is of a size to permit the upward passage therethrough of the head 24 but too small for the passage of the base 25, and the hole 30 is of a size to receive the neck portion 31 of the boss 23 and the grommet 26 when the same are moved laterally from the hole 29 to the hole 30, the flanges of the grommet 26 clasping both sides of the wall 18 at the rim of the hole 30. The sliding of the boss from the hole 29 to the hole 30 is effected by turning the motor assembly angularly about its axis, counter-clockwise as viewed in Fig. 5, the holes 29 and 30 being in eclipsing communication. After this, a locking plate 32 comprising a pair of discs with flanges adapted to overlap the opposite sides of the rim of the hole 29, is located in the hole 29, the discs thereof being clamped together by a screw and nut 33 (Fig. 15) whereby the flanges of the discs clamp the rim of the hole 29. These discs have arc shaped cut-outs as shown in Fig. 5 to register with the grommeted neck portion 31 of the boss.

Within the skirt 9 and disposed diametrically thereof is a cross plate 34, (Fig. 1), which may have strengthening side flanges 35, secured at its ends to the opposite sides of the skirt, and provided with a central opening 34' the rim of which is secured, as by rivets or spot welding to the border of the wall 18 of the mounting plate 15. To an end of this cross plate is fixed a supporting bracket 36 connected to the lower end of a wringer standard or post 37 to the upper end of which is suitably connected a wringer device 38. This wringer device is present only when the machine of this invention is used as a clothes washing machine. To the lower end of the standard 37 is connected a gear housing 39 containing suitable gearing operatively connected to a driving shaft 40 for the wringer and also operatively connected to a pulley 41 over which runs a belt 42 to a pulley 43 keyed to the upper end of the shaft 44 of the motor 20 (Figs. 1 and 2) and held in place by a thrust screw or bolt 45. To the upper surface of the pulley 43 is secured, as by bolts or rivets 46, the plate part 47 of the clutch drum 48 having an upstanding flange 49 provided with an upper flared rim 50 (Figs. 2, 10 and 13).

The mounting member 12 has an upwardly extending conical wall 51 provided at its apical portion with a vertically disposed bearing hub 52 in which are bearing elements 53, 55 and liquid sealing means 54, the element 53 having a flange overlying the upper end of the hub 52, the element 54 being of any suitable sealing means for liquid, and the element 55 being fixed in the lower end of the hub 52 and having an annular channel for lubrication purposes for shaft 56 rotatable in these bearings. To the upper end of this shaft is fixed an impeller driving head 57 having a thrust bearing lower flanged end 58 rotative upon an antifriction disc 59 serving both as a thrust bearing and a sealing means.

The lower end of the shaft 56 is provided with spline flutes 60 with which is splined a cylindrical clutch hub or sleeve 61 to the end portions of which are fixed annular thrust discs 62 and 63 between which is provided an annular clutch throw cranking space 64. In this space extends the end 65 of a crank 66 having its shank rotatably mounted in a bearing means 67 located in a side opening provided in the mounting member 13 and secured to the top of the mounting member 15, as by screws 67a. To the outer end of this crank is coupled a shaft 68 (Fig. 1) the outer end portion of which is rotatable in a bearing means 69 fixed in the side wall of the skirt 9 and has secured to the projecting end thereof a handle 70. By turning this handle the crank pin 65 may be raised or lowered to raise or lower the clutch hub 61 by way of the thrust plates or rings 62 and 63 (Fig. 2).

Upon the thrust plate 62 presses a spring 71 (Figs. 2 and 10) the upper end of which reacts against a thrust ring 72 bearing against an anti-friction ring 73 bearing against the lower end of the bearing element 62. The spring 71 normally tends to thrust the clutch hub downwardly. When the crank 66 is turned to lower the crank pin 65, the spring 71 forcibly moves the clutch hub 61 downward together with the clutch parts carried by it, as later described.

Clutch hub 61 is limited in its downward travel caused by spring 71, by the head of a screw fastened in the end of shaft 56. This limited travel of the clutch hub prevents any end pressure or thrust being imparted against drum 48 so as to create a disturbing thrust load on the motor shaft.

The mounting member 13 has (Figs. 3 and

11) integrally formed therewith a drain spout or outlet means 74 having its inlet end in registry with a drain passage 75 provided in a part of the mounting member 12, the outer end of the spout having a flange 76 to which may be secured any suitable fitting of a drain duct (not shown).

To the lower end of the clutch hub 61, just beneath the thrust plate 63, are secured cup shaped clutch plates 77 and 78 of different diameters and having depending flanges 79 and 80 which provide between them a channel in which is the beaded upper end 81 of a tubular flexible clutch coupling 82. This ring 82 may be composed of rubber, composition, etc., and is capable of having a certain amount of torsional give to afford a smooth coupling of power transmission when the clutch means is engaged. The bead 81 may be clamped between the flanges 79 and 80, the upper portion of the flange 80 being polygonal in form, as hexagonal, to prevent the bead 81 from turning in the channel between the flanges 79 and 80, and thus to afford better torsional purchase when transmitting the rotational stresses. The lower end of the flexible tube 82 is provided with a bead or flange 83 which is clamped between the upwardly extending flanges 84 and 85 of clutch rings 86 and 87. In this case also the lower part of the flange 84 is polygonal in form, as hexagonal, this affording the torsional purchase mentioned. The edges of the flanges 79 and 84, however, are circular or annular. The horizontal portions of the rings 86 and 87 are secured together, as by rivets or the like 86a (Figs. 4 and 13).

Within the ring 82 is a trust ring 88 which may be of the same composition as the ring 82 but preferably stiffer. The upper end of ring 88 engages the plate 78 and its lower end is fixed in the channel of a ring 89 engaged with the upper end of the flange 85 (Fig. 13). To the under side of the plate 87 (shown of hexagonal form in Fig. 5) are provided pivot pins 90 to each of which is pivotally connected an end of a clutch lever 91 having at its free end a downwardly extending finger 92, (Figs. 5 and 6). At an intermediate portion each lever 91 has an upwardly extending flange 93 to which is secured, as by rivets 94, (Figs. 2 and 13) a friction piece 95 acting as a clutch shoe for frictional clutching engagement with the inner surface of the flange 49 of the clutch drum 48.

In a plane just above the levers 91 are horizontally disposed U-shaped springs 96 the free ends of which have downwardly extending hooks 97 which hook over the inner edges of the levers 91 and in notches 98 provided in the edges of the levers 91. The springs 96 thus constantly urge the levers 91 outwardly so as to press the shoes 95 against the clutch drum flange 49 when the clutch hub 61 and the parts carried by it are lowered by the crank 66. The inward and outward movements of the levers 91 are limited by the ends of elongated openings or slots 99 (Figs. 5 and 6) in each of which downwardly projects a stop pin 100 fixed at its upper end to the horizontal flange or wall 87 of the ring 85.

As the clutch means is forced down by the crank 66 (Fig. 10) the shoes first frictionally engage the flared part 50 of the drum flange 49, which part 50 acts as a wedge to force the shoes 95 and the levers 91 inward against the resistance of the springs 96. When the shoes 95 reach the cylindrical part of the flange 49 they frictionally clutch such flange and take up the rotation of the drum 48 and rotate almost in unison therewith but lagging slightly. A further downward movement brings the depending fingers 92 at the ends of the levers 91 into the path of buttons 101, fixed to the top surface of the drum wall 47 so that as the fingers 92 engage these buttons there is a positive clutching and a positive drive from the drum 48 by way of the clutch means to the shaft 56.

Integral with the annular mounting member 12 are upwardly extending posts 102 which at their upper ends are integral with a throat ring 103 having an upper outwardly flared flange 104 and an annular seating shoulder 105. At suitable points the ring 103 has outwardly extending bayonet lugs 106 (Figs. 2 and 14) which are located in bayonet slots 107 provided at suitable points in a locking ring 108 secured to the under side of the nozzle ring 109. The periphery of this ring has a shoulder 110 upon which is seated the inner rim of a plate 111 which forms a bottom wall for the washing compartment and separates same from a sump compartment therebelow. The outer margin of this plate has a series of downturned fingers 111a which rest on the annular shoulder 8 (Fig. 1) said plate being sufficiently flexible so that water pressure will hold same solidly on the supporting shoulders. Between the fingers 111a are notches through which water is withdrawn from the compartment above the plate 111 into the sump and in addition the plate has a plurality of apertures 111b unformly distributed around the marginal zone thereof for the same purpose.

The nozzle ring 109 has an inner downwardly curved rim 112 which fits with and seats upon the upwardly flared flange 104 and the annular seat 105. Extending upwardly from the nozzle ring 109 is a circular series of vertical nozzle walls or vanes 113 which are integral at their upper ends with a conical wall 114 forming the top of the nozzle chamber in which the fluid is subjected to pressure and caused to pass forcibly radially through the nozzle passages between the nozzle walls 113 and between the top 114 and the nozzle ring 109 and to issue through the nozzle orifices or openings 115. The apical portion of the top 114 has a hub 116 in which is fixed the lower end of a center post 117 of hollow cylindrical form, having a closed upper end 118 (Fig. 1) and a closing cap 119 in its lower end (Fig. 2).

Around the outside of the assembly or series of posts 102 is a conical grid 120 having an upper annular collar 121 vertically slidable along the outer edges of the posts 102, and having a basal ring or rim 122 adapted to rest upon the bottom 3 of the receptacle 1. The inclined wall of the grid 120 has elongated openings 123 for the free passage of the fluids from beneath the bottom 111 to the lower part of the bottom 3 and through the passages between the posts 102.

When the nozzle chamber is lowered to its seat 105 it is so turned about its axis that the vertical portion 107a of each bayonet slot 107 in the ring 108 will receive a bayonet lug 106, and then the nozzle ring 109 with the attached ring 108 is so turned that the bayonet lugs 106 are in the locked position shown in Fig. 14, the lower wall 108a of the bayonet joint portion of the ring 108 is wedge shaped or inclined so that the bayonet lug 106 becomes tight in its relative movement toward the closed end of the bayonet slot 107.

To prevent accidental unlocking, the ring 108 carries a spring pressed pivoted latch 124 (Fig. 8) adapted to fit into the bayonet slot 107 behind the lug 106.

The impeller driving head 57 fixed to the upper end of the shaft 56 is formed on the periphery with coupling ribs or keys 125 (Fig. 7) which engage internal grooves of the upper portion 126 of the impeller hub to provide a detachable driving connection, said impeller hub being stepped to form an annular shoulder 127 which seats upon the shoulder or flange 58 of the impeller driving head 57, and to provide a depending skirt portion 128 (Fig. 2) surrounding the upper end of the bearing hub 52. This skirt portion has the spiral impeller blades 130 integral therewith and forming a lifting screw, said blades being arranged with the lower portions 129 thereof extending along the skirt portion 128 of the hub and with portions 131 extending thereabove along the reduced hub portion 126 but spaced therefrom as shown in Figs. 1 and 12.

The lower end of each blade 130 is preferably pitched slightly upwardly toward the outer periphery of the impeller as indicated at 130^b in Fig. 2, while the inner edge of each blade is gradually widened as indicated at 130^a in Fig. 12 as it approaches the upper end to produce upper and lower flaring surfaces 131^a which tend to force the liquid radially outward at the top of the impeller.

The stepped impeller hub 126, 128 is closed at the top as shown in Fig. 2 to provide an air pocket therein which by reason of the depending arrangement of the skirt portion 128 around the upper end of the bearing hub 52 provides an air seal to prevent access of water to the upper end of the bearing hub 52 and thus affords a safeguard in addition to the seal 54 to prevent leakage of water from the interior of the receptacle along the impeller shaft.

In assembling, the base grid 120 is slid down over the posts 102 for the grid to rest on the bottom 3. If the impeller device is not in place, it may be so lowered that hub 126 is coupled to the impeller driving head 57. Then the nozzle device is lowered in place so that it seats on the seat 105 at the top of the throat ring. It is so turned that the bayonet lugs 106 enter the slot 107 and then turned to lock the same. The bottom or grid 111 is then placed to seat in the shoulders 110 and 8.

With the motor running, the operator may so turn the crank 66 as to lower the crank pin 65 and the clutch mechanism carried on the hub 61 splined on the shaft 56. This causes the clutch shoes 95 to frictionally clutch with the drum 48 and to be driven thereby. A further downward movement of the crank pin 65 causes the clutch fingers 92 to positively clutch with the buttons 101 on the drum 48 so that the drive becomes mechanically positive. As the fingers 92 engage these buttons 101, the levers 91 are given a slight inward movement to release the shoes from the drum rim 49 and to the extent permitted by the oval slot 99 in the levers 91.

As the shaft rotates the impellers 130 in the throat 103 and in the nozzle chamber, the fluid is forced upwardly from over the wall 51 and the bottom 3 of the receptacle 1 and into the nozzle chamber to be forcibly projected through the nozzle passages and the nozzle orifices 115 in radial jets into the lower part of the receptacle 1 over the bottom or grid 111. This causes a whirling and turbulent action of the fluid and whatever substances may be held in suspension thereby, such as clothes in washing water or cleansing fluid. The effect is to force the fluid toward the wall of the receptacle, and then upward, then inward, and then downward. Some of the fluid returns to the sump above the bottom 3 where it is taken up again by rotary impellers 130.

While the device is preferably adapted for washing clothes, it is to be understood that it is also adapted to wash dishes or other articles, or to mix liquids. When used as a clothes washing machine, it will be apparent from the disclosure that the clothes cannot possibly be contacted by the fluid impelling means, but are moved about and acted upon only by the washing fluid itself, and cannot be damaged or injured in any way, the liquid in the compartment above the plate 111 being propelled entirely by the liquid discharge from the impeller 130 which is caused to sweep outwardly over said plate 111 at high velocity in substantially the form of a sheet which imparts to the liquid thereabove cyclic flow to and from the center of the compartment substantially in upright planes which diverge outwardly from the center of the compartment to the surrounding wall thereof.

While I have herein shown and described my invention in a preferred form, I am aware that various changes and modifications may be made without departing from the principles of my invention, the scope of which is to be determined by the appended claims.

Having thus disclosed the invention, I claim as my invention:

1. In a machine for imparting to liquid in a compartment cyclic flow inwardly toward and outwardly from the center of the compartment in substantially upright outwardly divergent planes, the combination of a receptacle having therein a compartment with a wall above which the aforesaid cyclic flow of liquid is caused to occur, a liquid impeller arranged to withdraw liquid marginally from the bottom of the compartment space above said wall and to discharge same upwardly at the center of said wall, and means which is positioned in the path of said upwardly flowing discharge and at approximately the level of said wall deflects said upwardly flowing discharge laterally and radially outward along the top of said wall in substantially an annular sheet.

2. In a machine for imparting to liquid in a compartment cyclic flow inwardly toward and outwardly from the center of the compartment in substantially upright outwardly divergent planes, the combination of a receptacle having therein a compartment with a wall above which the aforesaid cyclic flow of liquid is caused to occur, a liquid impeller arranged to withdraw liquid marginally from the bottom of the compartment space above said wall and to discharge same upwardly at the center of said wall, and means which is positioned in the path of said upwardly flowing discharge and at approximately the level of said wall deflects said upwardly flowing discharge laterally, said facilities having annular outlet means under the margin thereof and directed radially outward through which said laterally deflected discharge is forcibly ejected substantially radially outward along the top of said wall.

3. In a machine for imparting to liquid in a compartment cyclic flow inwardly toward and outwardly from the center of the compartment

in substantially upright outwardly divergent planes, the combination of a receptacle having therein a compartment with a wall above which the aforesaid cyclic flow of liquid is caused to occur, said wall having an annular step at the center, a liquid impeller arranged to withdraw liquid marginally from the bottom of the compartment space above said wall through an annular zone remote from said annular step and to discharge same upwardly at the center of said annular step, the area within the annular step having an overlying cover which is positioned in the path of the upward discharge and at approximately the level of said step deflects said upward discharge radially outward through the margin of the annular step onto the said wall of the compartment.

4. In a machine for imparting to liquid in a compartment cyclic flow inwardly toward and outwardly from the center of the compartment in substantially upright outwardly divergent planes, the combination of a receptacle having therein a compartment for the liquid and said compartment having a wall above which the aforesaid cyclic flow of liquid is caused to occur and said wall being provided with an opening at the center, a cover bridging said opening and marginally elevated above said wall, a liquid impeller arranged to withdraw liquid marginally from the bottom of the compartment space above said wall and discharge same upwardly through said opening at the center of the said wall of the compartment, said cover being arranged to deflect the upwardly flowing discharge at approximately the level of the wall opening radially outward under the elevated cover margin onto the said wall.

5. In a machine for imparting to liquid in a compartment cyclic flow inwardly toward and outwardly from the center of the compartment in substantially upright outwardly divergent planes, the combination of a receptacle having therein a compartment for the liquid and said compartment having a wall above which the aforesaid cyclic flow of liquid is caused to occur and said wall being provided with an opening at the center, a cover bridging said opening and having an annular series of radially directed openings under the margin of said cover, a liquid impeller arranged to withdraw liquid marginally from the bottom of the compartment space above said wall and discharge same upwardly through said opening at the center of said wall against the aforesaid cover, said cover being arranged to deflect said upwardly flowing discharge at approximately the level of the wall opening radially outward toward the said openings under the margin of the cover and through said openings along the top of the said wall.

6. In a machine for imparting to liquid in a compartment cyclic flow inwardly toward and outwardly from the center of the compartment in substantially upright outwardly divergent planes, the combination of a receptacle having therein a compartment for the liquid and said compartment having a wall above which the aforesaid cyclic flow of liquid is caused to occur, a liquid impeller arranged to withdraw liquid marginally from the bottom of the compartment space above said wall and to discharge same upwardly at the center of said wall, and means in the path of said upwardly flowing discharge constructed and arranged to deflect said upward discharge laterally at the top of said wall, said means having annular outlet facilities under the margin thereof through which said laterally deflected discharge is forcibly ejected, said facilities including an annular series of guides between and by which the said laterally deflected discharge is directed radially outward along said wall.

7. In a machine for imparting to liquid in a compartment cyclic flow inwardly toward and outwardly from the center of the compartment in substantially upright outwardly divergent planes, the combination of a receptacle having therein a compartment for the liquid and said compartment having a wall above which the aforesaid cyclic flow of liquid is caused to occur, an annular housing below said wall and having an opening from the interior thereof through the center of said wall, a cover bridging the said opening and having the margin elevated above the rim of the opening, a liquid impeller arranged to withdraw liquid marginally from the bottom of the compartment space above said wall into the interior of said housing and to discharge same from the interior of the housing upwardly through the aforesaid housing opening against the bridging cover, said cover having radial passageways under the margin thereof leading directly from the upper end of the aforesaid opening of the housing.

8. In a machine for imparting to liquid in a compartment cyclic flow inwardly toward and outwardly from the center of the compartment in substantially upright outwardly divergent planes, the combination of a receptacle having therein a compartment for the liquid and said compartment having a wall above which the aforesaid cyclic flow of liquid is caused to occur, an annular housing below said wall and having an opening from the interior thereof through the center of said wall, a cover bridging the said opening, an annular series of radially extending spacers between the margin of said cover and the rim of said opening, and a liquid impeller arranged to withdraw liquid marginally from the bottom of the compartment space above said wall into the interior of said housing and to discharge same through the aforesaid housing opening the bridging cover.

9. In a machine for imparting to liquid in a compartment cyclic flow inwardly toward and outwardly from the center of the compartment in substantially upright outwardly divergent planes, the combination of a receptacle having therein a compartment for the liquid and said compartment having a wall above which the aforesaid cyclic flow of liquid is caused to occur, an annular housing below said wall and having an opening from the interior thereof through the center of said wall, a cover bridging the said opening and having a quick detachable connection with the housing, the margin of the cover being positioned at an elevation above the rim of the housing opening, and a liquid impeller arranged to withdraw liquid marginally from the bottom of the compartment space above said wall into the interior of the housing and to discharge same therefrom between the margin of said cover and the rim of the housing opening.

10. In a machine for imparting to liquid in a compartment cyclic flow inwardly toward and outwardly from the center of the compartment in substantially upright outwardly divergent planes, the combination of a receptacle having therein a compartment for the liquid and said compartment having a wall above which the aforesaid cyclic flow of liquid is caused to occur

and said wall being provided with an opening at the center, a cover bridging said opening and marginally elevated above the wall, a liquid impeller arranged to withdraw liquid marginally from the bottom of the compartment space above said wall and to discharge same upwardly through said opening at the center of said wall, said cover being arranged ot deflect the upwardly flowing discharge approximately at the level of said wall radially outward under the elevated cover margin onto the said wall and said cover having a center post extending upwardly therefrom and a flaring contour from the base of said center post to the cover margin.

11. In a machine of the class described, the combination of a receptacle with a main compartment therein adapted to contain liquid and provided with a wall and a sump compartment under said wall, a central housing in the sump compartment having a closed upper end projecting upwardly through the center of the said wall, and an impeller in the housing arranged to withdraw liquid from the main compartment into the margin of the sump compartment and therefrom into the interior of the housing, said upper end of said housing having annular outlet means therearound approximately at the upper end of the impeller.

12. In a machine of the class described, the combination of a receptacle having therein a compartment adapted to contain liquid and provided with a wall above which liquid is circulated in the compartment, a housing extending upwardly through the center of and having annular outlet means substantially at the top of said wall, said housing having therein an impeller the upper end of which is substantially at the level of the aforesaid annular outlet means and said impeller being arranged to withdraw liquid marginally from said compartment and to discharge same through said annular outlet means onto said wall of the compartment.

13. In a machine of the class described, the combination of a receptacle having therein a compartment adapted to contain liquid and provided with a wall above which liquid is circulated in the compartment, a housing extending upwardly through the center of said wall and having an annularly enlarged upper end with radially directed outlet means around the periphery thereof substantially at the top of said wall, said housing having therein an impeller, the upper end of which is substantially at the level of the aforesaid annular outlet means and said impeller being arranged to withdraw liquid marginally from said compartment and to discharge same through said annular outlet means onto said wall of the compartment.

14. In a machine of the class described, the combination of a receptacle having therein a compartment adapted to contain liquid and provided with a wall above which liquid is circulated in the compartment, a housing extending upwardly through the center of and having annular outlet means substantially at the top of said wall, said housing having therein a screw impeller with spiral blades flared along their inner edges progressively to their upper ends which are substantially at the level of the aforesaid annular outlet means and said impeller being arranged to withdraw liquid marginally from said compartment and to discharge same through said annular outlet means onto said bottom wall of the compartment.

15. In a machine of the class described, the combination of a receptacle having therein a compartment adapted to contain liquid and provided with a wall above which liquid is circulated in the compartment, a housing extending upwardly through the center of and having annular outlet means substantially at the top of said wall, said housing having therein an impeller the upper end of which is substantially at the level of the aforesaid annular outlet means and said impeller being arranged to withdraw liquid marginally from said compartment and to discharge same through said annular outlet means onto said wall of the compartment, said housing being provided below said wall with an annular apertured skirt therearound through the apertures of which the withdrawn liquid is supplied to the impeller.

16. In a machine of the class described, the combination of a receptacle having therein a compartment adapted to contain liquid and provided with a wall above which liquid is circulated in the compartment, a deflector projecting above said wall at the center and sloping downwardly and radially outward, and a liquid impeller operable to withdraw liquid marginally from the bottom of the compartment and discharge same radially outward under the marginal edge of said deflector onto said wall.

17. In a machine of the class described, the combination of a receptacle having therein a compartment adapted to contain liquid and provided with a wall within a surrounding side wall, there being an annular surface at the juncture of said walls curved outwardly and upwardly, a housing at the center of said first mentioned wall with annular outlet means around the margin thereof directed toward the annular curved surface aforesaid, outlet means distributively arranged around the compartment adjacent said annular surface, and a liquid impeller arranged to discharge liquid through said annular outlet means and having an intake with which the aforesaid outlet means communicate.

18. In a machine of the class described, the combination of a receptacle having therein a compartment adapted to contain liquid and provided with a wall within a surrounding side wall, a liquid impeller arranged to withdraw liquid marginally from the bottom of the compartment and discharge same outwardly over the first mentioned wall from the center to the outer margin thereof, one of said walls having an annular area extending along the other wall and curved thereto and located in the path of the discharged liquid to deflect same from said first mentioned wall upwardly along the side wall of the compartment.

19. In a machine of the class described, the combination of a receptacle having therein a compartment adapted to contain liquid and provided with a wall within a surrounding side wall, a deflector projecting above the first mentioned wall at the center and sloping downwardly and radially outward, a liquid impeller operable to withdraw liquid marginally from the bottom of the compartment and discharge same radially outward under the marginal edge of said deflector onto the said first mentioned wall, and said walls having an annular wall area therebetween with an outwardly and upwardly curved surface surrounding the sloping wall of the deflector and in opposed relation thereto by which the liquid discharged radially outward onto said first mentioned wall is deflected upwardly along the side wall of the compartment.

20. In a machine of the class described, the

combination of a receptacle having therein a compartment adapted to contain liquid and provided with a centrally apertured wall above which liquid is circulated in the compartment, a housing at the center of said wall and having a portion projecting upwardly through the center aperture of said wall and provided with annular outlet means around the margin of said projecting portion, and an impeller in said housing arranged to withdraw liquid marginally from the bottom of the compartment and discharge same outwardly through said annular outlet means of the housing over said wall, said housing and said receptacle having supporting means with which the outer and inner margins of the said wall are respectively engaged and said wall being flexible to yieldingly engage the supporting means.

WILLIAM ROCKE.

CERTIFICATE OF CORRECTION.

Patent No. 2,250,315. July 22, 1941.

WILLIAM ROCKE.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, second column, line 35, for "unformly" read --uniformly--; page 5, second column, line 46, claim 8, after the word "opening" insert --against--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 9th day of September, A. D. 1941.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)