

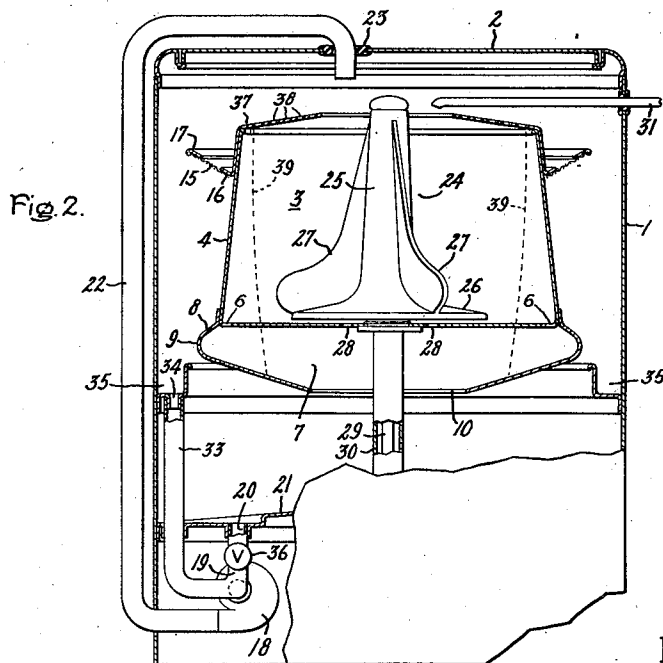
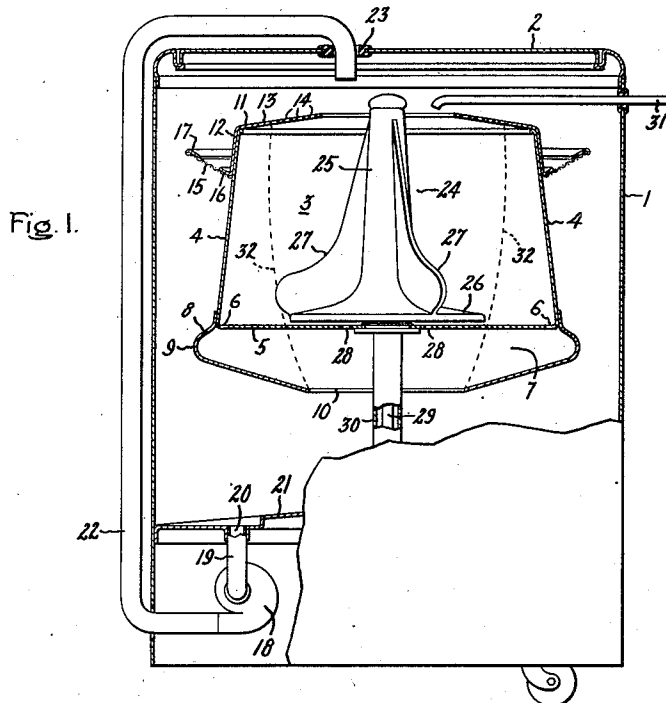
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WASHING MACHINE AND METHOD

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WASHING MACHINE AND METHOD

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The present invention relates to washing machines of the type in which clothes are washed and centrifugally dried in a rotatable tub.

The object of my invention is to provide an improved construction and arrangement in washing machines of this type, and for a consideration of what I believe novel and my invention, attention is directed to the following description and the claims appended thereto.

In the accompanying drawing, Fig. 1 is a sectional elevation of a washing machine embodying my invention, and Fig. 2 is a sectional elevation of a modification.

Referring to the drawing, there is shown a washing machine having an outer casing 1 provided with a cover 2. In the lower part of the casing and above the normal water level therein is a rotatable tub 3 for receiving clothes to be washed and centrifugally dried. The tub has side walls 4 flaring downward and outward from the top and connected to a bottom wall 5. At the region of greatest diameter are discharge openings 6 through which liquid is centrifugally discharged upon rotation of the tub. Surrounding the discharge openings 6 is a chamber 7 formed by walls 8 fixed to the receptacle side walls above the openings 6 and extending downward and outward therefrom to a point 9 and thence extending downward and inward beneath the bottom wall 5 of the tub and having the inner edges thereof defining an opening 10 beneath the center of the tub. At the top of the tub is a rim 11 comprising walls 12 extending downward over the upper end of the side walls 4 and fixed thereto, and walls 13 extending radially inward and upward from the top edge of the side walls. The walls 13 are imperforate adjacent the upper edge of the side walls and at the inner part are provided with openings 14 defining the liquid level in the tub. During washing, the liquid in the tub overflows through the openings 14 and falls onto an annular filter 15 of cloth or wire mesh screen secured at its inner edge to a flange 16 integral with the lower end of the walls 12 and extending outward and upward therefrom. At its outer edge the filter 15 is provided with a stiffening ring 17. Due to the upward inclination of the filter 15 a trough is provided for receiving the liquid overflowing the openings 14. Under normal operation the liquid flows through the filter, and the solid particles entrained in the liquid are retained on the filter. If the filter should become clogged the liquid will flow over the upper edge of the filter. In either case the liquid falling on the filter is returned to the bot-

tom of the casing 1 whence it is returned to the tub by a pump 18 having its intake conduit 19 connected to a drain opening 20 in the bottom wall 21 of the outer casing and having its discharge conduit 22 extending upward along the outside of casing 1 and in through an opening 23 in the cover 2 above the top opening of the tub 3. The pump 18 is operated throughout the washing operation and continually circulates liquid from the bottom of the outer casing to the receptacle, whence it overflows through the openings 14 and is filtered by the filter 15.

Within the tub is an agitator 24 having a vertical hub 25 terminating at its lower end in a disk 26 adjacent the bottom wall 5 of the tub. Projecting from the agitator hub are three radial blades 27 which, upon oscillation of the agitator, agitate the liquid and clothes for washing. Beneath the agitator disk 26 are drain openings 28 in the bottom wall 5 of the tub.

The machine is operated by a vertical shaft 29 extending upward from the bottom of the outer casing through a sleeve 30, the upper end of which is above the normal water level in the casing. The shaft 29 is selectively oscillated at washing speed to oscillate the agitator or rotated at centrifugal drying speed to rotate the tub by suitable mechanism located beneath the bottom wall 21 of the casing. Suitable mechanism for selectively oscillating and rotating the shaft and for supporting and driving the agitator and tub is well understood in the art and illustration thereof is not required for the purposes of the present invention. Such mechanism may, for example, be that shown in Patent 2,161,618—G. W. Dunham.

In the use of the washing machine the clothes are loaded in the tub 3, and an amount of liquid slightly greater than the capacity of the tub 3 is put in the outer casing 1. The pump 18 is then started to pump the liquid from the casing 1 to the tub 3. When the tub 3 is full, the agitator 24 is oscillated at washing speed by the shaft 29. The operation of the pump 18 continues throughout the washing operation, and the liquid overflowing the openings 14 at the top of the tub falls onto the filter 15 and is filtered and returned to the bottom of the casing 1. During the washing operation, liquid is therefore continually withdrawn from the tub, filtered, and the filtered liquid returned to the tub. At the conclusion of the washing operation, oscillation of the agitator 24 and the operation of the pump 18 are stopped and the tub is rotated at centrifugal extracting speed by the shaft 29, causing part of the liquid

to be centrifugally discharged over the upper edge of the tub. Some of this liquid falls on the filter 15. Since the filter is rotating, the liquid falling thereon is thrown radially outward along the upper surface of the filter by centrifugal force, flushing lint and solid particles off the upper surface of the filter. All of the liquid discharged from the tub collects in the bottom of the casing 1. The rest of the washing liquid remains in the tub in an annular layer on the tub side walls as indicated by the dotted line 32. The foregoing operation may be termed the preliminary drying operation. The tub is now stopped and the annular layer of liquid indicated by the dotted lines 32, being no longer held by centrifugal force against the tub side walls, is drained to the casing 1 through openings 6 and 28. All of the washing liquid in the bottom of the casing 1 may be pumped to a drain by removing the pump discharge conduit 22 from the cover and connecting it to a drain. Rinsing liquid is then introduced into the tub 3 through a conduit 31, and the tub is rotated at centrifugal extracting speed by the shaft 29, causing the liquid and clothes to be thrown outward against the side walls of the tub in an annular layer indicated by the dotted lines 32. Any excess rinsing liquid is centrifugally discharged either through the openings 14 or through the opening 10. The clothes while against the side walls of the tub are subjected to agitation due to the turbulence of the liquid under centrifugal force, and the resultant flexing of the fibers of the clothes removes the washing solution from the clothes. At the conclusion of the rinsing operation the rotation of the tub is stopped, and as soon as the speed of rotation decreases to a point at which the centrifugal force is insufficient to hold the liquid and clothes against the tub side walls, the liquid and clothes fall to the bottom of the tub and the liquid is drained therefrom through openings 6 and 28. This liquid, which contains a substantial part of the washing solution, falls into the bottom of the casing 1 and is stored therein. When the liquid is drained from the tub 3 there remains a substantial amount of liquid which is absorbed in the clothes. This liquid is removed by again rotating the tub 3 at its extracting speed. During this rotation the residual liquid in the clothes is centrifugally discharged through openings 6 to the chamber 7 beneath the bottom of the tub. The chamber 7 is of such size that all of the liquid absorbed in the clothes can be held therein. When the clothes are dry the rotation of the tub 3 is stopped and the liquid in the chamber 7 drains to the casing 1 through the opening 10.

The clothes, which have been washed, rinsed, and dried, may now be removed from the tub. To wash a succeeding batch of clothes, the liquid in the bottom of the casing is pumped to the tub 3 and additional washing compound added.

The modification shown in Fig. 2 is similar to the previously described construction, corresponding parts being indicated by the same reference numerals. In the modification the intake of the pump 18 is at all times connected by a conduit 33 to an opening 34 in an annular trough 35 on the inner walls of the outer casing 1. The trough 35 is arranged to catch liquid centrifugally discharged from the tub 3 so that such liquid may be kept from mixing with the liquid in the bottom of the casing. A valve 36 is arranged in the intake conduit 19 connected to the opening 20 in the casing bottom wall 21. When the valve

36 is open the pump draws liquid from both the trough 35 and the bottom of the casing. When the valve 36 is closed the pump draws liquid only from the trough 35. The rim 37 of the tub 3 is provided with openings 38 extending closer to the upper edge of the tub side walls 4 than the openings 14 in the previously described construction. The openings 38 limit the amount of liquid which can be held on the tub side walls during centrifugal drying. In all other respects the modification is the same as the previously described construction.

In the use of the modification the outer casing 1 is filled with an amount of liquid slightly greater than the capacity of the tub 3, the valve 36 is opened, and the pump 18 is started to pump liquid from the bottom of the casing into the tub 3. The tub is then loaded with clothes and the agitator 24 oscillated at washing speed by the shaft 29. The operation of the pump continues throughout the washing operation and the excess liquid overflows through the openings 38 and falls on the filter 15, through which it flows to the outer casing. During washing, liquid is continually withdrawn from the tub 3, filtered, and returned thereto. At the conclusion of the washing operation the oscillation of the agitator and the rotation of the pump 18 are stopped and the tub is rotated at centrifugal extracting speed by the shaft 29, causing part of the liquid to be centrifugally discharged over the upper edge of the tub through openings 38. Some of this liquid falls on the filter 15 and, since the filter is rotating, is thrown outward over the upper edge of the filter by centrifugal force, flushing lint and solid particles from the upper surface of the filter. This rotation of the tub continues until the liquid remaining in the tub assumes the position indicated by dotted lines 39, at which time the rotation is stopped and the liquid remaining in the tub is drained to the casing 1 through openings 6 and 28. The valve 36 is then shut and the pump discharge conduit 22 is removed from the cover 2 and connected to a drain. The tub 3 is rotated by the shaft 29 at centrifugal extracting speed and rinsing liquid is introduced to the tub through the conduit 31. The liquid and clothes are thrown outward by centrifugal force against the side walls 4 and form an annular layer thereon indicated by dotted lines 39. The introduction of rinsing liquid is continued and the excess liquid is centrifugally discharged through the openings 38 against the side walls of the outer casing 1 whence it falls into the trough 35 and is pumped by the pump 18 to the drain. The layer of liquid indicated by the dotted lines 39 covers the clothes and cushions the impact of the rinsing liquid on the clothes and prevents damage to the fibers of the clothes. There is also some agitation of the clothes in the layer of liquid lining the tub side walls, and this agitation flexes the fibers of the clothes and assists in removing the washing solution therefrom. The introduction of rinsing liquid and the rotation of the tub continue until the clothes have had the desired amount of rinsing. The rotation of the tub is then stopped, and as soon as the speed is decreased to a point at which the liquid and clothes can no longer be held by centrifugal force against the side walls of the tub, the liquid and clothes fall to the bottom of the tub and the liquid drains to the outer casing through openings 6 and 28. The residual liquid absorbed by the clothes is removed therefrom by again rotating the tub 3 at its extracting speed. This liquid

is then centrifugally discharged through the openings 6 into the chamber 7 which has sufficient capacity to hold the liquid. When the rotation of the tub is stopped, the liquid in the chamber 7 drains to the outer casing, and the clothes, which have been washed, rinsed, and dried, may be removed from the tub.

To wash a succeeding batch of clothes, the discharge conduit 22 is returned to the position illustrated and the valve 36 is opened so that the washing solution which has been stored in the bottom of the casing may be pumped into the tub 3.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a washing machine, a rotatable tub for receiving clothes to be rinsed and centrifugally dried having side walls provided with centrifugal discharge openings in the region of greatest diameter, walls on the tub extending radially inward of said discharge openings for retaining an annular layer of liquid on said side walls during extracting and for providing a chamber outside the tub and radially outward of said discharge openings for receiving liquid discharged from said openings, and a continuously open drain for the tub and chamber radially inward of said annular layer of liquid through which liquid in the tub and chamber drains when the tub is stationary.

2. In a washing machine, a rotatable tub for

receiving clothes to be rinsed and centrifugally dried having side walls flaring downward and outward from the top and having centrifugal discharge openings in the region of greatest diameter, walls on the tub extending radially inward of said discharge openings for retaining an annular layer of liquid on said side walls during extracting and for providing a chamber outside the tub and radially outward of said discharge openings for receiving liquid discharged from said openings, and a continuously open drain for the tub and chamber radially inward of said annular layer of liquid through which liquid in the tub and chamber drains when the tub is stationary.

3. The method of operating a washing machine having a spinner basket with walls for retaining an annular layer of liquid in the basket during centrifuging, said walls including a chamber having a part radially outside the basket and having a drain for the chamber radially inward of said part, which comprises charging the basket with clothes, adding rinse liquid and rotating the basket at a speed sufficient to centrifugally fill the chamber with liquid and to hold the clothes and liquid in an annular layer in the basket by centrifugal force, retarding the basket to drain the chamber, and then rotating the basket to centrifugally discharge into the chamber the liquid remaining in the clothes.

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