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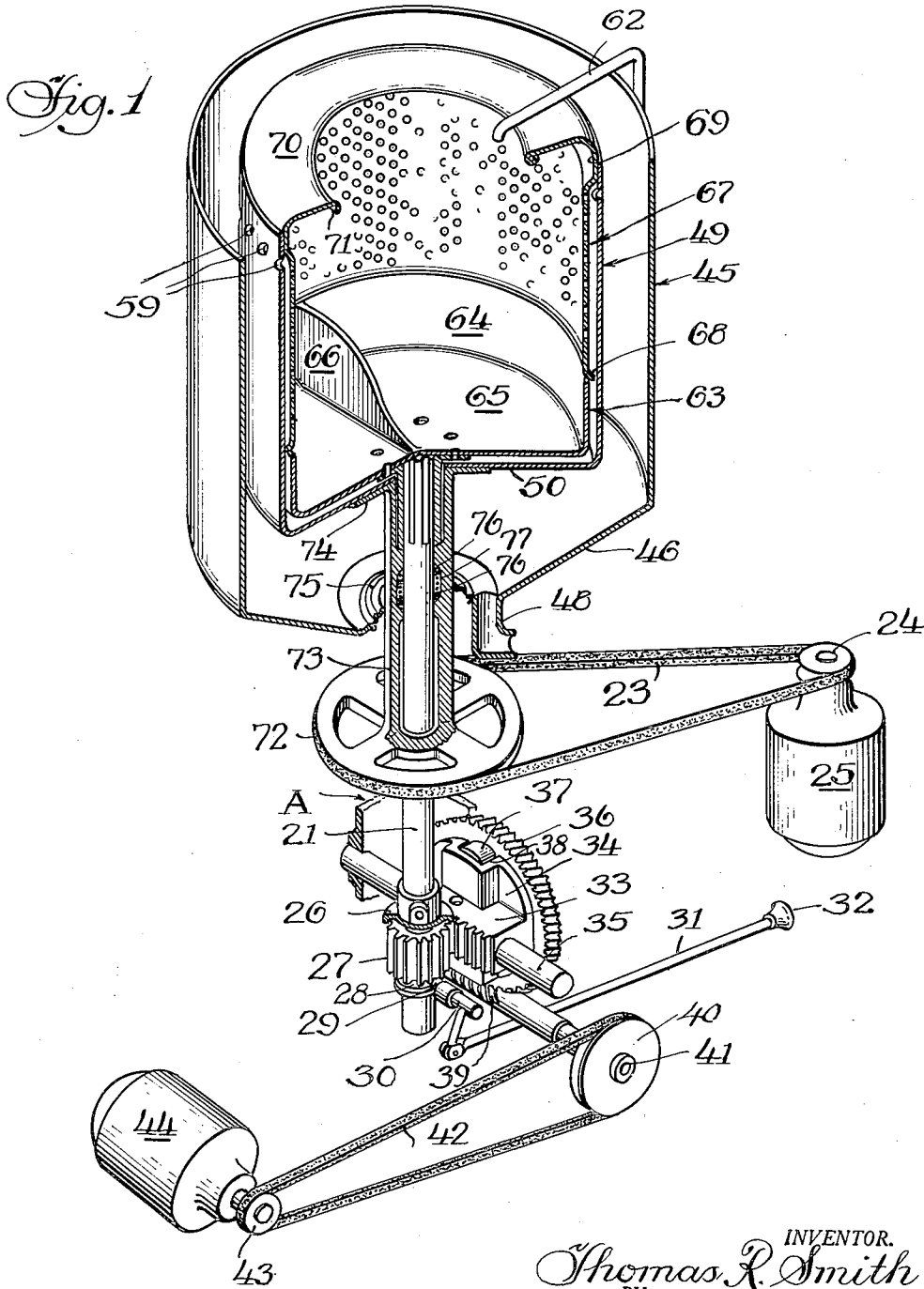
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2,575,691

CLOTHES-WASHING MACHINE

Original Filed Jan. 21, 1947

2 SHEETS—SHEET 1



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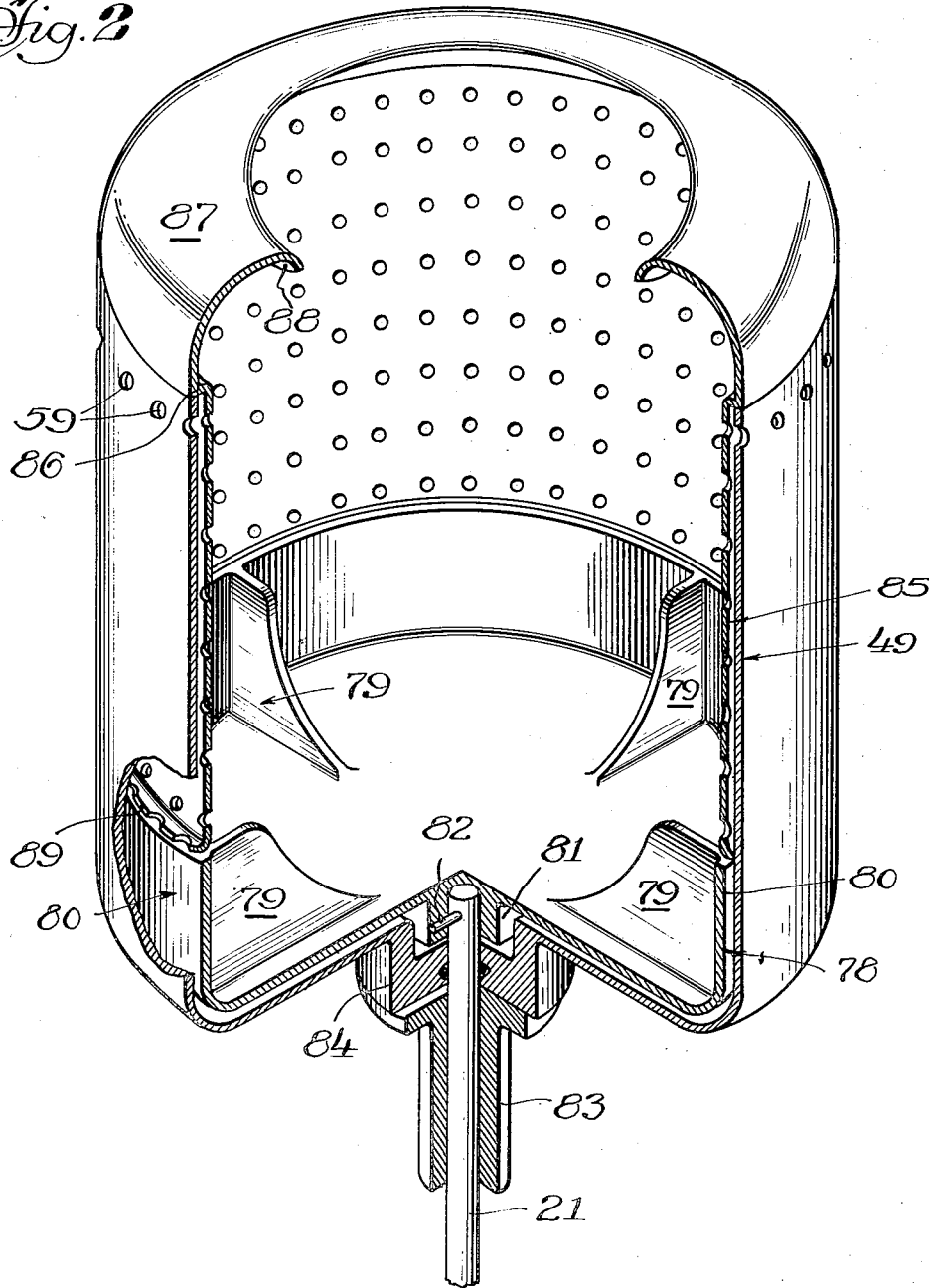
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2 SHEETS—SHEET 2

Fig. 2



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UNITED STATES PATENT OFFICE

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CLOTHES-WASHING MACHINE

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2 Claims. (Cl. 68—23)

1

The present invention relates to a novel clothes washing machine provided with an outer and an inner tub, an agitator of approximately cup-shape within the inner tub and of a diameter and shape closely conforming thereto, and a perforated liner or foraminous member projecting

above the outer or upper peripheral edge of the agitator and extending vertically along and in spaced relation with the interior of the inner tub. Among the objects of the present invention is the provision of a novel washing machine assembly including a novel cup-shaped agitator mounted within and of approximately the diameter of the inner tub, the agitator being so constructed, arranged and operated as to be rapidly oscillated in the inner tub during the washing operation and rapidly rotated with the inner tub during the spinning or drying operation.

Another object of the present invention is the provision of a novel inner tub assembly for washing and centrifugally drying clothes, and including a cup-shaped agitator and a separate foraminous liner or perforated cylindrical portion extending thereabove and in spaced relation with the tub.

The present invention further comprehends a novel clothes washing machine having an inner tub assembly or unit including an agitator having an upstanding or vertically extending outer peripheral side wall and one or more upstanding vanes or impeller blades projecting radially inward from the side wall of the agitator, and a perforated or foraminous liner or basket disposed thereabove.

The invention further resides in the construction, combination and arrangement of parts illustrated in the accompanying drawings, and while there is shown therein a preferred embodiment, it is to be understood that the same is susceptible of modification and change, and comprehends other details, arrangements of parts, features and constructions without departing from the spirit of the invention.

The present application is a division of my pending patent application Serial No. 723,340, filed January 21, 1947.

In the drawings:

Figure 1 is a fragmentary view in perspective of an embodiment of a novel clothes washing machine and the power drive mechanism for operating the same.

Figure 2 is an enlarged fragmentary perspective view of an alternate embodiment of agitator and tub construction for the clothes washing machine.

2

Referring more particularly to the disclosure in the drawings and especially to the novel illustrative embodiment therein, the present invention comprehends the provision of a novel washing machine of the type adapted to effectively wash clothes by means of a novel rapidly oscillating agitator and thereafter centrifugally dry the clothes so washed by rapid rotation of the agitator, an inner tub and a perforated liner or basket.

To effectively operate the washing machine assembly there is provided a vertically arranged drive shaft 21 for oscillating the agitator, and a drive pulley 72 is suitably keyed or pinned to a hollow drive shaft or sleeve 73 and when rotated rapidly spins the assembly in one direction for drying the clothes. Such rotation may be accomplished through a belt 23 driven from a pulley 24 on a motor or other power source 25.

For oscillating the agitator there is keyed or pinned to the drive shaft 21 adjacent its lower end a clutch 26 having a depending clutch face, and adjacent thereto is a pinion 27 loose and slidable upon the shaft and provided at its lower end with an annular recess 28 receiving an eccentric pin or cam 29 on the end of a shifter shaft 30. This shifter shaft is connected to a rod 31 actuated by a handle or knob 32 whereby the operator by manipulating the handle or knob 32 may raise the pinion 27 into clutching engagement with the clutch 26 to oscillate the shaft 21, or lower the pinion 27 out of clutching engagement and thereby prevent oscillation of this shaft.

The pinion 27 is in continuous meshing engagement with a rack 33 provided on a face of a cross head 34 and slidably mounted on a fixed rod 35. Disposed at the rear of the cross head 34 is a worm wheel 36 provided with a cross pin and roller 37 operating in a vertical slot 38 in the rear face of the cross head 34 and to the rear of the rack 33. A worm 39 is in meshing engagement with and drives the worm wheel 36 through a pulley 40 pinned or keyed on the end of a worm shaft 41 and driven by a belt 42 from a pulley 43 on the drive shaft of a motor or other power source 44. Thus when the motor 44 is operating, the worm and worm wheel are continuously rotated and the worm through the eccentric pin connection with the cross head continuously reciprocates the rack 33. As the pinion 27 remains in mesh with the rack regardless of its vertical position, it will be continuously oscillated thereby. However, as this pinion is free to turn or slide vertically on the drive shaft 21, it does not transmit its oscillatory motion to the drive shaft

3

except when the pinion has been moved or raised into clutching engagement with the clutch 26. The oscillating mechanism is preferably enclosed within an oil-tight housing or gear casing A, which is shown as broken away to more clearly illustrate the power drive.

The novel washing machine assembly comprises an outer stationary tub 45 having a base or bottom 46 through which projects the vertical drive shaft 21. A drain outlet 48 permits rapid draining of the tub after washing and spinning operations. Mounted upon the upper end of the hollow shaft or sleeve 73 by any suitable means is an inner rotatable tube 49 having its base 50 located above and spaced from the bottom 46 of the outer tub, and its cylindrical side wall spaced from the side wall of the outer tub. A pipe or conduit 62 provides a water inlet into the inner tub 49.

Mounted within the inner tub but closely adjacent thereto is a cup-shaped agitator 63 directly connected to the splined shaft for oscillation and provided with a cylindrical, upstanding side wall 64, a base 65 imperforate except for a few openings or perforations which may be located adjacent the center of the base to permit effective drainage, and a single upstanding vane or blade 66. Disposed above and separate from the agitator is a cylindrical member or perforated liner 67 having its lower edge 68 disposed closely adjacent to the upper edge of the agitator. At its upper end the perforated liner is provided with an annular enlargement or bead 69 disposed against the upper edge of the inner tub directly above the drain openings 59. This annular enlargement 69 and the lower edge 68 retains the perforated liner in the desired location with the perforated side wall thereof in spaced relation with the interior of the inner tub 49 and prevents relative movement therebetween. Above the enlargement or bead 69 the perforated liner is provided with an inwardly curved flange or ledge 70 having its inner edge or lip 71 curled inwardly to define an opening for the clothes and wash water.

As the agitator 63 is oscillated and the inner tub 49 and the perforated liner 67 remain stationary during the washing operation, a separate drive shaft for rotating the inner tub and the perforated liner is provided. This consists of a spin drive pulley 72 formed or provided with a hollow drive shaft or sleeve 73 having its upper flanged end 74 suitably secured to the base 50 of the inner tub 49. A diaphragm seal 75 in the bottom 46 of the outer tub 45 encompasses the shaft or sleeve 73 to permit relative movement and to prevent leakage thereat, while suitable sealing means such as a pair of resilient or rubber-like sealing rings 76 spring pressed against the tapered sides of a V-shaped groove 77, prevent leakage between the oscillatory shaft 21 and the hollow drive shaft or sleeve 73 for rotating the inner tub for spin drying. It is to be understood that except when the pulley 72 is rotated by the motor or power source 25, the tub 49 and perforated liner 67 are held against rotation or oscillation.

During the spin drying operation the oscillating shaft 21 is free from the clutch 26, thus permitting the agitator and its shaft to rotate with the inner tub 49 and its perforated liner 67 due to internal friction set up in the system and the inertia of the water and clothes in the tub. The water, dirt and other foreign matter passing through the perforations in the perforated liner are carried upwardly along the interior of the in-

4

ner tub and pass out through the row of holes or openings 59 adjacent the top of the inner tub and collected in the outer tub 45. From the outer tub this water, dirt and foreign matter are pumped or drained away for discharge through the drain outlet 48.

Fig. 2 is an enlarged fragmentary view of another embodiment of inner tub assembly similar to that shown in Fig. 1 except for the employment of an agitator 78 having a plurality of equally spaced vanes or water impelling blades 79. The disclosed assembly is intended to be mounted within an outer tub or other container or collector ring for collecting the water, dirt or other foreign matter during the spinning operation.

The agitator 78 is of cup-shape with its side wall 80 extending substantially vertical and with the vanes or blades 79 extending radially inwardly from the side wall but stopping short of the center to provide an unrestricted space thereat. The vertical drive shaft 21 for oscillating the agitator 78 is shown as connected to the hub 81 of the agitator by a drive pin 82, and the hollow shaft 83 and hub 84 of the tub 49 is connected to a spin drive pulley 72 similar to that shown in Fig. 1. The perforated liner or foraminous member 85 is enlarged adjacent its upper end to provide a shoulder or ledge 86 adapted to seat upon the upper edge of the tub, and an upwardly and inwardly curved flange 87 provided with an inwardly bent edge or lip 88 defining an opening for the clothes and wash water. At its lower edge the perforated liner is provided with an outwardly bent flange 89 adapted to seat against the interior of the tub.

In the washing operation the agitator 78 is oscillated through a desired arc and at a desired speed of oscillation. As with the embodiment shown in Fig. 1, the agitator may be oscillated through an arc of approximately $\frac{1}{2}$ of a revolution and at a speed of approximately 50 to 60 oscillations per minute. This action sets up a centrifugal force which causes the washing fluid or wash water and clothes to move outward against the sides of the cup-shaped agitator where these sides throw this wash water and clothes upward. The wash water and clothes are then drawn down into the center of the agitator and again forced outwardly, upwardly and inwardly in a continuous path and in a continuous closed cycle. The twisting and turning of the clothes caused by the water and washing action, as well as by the action of the blades on the clothes, gives the desired washing action.

In the drying operation, the entire inner tub assembly including the agitator and perforated liner, are spun about the shaft for drying the clothes in the manner outlined in connection with the disclosure in Fig. 1.

The liner or member 85 is perforated throughout to allow the water and dirt to pass there-through, although the openings are of a size to prevent buttons, nails or other large foreign objects from passing therethrough. The perforated liner also holds the clothes away from the walls of the tub during the spinning action and is so spaced with respect to the walls of the tub as to permit the water and dirt to pass therebetween and be discharged. The perforated liner also prevents the dirty water from being blocked off by the clothes along the side walls of the tub 49 and thereby prevents the dirt from being filtered through and retained in the clothes during the spinning operation. To facilitate discharge of and to carry the water and dirt upwardly by cen-

trifugal force, the tub 49 is preferably made slightly larger or of greater diameter at the top than at the bottom

When clothes are to be washed and assuming the inner tub has been supplied with a requisite depth of water, the motor 44 is started and the pinion 27 is clutched to the drive shaft 21. Clothes and soap are then added and the clothes washed for the desired period. During such washing operation the agitator is oscillated through a desired arc and speed of oscillation (for example, through an arc of approximately $\frac{1}{2}$ of a revolution and at a speed of 50 to 60 oscillations per minute).

The water action produced with the single vane or blade gives a vigorous washing action with the water and clothes carried outwardly, then upwardly along the side of the perforated receptacle or basket and then over to the opposite side to complete its cycle. During such washing the heavy dirt and other foreign particles or matter of a size that may pass through the perforations in the basket, drop or pass therethrough and collect in the space between the basket and the inner tub.

When it is desired to spin the clothes dry, the pinion 27 is declutched from the drive shaft 21 and the motor or other power source 25 drives the pulley 72 and rotates the drive shaft, inner tub 49 and perforated receptacle or basket at a relatively high rate of speed and in one direction. During this spinning operation, centrifugal action causes water from the clothes to be expelled and to pass through the perforations in the perforated basket or receptacle and this water along with the dirt and foreign particles which have dropped through the perforated basket or receptacle during the washing operation are carried outward and up the interior wall of the tub 49 to be discharged through the openings or perforations 59 into the space between the inner and outer tubs, without coming in contact with the clothes. This dirt and water is collected in the outer tub 45 and pumped out or otherwise discharged through the drain outlet 48.

Although in Fig 2 the agitator is shown as provided with a plurality of blades, I generally prefer employing but a single water impelling blade or vane in the present novel assembly, especially when the agitator is oscillated through an arc of approximately $\frac{1}{2}$ of a stroke. This is due primarily to the fact that with but a single vane or blade the water and clothes go up one side of the tub, across and down the other side without constricting the movement of the clothes.

Although the agitator of Figs. 1 and 2 has no positive connection with the tub at any time and during the washing operation the agitator is oscillated and the tub is held stationary, during the spinning operation the agitator shaft 21 is disengaged or free from the clutch and the agitator and its shaft rotate with the tub due to

the internal friction set up in the system and the inertia of the clothing and water in the tub.

From the above description and the disclosure in the drawings, it will be apparent that the present invention comprehends a novel washing machine assembly provided with a cup-shaped agitator of a diameter substantially that of the tub in which it operates, and a novel inner tub assembly including the agitator and perforated liner extending upwardly along the interior of the tub but in spaced relation therewith, the perforated liner being formed separate from the agitator but rotatable therewith during the drying operation.

Having thus disclosed the invention, I claim:

1. A clothes washing machine and centrifugal drier comprising an outer stationary tub, an inner tub rotatably mounted within the outer tub, an oscillatory cup-shaped agitator mounted in the inner tub and provided with a flat base disposed adjacent the bottom of the inner tub and an imperforate peripheral wall disposed adjacent and conforming to the interior of the side wall of the inner tub, a perforated liner conforming to but disposed in closely adjacent relation with the interior of the side wall of the inner tub and disposed immediately above the peripheral wall of the agitator, means for oscillating the agitator within the inner tub while maintaining the inner tub and perforated liner stationary, and means for rapidly rotating the inner tub, liner and agitator for centrifugally extracting the wash water and drying the clothes.

2. A clothes washing machine and centrifugal drier comprising an outer stationary tub, an inner tub rotatably mounted within the outer tub, an oscillatory cup-shaped agitator mounted in the inner tub and provided with a base disposed adjacent the bottom of the inner tub and an imperforate peripheral wall disposed adjacent and conforming to the interior of the side wall of the inner tub, a perforated liner conforming to but disposed in closely adjacent relation with the interior of the side wall of the inner tub and disposed immediately above the peripheral wall of the agitator, means for oscillating the agitator within the inner tub while maintaining the inner tub and perforated liner stationary, and means for rapidly rotating the inner tub, liner and agitator for centrifugally extracting the wash water and drying the clothes.

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