Nov. 21, 1944. J. W. JACOBS 2,363,184

DOMESTIC APPLIANCE

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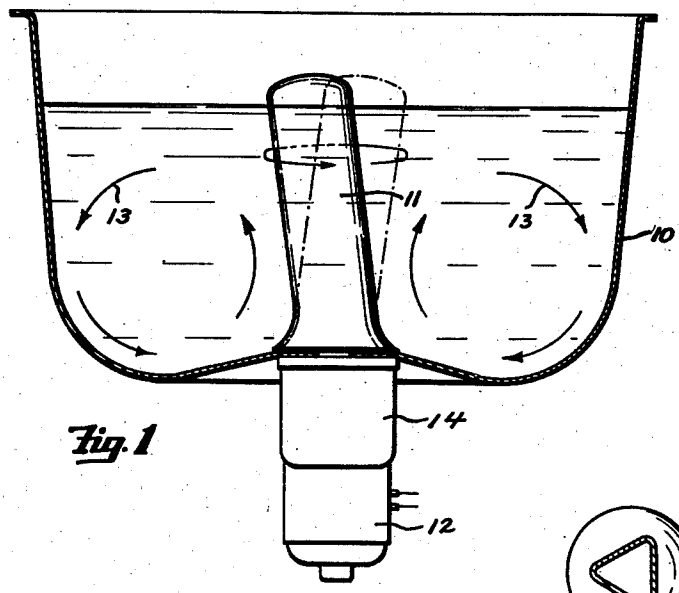


Fig. 1

Fig. 7

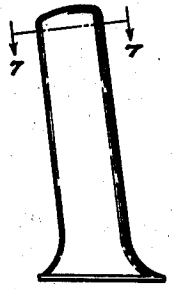


Fig. 6

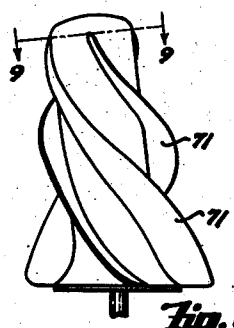


Fig. 8

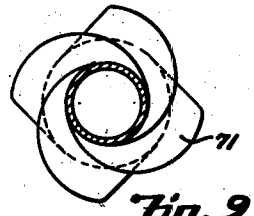


Fig. 9

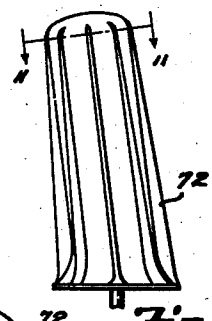


Fig. 10

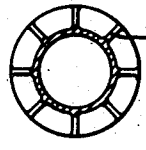


Fig. 11

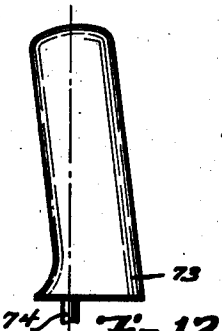


Fig. 12

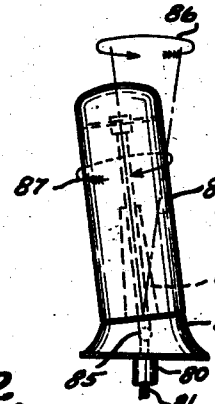


Fig. 13

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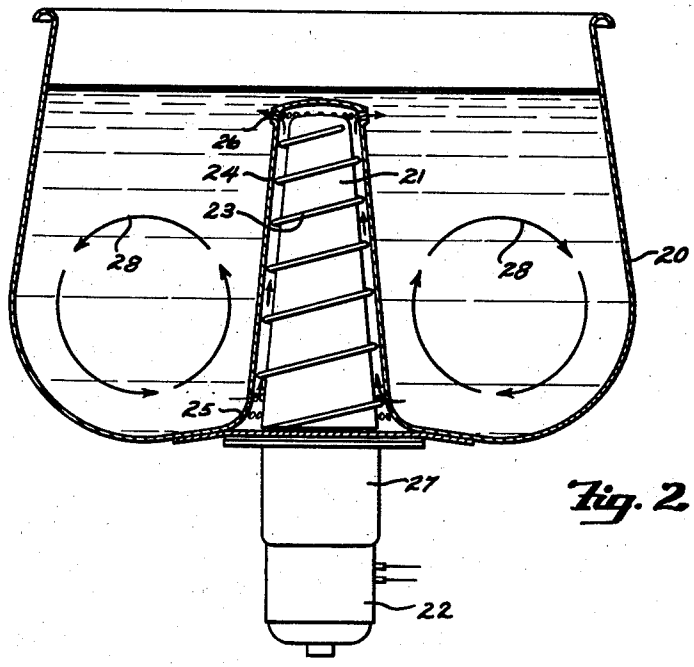


Fig. 2

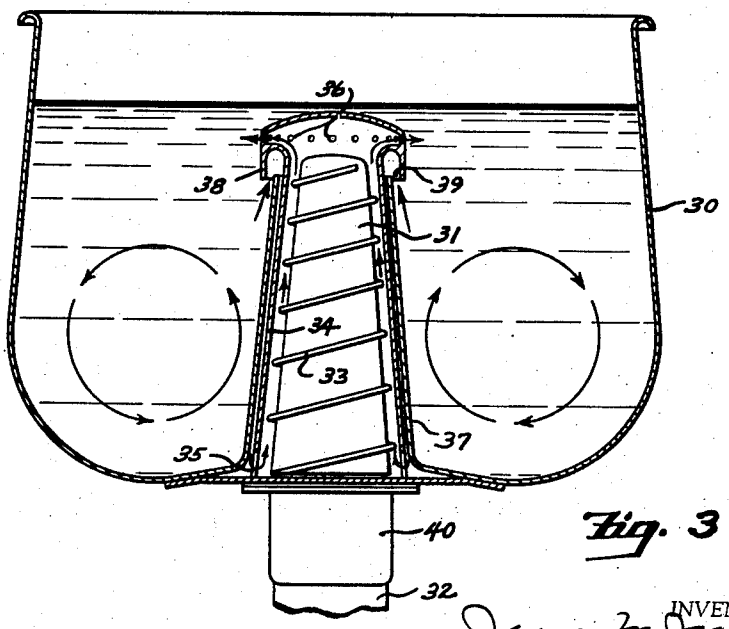


Fig. 3

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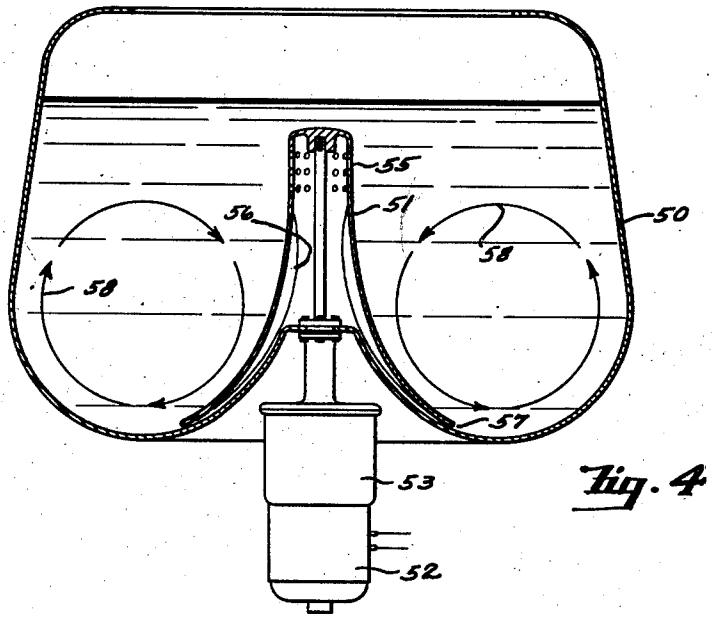


Fig. 4

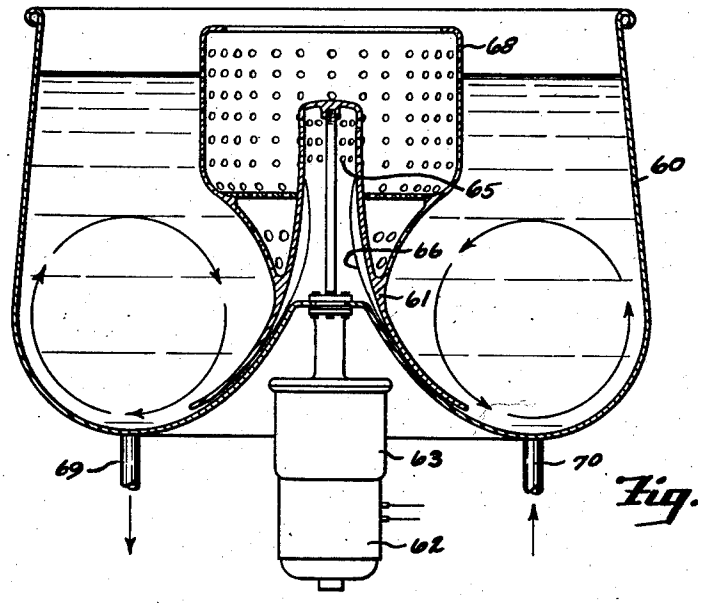


Fig. 5

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Patented Nov. 21, 1944 2,363,184

UNITED STATES PATENT OFFICE

2,363,184

DOMESTIC APPLIANCE

James W. Jacobs, Dayton, Ohio, assignor to General Motors Corporation, Dayton, Ohio, a corporation of Delaware

Application August 31, 1940, Serial No. 355,007

2 Claims. (Cl. 68—133)

This invention relates to domestic appliances, and more particularly to washing machines.

An object of this invention is to provide a simplified form of washing machine with a rotating agitator.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a vertical cross-section, somewhat diagrammatic, of one form of my invention;

Fig. 2 is a view similar to Fig. 1, but showing a modified form of the invention;

Fig. 3 is a view somewhat similar to Fig. 2, but showing a further modification;

Fig. 4 is a view somewhat similar to Fig. 1, but showing a modified form of agitator;

Fig. 5 is a view similar to Fig. 4, but showing a centrifugal basket added to the agitator;

Fig. 6 shows a slightly modified form of the agitator shown in Fig. 1;

Fig. 7 is a cross-section taken along the line 7—7 of Fig. 6;

Fig. 8 shows a slightly modified form of the agitator shown in Fig. 1;

Fig. 9 is a cross-section taken along the line 9—9 of Fig. 8;

Fig. 10 shows a slightly modified form of the agitator shown in Fig. 1;

Fig. 11 is a cross-section taken along the line 11—11 of Fig. 10;

Fig. 12 shows a slightly modified form of the agitator shown in Fig. 1; and

Fig. 13 shows a form of agitator in which rotation and gyration are produced differentially.

A washing machine embodying my invention may comprise a tub 10, preferably circular in horizontal cross-section. Within this tub is placed a column-like agitator 11, which is mounted on suitable bearing and stuffing box means in the bottom of the tub. A motor 12 is provided, preferably below the tub, which is connected with the agitator 11 to produce rotation of the agitator. The agitator is slightly inclined from the vertical to cause one end of the agitator to gyrate while rotating. Preferably the inclination is such that the upper end of the agitator is gyrated.

The agitator may be substantially cylindrical in shape as shown in Fig. 1, and the motion imparted to the agitator is such as to produce a movement of the clothes within the tub as indicated by the arrows 13 which agitates the clothes and cleans them.

The rotation imparted to the agitator 11 may be a continuous rotation, or it may be periodic rotation with or without reversal of direction of rotation after each period. For this purpose a transmission 14 may be provided to alter the speed of rotation, or to impart the desired periodic rotation to the agitator. The mechanism for periodic reversal of rotation may be like that shown in the Voss Patent 1,108,531 or the Kirby Patent 2,135,084.

In the form shown in Fig. 2, the tub 20 preferably also is circular in horizontal cross-section. A column-like agitator 21 is mounted centrally of the tub and a motor 22 is provided for imparting rotation to the agitator. A spiral vane 23 is secured to the outer surface of the agitator, and a cylindrical casing 24 is placed outside of the agitator. Apertures 25 and 26 are provided to allow circulation of fluid through the casing 24 under the impulse of the vane 23. Preferably, if a continuous rotation is imparted to the agitator 21, the aperture 25 may be the inlet and the aperture 26 may be the outlet for the fluid. However, the flow of fluid may be reversed even under continuous rotation in one direction, and will be periodically reversed if the agitator 21 is periodically reversed. In order to impart either a continuous rotation, a periodic rotation in the same direction, or a periodic rotation in opposite directions to the agitator 21, a transmission 27 may be provided. Motion and agitation of the clothes within tub 20 is thus produced as indicated by the arrows 28.

In Fig. 3, the tub 30 may be substantially the same as tub 20. The column-like agitator 31 is provided with a spiral vane 33 and is driven by a motor 32 substantially the same as in Fig. 2. An inner cylindrical casing 34 is placed around the agitator 31 and is provided with fluid flow apertures 35 and 36 substantially corresponding to fluid flow apertures 25 and 26. In addition, an outer cylindrical casing 37 is placed around the casing 34. The upper end of the casing 34 is provided with a downwardly extending lip 38 to provide a fluid flow passage 39. A transmission 40 is provided to impart either a continuous rotation in one direction to the agitator or periodic rotation in the same direction or a periodic rotation in reverse directions. The flow of liquid is thus induced through the fluid flow passages 35, 36 and 39 depending on the direction of rotation of the agitator.

Fig. 4 shows a tub 50 provided with a conical

vertically disposed agitator 51. This agitator may be rotated continuously or periodically in the same direction or in opposite directions by the motor 52 acting through the transmission 53. Apertures for the flow of liquid into the interior of the agitator are provided at 55. The outside surface of the agitator is preferably substantially smooth. The interior of the agitator may be provided with fluid flow inducing means in the form of vertical or spiral vanes 56 which induce a forced circulation of liquid from the top of the agitator to the bottom where the liquid is discharged at 57 to produce agitation of the clothes as indicated by the arrows 58.

In the modification shown in Fig. 5 the tub 60 is provided with an agitator 61 substantially the same as agitator 51. This agitator is driven by the motor 62 through the transmission 63 substantially the same as in Fig. 4. Fluid flow means 65 are provided at the top of the agitator and vane means 66 are placed within the agitator. A centrifugal basket 68 is placed on top of the agitator and the clothes, after agitation, may be placed in the basket where they may be centrifugally dried after the liquid has been discharged from the tub. During agitation, the liquid stands to the level indicated in the drawings and the clothes are agitated by motion of the agitator 61, which motion may be either continuous rotation or periodic rotation in the same or opposite directions. After the clothes have been washed, they are placed in the basket 68 and the liquid is discharged from the tub through the outlet 69. Thereafter the clothes are centrifuged in the basket 68. The inlet connection 70 may be provided for introducing liquid into the tub. The inlet and outlet connections 69 and 70 may, if desired, be provided with valves which may be manually or automatically actuated.

In the modification shown in Figs. 6 and 7 the agitator, instead of being cylindrical as shown in Fig. 1, may be triangular in cross-section to increase the agitation of the clothes. In the modification shown in Figs. 10 and 11, the vanes 72 are substantially straight and extend axially of the column-like agitator while in Figs. 8 and 9 the vanes 71 are spiral. In the modification shown in Fig. 12, the bottom portion 73 of the agitator is eccentrically mounted with respect to the shaft 74 to produce an agitating action at the bottom of the agitator instead of at the top.

Fig. 13 shows an agitator which may be differentially rotated and gyrated. For this purpose coaxial shafts 80 and 81 may be provided to pass through the bottom of the tub through proper stuffing boxes as is well known in the art. The shafts 80 and 81 may be secured to suitable transmission and motor means, not shown, to produce differential rotation of the shafts. The shafts may rotate in the same direction at different speeds or they may rotate in opposite directions at the same or different speeds. Also they may be periodically rotated in the same or opposite directions to produce a differential rotation with regard to each other. The outer shaft 80 is secured to oblique bearing means 82 in the form of a conical base having an upwardly directed bearing 83 extending obliquely from the vertical. The column-like agitator 84 is rotatably mounted on the bearing 83 and is secured to the shaft 81 through the medium of the universal joint 85. By this construction gyration can be imparted to the agitator as indicated by the arrow 86 while a differential rotation may be imparted to the agitator as indicated by the arrow 87. The gyration and rotation may be in opposite directions, or they may be in the same direction at differential speeds.

In the embodiment shown in Figs. 1 and 6 to 12 inclusive, the agitator preferably is rigidly secured to the driving shaft. This causes these agitators to gyrate (the axis at one end to move in a circle) and also causes the outer surface of these agitators to rotate about the axis of the tub. There is one rotation of the outer surface during each complete gyration. However, for certain types of washing machines, these agitators may be rotatably mounted on inclined extensions of the driving shafts. This type of arrangement is illustrated in the Miller Patent 2,145,453 and the Skinner Patent 2,192,758. This permits the agitators to gyrate without necessarily causing any rotation of the outer surfaces of the agitators.

The agitators shown in Figs. 2 to 5 inclusive are also preferably rigidly secured to the driving shaft to cause their outer surfaces to rotate.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A washing machine comprising a tub, coaxial shafts, means for differentially rotating said shafts, oblique bearing means secured to one of said shafts, an agitator in said tub rotatably mounted on said bearing means and secured to the other of said shafts.

2. A washing machine comprising a tub, an agitator in the form of a column having its base substantially concentric with the central vertical axis of the tub, said agitator extending upwardly at an angle from said base, means for moving the upper end of said agitator in an endless path within said tub to agitate the contents of the tub, and means for rotating said agitator independly of said movement of its upper end.

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