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H. T. DONOHUE

2,080,657

WASHING MACHINE

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Fig. 1.

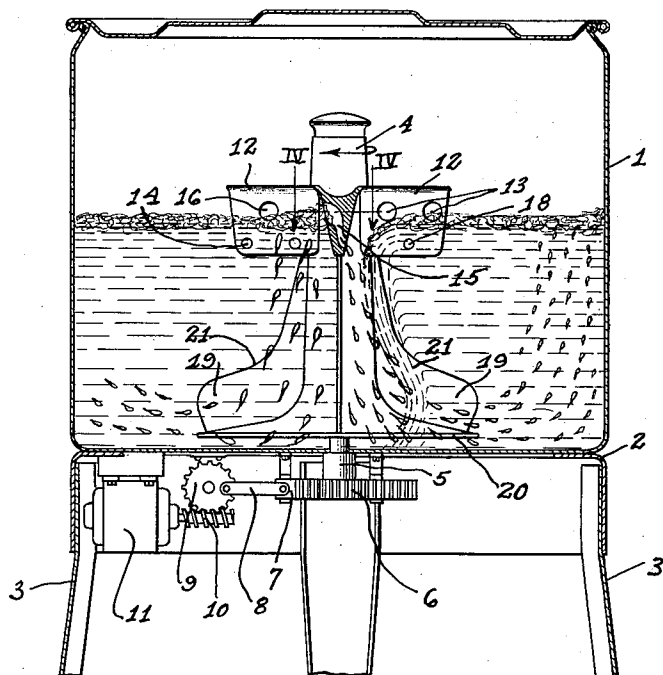


Fig. 2.

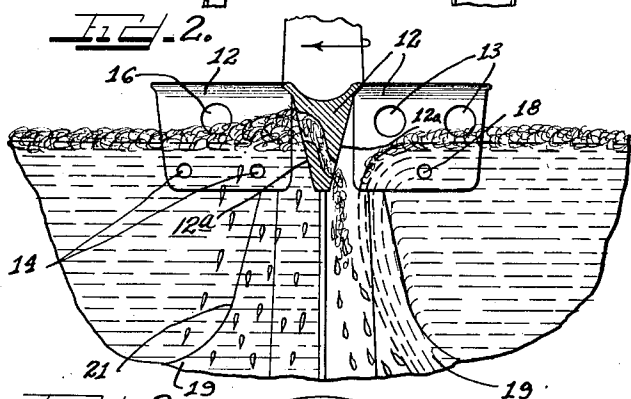


Fig. 3.

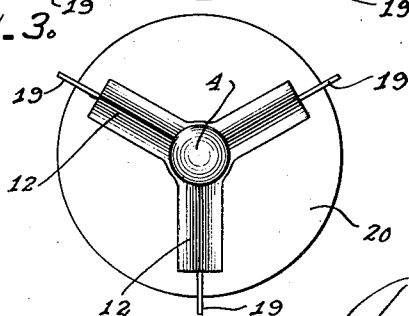
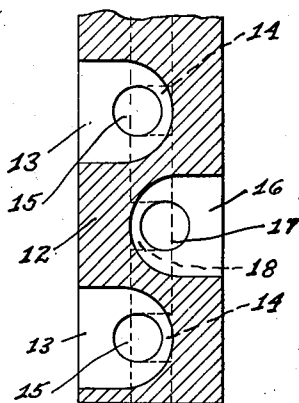


Fig. 4.



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UNITED STATES PATENT OFFICE

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WASHING MACHINE

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4 Claims. (Cl. 68—15)

This invention relates to an apparatus for washing clothes.

In washing machines heretofore in use, no proper provision has been made for aerating the washing fluid and clothes to furnish the necessary oxygen for coaction with the cleaning agent such as soap for rendering the same efficient as a cleaning agent, nor have means been provided for properly utilizing the suds that generally float upon the top of the washing fluid.

This invention is designed to overcome the above noted defects in the provision of a novel apparatus by means of which the washing fluid and clothes are properly aerated to render the cleaning agent more effective and in which the suds floating upon the washing fluid are interspersed in the washing fluid for utilization in the cleansing of the clothes during the washing operation.

More specifically the invention contemplates the forcing of air into the washing fluid during the operation thereof and causing the floating suds to follow, partially thru the creation of a vacuum in the tub.

The invention comprises the novel apparatus hereinafter described and more particularly pointed out and defined in the appended claims.

In the accompanying drawing which illustrates a preferred form of apparatus for carrying out this invention:

Figure 1 is a vertical sectional view thru a washing apparatus involving this invention.

Figure 2 is an enlarged fragmentary sectional view thru the agitator illustrating in diagrammatic form the action thereof with respect to the washing fluid.

Figure 3 is a top plan view of the agitator.

Figure 4 is an enlarged sectional view taken upon the line IV—IV of Fig. 1, looking in the direction of the arrows.

In accordance with this invention, a batch of clothes is placed in a suitable cylindrical tub which is then filled to a predetermined height with washing fluid including a suitable cleansing agent such as soap. The fluid and clothes are then agitated to create a partial vacuum in the mass and to force air downwardly for aerating the mass and for creating suds near the bottom of the tub and forcing the same thru the batch of clothes, and at the same time drawing the suds on top of the washing fluid downwardly.

In the drawing, there is shown a preferred form of apparatus for carrying out the above noted process. While the structure and operation of this apparatus will be specifically described, it will be understood that it is merely illustrative of this invention and that various other forms may be devised for accomplishing the desired purpose. The illustrated apparatus consists of a cylindrical tub 1 supported upon a suitable base 2 having legs 3 attached thereto.

Centrally of the tub 1, there is an agitator 4 provided with a suitable shaft 5 extending thru the bottom of the tub. This shaft is provided with a spur gear 6 which is engaged by a reciprocating rack bar 7 connected to a link 8. The link 8 is pivotally connected to an operating gear 9 which is driven by a worm 10 on a shaft of the motor 11. It will be appreciated that the reciprocation of the rack bar 7 will alternately rotate the agitator in opposite directions. The extent of such alternate rotation depends upon the stroke of the rack bar and the diameter of the gear 6 which of course can be designed to obtain any desired fractional rotation of the agitator.

The agitator 4 is of novel construction and comprises a plurality of radially extending arms 12. In the present instance, three equally spaced arms 12 are illustrated, but it is contemplated that the number of such arms may be varied. With reference to Fig. 2, it will be noted that the arms 12 have downwardly converging sides 12a causing the arms to be substantially triangular or V-shaped in cross-section.

Each arm has a plurality of inlet ports 13 and a corresponding number of outlet ports 14 at a lower elevation than the inlet ports. The ports 13 and 14 are connected by downwardly directed passages 15. It will be observed that the passages 15 and outlet ports 14 are of smaller diameter than the inlet ports, a feature which tends to increase the velocity at the outlet ports. When the agitator is rotated in the direction indicated by the arrow, the water will rise in front of the arms and be forced thru the openings 13, passages 15 and force the air confined therein into the washing fluid as will later more fully appear.

Each arm 12 also has a reverse inlet port 16 upon the opposite side from the ports 13 that communicates with a downwardly extending passage 17 of smaller diameter, which in turn communicates with an outlet port 18 which comes into action during reverse rotation. While only one inlet port 16, passage 17 and outlet port 18 have been illustrated, it will be appreciated that the same may be duplicated as desired.

The inlet ports, passages and outlet ports as

above described constitute downwardly extending passages thru the arms that may be provided with intermediate slight restrictions as shown.

The agitator is also provided with radially extending vanes 19 in alignment with the arms 12, and which vanes merge with a circular base 20 forming the bottom of the agitator which is shown as slightly spaced above the bottom of the tub. It will be noted that the outer free edges 21 of these vanes slope downwardly and outwardly so that a greater volume of washing fluid will be moved at the bottom.

Before the apparatus or machine is put into operation, a suitable quantity of clothes is put into the tub and the same is filled to a predetermined height with washing fluid. This predetermined height of fluid is governed by the height of the openings 13 and 16, and it should be slightly therebelow as shown to allow air to exist in the passages 15. A cleansing agent such as soap will of course be put into the washing fluid before the motor is started.

In Figs. 1 and 2, the agitator is shown as revolving in a clockwise direction and as it thuswise revolves, the washing fluid will rise or back up against the front side of the arms 12 and the pressure arising from the displacement of this elevated portion of the washing fluid will force a certain amount thereof through the passages formed by the ports 13, conduits 15 and outlet ports 14 and force the air in such passages down into the washing fluid as shown in Figs. 1 and 3. Such rotation of the agitator will also create a partial vacuum in the regions of the junctures of the vanes 19 with the bottom plate especially in the corners thereof. This vacuum will assist in drawing down the air and it will also draw some of the suds downwardly as shown. The washing fluid that is forced downwardly is the top fluid which contains the suds that aid in washing the clothes. The major part of the air that is forced thru the arms and downwardly into the tub as above set forth strikes the bottom of the tub and plate 20 in the form of bubbles that break up into a greater number of soap bubbles that rise through the tub and penetrate and pass thru the clothes. The slugs of suds and water that follow the air down into the tub assist in the washing operation as is obvious.

When the agitator is reversed, the same operation will be repeated. The sudden reversal of the agitator is exceedingly effective for drawing the washing fluid and suds thru the passages in the vanes and forcing the air therein under pressure into the vacuum in the tub.

It will be appreciated that the air is simultaneously forced downwardly in the tub at a plurality of points, so that the whole of the in-

terior of the tub is properly aerated. This air will act upon the cleansing agent in the fluid to form suds or the like that will act more efficiently upon the clothes in passing thru the same.

It will be evident that according to this invention, the interior of the washing fluid is thoroughly aerated to render far more effective the cleansing agent. At the same time, suds on top of the washing fluid are drawn into the interior thereof and passed thru the clothes. It is therefore possible to wash clothes far more effectively according to this invention than heretofore.

I am aware that various changes may be made in the apparatus herein disclosed without departing from the principles of this invention and I do not propose limiting the patent granted thereon otherwise than is necessitated by the prior art or appended claims.

I claim as my invention:

1. In a washing machine, a tub, an oscillatory agitator in said tub, said agitator having substantially horizontally extending radial arms and vanes below said arms in alignment therewith; said arms having downwardly inclined passages therethrough for trapping air and forcing the same into said tub when the agitator is oscillated.

2. In a washing machine, a tub adapted for containing a washing fluid, an oscillatory agitator in said tub, said agitator having vanes and substantially horizontally extending radial arms above said vanes and in alignment therewith, said arms having downwardly inclined air passages therethrough, the entrances to said passages being designed to be normally located above the fluid level, and the outlets thereof being designed to be normally located below the fluid level for the purpose set forth.

3. In a washing machine, a tub adapted for containing a washing fluid, an oscillatory agitator in said tub, said agitator having substantially horizontally extending radial arms with downwardly inclined air passages therethrough, said arms having downwardly converging sides and vanes below said arms and in alignment therewith and means for oscillating said agitator and causing a partial vacuum adjacent said vanes for the purpose set forth.

4. In a washing machine, a tub adapted for containing washing fluid, an agitator in said tub, said agitator having projections with downwardly sloping air passages, said passages having entrances substantially adjacent the water line for receiving air and outlets a distance below the water line, said agitator also having vanes beneath said projections that create a partial vacuum for drawing air downwardly through the passages and means for oscillating said agitator.

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