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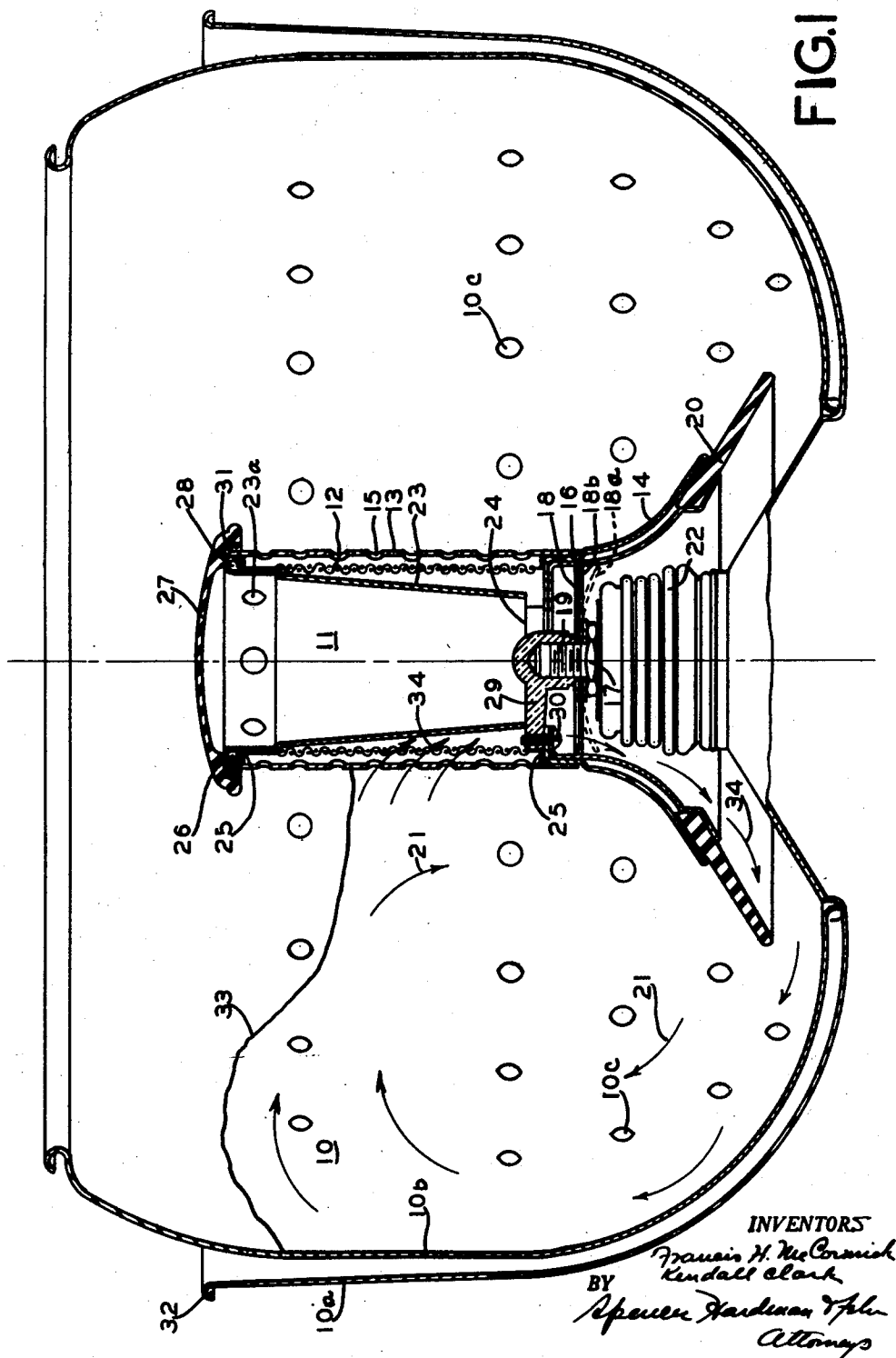
F. H. McCORMICK ET AL

2,498,894

CLOTHES WASHING MACHINE AND AGITATOR THEREFOR

Filed July 26, 1943

2 Sheets-Sheet 1



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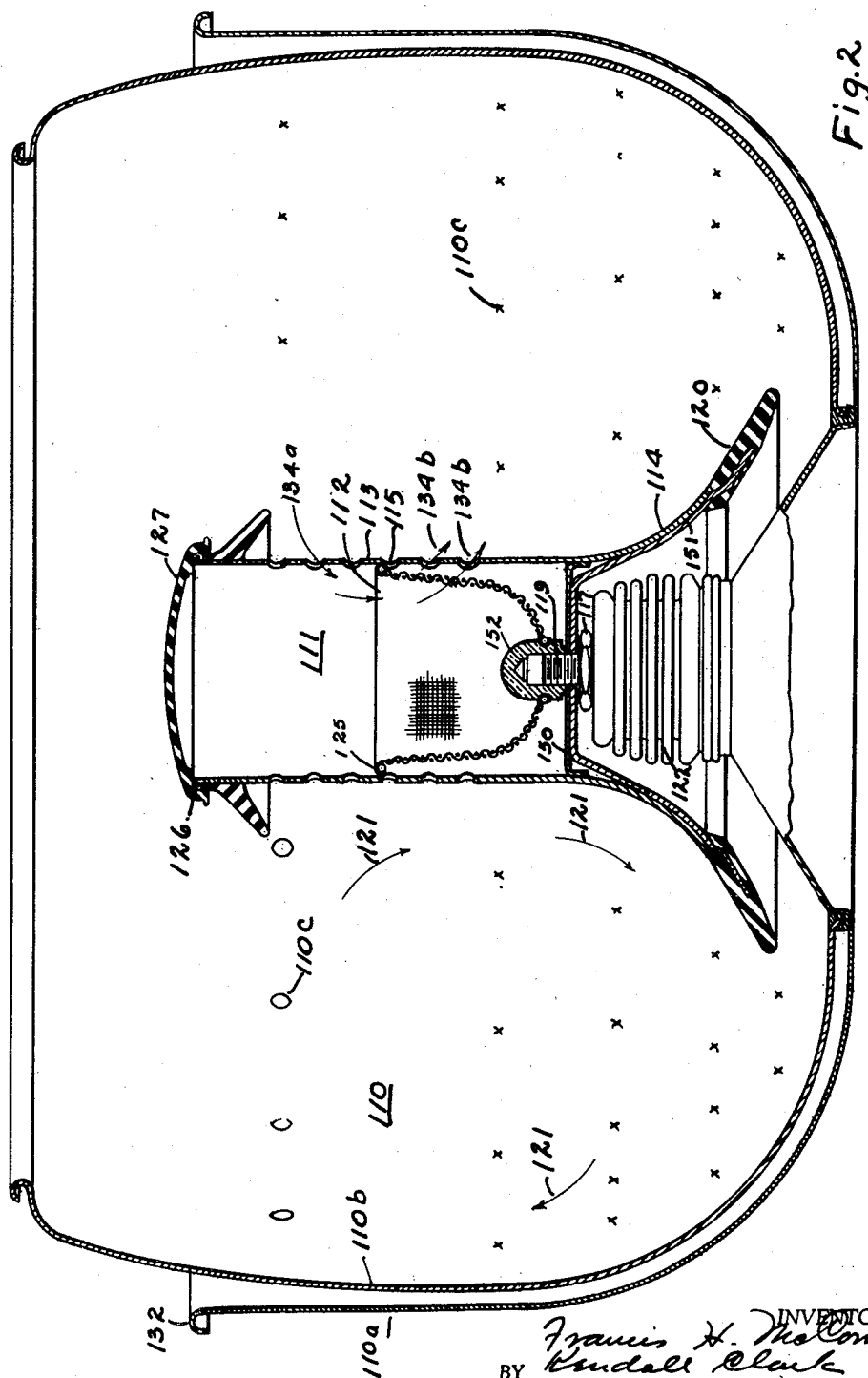
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2 Sheets-Sheet 2



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2,498,894

CLOTHES WASHING MACHINE AND
AGITATOR THEREFOR

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6 Claims. (Cl. 68—17)

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

An object of this invention is to provide a clothes or fabric washing machine having a tub provided with agitating means which not only serves to circulate the contents of the tub and apply to the fabrics a scrubbing and flexing action, but simultaneously collects from the liquid on a readily cleanable screen such extraneous substances as the lint and soap scum formed during the washing process.

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 shows a vertical cross-section of the tub portion of a washing machine embodying features of the invention;

Fig. 2 shows a vertical cross-section similar to Fig. 1, but showing a modified form of agitating means.

A washing machine embodying features of this invention may include a tub construction 10, which, if desired, is capable of rotation for the centrifugal drying of the tub contents. For this purpose the tub may include an outer liquid retaining, or imperforate, receptacle 10a and an inner perforate receptacle 10b, provided with perforations 10c, both of said receptacles being rigidly fastened together to remain stationary or to be rotated together by power mechanism, not illustrated, and which may be of any desired construction, and may be attached to the lower central portion of the tub construction. Such mechanism, by way of example, may be of the character disclosed in the copending application of Kendall Clark, S. N. 358,871, filed September 28, 1940, Patent No. 2,366,236, patented Jan. 2, 1945.

The washing machine tub 10 may be provided with agitating means in the form of a washing element 11, which washing element may be provided with scum removing extraneous substance arresting means 12 capable of arresting or removing from the liquid such extraneous substances as lint and scum.

The washing element 11 preferably is formed with an upper cylindrical portion 13 and a lower conical portion 14. The cylindrical portion 13 is provided with openings 15 through which liquid may circulate into the interior of the washing element. These openings 15 are larger than

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any extraneous matter particles, and hence do not perform any arresting function.

Means may be provided for causing a forcible circulation of liquid through the extraneous substance arresting means or screen 12. Preferably this takes the form of valve means 16, which is operated by the action of the vertical reciprocation of the washing element or agitator 11. The valve means preferably is in the form of a rubber-like disc held by the nut 17 at its central portion against a perforated valve seat 18. The construction is such that the valve 16 opens away from the valve seat 18 on the up-stroke of the agitator to the position 18a and closes on the down-stroke of the agitator to the position 18b.

It is to be noted that the perforated shell 13 forms a protecting cover for the screen 12 which prevents the clothes or fabrics from coming in contact with the screen 12. The openings 15, being appreciably larger than the lint and scum particles, and being much larger than the openings in the screen 12, allow the lint and scum particles to pass through the perforated shell 13 to be arrested by the screen 12. At the same time the shell 13 prevents the fabrics from coming into contact with the screen 12 and therefore prevents the fabrics from brushing the arrested lint and scum particles from the screen.

The washing element or agitator 11 preferably is mounted on a vertically reciprocable shaft 19, which is connected to power mechanism in the lower portion of the machine, not shown, to produce rapid vertical reciprocations of the agitator. The washing element may be reciprocated at a speed of from 250 to 500 reciprocations per minute. These rapid reciprocations produce a major toroidal circulation of liquid and fabrics, or other articles being washed, as indicated by the arrows 21.

If desired, a conical flexible lip or cone 20 may be provided at the lower edge of the washing element. A flexible bellows 22 may be secured to the central portion of the tub 10 and to the shaft 19, to prevent flow of liquid into the driving mechanism.

A detergent dispensing means may be provided in the agitator 11. This may take the form of a funnel 23, provided with perforations 23a at its upper end and the opening 24 at its lower end. Preferably the filter or screen 12 is cylindrical in form and may be made of fine metal mesh or cloth reinforced by metal mesh. The screen may be of any suitable size fine mesh. If it is to arrest mainly lint, the perforations or

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openings may be one-eighth inch or less in size; but, if desired, the screen may be as fine as 100 mesh per lineal inch. The screen is provided with flanges 25 to hold it spaced from the cylindrical shell 13. The funnel 23 is provided with a flanged upper end 28, which overlaps the flange 25 of the screen 12. A cap 27 may be removably secured to the upper inlet of the shell 13, which is provided with a shoulder 28, to hold the upper end of the funnel 23 in place. The lower end 24 of the funnel 23 bears against the spider 29, carried by the upper end of the shaft 19 and which is secured to the washing element, for example, by the screw construction 30. The cap 27 may be held in place either by its own resilient construction cooperating with the flange 31, or it may be internally screw-threaded to cooperate with an external screw-threaded construction on the shell 13.

In the operation of the washing machine, the cap 27 is removed, and a suitable detergent, such as powdered soap, is placed in the funnel 23. The cap 27 is replaced. Thereafter, clothes, or other fabrics or articles to be washed, and water or other washing liquid are introduced into the tub 10 to substantially fill the tub near the level of the upper lip 32 of the tub 10a.

The power mechanism, not shown, then is energized to produce rapid reciprocation of the agitator 11, and this causes a major toroidal circulation of liquid and fabrics as indicated by the arrows 21. This major circulation does not pass through the screen 12, but circulates down outside the washing element. The upper surface of the liquid then assumes a shape somewhat as indicated by the line 33. The agitator also produces a minor circulation, indicated by the arrows 34 through the screen 12 and near the funnel 23. This minor circulation passes through the screen 12, and any particles of lint and scum which are carried by this minor circulation pass through the openings 15, but are arrested by the screen 12.

Circulation of liquid near the funnel 23 and surging into it also serves to mix the detergent with the washing liquid. The use of the funnel 23 to mix the detergent prevents the undissolved detergent from depositing on the fabrics. The circulation or flow of liquid into the funnel 23 may be produced by liquid passing through the openings 23a, or it may be produced by the alternate surging of liquid upward and downward through the opening 24, or it may be provided by a combination of both.

The minor circulation of liquid, indicated by the arrows 34 preferably is produced by the action of the valve means 16, operating because of the vertical reciprocation of the agitator.

After the agitation or wash period is terminated, the vertical reciprocation of the agitator 11 may be stopped and the tub 10, together with the agitator 11 may be rapidly rotated to centrifugally dry the clothes or other articles being washed. The liquid flows through the perforations 10c of inner basket 10b and over the lip 32 of the outer tub 10a. Thereafter, if desired, a rinse liquid, such as water alone, may be introduced into the tub and the operation repeated one or more times to rinse the clothes.

Where liquid is referred to, water alone, or water and soap, or any other cleaning fluid may be used.

The term "extraneous substance" as used herein is intended to define any or all of the undesirable substances of a non-colloidal nature which tend to

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circulate with the washing fluid and which, unless removed, tend to deposit on the articles being washed, particularly during the drying operation. Such substances include lint, which comes from the clothes themselves, or insoluble particles produced by reaction such as between soap, water and/or soil during the washing operation, or any other similar undesirable substances.

The screen 12 may be removed periodically to be cleaned, and to be returned in a clean condition.

In the modification shown in Fig. 2, a vertically reciprocable washing element is used, and is provided with lint and scum arresting means somewhat similar to Fig. 1; but the minor circulation of liquid is produced without the aid of valve means. Wherever applicable, the construction and operation shown in Fig. 2 is substantially the same as in Fig. 1, and corresponding parts have been numbered with the same numeral; but with 100 added thereto. Therefore, wherever numerals 100 higher than in Fig. 1 are used, the same description and operation is intended to apply and the description is not repeated.

The washing element 111 is provided with a perforated shell 113 having perforations 115. It is also provided with a screen 112 having upper and lower flanges 125. This screen rests on the nut 152 at its lower end, and is held in place at its upper end by the shell 113. The lower flange 125 may snap into a groove in the nut 152. The agitator 111 is provided with a lower conical portion 114 and a flexible conical lower lip 120, which is held in place by an inner metal or plastic cone 151. The disc 150 and cone 151 are secured to the agitator 111 and are held in place between the nut 117 and cap 152, to secure the agitator to the shaft 119. A flange 153, of rubber or the like is secured to the upper end of the shell 113.

In the operation of this modification, the cap 127 is removed, and detergent is placed inside of the screen 112. Thereafter the cap 127 is replaced over the shell 113. Fabrics to be washed are placed in the inner basket 110b and liquid is introduced to a level near the overflow lip 132. Thereafter the agitator 111 is rapidly reciprocated vertically, and this produces the major toroidal circulation of fabrics and liquid indicated by the arrows 121. This major toroidal circulation, together with the action of flange 153, also induces a minor circulation of liquid through the agitator 111, which minor circulation enters through the upper perforations 115 as indicated at 134a. The minor circulation passes into and out of the screen 112. The minor circulation passes out of the agitator 111 through the lower perforations 115 as indicated at 134b. The lint and scum particles are arrested on the inner surface of the screen 112, and these may later be removed after the washing operation by the removal of screen 112 from the agitator, so that the screen may be brushed or washed for reuse.

Otherwise the construction and operation of the modification shown in Fig. 2 is the same as that heretofore described with respect to Fig. 1.

While the extraneous substance arresting constructions, and detergent disturbing devices have been shown for use with centrifugally rotatable tubs, it is to be understood that many of the advantages may be obtained when used with stationary tubs and with roller wringer constructions, and, accordingly, such modifications are within the purview of the invention.

The term "screen" as used herein is intended

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to define any device capable of arresting extraneous substances, and may be any filter, or arrester, made of coarse fabric, wire mesh, closely spaced parallel wires or bars, perforated metal, or the like.

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, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. In a washing machine, a tub, an agitator centrally located in said tub, said agitator comprising a generally cylindrical casing in the upper part of said agitator and a generally conical extension in the lower part of said agitator, said cylindrical casing having relatively large openings along its vertical wall and having an aperture at its upper end, a screen in said agitator having relatively small openings and being removable through said aperture, a removable cover for said aperture, and means to move said agitator back and forth in said tub to cause a major circulation of fluid in said tub outside said agitator and a minor circulation of fluid through said openings.

2. In a washing machine, a tube, an agitator centrally located in said tub, said agitator comprising a generally cylindrical casing in the upper part of said agitator and a generally conical extension in the lower part of said agitator, said cylindrical casing having relatively large openings along its vertical wall and having an aperture at its upper end, a screen in said agitator having relatively small openings and being removable through said aperture, a removable cover for said aperture, and means to reciprocate said agitator vertically in said tub to cause a major unidirectional toroidal circulation of fluid in said tub outside said agitator and a minor circulation of fluid through said openings.

3. In a washing machine, a tube, an agitator centrally located in said tub, said agitator comprising a generally cylindrical casing in the upper part of said agitator and a generally conical extension in the lower part of said agitator, said cylindrical casing having relatively large openings along its vertical wall and having an aperture at its upper end, a screen in said agitator having relatively small openings and being removable through said aperture, a removable cover for said aperture, a one-way valve in said agitator, and means to move said agitator back and forth in said tub to cause a major circulation of fluid in said tub outside said agitator and a minor circulation of fluid through said openings.

4. In a washing machine, a tub, an agitator centrally located in said tub, said agitator comprising a generally cylindrical casing in the upper part of said agitator and a generally conical extension in the lower part of said agitator, said cylindrical casing having relatively large openings along its vertical wall and having an aperture at its upper end, a screen in said agitator having relatively small openings and adapted to receive dispersible laundering material introduced through said aperture to be disseminated during operation of said agitator, an openable cover for said aperture, and means to move said agitator back and forth in said tub to cause a major circulation of fluid in said tub outside said agitator and a minor circulation of fluid through said openings.

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5. In a washing machine, a tub, an agitator centrally located in said tub, said agitator comprising a generally cylindrical casing in the upper part of said agitator and a generally conical extension in the lower part of said agitator, said cylindrical casing having relatively large openings along its vertical wall and having an aperture at its upper end, a screen in said agitator having relatively small openings and adapted to receive dispersible laundering material introduced through said aperture to be disseminated during operation of said agitator, an openable cover for said aperture, and means to reciprocate said agitator vertically in said tub to cause a major unidirectional toroidal circulation of fluid in said tub outside said agitator and a minor circulation of fluid through said openings.

6. In a washing machine, a tub, an agitator centrally located in said tub, said agitator comprising a generally cylindrical casing in the upper part of said agitator and a generally conical extension in the lower part of said agitator, said cylindrical casing having relatively large openings along its vertical wall and having an aperture at its upper end, a screen in said agitator having relatively small openings and adapted to receive dispersible laundering material introduced through said aperture to be disseminated during operation of said agitator, an openable cover for said aperture, a one-way valve in said agitator, and means to move said agitator back and forth in said tub to cause a major circulation of fluid in said tub outside said agitator and a minor circulation of fluid through said openings.

FRANCIS H. McCORMICK.
KENDALL CLARK.

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The following references are of record in the file of this patent:

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Certificate of Correction

Patent No. 2,498,894

February 28, 1950

FRANCIS H. McCORMICK ET AL.

It is hereby certified that errors appear in the printed specification of the above numbered patent requiring correction as follows:

Column 4, line 23, for "Fig. 7" read *Fig. 1*; column 5, lines 27 and 42, for the word "tube" read *tub*;

and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 16th day of May, A. D. 1950.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.