Feb. 8, 1938. R. E. REED 2,107,426

WASHING MACHINE

Filed Jan. 17, 1936 2 Sheets-Sheet 1

Fig. 1

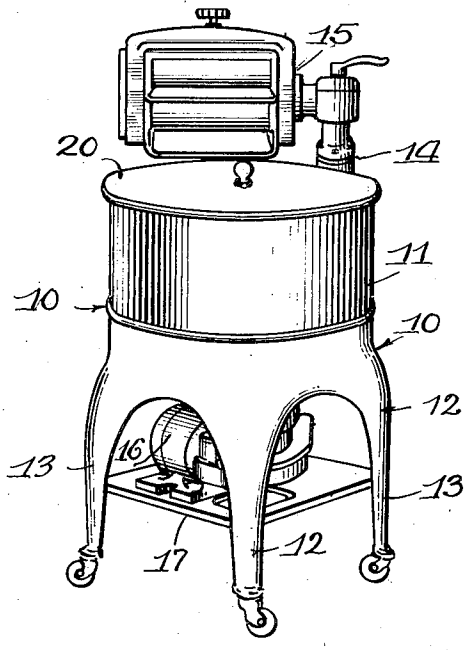
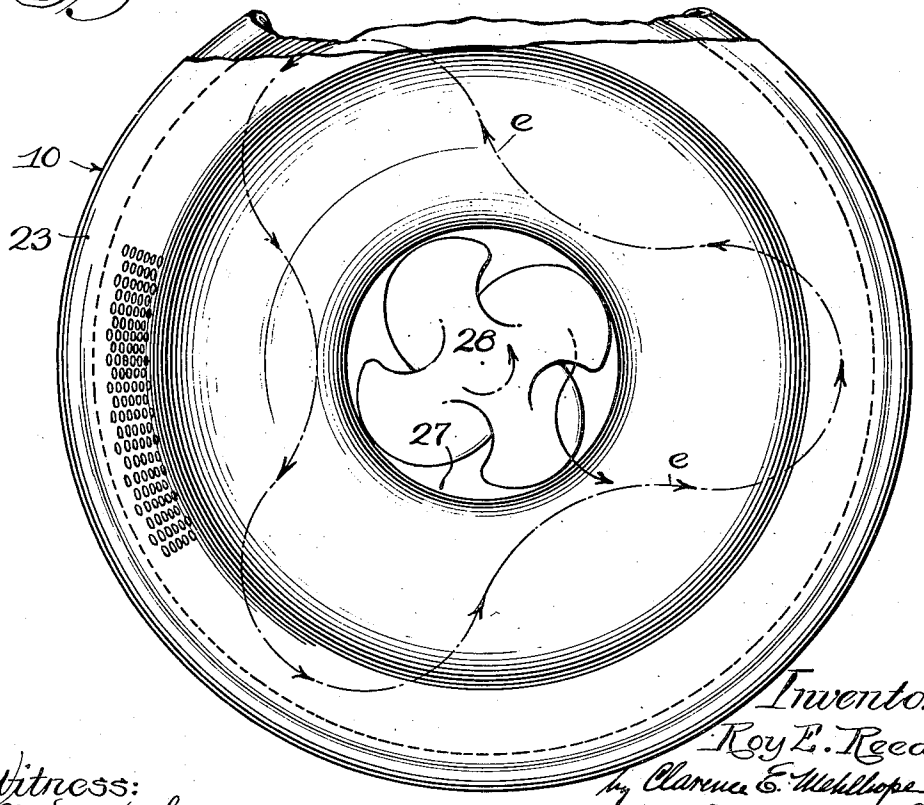


Fig. 2



Witness:
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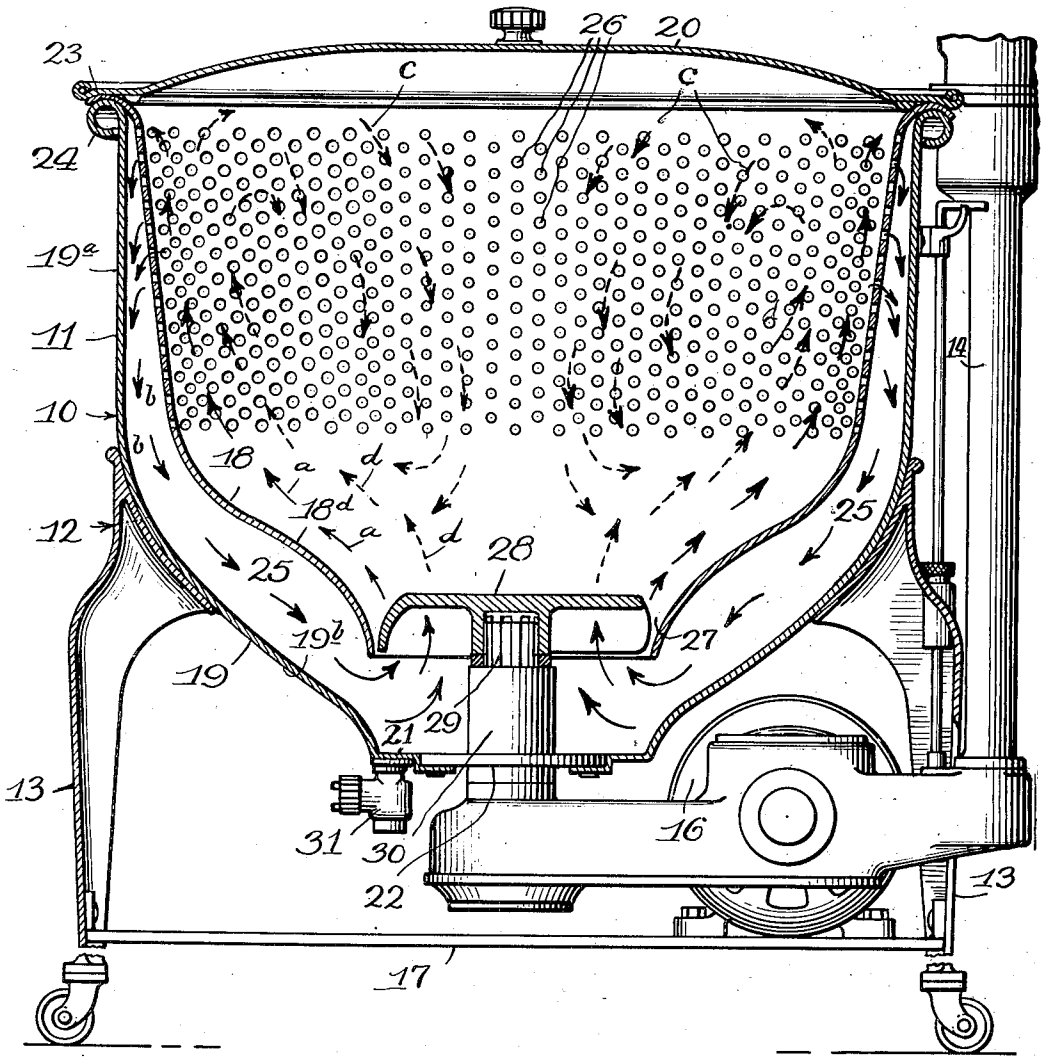


Fig. 3

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Patented Feb. 8, 1938 2,107,426

UNITED STATES PATENT OFFICE

2,107,426

WASHING MACHINE

Roy E. Reed, Ripon, Wis., assignor of one-fourth to Horace Hull, Denver, Colo., one-fourth to Louis B. Reed, Greeley, Colo., and one-fourth to William E. Haseltine, Ripon, Wis.

Application January 17, 1936, Serial No. 59,555

11 Claims. (Cl. 68—37)

This invention relates to improvements in washing machines, and consists of the matters hereinafter described and more particularly pointed out in the appended claims.

The object of the invention is to provide a washing machine of simple and economical construction, without agitators or devices of any kind for physically contacting the articles to be washed, but including means for producing a strong and rapid upward flow of liquid along and near the sides of the tub to hold the articles in suspension, together with a less rapid flow at the top towards the center and then downward in a rolling flow towards the bottom of the tub before reaching which the current of the liquid in the tub is again directed upwardly as in the beginning. With this flow of current, the body of liquid in the tub has imparted to it a comparatively slow rotary movement. As a result, the water is forced through the interstices of the clothes so that the clothes are thoroughly cleansed without rubbing or beating contact with any mechanical member.

The objects and advantages of the invention will appear more fully as I proceed with my specification.

In the drawings:—

Figure 1 is a perspective view of a washing machine embodying the features of my invention;

Figure 2 is a top plan view of the washing machine with the cover removed;

Figure 3 is a vertical central section through the machine.

Referring now to that embodiment of the invention illustrated in the drawings:—10 indicates the washing machine as a whole. As shown, it consists of a tub 11 mounted on a base 12 having legs 13. At the side of the tub is supported the usual vertical housing 14 containing the shaft and connections for operating a wringer 15. 16 indicates a motor for driving both the washing machine mechanism and the wringer, said motor being mounted on a shelf or platform 17 attached to the legs 13 of the base.

The tub 11, open at the top, has a duplex wall,—an inner wall 18 and an outer wall 19. A lid 20, concavo-convex as shown, of any familiar type, closes the open top of the tub. The outer wall 19 is vertical for about half way, as indicated at 19a and then converges towards the bottom, as indicated at 19b and has a horizontal annular flange 21, to which is attached a flat, circular bottom plate 22 to close it. The inner wall 18 is suspended within the outer wall 19 in any convenient manner and preferably by means of a top flange 23 which engages upon a voluted rim 24 at the top of the outer wall 19. The inner wall 18 is of less depth than the outer wall 19 and diverges from said outer wall from the top towards the bottom to provide a passageway 25 between the two walls. Said passageway increases in width from top to bottom more gradually in the upper part of the tub in the neighborhood of the vertical part 19a of the outer wall, but more rapidly in the neighborhood of the converging part 19b of said outer wall, where the inner wall 18 converges more sharply at 18d, as clearly shown in Figure 3.

The upper part of the inner wall and preferably for a little more than half its depth from the top, is perforated to provide openings 26, which connect the interior of the tub with the annular passageway 25 between the two walls. At the bottom the inner wall is turned down nearly vertically to provide a circular throat or inlet 27 to connect it with the space below in the bottom of the tub and thus with the annular passageway 25 which opens into said space. Within the throat 27 is located an impelling device designed to impart a rapid flow of liquid upwardly along the sides of the inner wall 18 of the tub.

Preferably and as shown, the impelling device is a screw propeller 28. Said propeller is of a type designed to displace liquid in large quantities, so as to impart a rapid flow of liquid at a high rate upwardly and along the sides of the tub. It should also be of such design as to produce the required suction on the vacuum side of the propeller in order to produce the required flow of the liquid drawn through the perforations 26 into and through the passageway 25 down to the space below the propeller to supply the necessary volume for re-introduction into the interior of the tub through the throat 27, to the impelling side of the propeller. To this end the propeller may be a four blade propeller and I have found that a propeller well suited for the purpose is such as that shown and described in the patent to Horace Hull, Number 1,825,868, dated October 6, 1931.

The propeller 28 is suitably mounted in any familiar manner on an upright shaft 29 which depends through the bottom plate 22 and is operatively connected to the motor 16. (Said connection is not shown.) A housing 30 with a suitable stuffing box provides bearing for the shaft 29. A drain cock 31 of familiar type is provided in the bottom of the outer wall of the tub. The details of the construction of housing, stuffing

box, and connections between the shaft 29 and the motor 16 are of any familiar type and require no further description, as they form no part of the invention.

The operation of the machine is as follows:—The tub is filled in the usual manner with washing liquid, as hot water and soap suds, up to within a short distance from the top of the tub. Through the perforations 26 in the inner wall 18 and through the throat 27 the liquid flows into and fills the annular passageway 25 and the space below the bottom of the propeller, as well as the space within the inner wall of the tub. The fabrics are then introduced and the lid is applied to close the top of the tub. The motor is then started, acting to drive the propeller continuously in one direction at high speed. The liquid is impelled upwardly and along the sides of the inner wall 18 of the tub. A large part of the liquid flows rapidly through the perforations 26 into the passageway 25 through which it is drawn downwardly by the exhausting action of the propeller into the space below it, whence it passes upwardly again through the throat 27 into the inside of the tub. This flow of the liquid is indicated by the arrows *a* within the tub and the arrows *b* in the passageway 25. The upward flow of the liquid holds the fabrics in suspension above the propeller and prevents contact of the fabrics with said propeller or with the walls of the inner tub.

The part of the liquid which does not pass through the perforations 26 into the passageway 25, when it reaches the top of the tub, is rolled over towards the center of the tub, as indicated by the arrows *c*. It then flows down towards the propeller 28, but before it reaches said propeller, it is turned back by the upward flow from the propeller, as indicated by the arrows *d*. In this movement of the liquid, the fabrics are carried along therewith, first up along the sides of the inner wall of the tub, which they do not appear to touch, and then in a rolling movement towards the center and down towards the bottom of the tub and then back to the top. At the same time, the entire body of liquid within the inner wall of the tub is given a comparatively slow rotary movement in the same direction, which also effects the movement of the fabrics in the tub. This movement is indicated in horizontal projection by the arrows *e* in Figure 2.

The liquid is forced through the interstices of the fabrics in such fashion as to remove dirt and thoroughly cleanse the fabrics, which appear to curve back and forth upon themselves as they travel with the liquid, sometimes being stretched out and at other times being wrinkled or contracted upon themselves.

When filling the tub with the washing liquid in the usual manner, the tub should not be filled too full, since upon the geyser-like action produced and the rolling surging movement of the washing solution at the top towards the center, the liquid might slop over if the lid 20 is not on the tub. To prevent this, the lid itself is concavo-convex, as indicated, so as to provide space above the top of the tub.

The cross sectional area of the annular passageway 25 as it approaches the bottom of the tub, as well as the distance between the inlet throat 27 and the bottom of the tub, must be ample to provide a free and full passageway for the required rate of flow to return the liquid to the intake side of the propeller, as required by the upward drive of the liquid at the slip or impelling side of said propeller.

I claim as my invention:

1. A washing machine comprising a tub having inner and outer walls, the inner wall terminating above the tub bottom in an annular inlet throat, said inner and outer walls being formed to provide an annular passageway between them increasing in cross sectional area from the top to the bottom of the tub, where it communicates with the space below said inlet throat, the upper part of the inner wall being provided with perforations opening into said annular passageway, and means for impelling a rapid flow of liquid upwardly along the sides of said tub and for returning the liquid discharged through said perforations into said passageway back to said inlet throat.

2. A washing machine comprising a tub having inner and outer walls, the inner wall terminating above the tub bottom in an annular inlet throat, said inner and outer walls being formed to provide an annular passageway between them increasing in cross sectional area from the top to the bottom of the tub, where it communicates with the space below said inlet throat, the upper part of the inner wall being provided with perforations opening into said annular passageway, and a propeller mounted in said inlet throat and adapted to drive the liquid upwardly along the sides of said tub and to return the liquid discharged through said perforations into said passageway back to said inlet throat.

3. A washing machine comprising a tub having inner and outer walls, the inner wall terminating above the tub bottom in an annular inlet throat, said inner and outer walls being formed to provide an annular passageway between them increasing in cross sectional area from the top to the bottom of the tub, where it communicates with the space below said inlet throat, the upper part of the inner wall being provided with perforations opening into said annular passageway, a propeller mounted in said inlet throat and adapted to drive the liquid upwardly along the sides of said tub and to return the liquid discharged through said perforations into said passageway back to said inlet throat, and means for rotating said propeller continuously in one direction.

4. A washing machine comprising a tub having inner and outer walls, the outer wall being substantially vertical at the top and converging inwardly at the bottom, the inner wall being formed to close against said outer wall at the top and converging from the top towards the tub bottom and terminating in a short, substantially upright, annular inlet throat, thereby providing an annular passageway between the two walls increasing in cross sectional area from the top to the bottom of the tub, where it communicates with the space below said inlet throat, the upper part of the inner wall being provided with perforations opening into said annular passageway, and a propeller mounted in said inlet throat and adapted to drive the liquid upwardly along the sides of said tub and to return the liquid discharged through said perforations into said passageway back to said inlet throat.

5. A washing machine comprising a tub having inner and outer walls, the inner wall terminating above the tub bottom in an annular inlet throat, said inner and outer walls being formed to provide an annular passageway between them from the top to the bottom of the tub, where it

communicates with the space below said inlet throat, the upper part of the inner wall being provided with perforations opening into said annular passageway, and means for impelling a rapid flow of liquid upwardly along the sides of said tub and for returning the liquid discharged through said perforations into said passageway back to said inlet throat.

6. A washing machine comprising a tub having inner and outer walls, the inner wall terminating above the tub bottom in an annular inlet throat, said inner and outer walls being formed to provide an annular passageway between them from the top to the bottom of the tub, where it communicates with the space below said inlet throat, the upper part of the inner wall being provided with perforations opening into said annular passageway, and a propeller mounted in said inlet throat and adapted to drive the liquid upwardly along the sides of said tub and to return the liquid discharged through said perforations into said passageway back to said inlet throat.

7. A washing machine comprising a tub having inner and outer walls, the outer wall being substantially vertical at the top and converging inwardly at the bottom, the inner wall being formed to close against said outer wall at the top and converging gradually along the straight part of said outer wall and more rapidly therebelow and terminating in a short, substantially upright annular inlet throat, thereby providing an annular passageway between the two walls, increasing in cross sectional area from the top to the bottom of the tub, where it communicates with the space below said inlet throat, the upper part of the inner wall being provided with perforations opening into said annular passageway, and a propeller mounted in said inlet throat and adapted to drive the liquid upwardly along the sides of said tub and to return the liquid discharged through said perforations into said passageway back to said inlet throat.

8. A washing machine comprising a tub having inner and outer walls, the outer wall being substantially vertical at the top and converging inwardly at the bottom, the inner wall being formed to close against said outer wall at the top and converging gradually along the straight part of said outer wall and more rapidly therebelow and terminating in a short, substantially upright annular inlet throat, thereby providing an annular passageway between the two walls, increasing in cross sectional area from the top to the bottom of the tub, where it communicates with the space below said inlet throat, the upper part of the inner wall being provided with perforations opening into said annular passageway, and means for impelling a rapid flow of liquid upwardly along the sides of said tub and for returning the liquid discharged through said perforations into said passageway back to said inlet throat.

9. A washing machine comprising a tub having inner and outer walls, the inner wall terminating above the tub bottom in an inlet throat, said inner and outer walls being formed to provide a passageway between them from a point near the top to the bottom of the tub, where it communicates with a space below said inlet throat, the upper part of the inner wall being provided with perforations opening into said passageway, and means for impelling a rapid flow of liquid upwardly along the sides of said tub and for returning the liquid discharged through said perforations into said passageway back to said inlet throat.

10. A washing machine comprising a tub having inner and outer walls, the inner wall terminating above the tub bottom in an inlet throat, said inner and outer walls being formed to provide a passageway between them from a point near the top to the bottom of the tub, where it communicates with a space below said inlet throat, the upper part of the inner wall being provided with perforations opening into said passageway, and a propeller mounted in said inlet throat and adapted to drive the liquid upwardly along the sides of said tub and to return the liquid discharged through said perforations into said passageway and back to said inlet throat.

11. A washing machine comprising a tub having inner and outer walls, the inner wall terminating above the tub bottom in an inlet throat, said inner and outer walls being formed to provide a passageway between them from a point near the top to the bottom of the tub, where it communicates with a space below said inlet throat, the upper part of said inner wall being provided with perforations opening into said passageway, a propeller mounted in said inlet throat and adapted to drive the liquid upwardly along the sides of said tub and to return the liquid discharged through said perforations into said passageway and back to said inlet throat, and means for rotating said propeller continuously in one direction.

ROY E. REED.