June 10, 1947. D. R. NEAL 2,421,803

SCUM OVERFLOW FOR CLOTHES WASHING MACHINES

Filed Oct. 18, 1943 2 Sheets-Sheet 1

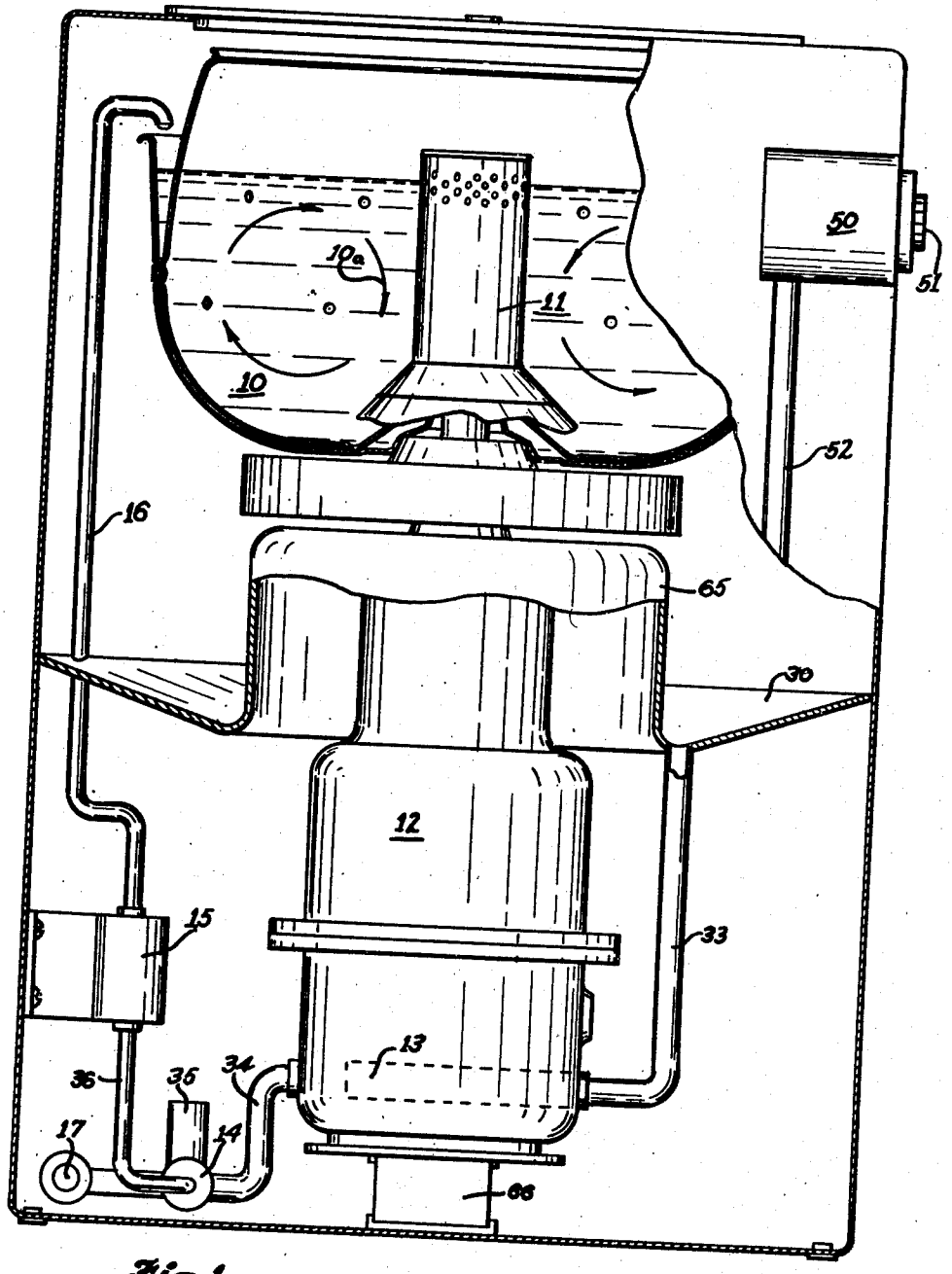



Fig. 1

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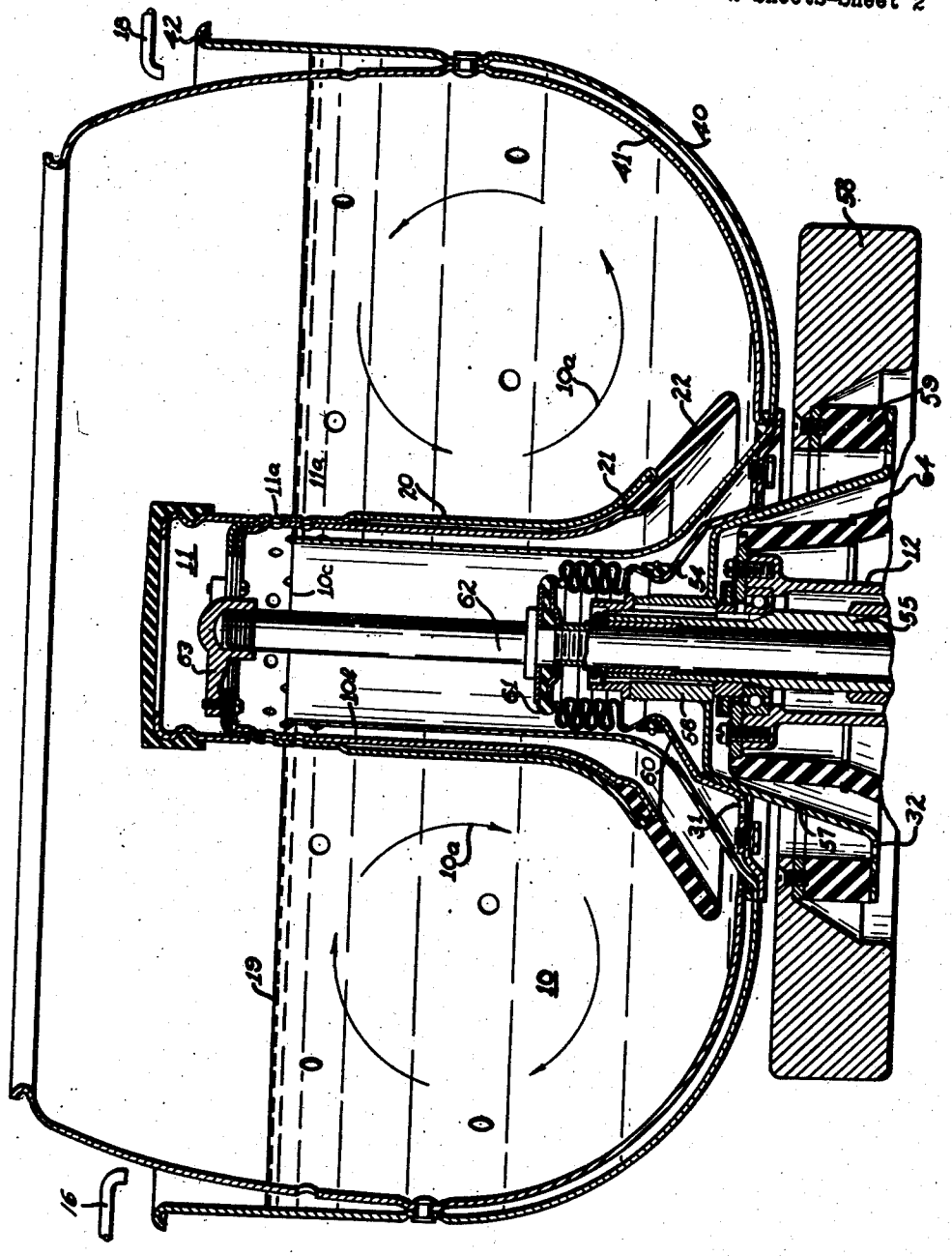



Fig. 2

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Patented June 10, 1947

2,421,803

# UNITED STATES PATENT OFFICE

2,421,803

## SCUM OVERFLOW FOR CLOTHES-WASHING MACHINES

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Application October 18, 1943, Serial No. 506,692

4 Claims. (Cl. 68—23)

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

An object of this invention is to provide an improved means of removing the scum from the washing agent while the washing operation is in progress.

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-sectional view, somewhat diagrammatic, of a washing machine embodying features of my invention; and

Fig. 2 is an enlarged cross-sectional view of the upper part of the washing machine.

During the washing operation in a washing machine, scum is formed which tends to float on the washing agent. If this scum is not removed, it is likely to be deposited on the fabrics or clothes being washed. By this invention, a toroidal flow is formed in the body of washing fluid and fabrics, which tends to localize accumulations of scum on the surface of the liquid, and these scum accumulations, together with a small amount of liquid, are drained off over a dam or pipe. Thus the deposit of scum on the fabrics or clothes is prevented.

In the form of the invention now preferred, a tub 10 is provided with an agitator 11 which is of a character to produce toroidal flow in the fabrics and liquid as indicated by the arrows 10a. An overflow dam or stand-pipe 10b is provided, which has an overflow edge 10c. The agitator 11 is provided with apertures 11a adjacent the overflow edge 10c so that the scum, which is swept by the toroidal flow toward the center of the tub, passes through these apertures 11a and overflows the edge 10c together with a small portion of the washing agent or liquid. The scum and liquid may be discharged into the house drain, or liquid may be filtered from the scum and may be returned to the tub.

If desired, the washing machine may include driving mechanism in casing 12, a pump 13, a selector valve 14, a filter 15, a return pipe 16, a discharge pipe 17, and, if desired, a filling pipe 18.

The tub 10 is adapted to retain a charge of liquid washing agent and fabrics to a level approximately at 19, at or slightly below overflow edge 10c as indicated in the drawings. The agitator 11 is capable of producing a toroidal flow of washing agent and fabrics in the tub preferably in a direction so that the toroidal flow is

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directed towards the central portion of the tub. For this purpose, the agitator may include a cylindrical portion 20 having a lower conical extension 21 provided with a flexible cone 22. The agitator is vertically reciprocated in a series of short quick reciprocations of from about 200 to 400 reciprocations per minute. Such reciprocation produces the toroidal flow with the upper surface directed toward the center of the tub as indicated by the arrows 10a.

During the washing operation, scum is produced in the washing agent, and tends to accumulate at the surface of the liquid near the center of the tub. Means are provided for skimming the scum and a small portion of the liquid agent at the top surface of the liquid agent, preferably at the central point of the tub. For this purpose an overflow dam or pipe 10b is placed inside of the agitator 11, and extends upwardly substantially to, or slightly above, the normal level 19 of the washing agent. The agitator 11 is provided with apertures 11a near the level 19, to allow the scum and washing agent to flow over the dam 10b, thus carrying the scum away from the main body of washing agent.

The skimmed portion of the washing agent may be discarded to the discharge pipe 17 which may be connected to the sewer, or may be filtered through the filter 15, where the scum is arrested, and the filtered washing agent may be returned through the pipe 16 to the tub 10. For this purpose a drain receptacle 30 may be placed under the tub 10 into which the skimmed washing agent flows from the overflow dam 10b. This washing agent, overflowing the dam 10b, may flow through the apertures 31 and 32 into the receptacle 30. From thence it may flow through a pipe 33 to the pump 13. The pump 13 discharges through the pipe 34 to the selector valve 14. The selector valve 14, controlled by the solenoid 35, may cause the pump discharge to be directed selectively to the discharge pipe 17 or to the pipe 36 from whence it flows through the filter 15 and pipe 16 back to the tub 10.

If desired, the tub 10 may be rotatable, so that the washing agent can be separated centrifugally from the fabrics by rapid rotation of the tub. For this purpose the tub 10 may include an outer imperforate tub 40 and an inner perforate tub 41. The imperforate tub 40 may be formed with an upwardly extending outer overflow rim 42, and with the inner overflow rim 10b. When the tub 10 is rapidly rotated, the fabrics are retained by the perforate tub 41, while the washing agent overflows centrifugally

rim 42 into the drain receptacle 30, from whence it flows through the pipe 33, pump 13, pipe 34, selector valve 14 and discharge pipe 17.

If desired, the washing machine may be provided with automatic controls. To this end a timer switch 50 may be provided with a setting handle or knob 51. Suitable control lines may extend through the cable casing 52 to the power mechanism 12, selector valve 14, and, if desired to suitable solenoid valve controls (not shown) for the pipe 18. The timer 50 operates a plurality of switches in proper sequence so that the first operation is to cause liquid washing agent to be introduced from the house water supply, through suitable hot and cold water solenoid valves, through the pipe 18, into the tub 10 approximately to the level 19. Thereafter the switch 50 causes the power mechanism in casing 12 to reciprocate the agitator 11 for a sufficient length of time to cause the toroidal flow and washing action to take place. During this time the top surface of the washing agent is skimmed by overflow over the dam 10b. If desired, at this time, a small amount of additional washing agent may be slowly introduced through the pipe 18 as the washing action progresses. During the washing operation, the selector valve 14 may be placed in a position either to discharge into the discharge pipe 17 or, if desired, into the pipe 36, filter 15, pipe 16 and back to the tub 10. After the washing operation has terminated, the switch arrangement in timer 50 causes the mechanism in casing 12 to rotate the tub 10, while reciprocation of the agitator 11 is terminated, and this rotation causes the liquid washing agent to be discharged over the rim 42 into the receptacle 30 from whence it flows through the pipe 33, pump 13, pipe 34, valve 14 to the discharge pipe 17.

Any suitable construction may be used for accomplishing the foregoing. If desired, the tub 10 may be supported on a rotatable sleeve 55. The sleeve 55 is rotated by mechanism in casing 12 and is rotated by power derived from an electric motor in the casing 12. The sleeve 55 has secured thereto a ring 56 which carries a cone 57 to which a counterbalancing ring 58 is secured by means of a resilient ring 59. The cone 57 is apertured at 32. The cone 57 also carries a second cone 60 which is secured to the imperforate tub 40. The cone 60 is apertured at 31. A flexible bellows 61 is secured to the upper edge of cone 60 and also to the vertically reciprocable shaft 62, to which the agitator 11 is secured by means of the spider 63. The shaft 62 extends downwardly inside the sleeve 55 into the mechanism in casing 12, where it is connected to suitable transmission for vertical reciprocation. The transmission casing 12 is supported on a flexible collar 64 which, in turn, is supported on the upwardly extending wall 65 of the receptacle 30. The lower end of the power mechanism casing 12 may be supported on a flexible block 66. Details of the counterbalancing ring driving mechanism and supports are more fully described in the application of Kendall Clark, Serial No. 358,871, filed Sept. 28, 1940 (Patent 2,366,236, granted Jan. 2, 1945), to which reference is made, if necessary, for a more detailed description of the operation and construction of these parts.

In the operation of the machine, fabrics such as wearing apparel, are placed in the tub 10 together with a detergent, such as powdered soap. The timer 50 is set to control the desired sequences. The timer 50 then causes washing



agent, such as hot water, to be introduced at proper temperature and the proper quantity through the pipe 18 to fill the tub substantially to the level 19. The timer 50 then causes the agitator 11 to be vertically reciprocated. This reciprocation causes the toroidal flow, with the top surface directed inwardly toward the center of the tub. Scum and a small portion of the washing liquid overflow the dam or pipe 10b from whence it flows through the apertures 31 and 32 to the receptacle 30. From thence it flows through the pipe 33, pump 13, pipe 34 selectively either to the discharge pipe 17 or through the pipe 36, filter 15, pipe 16 back to the tub 10. If desired at this time, a small continuous stream of washing liquid is automatically maintained at 18 to replace or augment the liquid overflowing the dam 10b. After the washing operation has terminated, the timer 50 stops reciprocation of the agitator 11 and causes rapid rotation of the tub 10, so that the washing liquid is centrifugally discharged from the rim 42 into the receptacle 30, pipe 33, pump 13, pipe 34, valve 14 and discharge pipe 17. Thereafter these operations are repeated by the timer 50 with clear water, so that the clothes are rinsed one or two times substantially in the same manner as previously described with the exception that no detergent or soap is added for the rinsing operations.

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 receptacle to hold liquid, an overflow dam fixed in said receptacle, a vertically reciprocable agitator surrounding said dam, said agitator having perforations at the normal liquid level of said tub to permit scum to flow through said perforations and over said dam and having means to produce continuous toroidal circulation, and means for vertically reciprocating said agitator.

2. In a washing machine, a receptacle to hold liquid, a sleeve for supporting said receptacle, a vertically reciprocable shaft extending upwardly from said sleeve, a supporting apertured cone connecting said sleeve and receptacle, said cone being apertured for the flow of liquid, an overflow pipe secured to said receptacle around said apertured cone and extending upwardly above said cone, a flexible bellows connected to said cone and vertically reciprocable shaft, and a vertically reciprocable agitator secured to said reciprocable shaft, said agitator having scum overflow aperture means adjacent said overflow pipe, and having means to produce continuous toroidal circulation.

3. In a washing machine, a rotatable sleeve, an apertured cone secured to said sleeve, a second apertured cone secured to said first named cone, a rotatable tub supported on said second apertured cone outside the apertured portion of said second cone, a vertically extending overflow pipe carried by said tub and extending above said cones, a vertically reciprocable shaft in said sleeve extending above said overflow pipe, a water seal extending from said second named cone to said shaft, and an agitator surrounding said overflow pipe and secured to said shaft above said overflow pipe, said agitator having scum overflow aperture means adjacent said overflow pipe, and

having means to produce continuous toroidal circulation.

4. In a washing machine, an imperforate tub having an upwardly extending outer overflow rim and an upwardly extending inner overflow rim, a sleeve supporting said imperforate tub by an apertured support, a vertically reciprocable shaft in said sleeve extending into said inner rim, and an agitator secured to said shaft and surrounding said inner rim, said agitator having scum overflow aperture means adjacent said inner overflow rim, and having means to produce continuous toroidal circulation.

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