April 7, 1953 H. J. RAND 2,633,726

WASHING MACHINE AND DRIER WITH LIQUID CIRCULATION

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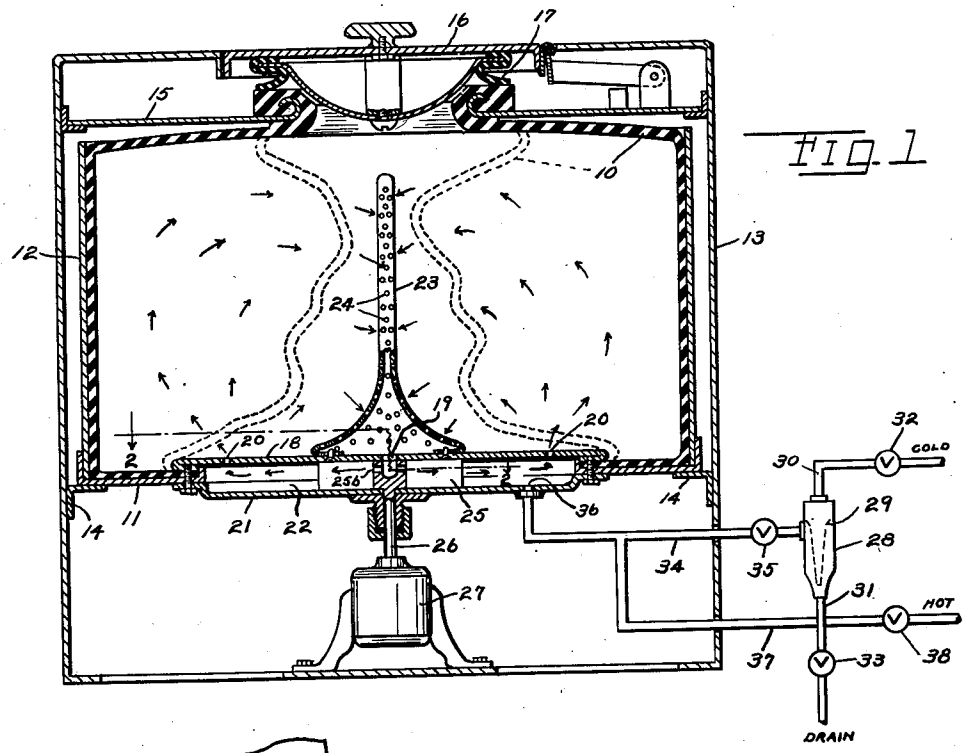


FIG. 1

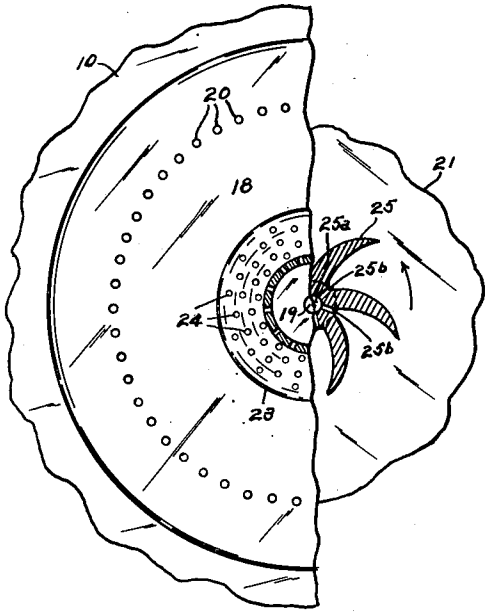


FIG. 2

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WASHING MACHINE AND DRIER WITH LIQUID CIRCULATION

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3 Claims. (Cl. 68—21)

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This invention relates to improvements in a washing machine of the collapsible bag type combined with a novel method of liquid circulation within the bag.

One of the objects of the present invention is to promote the efficient removal of scum or other floating extraneous material as the detergent is removed from the laundry.

Another object of the present invention is to provide a simple washing machine wherein the washing of the laundry is accomplished solely by means of a water circulation system and wherein the drying of the laundry is accomplished by the simple expedient of collapsing a flexible bag or diaphragm against the laundry.

Still another object of the present invention is to provide a novel combination of an impeller beneath the bottom wall of a bag container with means for circulating liquid from the bag centrally into the pump impeller and then outwardly and upwardly in the outer portions of the bag together with means for withdrawing detergent and air from the bag after the washing operation, whereby to cause the flexible bag to collapse against the laundry and squeeze the detergent out of it.

Other objects and advantages of the present invention will be apparent from the accompanying drawings and description and the essential features thereof will be set forth in the appended claims.

In the drawings,

Fig. 1 is a central sectional view through one form of washing machine embodying my invention; while

Fig. 2 is a fragmental sectional view somewhat enlarged taken along the line 2—2 of Fig. 1.

I have chosen to show my invention as applied to a washing machine of the general type disclosed in my copending application Serial Number 682,322, filed July 9, 1946, now Patent No. 2,477,682. In the present instance, however, a flexible bag 10 of rubberlike material is supported at the bottom by means of an annular plate 11 and supported along the sides by means of a cylindrical plate 12 which sets in the bottom plate. An outside housing 13 is provided with brackets 14 which support the bottom plate 11. The housing also is provided with a cross frame member 15 which firmly supports the neck of the flexible bag. A cover 16 is provided for closing the bag opening and this cover has a seal 17 between the edge of the cover and the neck of the bag so as to provide an air tight seal when vacuum is produced within the bag. This seal is disclosed and claimed in my copending application Serial Number 5,623, filed January 31, 1948.

In the present application the agitator provided for washing the laundry in my copending case is replaced by a novel liquid circulating means. The central bottom portion of the bag 10 is closed by a plate 18 which is provided with a central passageway or opening 19 and a plurality of peripheral passageways 20. I have used the term "peripheral" with reference to the openings 20, whether or not these openings are at the exact edge of the plate 18. Spaced below the plate 18 is the bottom cover 21 of a pumping chamber 22. The edges of the bag 10 are firmly clamped between the plate 18 and the housing cover plate 21 in a liquid tight manner as indicated in Fig. 1.

Preferably, I provide centrally of the plate 18 a perforated post 23 which rises over the passageway 19 to a point near the top of the bag 10 and is provided with perforations 24 along its entire length for a purpose later described.

Means is provided within the chamber 22 for providing a circulation of the detergent in the bag downwardly through the passageway 19 and upwardly through the passageways 20 so that the general circulation is in the direction of the arrows of Fig. 1. The means here shown comprises an impeller 25 which is secured to a shaft 26 which in turn is rotatable by means of the electric motor 27 fastened to the base of the housing 13. The impeller is provided with a central opening 25a which registers with the passageway 19. Other openings 25b extending radially of the impeller provide communication between the central opening 25a and the chamber 22 for the flow of liquid in the direction of the arrows of Fig. 1.

Means is provided for introducing detergent inside the bag 10 and for withdrawing detergent and air at the close of a washing operation. Where the detergent is water, I may use the system shown diagrammatically in Fig. 1. I have here shown an aspirator 28 of the injector type adapted to create a partial vacuum in the zone 29 when water is flowing inwardly through passageway 30 and outwardly through passageway 31. Cold water is supplied to passageway 30 controlled by valve 32. The discharge passageway 31 is controlled by valve 33. The zone 29 is connected by line 34 under the control of valve 35 to an opening 36 leading into the chamber 22. Line 34 in turn is connected by line 37 with a supply of hot water under the control of valve 38.

The operation of my device should now be clear. When it is desired to perform a washing operation, the clothes and soap are placed within the bag 10 after which the cover 16 is positioned as shown in Fig. 1. Valve 33 is then closed and valve 35 is opened. Cold and hot water are then introduced by opening valves 32 and 38 in the desired amounts to get water of the proper tem-

perature flowing into the bag 10. When the bag is filled to a proper level which may be determined by inspection through the cover 16, all valves are closed and the motor 27 is energized by means not shown. The water and soap are then circulated by means of the impeller 25 in the direction of the arrows shown in Fig. 1 which will produce a washing action upon the clothes inside the bag. At the close of the washing operation, and while the impeller 25 is still rotating, valves 35, 33 and 32 are opened so as to cause the aspirator 28 to withdraw liquid and air from the bag 10 and the chamber 22. As the bag 10 starts to move inwardly toward the broken line position of Fig. 1, some of the detergent liquid is constantly being removed through the outlet 36 by means of the aspirator. At the same time, the circulation caused by the impeller 25 keeps the scum and other extraneous material in the detergent in a continuous circulation so that it is substantially completely removed along with the detergent and none of this objectionable material is deposited on the clothes. It will be noted from the arrangement of the passageways 20, that the dirty detergent is continually being passed upwardly on the outside of the bundle of clothes and any floating scum or the like will come to the top of the liquid near the center of the bag where it will enter some of the openings 24 and pass downwardly through the hollow post 23 to the outlet.

Obviously, other means may be utilized for producing the circulation of liquid here described. Also, other means may be used to withdraw the liquid and air from within the bag such as the pump mentioned in my copending application. It is obvious also, that any arrangement of the flexible bag 10 will be satisfactory which provides a flexible wall adapted to move inwardly after the washing operation when a vacuum is created within it so that the bag presses upon the laundry to squeeze the detergent out of it.

What I claim is:

1. In a mechanism for the washing and drying of clothes, the combination of a tub having side and bottom walls, a flexible element lining said tub to contain wash fluid and clothes to be washed and dried, said bottom wall of said tub containing a pumping chamber centrally disposed with respect to said element and having a top plate provided with peripheral perforations and an imperforate bottom plate, a liquid impeller between said top plate and said bottom plate, an upstanding perforated post in said element centrally located with respect to said top plate and having a centrally disposed outlet in communication with said chamber, means to rotate said impeller to expel fluid through said peripheral perforations in an upward then inward and downward direction, said fluid being circulated through said perforate post and outlet to said chamber in a continuous manner, and means to dry said laundry comprising a fluid withdrawing means interconnected with said chamber, said peripheral perforations and said outlet, whereby on actuation with said liquid withdrawing means, said element collapses the laundry against said post.

2. In a mechanism for the washing and drying of clothes, the combination of a tub having side and bottom walls, a flexible element lining said tub, said element including a side wall and a partial bottom wall for containing wash fluid and clothes to be washed and dried, said element having an opening for insertion and removal of

laundry and an air-tight cover for said opening, said bottom wall of said tub containing a pumping chamber centrally disposed with respect to said element and having a top provided with peripheral perforations and an imperforate bottom, the bottom wall of said element being clamped between said top and said imperforate bottom of said chamber, a liquid impeller between said top and said imperforate bottom, an upstanding perforated post in said element centrally located with respect to said top and having an outlet into said chamber, means to rotate said impeller to force fluid through the peripheral perforations in an upward then inward and downward direction, said fluid being circulated through the perforate post and outlet to said chamber, and means to dry said laundry comprising a fluid withdrawing means interconnected with the chamber, whereby on actuation of said liquid withdrawing means, said element collapses the laundry against said post.

3. In a mechanism for the washing and drying of clothes, the combination of a tub having side and bottom walls, a flexible element lining said tub and having a side wall and a partial bottom wall for containing wash fluid and clothes to be washed and dried, said element having an opening for insertion and removal of laundry and an air-tight cover for said opening, said bottom wall containing a pumping chamber centrally disposed with respect to said element, said chamber including a top provided with peripheral perforations and an imperforate bottom, the bottom wall of said element being clamped between said top and said imperforate bottom of said chamber, a liquid impeller between said top and said imperforate bottom, an upstanding perforated post in said element centrally located with respect to said top and having an outlet into said impeller, said liquid impeller being provided with an axial bore and side openings from said bore into said chamber, said outlet being interconnected with said bore, means to rotate said impeller to force fluid through the peripheral perforations in an upward then inward and downward direction, said fluid being circulated through said perforate post, outlet, bore and openings to said chamber, and means to dry said laundry comprising a vacuum creating aspirator interconnected with said chamber, whereby an actuation of said aspirator, fluid is withdrawn from said chamber and said element to collapse said element against the perforate post.

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