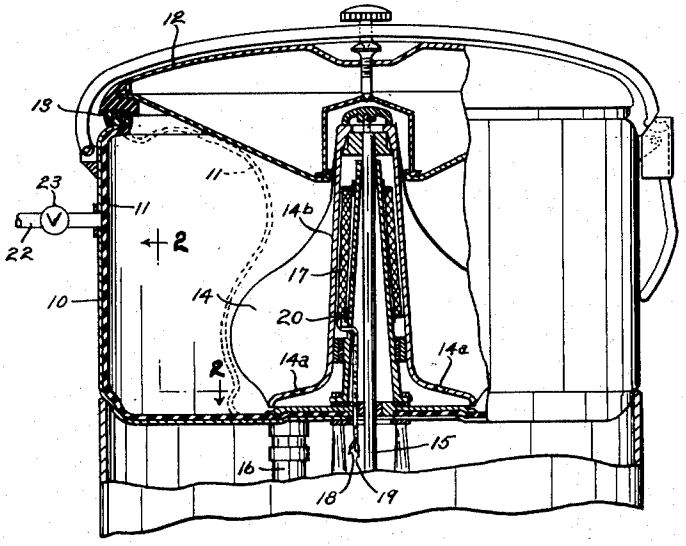
Oct. 27, 1953 H. J. RAND 2,656,697

LIQUID EXTRACTION WITH VACUUM AND HEAT

Filed Jan. 31, 1948

Fig. 1



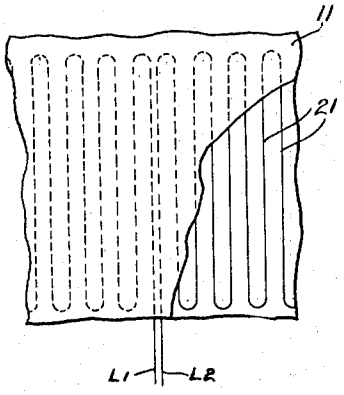


Fig. 2

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LIQUID EXTRACTION WITH VACUUM AND HEAT

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2 Claims. (Cl. 68—19)

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This invention relates to an improvement in a washing machine wherein the liquid detergent is extracted from the laundry by the combined use of vacuum and heat.

One of the objects of the present invention is to squeeze the detergent out of wet laundry by the collapsing of a flexible bag upon the laundry utilizing a partial vacuum within the bag while at the same time applying heat to the laundry.

Another object of the present invention is to apply the above invention by embedding an electrical heating element within the flexible bag itself so that as it presses upon the laundry it will apply heat to the laundry at the same time.

Another object of the present invention is to apply the same to laundry within a flexible bag wherein an agitator located centrally of the bag is provided to produce the washing operation. In such a combination, when the flexible bag is collapsed against the laundry to squeeze the detergent out of the same, means is provided for heating the agitator so as to supply heat to the laundry while under vacuum to remove the liquid detergent from it.

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

In the drawings,

Fig. 1 is a view partly in side elevation and partly in central sectional view showing one embodiment of my device, while

Fig. 2 is a fragmental elevational view taken along the line 2—2 of Fig. 1 and illustrating another form of my invention.

I have chosen to illustrate my invention as applied to a washing machine of the general type disclosed and claimed in my copending application, Serial No. 682,322, filed July 9, 1946, now U. S. Patent No. 2,472,682 dated June 7, 1949. In the present instance, within a tub 10 I provide a flexible bag 11 having an open top which is closed during a washing operation by means of a top cover 12. A suitable seal 13 is provided between the top cover and the open top neck of the bag during the washing and drying operations about to be described. In the central portion of the bag I provide an oscillator 14 which is connected by a downwardly extending shaft 15 by means of which the agitator is oscillated by means not shown. Liquid is introduced into the interior of the bag 11 through a conduit 16 coming up through the bottom of the tub and the bag. The agitator is perforated at 14a for the purpose of liquid flow. As described in my copending application, at the close of the washing operation a pump is operated in connection with the conduit 16 to withdraw the liquid and air from the interior of the bag, causing the same to collapse to the broken line position of Fig. 1 so as to squeeze the liquid detergent out of the laundry. It is an object of the present invention to apply heat at the same time that the flexible bag is pressing upon the laundry and while the latter is subjected to a partial vacuum. In the form of my device shown in Fig. 1 I provide a heating element 17 in the interior of the agitator. This heating element is in heat conducting relationship with the post 14b of the agitator. The heating element shown is of the electrical type and is supplied by heat through a suitable source connected to the wires 18 and 19. In the drawing as shown the heating element is stationary while the agitator is oscillated. If necessary or desirable, however, the heating element might be secured to the sleeve 14b and sliding shoes at the point 20 would transmit electricity to the heating element while the agitator was oscillating.

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In the form of my invention shown in Fig. 1, it will be obvious that when the bag 11 has been collapsed inwardly against the laundry by the creation of a vacuum inside the bag the laundry will be pressed tightly against the agitator 14. At this time if the heat is supplied to the heating element 17, the heat will be transmitted very efficiently to the bundle of laundry against the agitator because the laundry will surround the heating element on all sides.

In the form of my device shown in Fig. 2, a wire heating element 21 is imbedded within the layers of the flexible bag 11 this form of my device may be used with or without the heating element 17 shown in Fig. 1. When the device of Fig. 2 is used, after the flexible bag 11 has been collapsed inwardly against the laundry to squeeze the liquid detergent out of the same, the electrical current is supplied through lines L_1—L_2 to the heating element 21 within the flexible bag itself. This will cause the bag to surround the bundle of wet laundry as a warm blanket and will aid in the evaporation of the remainder of the liquid in the laundry under vacuum.

The connection shown at 22 in Fig. 1 is for the carrying out of my invention in still another manner. If the flexible bag 11 has no heating element 21 inside of it, nevertheless by the use of the connection 22 heat may be applied to the laundry as it is presssed inwardly against the agitator. In this form of my device, after the bag has been collapsed to the broken line position

of Fig. 1 by the creation of a partial vacuum inside the bag, I open the valve **23** to admit through the line **22** a heated fluid such as steam under pressure. This will fill the space between the bag **11** and the tub **10** so as to supply heat over the entire area of the flexible bag and this heat will be transmitted through the bag to the laundry on the inside. At the same time, the pressure of the steam will be added to the atmospheric pressure normally causing the bag to press against the laundry so that there is in addition to the heat, the extra additional pressure from the steam to cause the detergent to be squeezed out of the laundry.

It will be noted in all forms of my invention that I have taken advantage of the reduced vapor pressure of any water remaining in the laundry as it is being squeezed dry. Without raising the temperature of the laundry above 120° Fahrenheit, I may evaporate all of the water in the clothes and thus avoid any possibility of raising the clothes to an undesirable temperature where they might be burned.

What I claim is:

1. In a washing machine, a flexible liquid- and air-tight element adapted to contain laundry and a washing fluid, said element having an opening through which laundry may be inserted and removed, an air- and water-tight closure for said opening, means for agitating laundry within said element, means for withdrawing the liquid and air from said element creating a substantial vacuum therein to cause said element to collapse against said laundry to squeeze out the liquid by atmospheric pressure on the outside thereof, and means for applying heat to said laundry comprising a heating element located centrally of said agitator to evaporate liquid therefrom while said liquid is subjected to a reduced vapor pressure created by said vacuum.

2. Mechanism as in claim 1 wherein said means for applying heat to the laundry comprises an electric heating element disposed centrally of said agitator.

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