July 13, 1965 R. G. FECHO 3,194,398

METHOD OF BREAKING ADHESION OF WET CLOTHES TO THE WALLS OF A ROTARY EXTRACTOR

Filed June 7, 1961 2 Sheets-Sheet 1

Fig. 1.

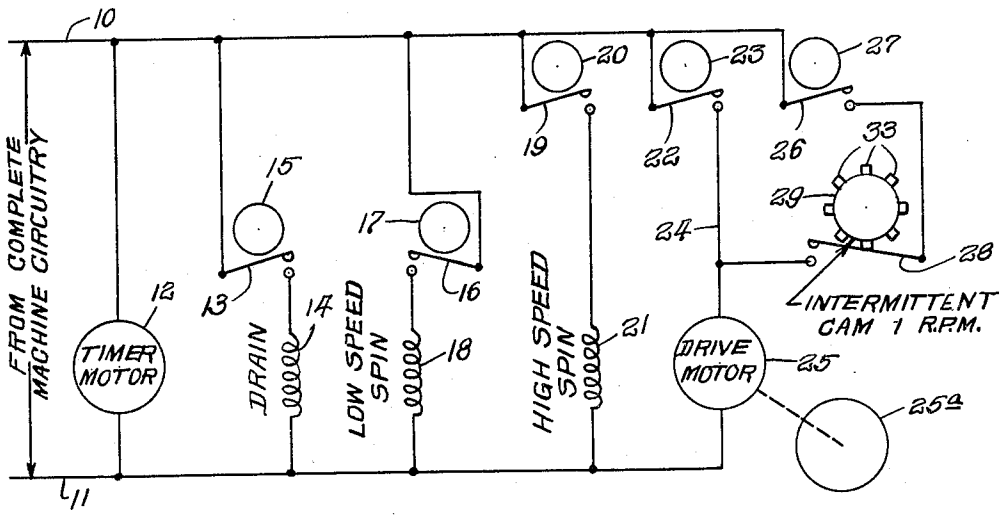
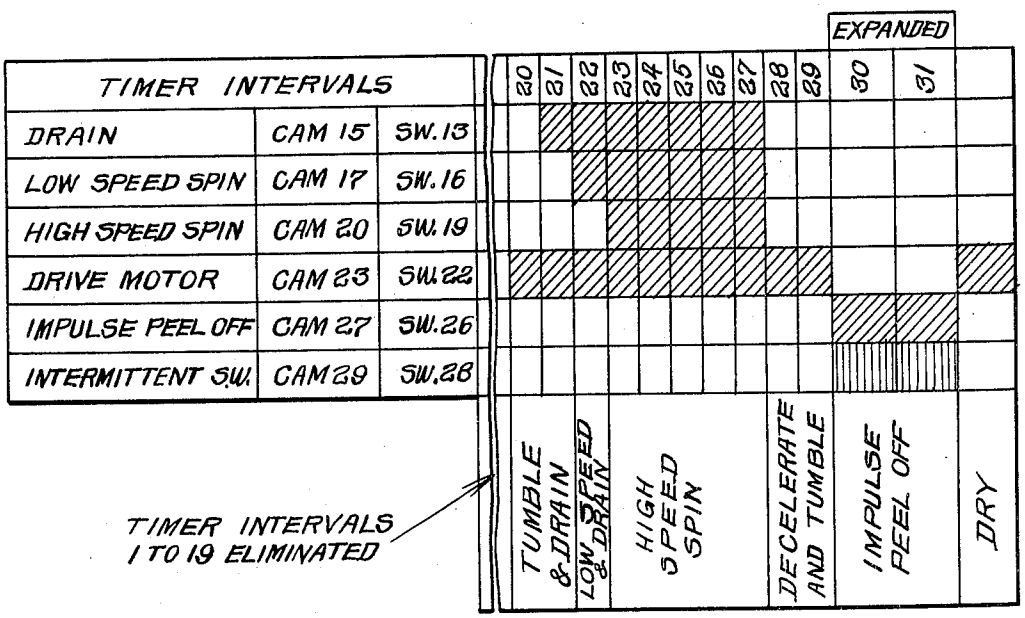


Fig. 2.



Inventor:
Rhine G. Fecho,
By Wegner, Brady, Wegner, Allen & Stellman, Attys.

July 13, 1965 R. G. FECHO 3,194,398

METHOD OF BREAKING ADHESION OF WET CLOTHES TO THE WALLS OF A ROTARY EXTRACTOR

Filed June 7, 1961 2 Sheets-Sheet 2

Fig. 4.

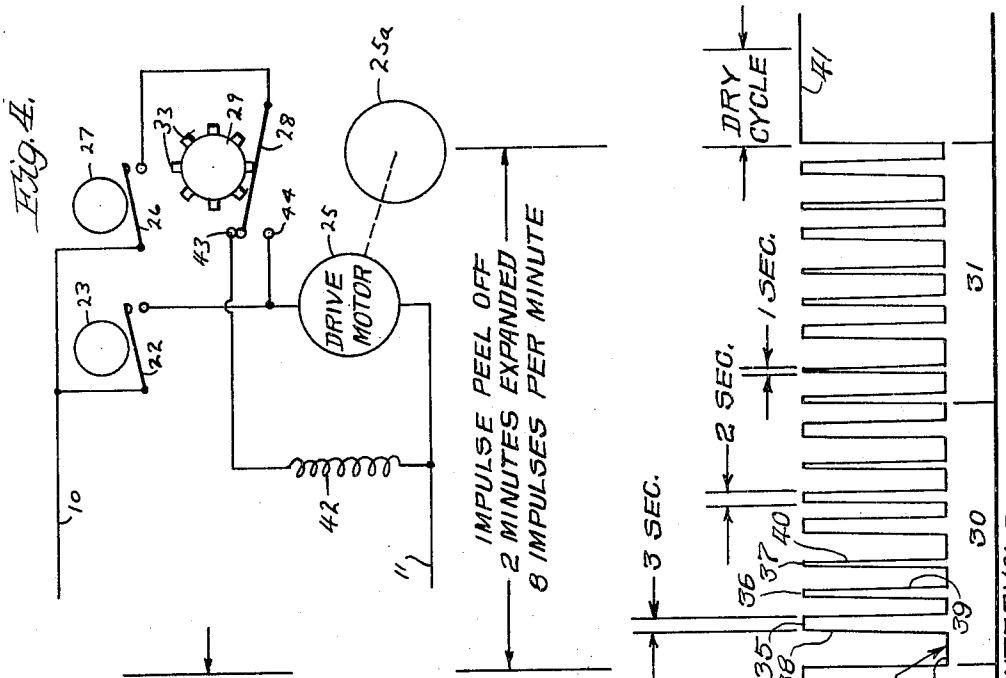
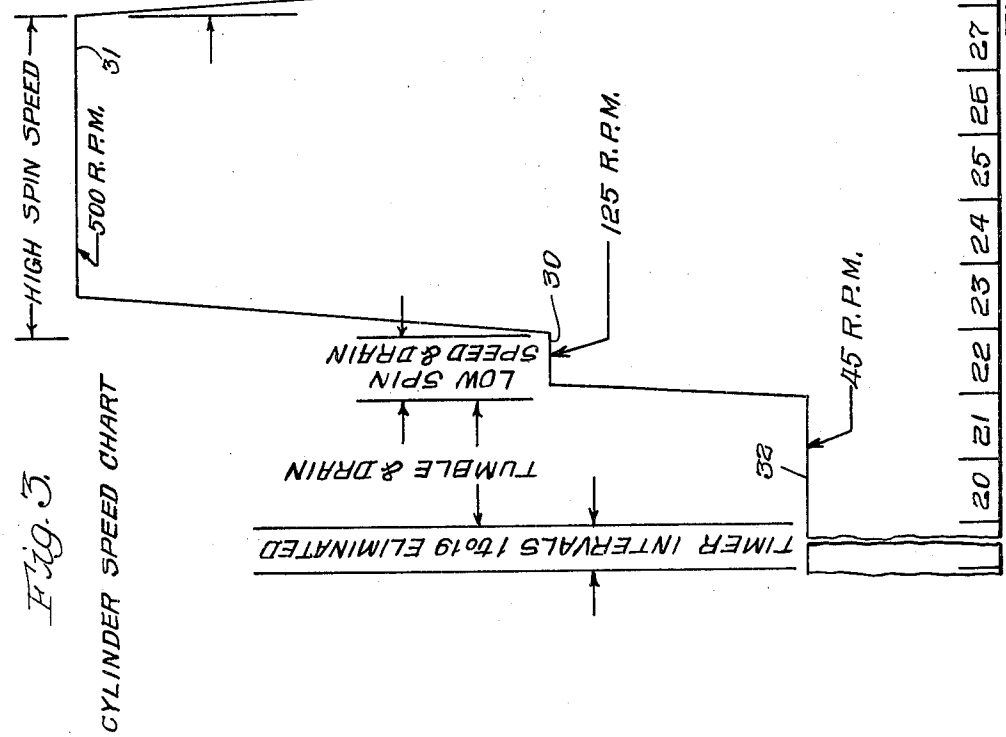


Fig. 3.



United States Patent Office 3,194,398 Patented July 13, 1965

3,194,398

METHOD OF BREAKING ADHESION OF WET CLOTHES TO THE WALLS OF A ROTARY EXTRACTOR

Rhine G. Fecho, Baroda, Mich., assignor to Whirlpool Corporation, a corporation of Delaware

Filed June 7, 1961, Ser. No. 115,459
2 Claims. (Cl. 210—78)

This invention relates to a method of breaking the adhesion of a wet clothes load to the walls of a high speed rotary fluid extractor following high speed extraction of fluid in a laundry machine.

In modern day laundry devices, particularly for household use, certain of these devices operate to remove water from the wet clothes load following the washing and rinsing cycles by high speed spinning of a drum or cylinder so that the water will be thrown out by centrifugal force. Many of these extractors operate at extremely high speeds such as around 500 revolutions per minute. This produces a severe clothes adhesion or plastering problem of the clothes load to the inner periphery of the cylinder, particularly in combination washer-dryers, since in these machines the clothes load automatically goes into a tumble dry period after the final extraction or spin period. If the clothes load or any portion thereof does not fall away from the inner surface of the cylinder or drum after the final extraction period, the drying air that passes through the device during the drying cycle will not contact sufficient areas of the load to dry it properly. An even more serious problem, however, is that the adhered portion of the clothes load under the influence of the heated air becomes practically baked to the inner surface of the drum or cylinder and will therefore have to be forcefully pulled free after the drying cycle. Those portions of the clothes load that have to be pulled off in this manner are practically always in a wet-to-damp condition and frequently are wrinkled so severely that even ironing does not remove these wrinkles.

The present invention successfully solves this problem by providing a method of breaking this adhesion of the wet clothes load to the inner periphery of the cylinder automatically so that this method is particularly applicable to the automatic laundry machines especially of the combination washer-dryer type wherein the entire washing, rinsing and drying operation is automatically controlled.

One of the features of this invention therefore is to provide an improved method of breaking the adhesion of a wet clothes load or any portion thereof to a high speed rotary water extractor containing this load following high speed extraction of the water.

Other features and advantages of the invention will be apparent from the following description thereof taken in conjunction with the embodiment of an apparatus for performing the method of the invention as discussed in the accompanying drawings. Of the drawings:

FIGURE 1 is a diagrammatic representation of a portion of the complete control circuit of an automatic washer-dryer combination including that portion of the circuit that controls the breaking of the adhesion of a wet clothes load to the inner periphery of the machine cylinder according to the method of this invention.

FIGURE 2 is a diagrammatic representation of a timer schedule showing the sequence of operation of the cams and switches of FIGURE 1.

FIGURE 3 is a speed chart for the rotatable cylinder or extractor drum of a washer-dryer combination illustrating one embodiment of the cylinder speeds over timer intervals as controlled by the circuit of FIGURE 1 according to the schedule of FIGURE 2.

FIGURE 4 is a modification of a portion of FIGURE 1 including an electrically operated brake actuator.

The embodiments illustrated in the accompanying drawings are for a customary washer-dryer combination in which washing, rinsing, water extraction and drying with heat applied will take place in the same rotatable cylinder or drum. The cylinder may be rotatable about either a vertical or horizontal axis and the invention here is not dependent upon the type of rotary extractor or upon any particular construction of the machine. A typical washer-dryer combination for home laundry is disclosed in the William F. Scott and Alvin E. Burkall application Serial No. 8,275, filed February 12, 1960, now Patent No. 3,080,059, issued March 5, 1963, and assigned to the same assignee as the present application. As the invention does not depend upon the type of laundry device or of the extractor used only those portions of a device pertinent to the invention, here a washer-dryer combination, are shown.

The wiring diagram of FIGURE 1 is a portion of the complete wiring diagram of a combination washer-dryer home appliance. It includes the controls for the last portions of the washing, rinsing and extracting cycles and thus includes that portion of the cycle used to control the rotation of the cylinder or drum in practicing the method of this invention.

As indicated by the legend in FIGURE 1, electric lines 10 and 11 are from the complete machine circuit. Between these lines is connected the timer motor 12. Also across these lines are connected in series a switch 13 and a solenoid 14 for operating a drain valve (not shown). Switch 13 is controlled by a rotatable cam 15. Connected between the lines 10 and 11 in series is a switch 16 controlled by cam 17 which operates a solenoid 18 for controlling the low speed spinning of the clothes containing cylinder, drum or extractor. Across the lines are connected in series a switch 19 controlled by a cam 20 and a high speed spin solenoid 21. Another switch 22 controlled by a cam 23 is connected to line 10 and then by an electric lead 24 to the driving motor 25 for the cylinder 25*a* of the machine with the other side of the motor being connected to the line 11. The line 10 is also connected to a switch 26 controlled by a cam 27. The switch 26 is in electrical series with the switch 28 whose other side opposite switch 26 is connected to the line 24. Switch 28 is opened and closed by an intermittent cam 29.

The time intervals of the timer schedule of FIGURE 2 and the speed chart of FIGURE 3 are of one minute duration. As can be noted, intervals 1–19 inclusive are omitted as these relate to the washing and rinsing cycles of the combination washer-dryer which form no part of the present invention. In addition, for clarity of illustration the intervals 30 and 31 are expanded in FIGURES 2 and 3.

As described previously, the timer schedule of FIGURE 2 and the speed chart of FIGURE 3 include the final operations of the complete wash cycle of the washer-dryer combination. During intervals 21–27 inclusive the timer cam 15 closes switch 13 to energize solenoid 14 to allow water to drain from the machine. During intervals 22–27 inclusive cam 17 closes switch 16 to energize the low speed spin solenoid 18 to spin the clothes containing cylinder 25*a* at low speed. However, this low speed is only maintained for one minute as indicated by the line 30 of FIGURE 3 because after interval 22 and during intervals 23–27 inclusive cam 20 closes switch 19 to operate the high speed spin solenoid 31 to drive the drum 25*a* at high spin speed as indicated by the line 31 on the speed chart. The spinning of the drum 25*a* at a high spin speed causes the clothes load to be "plastered" against the inner pe-

riphery of the drum. During intervals 25–29 inclusive cam 23 maintains switch 22 closed to operate the drive motor continuously. During intervals 20 and 21 before first the low speed spin and then the high speed spin commence, as explained previously, the motor is rotating the cylinder 25*a* at low tumble speed which is indicated at 32. The low speed spin solenoid 18 and high speed spin solenoid 21 operate clutches in a speed transmission system (not shown) and as shown in intervals 23 through 27 inclusive, it is necessary that both of these clutch control solenoids be energized in order to attain high speed spin.

The tumble speed as illustrated in the speed chart is less than the low spin speed which in turn is less than the high spin speed. These various speeds can be any desired speed so long as the tumble speed is slow enough so that centrifugal force will not hold the clothes load against the inner surface of the cylinder or drum 25*a* but will permit the clothes to fall from the inner surface of the cylinder as it is rotated for proper washing and drying action. In the illustrated embodiments the tumble speed is shown as 45 revolutions per minute, the low spin speed as 125 revolutions per minute and the high spin speed for the efficient extraction of water as 500 revolutions per minute. Thus the term "low" and "high" used herein are recognized as being purely relative terms.

At the beginning of timer interval 30 cam 23 opens switch 22 to break the circuit to the drive motor 25. At this same time cam 27 closes switch 26 so that operation of the drive motor is controlled by intermittent cam 29 operating switch 28. As is shown on the FIGURE 2 schedule, switch 26 is maintained closed through timer intervals 30 and 31 which as explained previously are shown expanded in FIGURES 2 and 3 of the drawings for clarity of illustration.

Cams 15, 17, 20, 23 and 27 in the illustrated embodiments are cams normally associated with appliance timers and rotate one complete revolution per total machine cycle as driven through gear reduction means by timer motor 12. Intermittent cam 29 in contrast to the above cams rotates at one revolution per minute or timer interval and has eight raised sections 33 so that one rotation of cam 29 closes switch 28 eight times. As the switch 26 is closed during intervals 30 and 31 as previously described the drive motor 25 is therefore operated eight times per minute. The representation of cam 29 and raised portions 33 is diagrammatic and a more accurate representation of the intervals during which switch 28 is closed by cam 29 is shown on the righthand side of FIGURE 3.

At the beginning of interval 30 cam 29 opens switch 28 so that the drive motor 25 stops as indicated by the rest line 34. At the end of approximately 5 to 7 seconds switch 28 is closed by one of the cam portions 33 and the motor accelerates to the tumble speed of 45 revolutions per minute since the solenoids 18 and 21 are deenergized at this time and this is maintained for 3 seconds as indicated by the line 35. At the end of this time the switch 28 is again opened so that the motor again comes to a rest. At the end of approximately 3 to 5 seconds, for example, the motor switch 28 is again closed by the next cam portion 33 and the speed is again accelerated to the tumble speed and this time it is maintained for 2 seconds as indicated by the line 36. Again the circuit to the motor is opened so that the motor comes to a rest and shortly thereafter the switch 28 is again closed by the next cam portion 33 so that the motor accelerates to the tumble speed and this is maintained for 1 second as indicated by the line 37. During the cycles of acceleration of the motor from a state of rest to a given speed, such as the illustrated 45 revolutions per minute the lowest available cylinder speed, followed by deceleration of the motor to a state of rest, the drum or cylinder due to its inertia is given a jerk which also jerks or impulses the wet clothes load relative to the cylinder. This tends to break adhered clothes loose from the inner surface of the drum. In the illustrated embodiments these cycles of acceleration, speed maintenance and deceleration with each cycle illustrated at 38, 39 and 40 on the speed chart are of decreasing intervals, here illustrated as 3 seconds, 2 seconds and one second, respectively. This constitutes a series of cycles. In the illustrated embodiments this series of three cycles of decreasing time are repeated throughout intervals 30 and 31. At the end of this series of cycles, all portions of the wet clothes load have been broken loose from adhesion to the inner surface of the drum so that the wet load can be tumbled by the rotating drum and heat applied for the dry cycle in the normal manner as illustrated by the line 41 on the speed chart of FIGURE 3.

In addition to the relative inertia effects between the cylinder and clothes load because of the acceleration and deceleration periods, there are enough of these periods during intervals 30 and 31 to assure that all portions of the adhering clothes will stop while these portions are in the top of the cylinder thus allowing the full force of gravity to act on the adhering portions to aid in their separation from the inner periphery of the cylinder. The different time increments serve further to assure that all portions of the adhering clothes load will come to rest in the top of the cylinder more so than if the acceleration and deceleration periods were of equal time increments.

Thus, as can be seen from the above description of the invention the method by which the adhesion of the wet clothes load to the walls of the high speed rotary water extractor is broken is accomplished by bringing the extractor substantially to a stop, accelerating the extractor to a desired speed which in any event is a plurality of revolutions per minute, again bringing the extractor to a stop to complete the first breaking cycle of acceleration and deceleration then repeating these cycles for a series of cycles. Between each cycle the drum or extractor is preferably brought substantially to a complete stop although of course this is not absolutely necessary as accelerating from a very slow speed during the breaking cycle will produce some beneficial effect. The breaking force of course is more efficient if the extractor is accelerated from a complete stop as then the inertia of the wet clothes load which tends to pull the clothes away from the rotating extractor is at its maximum.

FIGURE 4 is a modification of the circuitry shown in FIGURE 1 and includes a brake actuator solenoid 42 that operates a brake (not shown) that operates when the brake actuator solenoid 42 is energized to instantly brake the drum 25*a* to a stop. A brake of this type can be applied to any part of the drum drive system to accomplish the desired braking function. In the embodiment shown in FIGURE 4 a contact 43 is contacted by the switch arm 28 whenever one of the raised portions 33 of cam 29 is not forcing the switch arm 28 to its lower position against contact 44 to energize drive motor 25. Thus, whenever during intervals 30 and 31 when the drive motor 25 is deenergized, the brake actuator solenoid 42 is energized to cause the drum 25*a* to be instantly braked to the rest position 34 (FIGURE 3). This braking action intensifies the relative inertia effects between the clothes load and the braked cylinder to assure that the entire load will separate from the inner periphery of the drum 25*a*. Because of the increased effectiveness of the brake impulse system of FIGURE 4, there would not have to be as many impulses to assure that the entire clothes load would break free of the inner periphery of the drum.

Having described my invention as related to the embodiments shown in the accompanying drawings, it is my intention that the invention be not limited by any of the details of description, unless otherwise specified, but rather be construed broadly within its spirit and scope as set out in the accompanying claims.

I claim:

1. The method of breaking the adhesion of a wet clothes load to the walls of a high speed rotary fluid ex-

tractor containing said load following high speed extraction of fluid from said clothes load, comprising: bringing said extractor substantially to a stop subsequent to said high speed extraction; accelerating said extractor to a speed of a plurality of revolutions per minute and substantially less than said high speed; maintaining said speed for a period of a fraction of a minute; again bringing said extractor substantially to a stop to complete the first breaking cycle of acceleration, speed maintenance and deceleration; and repeating said cycles for a series of cycles in which each succeeding period of said speed maintained is of shorter duration.

2. The method of centrifuging fluid from wet fabrics comprising, rotating said cylinder at high centrifuging speeds to extract fluid from said fabrics and to plaster said fabrics against said cylinder, alternately braking and accelerating said cylinder to speeds substantially lower than said high speeds in a series of impulsing cycles of varied duration to abruptly change the angular velocity of said cylinder and generate separational inertia forces acting on said fabrics, and stopping said cylinder at substantially different angular positions at the end of each

such cycle to permit gravitational forces to aid in the separation of said fabrics from said cylinder.

References Cited by the Examiner

UNITED STATES PATENTS

2,760,639	8/56	Haverstock	210—68
2,867,107	1/59	Brown	68—24
2,875,526	3/59	Engel et al.	68—20 X
2,967,417	1/61	Bochan	68—24
2,975,902	3/61	Pinder	68—12
2,983,129	5/61	Metzger	68—19 X
2,990,706	7/61	Bochan	68—19 X
3,055,203	9/62	Toma	68—24 X
3,080,059	3/63	Scott et al.	210—144
3,100,387	8/63	Hubbard et al.	68—24 X
3,116,243	12/63	Khan et al.	210—788

FOREIGN PATENTS

829,292	3/60	Great Britain.

REUBEN FRIEDMAN, *Primary Examiner.*

HARRY B. THORNTON, EUGENE F. BLANCHARD, *Examiners.*