United States Patent

Loeb

[15] **3,647,354**

[45] **Mar. 7, 1972**

[54] FABRIC-TREATING METHOD

[72] Inventor: **Leopold Loeb,** Louisville, Ky.

[73] Assignee: **General Electric Company**

[22] Filed: **Nov. 24, 1969**

[21] Appl. No.: **879,031**

[52] **U.S. Cl.** .....**8/158,** 8/137, 68/12 R, 68/20

[51] **Int. Cl.** **D06l 1/00**

[58] **Field of Search** 8/142, 158, 137; 69/23, 28

[56] **References Cited**

UNITED STATES PATENTS

3,030,793	4/1962	Datlow et al.	69/23
3,512,923	5/1970	Dixon et al.	8/142

Primary Examiner—Walter A. Scheel
Assistant Examiner—Philip R. Coe
Attorney—James E. Espe, Harry F. Manbeck, Jr., Frank L. Neuhauser, Oscar B. Waddell and Joseph B. Forman

[57] **ABSTRACT**

An improved fabric-treating method is provided which may be used to treat fabrics with postwash treating chemicals, or to clean previously laundered fabrics of soil and detergent left deposited thereon, to to perform a combination of these functions. When used solely to clean previously laundered fabrics of soil and detergent, the fabrics are tumbled together with a quantity of water and transfer agent. When the process is also used to treat fabrics with postwash treating chemicals, such treating chemicals are tumbled simultaneously with the fabrics, water and transfer agent. In each instance, the quantity of water is sufficient only to dampen the fabrics. The tumbling causes the water and the transfer agent to contact the fabrics and causes soil and detergent from the fabrics to be distributed over the combined surface areas of the fabrics and the transfer agent. When a treating chemical is also employed, the tumbling additionally causes the treating chemical to be distributed over the surfaces of the fabrics. Following such tumbling, the soiled transfer agent is separated from the fabrics, whereby the fabrics are cleaned of soil and detergent distributed onto the transfer agent.

4 Claims, 3 Drawing Figures

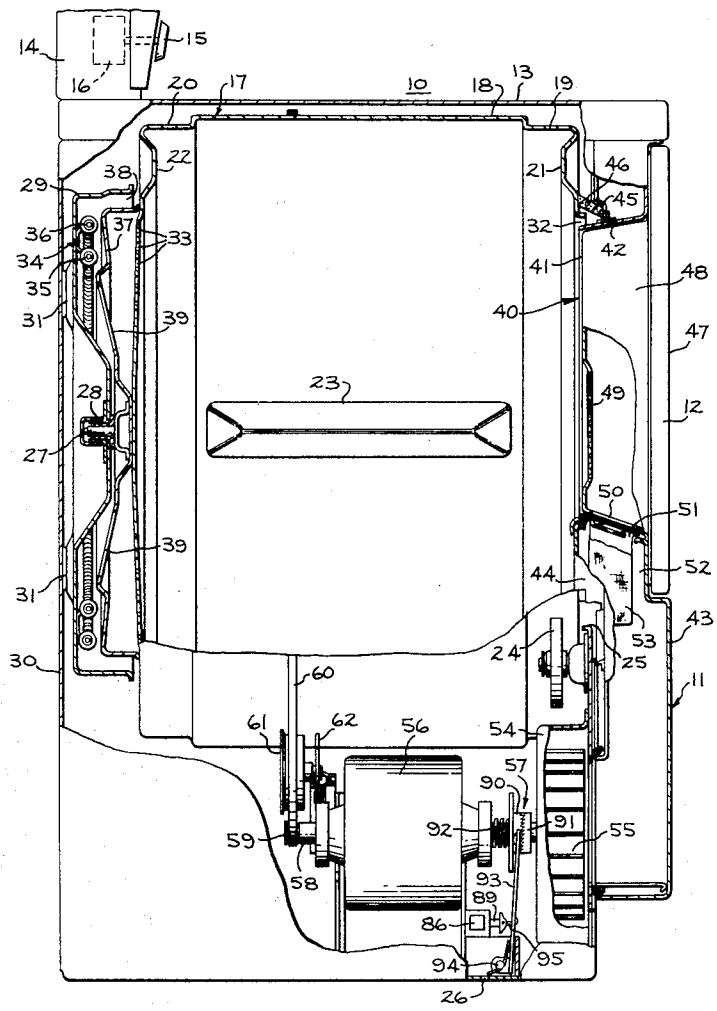
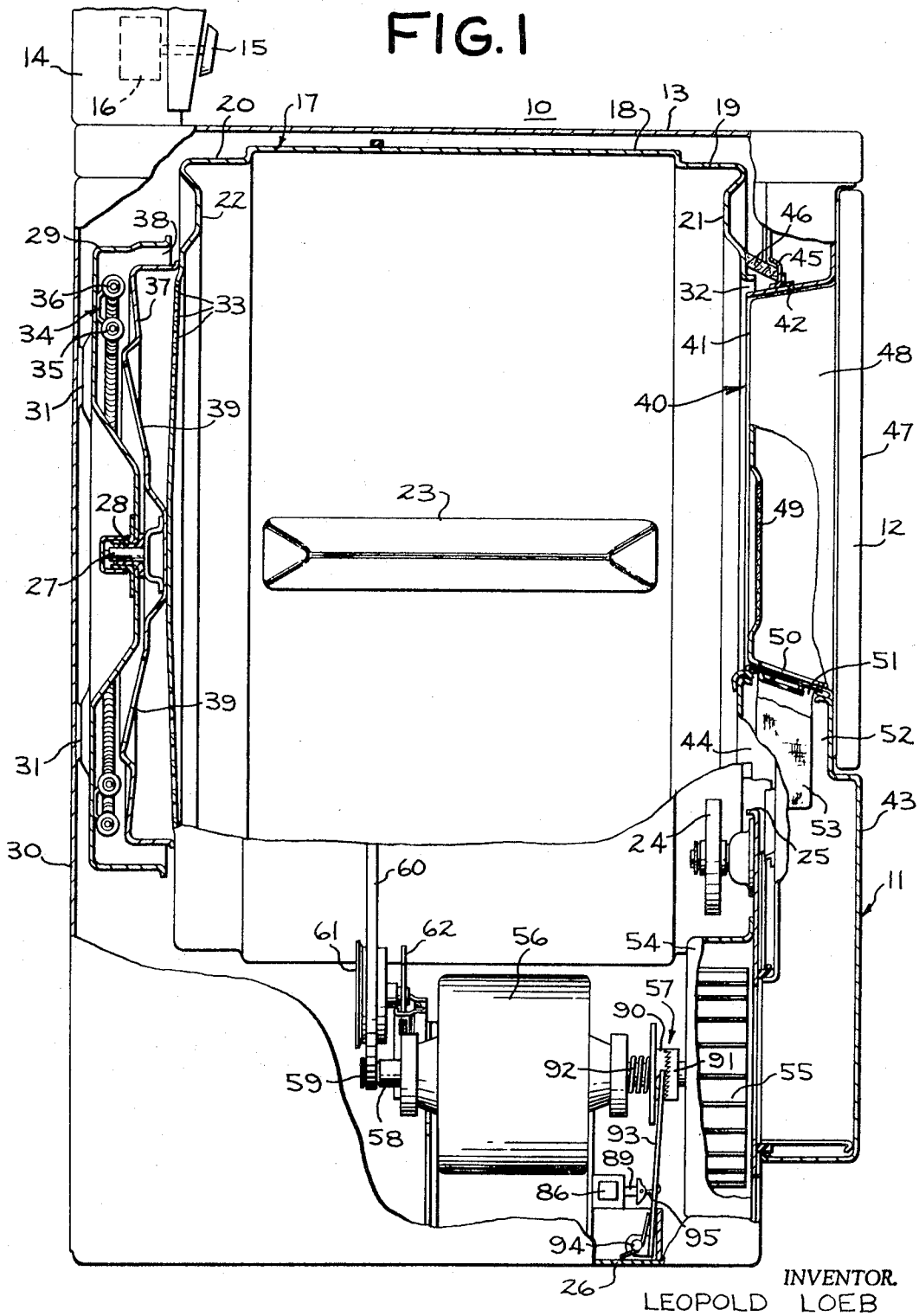


FIG. 1



INVENTOR.
LEOPOLD LOEB

BY James E. Egan
HIS ATTORNEY

FIG.2

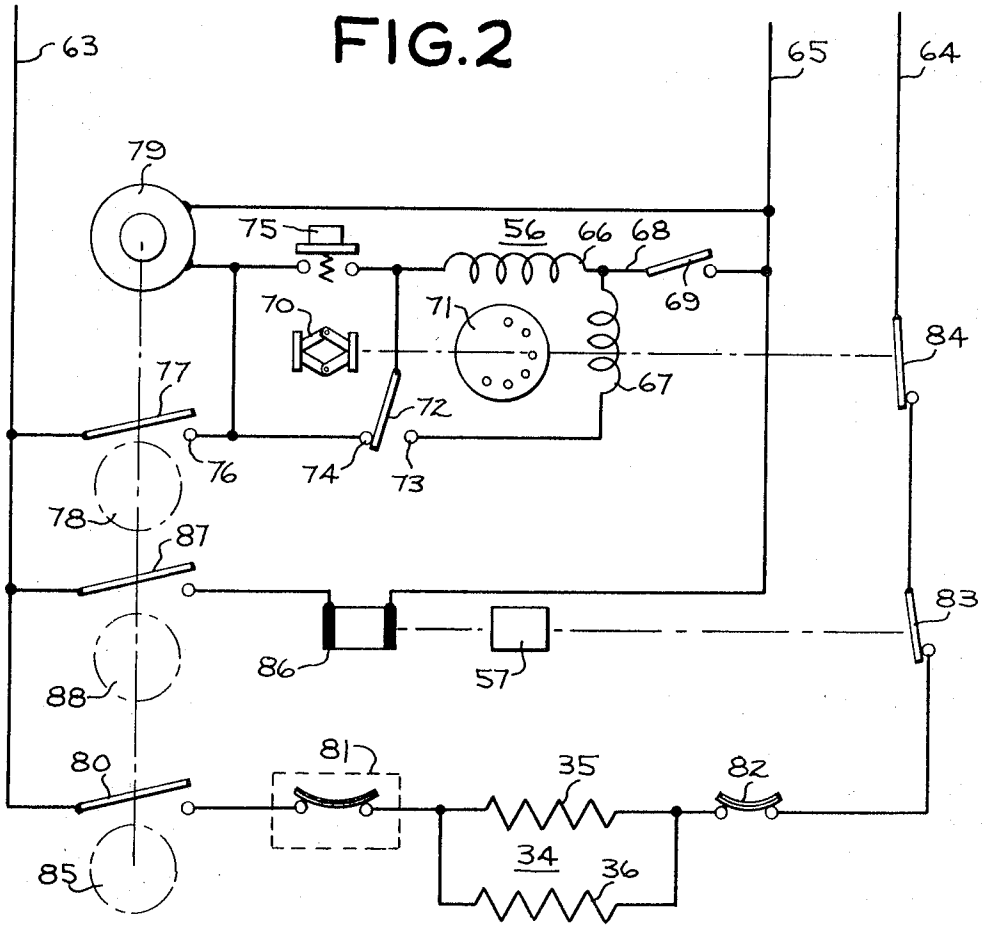
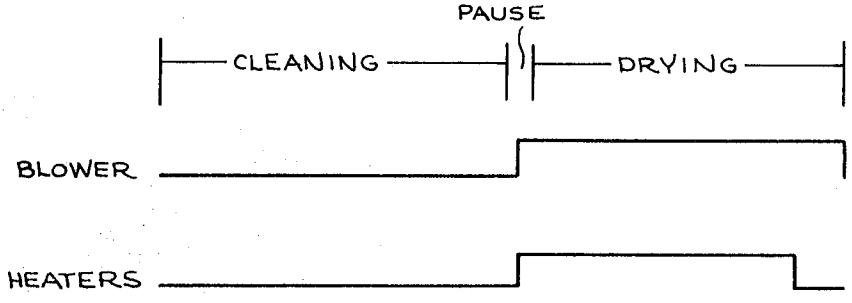


FIG.3



INVENTOR.
LEOPOLD LOEB
BY James E. Espe
HIS ATTORNEY

FABRIC-TREATING METHOD

BACKGROUND OF THE INVENTION

This invention relates to an improved fabric-treating method which may be used to treat fabrics with postwash treating chemicals, or to clean previously laundered fabrics of soil and detergent left deposited thereon, or to perform a combination of these functions.

In an application Ser. No. 879,315 filed concurrently herewith by William J. Ehner and assigned to the assignee of the instant invention, there is disclosed a method, hereinafter called the "dry wash" process, for cleaning soil from fabrics, which process employs a detergent and a quantity of water limited to that needed to only dampen the fabrics. In this regard, the dry wash method differs completely from previously known methods of submergence washing wherein a submergence bath of solution is required to loosen and carry away soil from the fabrics. By the term "dampen" is meant a wetting of the fabrics to a condition where there is some free water present on their surfaces during the cleaning process. The free water should be present in an amount sufficient to give mobility to the detergent employed in the cleaning process so that it is distributed across all of the fabric and transfer agent surfaces. In this regard, a quantity of water equal to 50 to 150 percent of the dry weight of the fabrics has been found to be sufficient. In accordance with the dry wash process, oleophobic oillike materials and particular substances of the nonorganic type may be cleaned from the fabrics by tumbling the fabrics together with the aforedescribed limited quantity of water, and a quantity of detergent and transfer agent. The tumbling causes the water, the detergent and the transfer agent to contact the fabrics, and it causes soil from the fabrics to be distributed over the combined surface areas of the fabrics and the transfer agent. Subsequently, the soiled transfer agent is separated from the fabrics whereby the fabrics are cleaned of the soil distributed onto the transfer agent.

Additionally disclosed and claimed in the aforementioned Ehner application is an improved automatic fabric drying machine, so modified and improved as to permit the performance of the dry wash process therein. It is to be noted, however, that the dry wash process characteristically is a detergent cleaning process, and makes no provision for the treating of fabrics with postwash treating chemicals or the subsequent cleaning of previously laundered fabrics so as to remove soil and detergent deposited thereon in the previous laundering process.

It is therefore an object of my invention to provide an improved fabric-treating method which may be used to treat fabrics with postwash treating chemicals, or to clean previously laundered fabrics of soil and detergent left deposited thereon, or to perform a combination of these functions.

It is a further object of my invention to provide such a fabric-treating method which is adapted to be carried out in the improved apparatus of Ehner.

SUMMARY OF THE INVENTION

Briefly stated, in accordance with one aspect of the present invention, there is provided an improved fabric treating method for removing soil and detergent left deposited on previously laundered fabrics, comprising the steps of tumbling together the fabrics and a quantity of water in contact with unsoiled transfer agent wherein the water comprises a quantity sufficient only to bring the fabrics to a condition of dampness. The tumbling causes the water and the transfer agent to contact the fabrics, and causes soil and detergent from the fabrics to be distributed over the combined surface areas of the fabrics and transfer agent. Thereafter, the soiled transfer agent is separated from the fabrics, whereby the fabrics are cleaned of the soil and detergent distributed onto the transfer agent.

In accordance with another aspect of my invention, an improved fabric-treating method is provided for treating fabrics with postwash treating chemicals, comprising the steps of tumbling the fabrics together with a quantity of water, treating chemical and transfer agent, wherein the water comprises a quantity sufficient only to bring the fabrics to a condition of dampness. The tumbling causes the water and the treating chemical to contact the fabrics and the transfer agent and causes the treating chemical to be distributed over the combined surface areas of the fabrics and transfer agent. Thereafter, the soiled transfer agent may be separated from the fabrics, whereby a quantity of the treating chemical is left distributed on the surfaces of the fabrics.

In accordance with still another aspect of my invention, there is provided an improved fabric-treating method which may be used to simultaneously clean previously laundered fabrics of soil and detergent left deposited thereon and to treat these fabrics with postwash treating chemicals. By this method, the fabrics are tumbled together with a quantity of water, treating chemical and transfer agent, wherein the water comprises a quantity sufficient only to bring the fabrics to a condition of dampness. The tumbling causes the water and treating chemical to contact the fabrics and the transfer agent and causes soil and detergent from the fabrics to be distributed over the combined surface areas of the fabrics and transfer agent while simultaneously causing the treating chemical to be distributed across the surfaces of the fabrics. Subsequently, the soiled transfer agent is transferred from the fabrics, whereby a quantity of the treating chemical is left distributed on the surface of the fabrics and the fabrics are cleaned of the soil and detergent distributed onto the transfer agent.

BRIEF DESCRIPTION OF THE DRAWINGS

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention, it is believed the invention will be better understood from the following description of the preferred embodiments taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a side elevational view of a clothes dryer adapted to clean fabrics according to the method of my invention;

FIG. 2 is a schematic electric circuit diagram illustrating a control circuit for the dryer of FIG. 1; and

FIG. 3 is a sequence control chart illustrating the positions of the switches in the circuit of FIG. 2 during the sequence of operation of the machine of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In accordance with one primary aspect of my invention, a new and improved fabric treating method, hereinafter called the "dry rinse" process, is provided for cleaning and treating fabrics. The method of my invention may be used to treat fabrics with postwash treating chemicals or to clean previously laundered fabrics of soil and detergent left deposited thereon, or to perform a combination of these functions. When used to treat fabrics with postwash treating chemicals, the method of my invention comprises the steps of tumbling together the fabrics and a quantity of water, treating chemical and transfer agent wherein the water comprises a quantity sufficient only to bring the fabrics to a condition of dampness. The tumbling causes the water and the treating chemical to contact the fabrics and the transfer agent and causes the treating chemical to be distributed over the combined surface areas of the fabrics and transfer agent. Subsequently, separation of the soiled transfer agent from the fabrics will leave a quantity of the treating chemical distributed over the surfaces of the fabrics. Treating chemicals of the type contemplated for use with my process may include fabric softeners, water repellents, bacteriostats, bacteriocides, flame retardants, etc.

When the method of my invention is used solely to clean previously laundered fabrics of soil and detergent, the fabrics are tumbled together with a quantity of water and transfer agent wherein the water comprises a quantity sufficient only

to bring the fabrics to a condition of dampness. The tumbling causes the water and transfer agent to contact the fabrics and causes soil and detergent from the fabrics to be distributed over the combined surface areas of the fabrics and transfer agent. Subsequently, separation of the soil and transfer agent from the fabrics will thereby clean the fabrics of the soil and detergent distributed onto the transfer agent.

When the method of my invention is used to simultaneously clean previously laundered fabrics of soil and detergent left deposited thereon and to treat the fabrics with postwash treating chemicals, the fabrics are tumbled together with a quantity of water, treating chemical and transfer agent and the water supplies a quantity sufficient only to bring the fabrics to a condition of dampness. The tumbling causes the water and the treating chemical to contact the fabrics and transfer agent and causes both the distribution of the chemical across the surfaces of the fabric and the distribution of the soil and detergent from the fabric over the combined surface areas of the fabrics and transfer agent. Subsequent separation of the soil and transfer agent from the fabrics will leave a quantity of the treating chemical distributed over the surfaces of the fabrics and will clean the fabrics of the soil and detergent distributed onto the transfer agent. It will be seen that this use of my method is substantially similar to the above-described fabric-treating process except that the fabrics being treated are initially in a somewhat soiled condition, which condition is additionally alleviated by the process here described.

It will be realized that my improved dry rinse method of treating and cleaning fabrics does not utilize the water as a carrier to pick up and hold soil and detergent from the fabrics and subsequently carry these substances to drain. Rather, the dry rinse method of my invention utilizes the water to dampen the fabrics, to wet and loosen soil and detergent, and to give mobility to the treating chemical thereby permitting a thorough distribution of the soil and detergent to be effected over the combined surface areas of the fabrics and transfer agent, and to permit a thorough distribution of the treating chemical onto the surfaces of the fabrics.

The quantity of water employed in my dry rinse process is ideally a quantity sufficient only to bring the fabrics to a condition of dampness. It will be recognized that the fabrics may already be in a condition of dampness from having been previously laundered, hence no water may need to be added. In other instances, a quantity of water must be added to bring the fabrics to a condition of dampness. By the term "dampen," I mean a wetting of the fabrics to a condition where there is some free water present on their surfaces during the cleaning or treating process. The free water should be present in an amount sufficient to give mobility to the treating chemical employed or to the soil and detergent to be removed, so that it may be distributed across the surfaces of the fabrics and transfer agent. A total quantity of water between 50 and 150 percent of the dry weight of the fabrics has been found acceptable in most instances.

A number of materials may be utilized as transfer agents, it being primarily desirable, as set out in the aforementioned Ehner application, that the material employed have a relatively high surface area per unit mass and that it have a compatible affinity for the soil to be cleaned from the fabrics such that the soil can be picked up by the transfer agent. Furthermore, the transfer agent may be either reusable or throwaway as convenience may dictate. Obviously, if the transfer agent is sufficiently inexpensive to be disposed of after a single use, the problem of purging the transfer agent of soil and detergent deposited thereon is obviated. It may also be desirable for the transfer agent to lend itself to automatic separation, whereby the complete dry rinse process may be performed automatically and may also be performed automatically in sequence with other fabric-laundering cycles such as the dry wash process.

Materials which have been successfully tested as transfer agents are terrycloth swatches, foamed rubber and foamed plastic blocks and particles of various configurations, sponges and the like. A transfer agent which appears to have particularly advantageous use in connection with the dry wash and dry rinse processes is polyethylene foam, as taught in two applications assigned to the assignee of the instant invention and filed concurrently herewith, Ser. No. 879,033 by L. A. DePas and Ser. No. 879,034 by B. D. Henderson. As pointed out in the DePas and Henderson applications, polyethylene foam has the advantage of being heat shrinkable, whereby the soiled transfer agent, once separated from the fabrics, may be significantly reduced in volume by heat shrinking to facilitate its disposal. In connection with a 3-pound load of cotton fabrics, for instance, one-eighth pound of polyethylene cubes measuring one-quarter inch on each side have been used successfully with 3 pints of water. By volume, this quantity of transfer agent may be better visualized as approximately 2 quarts of small, resilient foamed cubes.

The method of my invention is particularly adapted for use in an improved domestic automatic clothes dryer of the type disclosed and claimed in the aforementioned Ehner application. Such an improved clothes dryer particularly features selectively energizable means adapted to heat and circulates a stream of moving air through the enclosure to carry away moisture from the fabrics. To better enable one skilled in the art to understand the method of my invention, such an improved automatic clothes-drying machine is described below.

Referring to the drawings, and initially to FIG. 1 thereof, there is illustrated a domestic automatic clothes dryer **10** including an appearance and protective outer cabinet **11** having a door or closure **12** to provide access to the interior of the cabinet for loading and unloading fabrics. Provided on the top **13** of cabinet **11** is a control panel **14** which may, in a conventional way, include a suitable manual control **15** connected to a control assembly **16** mounted in the panel **14**. By manual setting of control **15**, the machine may be caused to start and automatically proceed through a cycle of operation.

Within cabinet **11**, there is provided a clothes-tumbling enclosure or drum **17** mounted for rotation on a substantially horizontal axis. Drum **17** is substantially cylindrical in shape, having a center cylindrical wall portion **18**, and outer cylindrical wall portions **19** and **20**, located respectively adjacent an annular front wall **21** and a circular rear wall **22** of the drum. Wall portions **18**, **19**, **20** are substantially imperforate to enable the drum or enclosure **17** to hold a depth of approximately 1 inch of liquid. On the interior surface of wall portion **18** there are a plurality of clothes-tumbling rubs **23** so that clothes are lifted up when the drum rotates, and then permitted to tumble back down to the bottom of the drum. The front of the drum **17** may be rotatably supported within outer casing **11** by suitable idler wheels, one of which is indicated by the numeral **24**. These wheels are rotatably secured to the top of the member **25** which extends up from the base **26** of the machine. The wheels **24** are disposed beneath the drum, in contact with portion **19**, so as to support the portion **19** on each side to provide a stable support.

The rear end of drum **17** receives its support by means of a stub shaft **27** extending from the center of wall **22**. Shaft **27** is secured within a bearing **28** formed in a baffle structure **29** which, in turn, is rigidly secured to the backwall **30** of the cabinet **11** by any suitable means such as welding at a number of points **31**. With the arrangement shown the drum may rotate on a horizontal axis, with rollers **24** providing the front support and stub shaft **27** within bearing **28** providing the rear support.

In order to provide for the flow of a stream of drying air through the clothes drum, it is provided with a central aperture or opening **32** in the front wall **21** and a plurality of perforations **33** in the rear wall **22**. The perforations **33** in the present case are formed to extend around the rear wall in the annulus. The opening **32** is in alignment with the opening in cabinet **11** covered by door **12**, and thus serves a dual purpose in that it also provides access to drum **17** for loading and unloading fabrics.

As has been stated, baffle structure 29 is rigidly secured to the backwall 30 of cabinet 11. Baffle structure 29 also serves to support heating means 34 which includes two resistance-type electrical heating elements 35 and 36, appropriately insulated from the baffle member. Elements 35 and 36 may be annular in shape so as to be generally coextensive with perforations 33 in drum 17. A baffle member 37 is rigidly secured to the rear wall 22 of the drum 17 outside the ring of perforations 33 and within the stationary baffle structure 29, so that an annular air inlet 38 is defined by baffles 29 and 37. In this manner a passage is formed for air to enter air inlet 38 between the baffles, pass over the heating means 34, and then pass through centrally located openings 39 formed in baffle 37 and perforations 33 into the interior of drum 17.

The front opening 32 of the drum is substantially closed by means of a stationary bulkhead generally indicated by numeral 40. Bulkhead 40 is made up of a number of adjacent members including the inner surface 41 of the access door 12, a stationary frame 42 formed as a flange on front wall 43 of the cabinet, the inner surface of an exhaust duct formed by the cooperation of member 44 and the front wall 43 of the cabinet, and an annular flange 45 mounted on the frame 42 of the front wall 43. It will be noted that a suitable clearance is provided between the inner edge of aperture 32 and the edge of bulkhead 40 so that there is no rubbing between the drum and the bulkhead during rotation of the drum. In order to prevent substantial air leakage through the aperture 32, a suitable ring seal 46 is secured to the flange 45 in sealing relationship with the exterior surface of the drum wall 21. Door 12, whose inner surface forms part of the bulkhead closing the opening, is mounted on cabinet 11 so that when the door is opened fabrics may be inserted into and removed from the drum through the door frame 42. It will be noted that the door includes an outer, flat imperforate section 47 and an inwardly extending hollow section 48, mounted on the flat outer section. Hollow section 48 extends into the door frame 42 when the door is closed, and the door surface 41 which comprises part of the combination bulkhead 40 is actually the inner wall of the hollow section.

The air outlet from the drum is provided by a perforated opening 49 formed in the inner wall 41 of hollow door section 48. The bottom wall section of door 12 and the adjacent wall of door frame 42 are provided with aligned openings 50 and 51, opening 51 providing an entrance to a duct 52 formed by the cooperation of member 44 with front wall 43. A lint trap 53 may be positioned in the exhaust duct 52 within opening 51 and supported by the door frame 42. Duct 52 leads downwardly and communicates with a housing 54. Housing 54 contains a blower 55 driven by motor 56 through clutch 57. The blower draws heated air through the duct 53 and then exhausts it from the cabinet 11 through an appropriate duct (not shown).

In addition to driving the blower, motor 56 constitutes the means for effecting rotation of drum 17. In order to effect this rotation, motor 56 is provided with a shaft 58 having a small pulley 59 formed at one end thereof. A belt 60 extends around the pulley 59 and also entirely around the wall section 18 of drum 17. The relative circumferences of the pulley 59 and the wall section 18 cause the drum to be driven by the motor at a speed suitable to effect tumbling of fabrics in the drum. In order to effect proper tensioning of the belt 60, a suitable idler assembly 61 is secured to the same support 62 which supports one end of the motor. Thus, air is pulled through the drum and, at the same time, the fabrics within the drum are tumbled. When the air passing through the drum causes vaporization of the moisture from the clothes, the vapor is carried off with the air as it passes out of the machine.

Referring now to FIG. 2, there is shown a schematic electric circuit diagram illustrating a basic or simplified control arrangement for the dryer of FIG. 1. It will be understood that many refinements such as temperature selection means, multiple-cycle selection means, and fabric temperature or resistance responsive control means for automatically concluding the operation of the dryer, etc., have not been shown in the circuit of FIG. 2 for the sake of simplicity. As shown, the entire control system of the machine may be energized across a three-wire power supply system which includes supply conductors 63 and 64 and a neutral conductor 65. For domestic use, conductors 63 and 64 will normally be connected across a 230-volt power supply, with 115 volts appearing between the neutral line 65 and each of the conductors, and with the neutral line being at ground voltage. Motor 56, connected between conductors 63 and 65, is a single-phase induction motor having a main winding 66 and a start winding 67, both connected at a common end to a conductor 68. Through a conventional door switch 69 (which is closed when door 12 is closed and open when the door is open) conductor 68 is connected to conductor 65.

Start winding 67 is connected in parallel with main winding 66 under the control of a speed responsive device such as that shown at 70, which is schematically shown as connected to rotor 71 of the motor. The speed responsive device 70 controls a switch 72 which is engageable with either a contact 73 or a contact 74. Switch 72 is engaged with contact 73 when the machine is at rest, and moves into engagement with contact 74 as the motor comes up to speed. It can rely be seen that engagement with contact 73 connects the start winding 67 in parallel with main winding 66, while movement of switch 72 away from this position opens the start winding. Thus, as rotor 71 comes up to speed, the start winding becomes deenergized and the motor then continues to run on the main winding 66 alone.

The starting of the motor is provided by a manually operable switch 75 which may, for instance, in the structure of FIG. 1, be moved to its closed position by depressing manual control 15. Switch 75 connects the motor to supply conductor 63 through contact 76 of a switch 77. The switch 75 is normally biased to the open position as shown in FIG. 2. When control 15 is depressed, assuming contacts 76 and 77 are closed, energization of the motor 56 is provided and, within less than a second under normal circumstances, the motor comes up to speed so that switch 72 moves from contact 73 to contact 74. As a result of this movement of centrifugally operated switch 72, the main winding 66 of motor 56 continues to be energized by a bypass around switch 75 when control 15 is released thus opening switch 75.

The switch 77 is controlled by a cam 78 which, in turn, is controlled by a timer motor 79 of the shutoff or timing control means. The cam 78 and timer motor 79 also are connected to manual control 15 so that rotation of the manual control causes the cam to rotate and close switch 77. Thereafter, the cam 78 is controlled by the timer motor 79 and, after a predetermined period of operation of the timer motor, the cam is effective to cause switch 77 to be opened for terminating or interrupting the operation of the machine.

An energizing circuit is also completed for heating means 34 through the following circuit. Starting at conductor 63, the circuit proceeds through a switch 80 and a dryness sensing thermostat 81 to the heater 34, and then through a conventional safety thermostat 82, and through switches 83 and 84 to conductor 64. Switch 80 is controlled by a cam 85 which, in turn, is controlled by timer motor 79. Switch 83 is controlled by a solenoid 86 and is normally closed when solenoid 86 is not energized. Switch 84 is centrifugally responsive to the speed of rotor 71 and is closed only when motor 56 has come up to speed so that there can be no energization of the heating means 34 except when motor 56 is operating properly. Thermostat 81 is positioned so as to sense the temperature of the fabrics within drum 17, or a temperature which varies substantially directly with the clothes temperature. When the clothes are at a temperature which indicates dryness, thermostat 81 will open, deenergizing heater 34.

With the possible exception that the wall portions 18, 19 and 20 of drum 17 are imperforate, the foregoing description substantially sets forth the configuration and arrangement of known domestic automatic dryers.

In order to carry out either the dry rinse method of my invention or the dry wash process taught by Ehner in the machine of FIG. 1, it is necessary that the means provided therein for heating and circulating air through the enclosure be selectively energizable. It is to be understood that during the dry rinse cleaning cycle, it is desirable to deenergize or to substantially deactivate both the air-heating and air-circulating means, so as to prevent undesired evaporation of the limited amount of water used to wet the fabrics. Therefore control means are provided which are adapted to substantially disable the air-circulating means or blower **55** and the heating means **34** so as to selectively permit the rotation of the drum or enclosure **17** with or without the flow of heated air therethrough. Such control means, in the embodiment of FIGS. **1** and **2**, comprises solenoid **86** connected on one side to neutral conductor **65**, and on the other side through a switch **87** to conductor **63**. The switch **87** is controlled by a cam **88** which, in turn, is controlled by timer motor **79**. Solenoid **86** operates an armature **89** which, when solenoid **86** is energized, disconnects motor **56** from blower **55** by means of clutch **57**, and which simultaneously opens switch **83**. Thus, when solenoid **86** is energized, blower **55** and heating means **34** are deenergized.

As many best be seen in FIG. **1**, clutch **57** comprises two frictionally engageable members **90** and **91**, member **90** being connected to output shaft **58** of motor **56**, and member **91** being connected to blower **55**. Members **90** and **91** are normally held in driving engagement by means of compression spring **92**. However, when armature **89** is moved inwardly of solenoid **86** by energization of solenoid **86**, lever **93** pivoted at **94** and attached to armature **89** by link **95** operates to move member **90** out of engagement with member **91**, thereby disengaging blower **55** from motor **56**.

In operation, the machine of FIG. **1** may be programmed to perform the entire cleaning and carrier separation functions of the dry wash and dry rinse processes, as well as a normal drying function, or separate ones of such functions. Cams **85** and **88** may be so designed such that during the cleaning function, switch **87** is closed causing solenoid **86** to deenergize blower **55** and heating means **34**, while during the drying operation, switch **87** is open and switch **80** is closed. By this arrangement, as may be better seen in FIG. **3**, the blower **55** is deenergized during cleaning but operates continuously during drying, while the heating means **34** is deenergized during cleaning and selectively energized during drying under the control of sensing means **81**.

In order to perform the dry rinse process of my invention in the machine of FIG. **1**, the fabrics to be cleaned or treated are placed into drum **17** along with the aforedescribed quantity of water and transfer agent. A treating chemical is additionally placed within the drum if it is desired to perform a postwash treating function. Control **15** is then moved to initiate operation of the machine in the dry rinse mode wherein heating means **34** and blower **55** are substantially deactivated during the rotation of drum **17**. The fabrics, water, treating chemical and transfer agent are thereby tumbled together causing soil and detergent from the fabrics to be distributed over the combined surface areas of the fabrics and transfer agent, and causing the treating chemicals to be distributed over the surfaces of the fabrics as previously described. Following this tumbling operation, separation of the transfer agent may be accomplished automatically during the initial portion of the drying operation. By way of illustration, if the transfer agent being used is ¼-inch cubes of polyethylene foam, such cubes are sufficiently buoyant to be carried out of drum **17** by the initiation of air circulation therethrough, whereafter such cubes may be caught in lint trap **53** or the like. In the alternative, such separation may be performed manually between the cleaning and drying operation.

From the foregoing, it should now be apparent that the method of my invention provides a new and improved process for treating and cleaning fabrics through tumbling contact with a transfer agent which causes distribution of the soil and detergent onto the combined surface areas of the transfer agent and the fabrics, and which may also be used to distribute a postwash chemical treating agent onto the fabrics. By such a method, the fabrics may be cleaned of the soil and detergent deposited onto the transfer agent by separating the transfer agent from the fabrics at the end of the tumbling operation.

As will be evident from the foregoing description, certain aspects of the invention are not limited to the particular details of the examples illustrated, and it is contemplated that other modifications or applications will appear to those skilled in the art. It is, therefore, intended that the appended claims cover such modifications and applications as do not depart from the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In connection with a method of cleaning soil from fabrics by tumbling together the fabrics and a dampening quantity of water, detergent and polyethylene foam transfer agent and subsequently separating the soiled transfer agent from the fabrics, and wherein the fabrics after the separation of the transfer agent are in a condition of dampness; the improvement of a method for subsequently removing soil and detergent left deposited on the fabrics, comprising the steps of:

tumbling together the damp fabrics and a quantity of unsoiled transfer agent, wherein the transfer agent comprises a polyethylene foam material having a large surface area per unit mass;

the tumbling causing the transfer agent to contact the fabrics, and causing soil and detergent from the fabrics to be distributed over the combined surface areas of the fabrics and the transfer agent; and thereafter

separating the soiled transfer agent from the fabrics, whereby the fabrics are cleaned of the soil and detergent distributed onto the transfer agent.

2. The invention of claim **1** wherein at least one treating chemical is simultaneously tumbled together with the fabrics and unsoiled transfer agent, whereby the fabrics are treated with said treating chemical while being cleaned of soil and detergent.

3. In connection with a method of cleaning fabrics in a domestic automatic clothes dryer of the type arranged for drying fabrics by tumbling them in an enclosure rotatable about a nonvertical axis, and having selectively energizable means adapted to heat and circulate a stream of moving air through the enclosure to carry moisture away from the fabrics, the method comprising the steps of placing the fabrics to be cleaned into the rotatable enclosure along with a dampening quantity of water, detergent and polyethylene foam transfer agent, rotating the enclosure with the air heating and circulating means deactivated whereby the fabrics, water, detergent and transfer agent are tumbled together causing the water, the detergent and the transfer agent to contact the fabrics, and causing soil from the fabrics to be distributed over the combined surface areas of the fabrics and the transfer agent, and thereafter separating the soiled transfer agent from the fabrics which remain in a condition of dampness whereby the fabrics are cleaned of the soil distributed onto the transfer agent, the improvement of a method of subsequently removing soil and detergent left deposited on the fabrics, the method comprising the steps of:

placing the damp fabrics into the rotatable enclosure along with a quantity of unsoiled transfer agent, wherein the unsoiled transfer agent comprises a polyethylene foam material having a large surface area per unit mass;

rotating the enclosure with the air heating and circulating means substantially deactivated whereby the fabrics and transfer agent are tumbled together;

the tumbling causing the water and the transfer agent to contact the fabrics, and causing soil and detergent from the fabrics to be distributed over the combined surface areas of the fabrics and the transfer agent; and thereafter

separating the soiled transfer agent from the fabrics, whereby the fabrics are cleaned of the soil and detergent distributed onto the transfer agent.

4. The invention of claim 3 wherein at least one finishing chemical is simultaneously tumbled together with the fabrics and unsoiled transfer agent, whereby the fabrics are treated with said treating chemical while being cleaned of soil and detergent.

* * * * *