

July 20, 1948.

J. W. DICKEY
LAUNDRY DRIER

2,445,516

Filed Aug. 5, 1944

3 Sheets-Sheet 1

Fig. 1

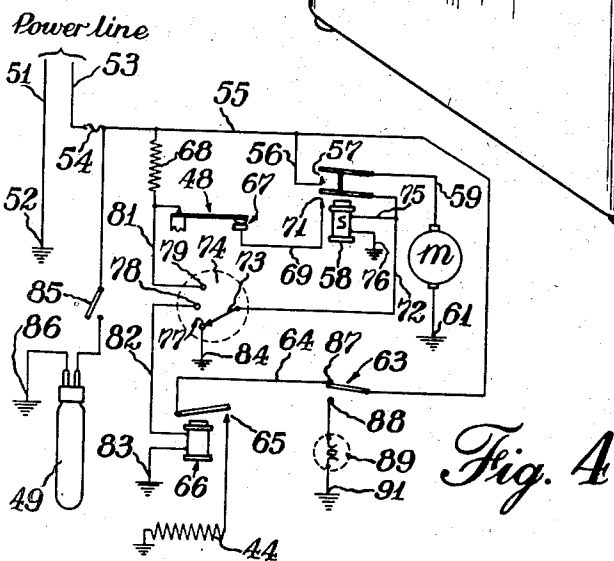
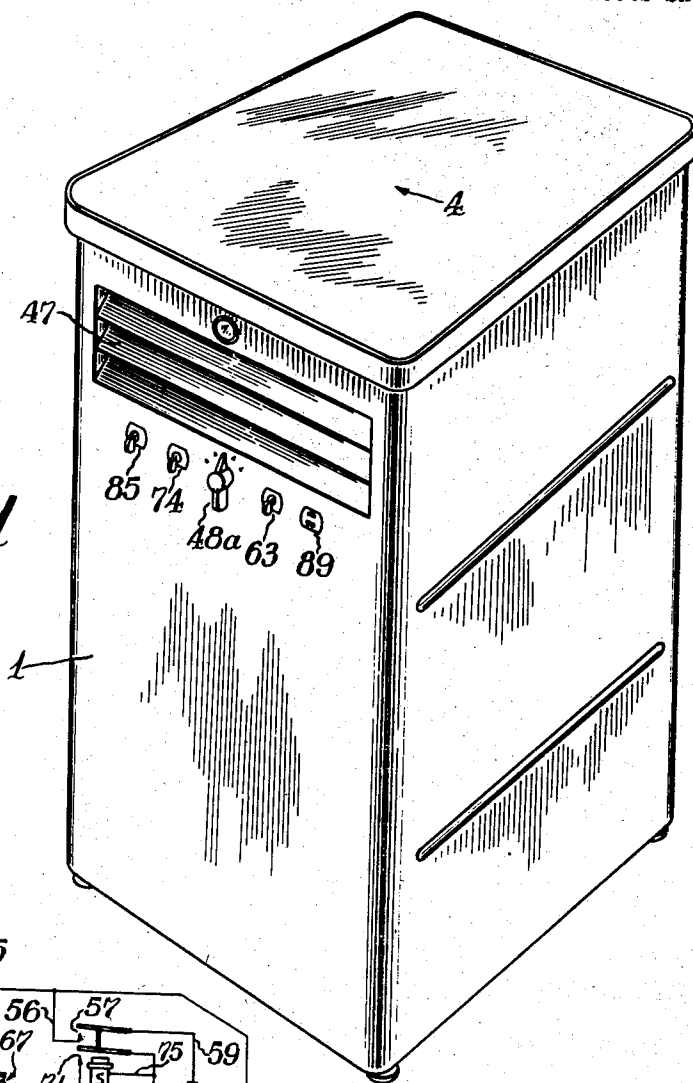


Fig. 4

Witness:
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3 Sheets-Sheet 2

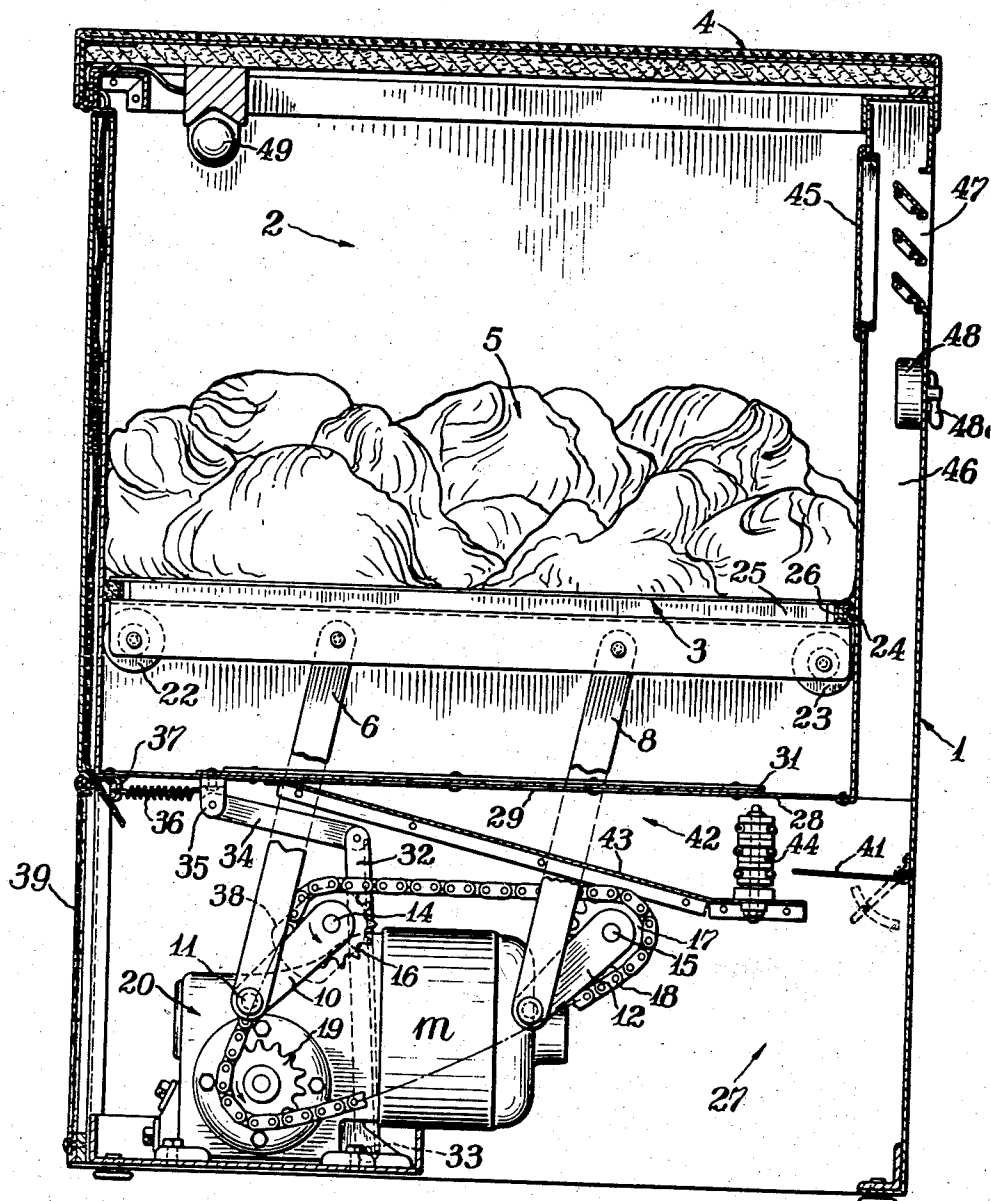


Fig. 2

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LAUNDRY DRIER

3 Sheets-Sheet 3

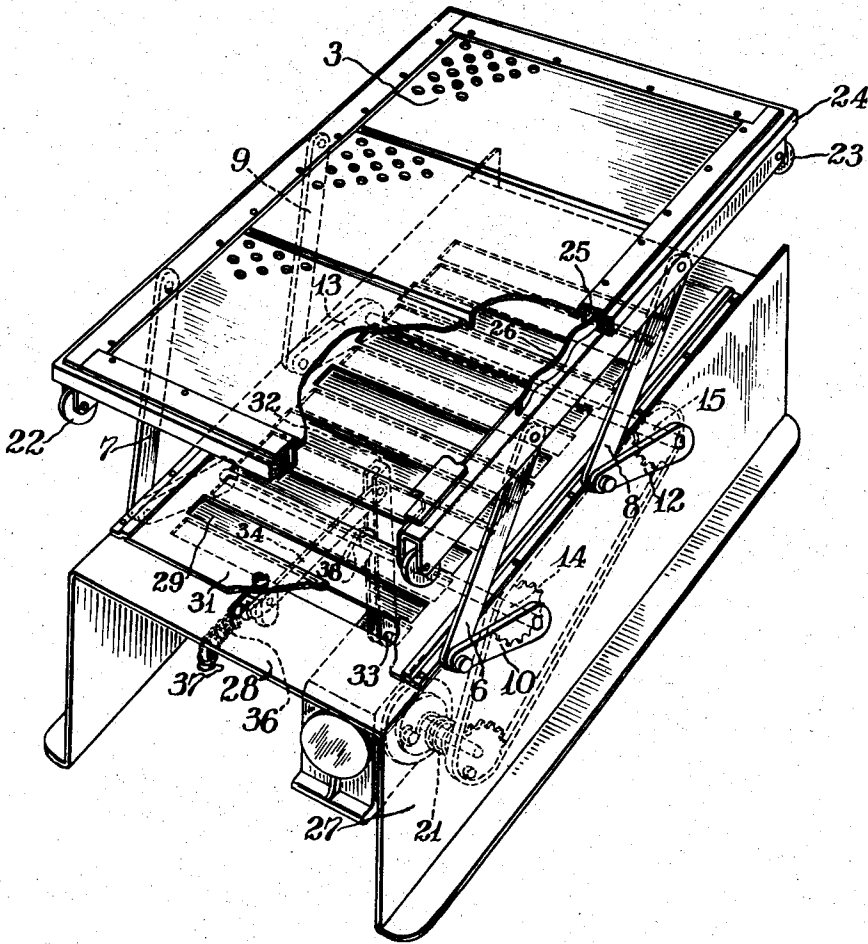


Fig. 3

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Patented July 20, 1948

2,445,516

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UNITED STATES PATENT OFFICE

2,445,516

LAUNDRY DRIER

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Application August 5, 1944, Serial No. 548,209

3 Claims. (Cl. 34-44)

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The present invention relates to a laundry dryer, and more particularly to a mechanical unit which is especially suitable for domestic use.

It is an object of the present invention to provide a novel laundry dryer which agitates the material to be dried while forcing warm, dry air therethrough so as to remove the moisture evenly and quickly while fluffing the material and preventing matting of the fibers.

It is another object to provide such a device in which the material to be dried is reciprocated vertically by a tossing action, while jets of air are directed upwardly through the material during the downward motion thereof.

It is another object to provide such a device in which the material to be dried is enclosed in a chamber, the bottom of which is a reciprocable perforated diaphragm, said material cooperating with the openings in the diaphragm after the manner of check-valves to permit upward flow of air through the material but opposing reversal of the flow.

It is another object to provide such a device incorporating valve means beneath the diaphragm admitting air during upward movement of the diaphragm and closing during downward movement so as to force the air up through the fabric to be dried.

It is another object to provide such a device in which the drying operation is automatically stopped when a predetermined reduction in the moisture content of the fabric has been secured.

It is another object to provide such a device in which the end point of the drying operation is determined by reference to the temperature of the emergent air.

It is another object to provide such a device incorporating means under the control of the operator for recirculating a portion of the emergent air in order to further control its temperature and relative humidity.

It is a further object to provide such a device which is so arranged as to prevent overloading the power supply by insuring that the means for agitating the material to be dried shall be rendered operative prior to energization of the heating means for the circulating air.

It is another object to provide such a device incorporating means for sterilizing the fabric, such means being effective to inhibit mildew of the material when it is stored in a damp condition prior to ironing.

Further objects and advantages will be apparent from the following description taken in

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connection with the accompanying drawing in which:

Fig. 1 is a perspective view of a preferred form of cabinet dryer;

Fig. 2 is a vertical section through the dryer;

Fig. 3 is a detail in perspective of the actuating means for the diaphragm and valve mechanism; and

Fig. 4 is a schematic diagram of the various operative elements of the dryer with their electrical circuits and control switches.

In Figs. 1 and 2 there is illustrated a dryer cabinet 1 providing a vertically extending chamber 2, the bottom of which is formed by a perforated diaphragm 3 which is vertically reciprocable therein so as to act as a piston. The top 4 of the cabinet is removable either completely or by a hinged connection if preferred in order to give access to the chamber for charging or removing the material 5 to be dried.

Means for reciprocating the diaphragm 3 in the chamber so as to toss the material 5 vertically is provided in the form of pairs of links 6, 7, 8, 9 pivoted at their upper ends to the diaphragm and at their lower ends to pairs of cranks 10, 11, 12, 13, respectively. Cranks 10, 11 are fixed on a cross shaft 14; cranks 12, 13 are fixed on a similar cross shaft 15 and means for rotating the cranks in unison is provided in the form of a pair of sprockets 16, 17 rigidly connected to the shafts 14 and 15 respectively and arranged to be rotated by a chain 18 driven from a sprocket 19 which is actuated by a motor M through a transmission 20. The driving sprocket 19 may be actuated positively by the transmission, or if desired a resilient connection such as indicated at 21 in Fig. 3 may be employed to smooth out the load on the motor and to increase the tossing action of the diaphragm.

Anti-friction guide means such as rollers 22, 23 are provided for guiding the diaphragm 3 in its vertical movement, and an obturating means is preferably provided for restricting the passage of air by the diaphragm. As here shown this means is in the form of a strip of packing material 24 located in a peripheral channel 25 of the diaphragm and pressed outwardly against the inner surfaces of the chamber 2 by suitable means such as an undulating strip of elastic material 26 (Fig. 3).

A channel shaped enclosure member 27 is located in the base of the cabinet 1 so as to form a chamber, housing the motor M and transmission 20, and acting as a conduit for incoming air whereby the motor is cooled, and its heat used

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to warm the air. The top 28 of this enclosure is provided with parallel slots 29, and a shutter 31 is slidably mounted thereon for covering and uncovering these slots thereby constituting valve means for controlling the admission of air into the space below the diaphragm 3.

Means for actuating the shutter 31 are provided comprising a lever 32 pivoted at 33 to the base of the cabinet and connected by a link 34 to a lug 35 projecting downwardly from said shutter. A spring 36 attached to the lug 35 and to a fixed anchorage 37 normally tends to move the shutter in a direction to open the valve means, while a cam 38 fixed on the crank shaft 14 is arranged to engage lever 32 and thereby move the shutter 31 into closed position during the downward movement of the piston 3, while permitting the shutter to be moved by the spring 36 into open position when the piston is raised.

The air to be circulated through the dryer is arranged to enter the motor chamber through a grille 39, and to flow past the damper 41 into a heating chamber 42 partitioned off from the lower part of the motor chamber by a wall 43 which slants down from the top 28 of the motor chamber. Electrical heating means 44 are mounted in the heating chamber 42 to raise the temperature of the air before its passage through the material to be dried.

The emergent air is permitted to leave the chamber 2 through a grilled opening 45 which leads into a flue 46 connecting with the outside atmosphere through a set of louvers 47. The lower end of the flue 46 opens into the heating chamber 42 under the control of the damper 41, the position of which determines the relative proportion of fresh air and recirculated air which enters the heating chamber.

According to the present invention, means are provided for stopping the actuation of the dryer when the fabric has been dried to the desired degree. The operation of this control is based upon the fact that the evaporating of moisture from the fabric lowers the temperature of the air passing therethrough, whereby under reasonably constant conditions the temperature of the emergent air is an index of the moisture content of the material. It is therefore possible to determine the desired end point of the drying operation by a controlling device which includes a thermostat placed in the exhaust passage from the dryer, the thermostat being adjustable in order to predetermine the desired extent of the drying operation. As shown in Fig. 2, a thermostat 48 is located in the stream of emergent air in the flue 46 and is adjustable by a calibrated setting device 48a to control the operation of the dryer.

Preferably a germicidal lamp 49 is mounted in the top of the chamber 2 in such a manner as to disinfect the contents and inhibit the mildewing of the fabric in those cases in which material may be stored in the container in a damp condition for a considerable length of time prior to ironing.

The wiring arrangement of the various elements is shown schematically in Fig. 4. As there shown one of the conductors 51 of the power line is grounded at 52 and the other conductor 53 is connected through a fuse 54 to a supply lead 55. A motor M is connected to the supply lead 55 by means of lead 56, normally open contacts 57 of a relay 58, and a lead 59, the motor being grounded at 61 to complete its circuit. The heater 44 is also energized from the supply lead

55 through a manual switch 63, lead 64, and normally open contacts 65 of relay 66.

Contacts 67 of thermostat 48 are connected to the supply lead 55 through a resistance unit 68 and are connected by a lead 69 to normally open contacts 71 of relay 58, from whence a wire 72 connects to the rotating arm 73 of a 3 point control switch 74, a tap 75 being provided to energize the relay 58 which is grounded at 76. The control switch 74 is provided with a stop contact 77, a running contact 78 and a starting contact 79. Starting contact 79 is connected by a lead 81 to the resistor 68, running contact 78 is connected by a lead 82 to the coil of relay 66 which is grounded at 83, and the stopping contact 77 is grounded at 84.

The germicidal lamp 49 is connected to the supply lead 55 through a switch 85 and is grounded at 86 to complete its circuit. The switch 63 which controls the heating element 44 is formed as a two-point switch, the point 87 being used to control the heating unit and the point 88 controlling a convenience outlet 89 grounded at 91.

In the operation of the device, starting with the parts in the positions illustrated in Fig. 4, and the container 2 being charged with material 5 to be dried, the arm 73 of switch 74 is moved upward by the operator past the contact 78, closure of which is without effect at this time, and then into engagement with the starting contact 79. This completes a circuit from the power lead 53 through fuse 54, supply lead 55, resistor 68, lead 81, contacts 79, 73, and leads 72 and 75 to the coil of relay 58 thereby energizing the coil and causing closure of contacts 57 and 71. Closure of contacts 57 completes the motor circuit through leads 56 and 59 whereby the motor is energized and the diaphragm 3 is thereby caused to reciprocate rapidly and toss the material 5 vertically upward. At the same time, rotation of the cam 38 causes actuation of the shutter 31 in synchronism with the movement of the diaphragm in such manner as to cause the diaphragm to act as a piston to pump air up through the fabric. In this pumping action the fabric itself co-acts with the openings in the diaphragm in the manner of check-valves to assist the pumping action. The size of the openings in the diaphragm and the number of said openings are so related to the diameter and stroke of the diaphragm that adequate pressure will be built up beneath the diaphragm to produce air jets which penetrate the fabric as it falls after the diaphragm in its down stroke and are thus effective to extract the moisture evenly and rapidly from the fabric.

After the motor M has been started, the arm 73 of switch 74 is moved back to the running contact 78. This does not deenergize the relay 58 inasmuch as the closure of contact 71 completes a holding circuit for said relay through the thermostatic contacts 67. Closure of contacts 73, 78 thus causes energization of relay 66 through leads 82, 83, thereby closing contacts 65 and causing energization of the heater 44. The air entering the chamber 42 is thus preheated in order to increase its effectiveness in extracting moisture from the fabric to be dried.

The drying operation continues until the moisture content in the fabric has been reduced to such a point that the temperature of the emergent air rises to a predetermined degree. When this point is reached the thermostatic contacts 67 open thus deenergizing relay 58 which permits contacts 57 and 71 to open thereby stopping the motor M and deenergizing heater 44. If it be

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desired to stop the dryer prior to the opening of contacts 67, this may be done by moving the arm 73 of switch 74 onto the stopping point 77. This shorts circuits and deenergizes the relay 58, thus opening the motor and heating circuits, excessive flow of current through the ground connection being prevented by the resistor 68.

It will be noted that the form of control illustrated and described insures that the heater 44 can be energized only after the motor M has been started and is in operation. This avoids the possibility of overloading the supply circuit by simultaneously energizing the motor and heater. The switch 63 is also provided for the purpose of avoiding overloads by rendering available the utility outlet 89 only during those periods when the heater 44 is not energized. This arrangement prevents simultaneous energization of the heater and any current consuming device fed by the utility outlet. The germicidal lamp 49 is independently controlled by the switch 85 since it may be desired to energize the lamp at times when the dryer is not in operation, and the current drain of the lamp is not sufficiently great to render special precautions necessary.

The damper 41 provides a convenient means for regulating the temperature of the circulating air, thereby controlling the thoroughness of the drying operation. The relative humidity of the circulating air is, of course, controlled by the temperature of the air and by the amount of moisture extracted from the material. Recirculation of the emergent air allows the heating unit 44 to raise the temperature thereof by successive stages whereby its ability to get moisture from the fabric is increased to any desired degree. This renders it possible to carry out the drying operation as thoroughly as desired and at the same time causes the material to be aerated by air which has been sterilized by the germicidal lamp so as to render the material substantially sterile.

Although but one embodiment of the invention has been shown and described in detail, it will be understood that other embodiments are possible and various changes may be made in the form and arrangement of the parts without departing from the spirit of the invention as defined in the claims appended hereto.

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What is claimed is:

1. In a laundry dryer a vertical container having a substantially uniform cross-section, a perforated piston in the container adapted to support the material to be dried, a partition below the piston having a movable shutter therein, means for vertically reciprocating the piston and means actuated by the reciprocating means for opening the shutter during the upward movement of the piston and closing the shutter during the downward movement thereof so as to pump air up through the material to be dried.
2. A laundry dryer as set forth in claim 1 including further means for heating the air below the piston, and means including a unitary switch for controlling the reciprocating and heating means, said switch being arranged to prevent energization of the heating means except when the reciprocating means is in operation.
3. A laundry dryer as set forth in claim 1 including further means for heating the air below the piston and thermostatic means for automatically deenergizing the dryer responsive to a predetermined rise in temperature of the air which has passed through the material to be dried.

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