

Jan. 29, 1952

W. L. KAUFFMAN, II

2,583,850

DRIER

Filed Jan. 29, 1943

3 Sheets-Sheet 1

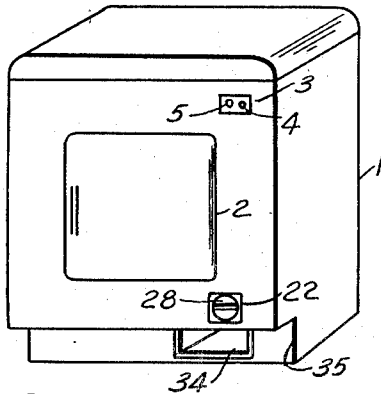


Fig. 1

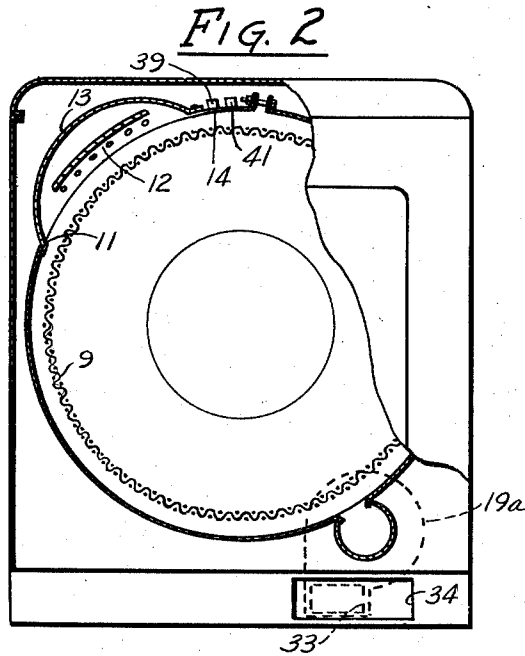


Fig. 2

Fig. 10

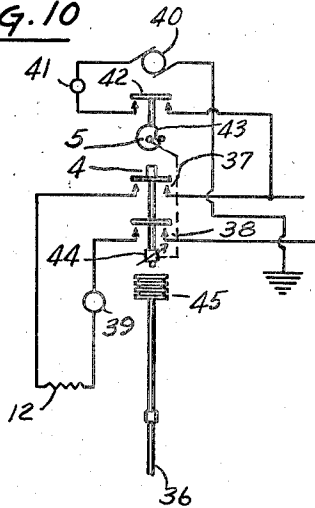
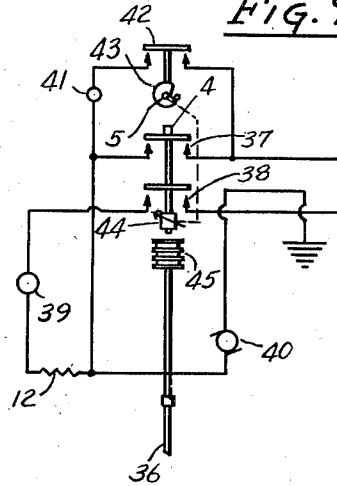


Fig. 9



Inventor

Walter L. Kauffman II

38

Ralph Hammer
Attorney

Jan. 29, 1952

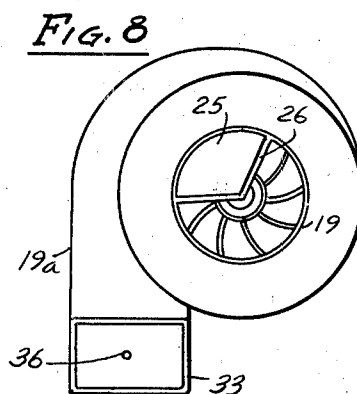
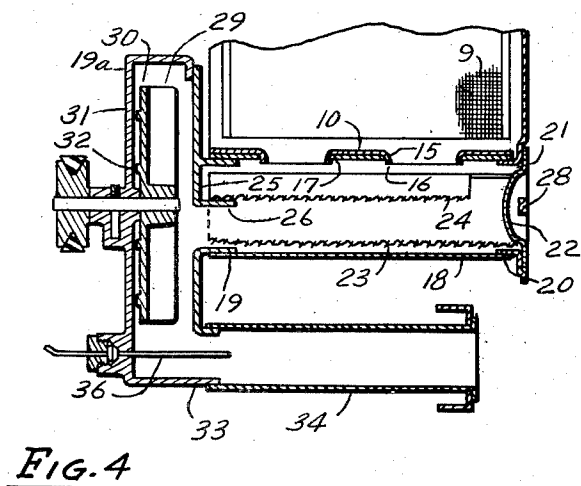
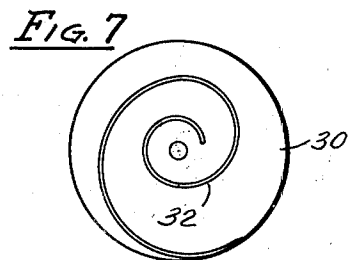
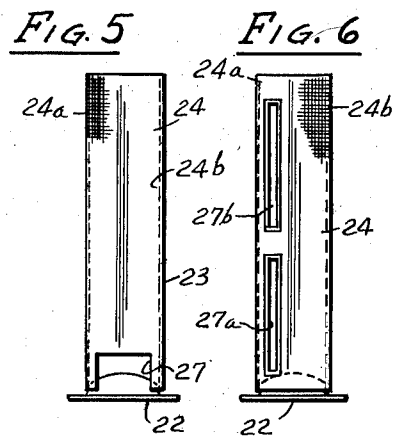
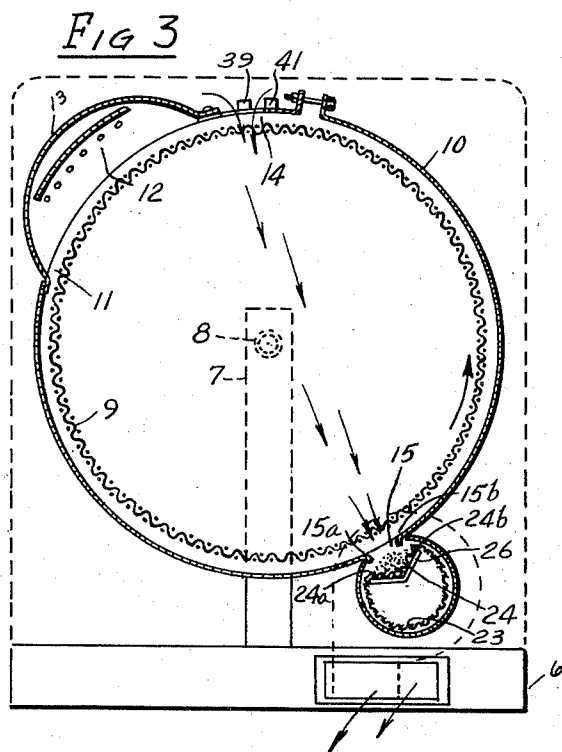
W. L. KAUFFMAN, II

2,583,850

DRIER

Filed Jan. 29, 1948

3 Sheets-Sheet 2



Inventor

Walter L Kauffman II
Ralph Hammer Attorney

Jan. 29, 1952

W. L. KAUFFMAN, II

2,583,850

DRIER

Filed Jan. 29, 1948

3 Sheets-Sheet 3

FIG. 11

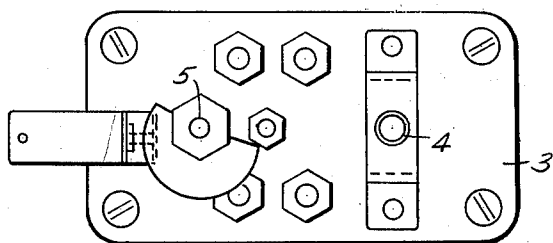


FIG. 14

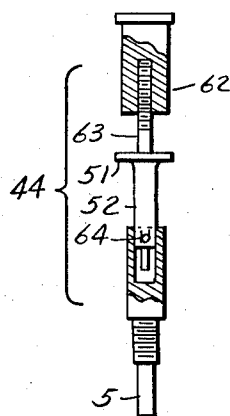


FIG. 12

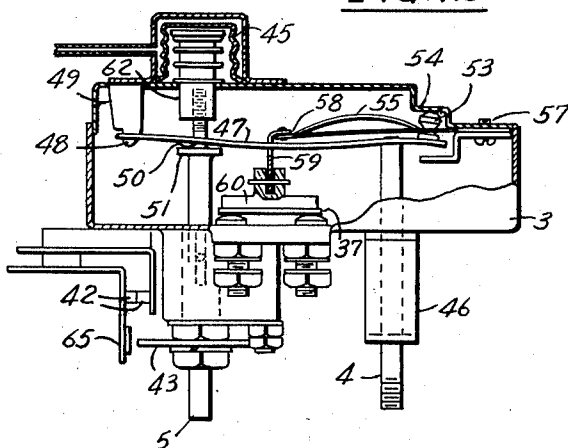


FIG. 15

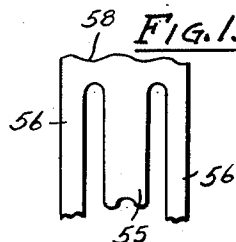
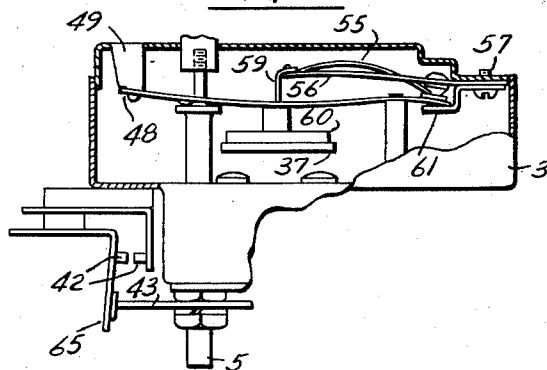


FIG. 13



Inventor

Walter L. Kauffman II

By

Ralph Hammer

Attorney

UNITED STATES PATENT OFFICE

2,583,850

DRIER

Walter L. Kauffman, II, Erie, Pa., assignor to
Lovell Manufacturing Company, Erie, Pa., a
corporation of Pennsylvania

Application January 29, 1948, Serial No. 4,985

5 Claims. (Cl. 34—82)

1

2

Tumbler type clothes driers have been made with an automatic control cycle responsive to the exhaust air temperature. Among the problems encountered have been the unwanted accumulation of lint and the high temperature of the clothes at the end of the drying cycle. This invention is intended to solve these problems through a lint trap at the point of discharge from the drum and by a controlled over-run at the end of the drying cycle giving the dried clothes a chance to cool. Further objects and advantages appear in the specification and claims.

In the drawings, Fig. 1 is a perspective of the clothes drier; Fig. 2 is a front elevation partly broken away; Fig. 3 is a sectional front elevation; Fig. 4 is a section through the lint trap and fan; Figs. 5 and 6 are plans of lint trap screens; Fig. 7 is a back view of the fan impeller; Fig. 8 is a front elevation of the fan showing the intake and discharge; Figs. 9 and 10 are control diagrams; Fig. 11 is a front elevation of the temperature control; Figs. 12 and 13 are edge views partly in section showing the contacts respectively in the closed and open positions; Fig. 14 is a detail of the temperature adjustment for the control; and Fig. 15 is a detail of the snap spring for the control contacts.

Referring to the drawings, 1 indicates a cabinet having on its front wall a door 2 for loading and unloading clothes and a control 3 provided with a "start" push button 4 and a temperature adjustment knob 5. The cabinet is carried on a base 6 (Fig. 3) having at its back a standard 7 carrying a bearing 8 for a horizontal perforate drum 9. The periphery of the drum is almost completely enclosed by a suitably supported wrap-around sheet 10. At an upper corner of the cabinet the wrap-around sheet has an opening 11 for a radiant heating element 12 within a reflector 13 which focuses the heat through the opening 11. During the operation of the drier, air is drawn into the cabinet through suitable louvers (not shown), flows around the outer surface of the wrap-around sheet 10 and reflector 13, enters the drum through a slot 14 at the leading edge of the reflector, and flows diagonally across the drum to outlet openings 15 in the wrap-around sheet. The parts heretofore described are or may be of common construction.

The openings 15 have flanges 16 projecting through and crimped over openings 17 in a fan inlet duct 18, the back end of which is telescoped over the inlet 19 of a fan casing 19a and the front end of which telescopes over an inwardly extending flange 20 around an opening

21 on the front wall of the cabinet. The opening 21 is normally closed by a cover 22 carrying a cylindrical filter screen 23 within the inlet duct 18. The filter screen has an indented trough 24 opposite the openings 15. The inner end of the screen 23 telescopes within the fan inlet 19. As best shown in Fig. 8, the part of the fan inlet 19 opposite the trough 24 is blocked by a wall 25 having peripheral flanges 26 underlying and helping support the side walls 24a, 24b of the trough.

The air stream flowing through the openings 15 carries a small amount of entrained lint, the accumulation of which in time becomes a nuisance. Being moist, due to the high humidity of the discharged air, the lint is sticky and tends to dry in an adherent coating.

There is no lint problem in the casing surrounding the drum 9. Apparently the air currents set up by the rotation of the drum sweep the adjacent casing surfaces clear. The entrained lint in the air discharged through the openings 15 is caught in the trough 24, tending to pile up on the wall 24b opposite the trailing lips 15b of the openings 15. This is due to the tangential component of motion of the air in the direction of the drum rotation. When the trough is full, the air flows through a by-pass or overflow passage to one side of the normal path of flow. In Fig. 5, a by-pass passage 27 is shown at the front of the filter screen. In Fig. 6, by-pass passages 27a and 27b are shown so as to be beneath the leading lips 15a of the openings 15 when the screen is assembled in the drier.

The accumulated lint may be removed by pulling handle 28 on the cover 22 removing the screen 23 from the duct 18. Any lint which falls off the screen can be easily removed from the smooth inner surface of the duct 18. The lint is in a felted condition which makes it easy to handle.

In the fan casing 19a is an impeller 29 having a hub 30 adjacent the back wall 31 of the fan casing. The rear surface of the hub carries a spiral rib 32 which keeps lint clear of the space between the hub and wall 31. Any lint accumulating on the wall 31 is scraped off and moved outward by the spiral rib. This is important if periodic cleaning of the lint trap is neglected.

The fan casing has a discharge 33 over which is telescoped a discharge duct 34 having its front end discharging into the toe space 35 at the front of the drier.

Extending through the back wall 31 into the discharge 33 is a thermostat bulb 36 for auto-

3

matically controlling the drier in response to the discharged air temperature. This location is chosen because there is substantially no tendency for lint to catch on the bulb and insulate it from the air and thereby introduce an error into the control.

The operation of the drier can be easily explained in connection with the control diagrams, Fig. 9. After loading the clothes, the drier is started by pushing the start button 4. This closes contacts 37, 38 in the high sides of a 230 volt power supply. Contacts 37 and 38 close a circuit to the heating element 12 through a temperature limiting thermostat 39. Contacts 37 also close a circuit to a motor 40 driving the fan and drum. The contacts 37 are bridged by a normally open thermostat 41 responsive to casing temperature and in series with contacts 42 controlled by a cam 43 turned by the temperature adjustment knob 5. The knob 5 controls an adjustment indicated at 44 (through a mechanical connection indicated by dotted lines in Figs. 9 and 10) which determines the dryness of the clothes at the end of the drying cycle. The highest temperature corresponds to completely dry clothes. Lower temperatures correspond to partially dry clothes. The lowest temperature shuts the drier down—prevents any drying. Thus the operator by adjusting the knob 5 preselects the dryness of the clothes. The thermostats 39 and 41 may be located on the top of the wrap-around sheet 10 to the right of the reflector 13 as shown in Figs. 2 and 3. In these locations the thermostats respond to the hottest part of the casing around the drum. The adjustment 44, described in detail later, determines the point at which the bellows 45, associated with the thermostat bulb 36, opens the contacts 37 and 38. In the lowest temperature position the adjustment is such that the contacts 37 and 38 are open at room temperature.

The thermostat 41 closes as soon as the drier casing is up to a temperature somewhat below the normal operating temperature. The closing of the thermostat 41 completes an auxiliary circuit around the motor contacts 37 which keeps the motor running after the opening of the contacts 37 and 38 by the bellows 45. This over-run period lasts until the casing has cooled to a point at which the clothes are comfortable to handle. The thermostat 41, in effect, adds an automatic cool off period to the end of the automatic drying cycle, controlled by the thermostat bulb 36.

It occasionally happens that the operator wishes to open the door 2 during the drying cycle to add odd pieces left out of the load. If these pieces are added before the thermostat 41 has closed, it is only necessary for the operator to pull out on the start button 4 which stops the motor and the power input to the heating element 12. However, if the casing has warmed up to a point at which the thermostat 41 has closed, the motor will keep on running if the drier is stopped by pulling out on the start button. This introduces confusion since the drier does not always behave in the same manner. In the present control this confusion is eliminated by the cam 43 on the shaft carrying the temperature adjustment knob 5. To stop the drier to add additional pieces the operator turns the temperature adjustment knob to the lowest position, which may be marked "Off." In this position the cam 43 opens the contact 42 and breaks the auxiliary circuit controlled by the temperature over-run thermostat 41. With

4

this control there is no possibility of confusion. The operator always starts the automatic drying cycle by pushing the start button 4. Whenever the operator turns the temperature adjustment knob to the "off" position, the drier stops. Because the "off" position corresponds to the lowest temperature adjustment the contacts 37 and 38 are also open.

The control diagram, shown in Fig. 10, has correspondingly numbered parts and operates in the same manner except that the temperature over-run thermostat 41 is connected in series with the motor and the contacts 42. Upon pushing the start button the motor circuit remains open until the drier casing comes up to the desired temperature. At this point the temperature over-run thermostat closes the motor circuit and keeps the motor circuit closed after the contacts 37 and 38 have been opened by the thermostat bulb 45. When the operator wishes to interrupt the automatic drying cycle to add additional pieces, the knob 5 is turned to the "off" position, opening the contacts 42 and interrupting the motor circuit and also the circuit to the heating element.

The control diagrams of Figs. 9 and 10, except for the addition of the cam 43 and the contacts 42, are as shown in my application Serial No. 652,362, filed March 6, 1946, now Patent 2,548,313.

The control 3 for the drier is shown in detail in Figs. 11-15, inclusive. The start button 4 is slidably guided in a bracket 46 and has its inner end connected to the free end of a bowed, nearly rigid strip 47 pivoted at 48 on a tab 49. Adjacent the pivot 48 the strip 47 has projections 50 which bear on a flange 51 on a shaft 52. The resiliency of the strip 47 is such that throughout the normal operating range the projections 50 are maintained in contact with the flange 51 by the inherent resiliency of the strip 47. The free end of the strip 47 carries a stop 53 which in the closed position is pressed against a surface 54 by an arched spring 55 which, as shown in Fig. 15, is the central member of an E-shaped spring steel stamping. The side legs 56 of the stamping are anchored at 57 on the control casing. In the position shown in Fig. 12 the spring 55 exerts a light pressure in the direction to hold the stop 53 against the surface 54. The base of the E-shaped stamping has fixed thereto an arm 59 pivotally carrying a holder 60 for the contacts 37 and 38. The spring 55 in the closed position exerts a pressure on the holder 60 in a direction to maintain the contacts 37 and 38 closed. It will be understood that the strip 47 has suitable clearance opening for the shaft 52 and for the contact carrying arm 59.

The contacts 37 and 38 may be opened by pulling out on the start button 4. This forcibly moves the free end of the strip 47 downward with reference to the arched spring 55. This changes the line of action of the spring, resulting in a snap action movement to the position shown in Fig. 13. In this position the free end of the strip 47 rests against a stop 61, and the spring 55 exerts an upward force on the arm 59, holding the contacts 37 and 38 in the open position.

The contacts 37 and 38 may also be opened through the action of the bellows 45. The bellows have fixed thereto a member 62 in which a reduced portion 63 of the shaft 52 is threaded. Upon expansion of the bellows 45, due to an increase in temperature of the thermostat bulb 36, the bellows force the shaft 52 downward, thereby moving the flange 51 and lowering the pivot point of the projection 50 on the flange 51. This

5

6

also results in a downward movement of the free end of the strip 47 and produces the same snap action opening of the contacts 37 and 38 described above.

The contacts 37 and 38 may also be opened 5 by turning the temperature adjustment knob 5 to the lowest temperature position. Rotation of the knob causes the reduced portion 63 of the shaft 52 to be threaded in and out of the part 62, thereby changing the relative position of the flange 51. This adjusting movement is permitted 10 by a pin and slot connection 64. Turning the temperature adjustment to the lowest position also results in a downward movement of the flange 51, lowering the pivot point for the strip 47 to a point at which the contacts 37 and 38 are 15 open.

The temperature adjustment knob shaft carries the cam 43 previously described in connection with the control diagram of Figs. 9 and 10. In 20 the normal position the cam 43 is spaced from a spring arm 65 carrying one of the contacts 42. In the lowest or "off" position of the temperature adjustment knob the cam 43 engages the arm 65 and separates the contacts 42 as indicated in 25 Fig. 13.

I claim:

1. In a clothes drier of the type having a casing containing a drum for tumbling the clothes and having an air inlet to the casing, and means 30 withdrawing air from the casing, the combination of a duct for the air having an inlet opening in a side wall communicating with the casing, a hollow screen insertable in the duct having a lint collecting recess in its outer surface opposite the 35 inlet opening and having its interior communicating with the air withdrawal means.

2. In a clothes drier of the type having a casing containing a drum for tumbling the clothes and having an air inlet thereto, the combination of 40 a duct for the air having an inlet opening in a side wall communicating with the casing, a fan having an intake connected to one end of the duct, a hollow screen insertable in the opposite end of the duct and having its interior leading 45 into the fan intake, a lint collecting trough in the screen opposite said inlet opening, and means blocking the end of the trough at the fan intake.

3. In a clothes drier, a drum for tumbling 50 clothes, a casing enclosing the periphery of the drum and having an air inlet thereto, a duct having a side wall adjacent the outer wall of the casing, said duct having an inlet opening through the adjacent casing and duct walls, a fan having 55

its intake connected to one end of the duct, a hollow filter screen insertable through the opposite end of the duct and having its interior leading to the intake, and a lint collecting recess in the screen opposite the inlet opening.

4. In a clothes drier of the type having a casing containing a drum for tumbling the clothes and having an air inlet thereto, and means withdrawing air from the casing, the combination of a duct for the air having an inlet opening in a side wall communicating with the casing, a screen in the duct having a lint collecting recess intercepting the air flowing through the inlet opening, and an open overflow passageway around the screen to one side of the normal path of air flow through the inlet opening.

5. In a clothes drier of the type having a rotatable drum for tumbling clothes, a casing enclosing the periphery of the drum and having an air inlet thereto, an axially extending duct having a side wall adjacent the outer wall of the casing, said duct having an elongated axially extending inlet opening through the adjacent casing and duct walls, a hollow filter screen having a trough intercepting the air flowing through the inlet opening, air exhaust means communicating with the interior of the screen and discharging to the outside air, and an open overflow passageway through the screen to the interior thereof under the leading edge of the inlet opening as regards the direction of rotation of the drum.

WALTER L. KAUFFMAN, II.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,193,305	Slagle	Aug. 1, 1916
1,339,260	Hurxthal	May 4, 1920
1,675,160	Carroll	June 26, 1928
1,756,821	Groen	Apr. 29, 1930
1,966,405	Galson et al.	July 10, 1934
1,996,253	Otis	Apr. 2, 1935
2,027,590	Hirsch	Jan. 14, 1936
2,050,625	Orr	Aug. 11, 1936
2,314,748	White	Mar. 23, 1943
2,315,354	Shanman	Mar. 30, 1943
2,334,025	O'Neill	Nov. 9, 1943
2,390,504	Berger	Dec. 11, 1945
2,398,880	Broglie	Apr. 23, 1946
2,403,416	Vandegriff	July 2, 1946
2,406,494	Ferris	Aug. 27, 1946
2,505,041	Gorsuch	Apr. 25, 1950