Nov. 6, 1962 D. W. SCOFIELD 3,061,942

FABRIC DRYER WITH LINT BURNING MEANS

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FIG. 1.

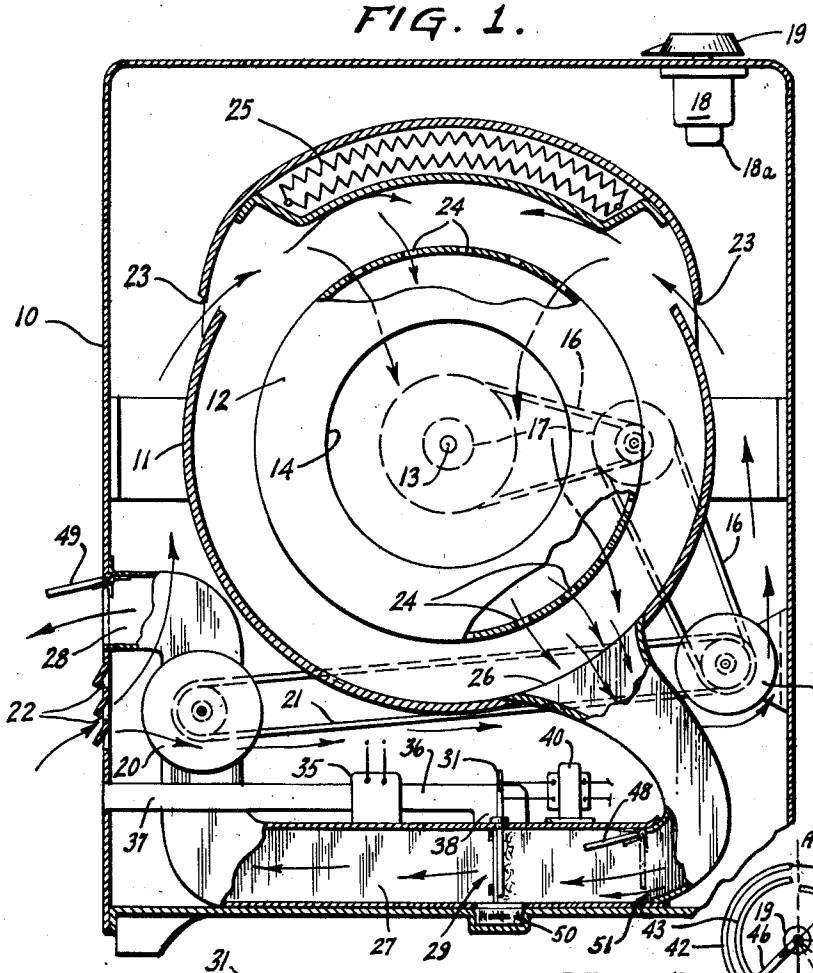


FIG. 4.

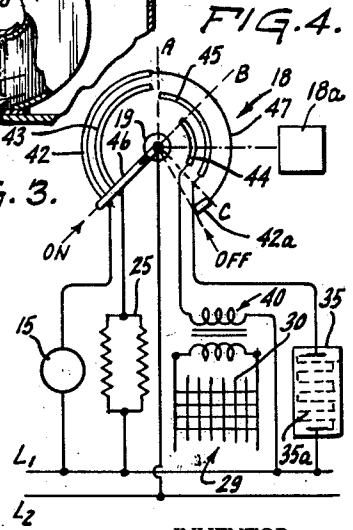
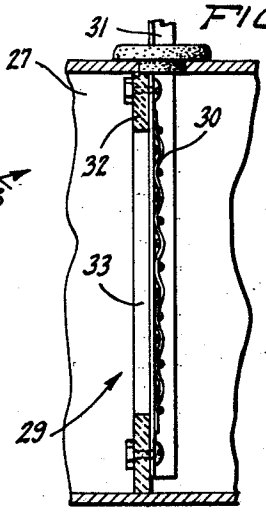


FIG. 3.



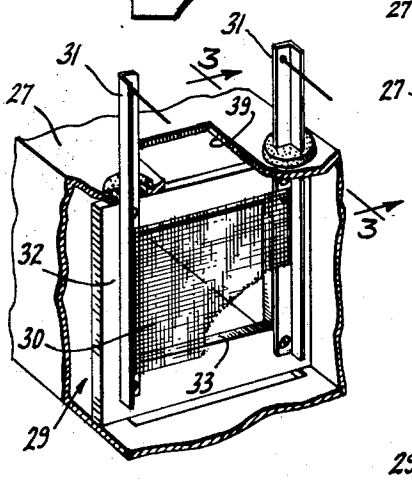


FIG. 2.

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FABRIC DRYER WITH LINT BURNING MEANS

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The present invention relates to laundry apparatus. More specifically the invention has to do with apparatus of the kind in which provision is made to dry clothes and which is devised especially, although not exclusively, for home usage.

In most apparatus of the above mentioned variety, the drying of the clothes is generally accomplished by circulation of heated air within an enclosure in which wet or damp clothes are tumbled or otherwise agitated to effect transfer of moisture to the circulated air. However, in such machines, the circulating air also picks up lint which forms during the drying process, and it is common practice to mount a trap in the passage which leads to the outside of the clothes-containing enclosure to intercept and remove lint from the air passing through said passage. Such a trap tends to become clogged with accumulated lint which results in deleteriously affecting the drying operation and gives rise to fire hazards.

It is therefore an important object of this invention to overcome the above noted undesirable features and to insure safety in the use of a clothes-drying machine by lessening the possibilities of undue and dangerous accumulation of lint in the air-circulating passages of the machine.

A characteristic feature of the invention resides in the provision of a clothes-drying machine wherein lint which accumulates therein is automatically eliminated at the end of each use.

It is also a characteristic feature of the invention to disposed of accumulated lint by burning the same, provision being made to eliminate serious objections which might arise from burning of the lint.

According to one aspect of the present invention, the above noted objects and novel features are achieved by utilization of a machine comprising an enclosure for containing clothes to be dried, said enclosure being associated with a heater and with air-circulating means to direct the flow of air into and out of said enclosure. Delinting means is arranged in the air-circulating means to trap lint entrained in moist air which flows from the drying enclosure. In particular accordance with the invention, the delinting means includes a novel combination of lint-burning means and vapor-treating means. The lint-burning means is adapted to ignite accumulated lint at the completion of the drying operation, and the vapor-treating means is adapted to eliminate the smoke together with the odors resulting from burning of the lint. Also, in particular accordance with the invention, a control arrangement is provided for automatically effecting the operation of the machine as well as of the lint-burning means and vapor-treating means. This control arrangement includes electrical connections and switch means, the latter functioning automatically, first to interrupt the operation of the driving motor for the machine, then to initiate operation of the vapor-treating means to place the same in operative condition, and thereafter to activate the burning means for igniting the lint trapped in the delinting means during the drying process.

The full nature of the invention and the manner in which the above mentioned and other objects and features are realized will be more fully understood from the following description taken in conjunction with the accompanying drawing, in which:

FIGURE 1 is a vertical sectional view of a laundering machine which includes a preferred embodiment of the present invention, certain parts being broken away and removed for purpose of clear illustration.

FIGURE 2 is a fragmentary view, in perspective and on an enlarged scale, showing that portion of the air exhausting duct or passage which encloses the lint intercepting and burning device of the embodiment illustrated in FIGURE 1;

FIGURE 3 is a sectional view, on a still larger scale, taken substantially on line 3—3 of FIGURE 2; and

FIGURE 4 is a diagrammatic view illustrating an arrangement of electric circuits and means for controlling the operation of the laundering apparatus as well as of various elements included in the preferred embodiment of the invention.

With more particular reference to the drawing, there is shown in FIGURE 1 those parts of a laundry apparatus which are essential to a clear understanding of the invention. As illustrated, the machine includes a cabinet structure **10** which encloses a drying enclosure or compartment **11** configured to house a clothes-containing receptacle **12** in the form of a perforated drum. This drum is mounted to rotate about a generally horizontal center axis **13**, and has an open front **14** through which clothes may be placed into and removed from the machine. This open front is disposed to confront the conventional sealing door, not shown, which is usually hinged on the cabinet structure of the machine.

An electric motor **15** is conveniently mounted within the cabinet **10** and rotatably drives the drum at required speed through the intermediation of belts **16** and pulleys **17**. The motor is adapted to be controlled by means of a timer and switching mechanism **18** having a manually operable setting knob **19**, and driven, as is customary, by means of a spring motor **18***a*.

Air-circulating means including a blower or fan **20** driven by the motor **15** through a belt **21**, or like connection, effects flow of air through the dryer. As represented by the flow arrows in FIGURE 1 of the drawing, air is admitted into the interior of the dryer through inlet means **22** and enters the drying enclosure or compartment **11** through intake passages **23**. Air circulating within said enclosure passes into and out of the drum through its perforations **24** and, thus, flows in contact with the clothes as they tumble in said drum. The walls of the enclosure and of the drum, as well as the air circulating through the machine, are heated and brought to drying temperatures by means of a heater **25**. As diagrammatically represented in the drawing, the heater is of the electrical resistance type and is conveniently mounted so that the air is heated by coming in heat exchange relation with the walls enclosing said heater. From the drying enclosure, air passes into an outlet passage **26** which opens out of a lower part of said enclosure and communicates with the inlet side of the blower **20** through an intake duct **27**, the outlet side of the blower communicating with a discharge duct **28**.

The heated air passing through the drum, in the manner described above, picks up and carries away moisture from the clothes thereby drying the same. Lint which forms in the clothes-drying process is also carried away or entrained in the air passing out of said enclosure. However, lint is prevented from escaping through the blower **20** and discharge duct **28**, by means of a lint collecting or trapping device designated at **29** and located in the intake duct **27**, between the outlet passage **26** and the fan or blower **20**.

As clearly seen in FIGURES 2 and 3, the device **29** includes a screen element **30** which, in practice, is adapted to constitute a lint burner. For that purpose the screen

is woven from electrical resistance wire of high heat generating and retaining properties, such as wire of a nickel-chromium alloy, for example the alloy known as "Nichrome." This screen element 30 is welded or otherwise securely affixed to a pair of rugged metal members which form terminals 31, the assembled screen and terminal members being mounted on an insulating support, such as a slab 32 of asbestos or like material, which occupies and spans the interior of the intake duct 27. The insulating slab is provided with a centrally disposed open area or window 33 which is covered by the mentioned screen element 30. Air circulating through the intake duct 27 flows through the screen, and the lint entrained in said air is intercepted by and accumulates on said screen.

As will be hereinafter more fully described, at the proper time in the sequence of operation of the apparatus electric current is supplied to the burner assembly so as to heat the screen and thereby ignite the lint accumulated thereon.

In particular accordance to the invention, the vapor resulting from burning lint is passed through a treating chamber 35 which is adapted to destroy smoke and odors. According to the preferred embodiment of the invention, the treating chamber encloses a catalytic incinerating unit 35*a* which, itself, forms no part of the present invention and thus need not be described in detail herein. However it may here be mentioned that a unit suitable for the purpose of the invention is one of well known type which utilizes a plurality of electrically heated coils each coated with a suitable catalyst, for example platinum, and having ohmic resistance such that when the coils are energized by a suitable source of electric current, they are maintained at the elevated temperature required for satisfactory activation of the catalyst to render smoke and odors undetectable.

As illustrated, the chamber 35 enclosing the catalytic unit is defined by conduit structure which provides an inlet conduit 36 and an outlet conduit 37 leading, respectively, into and out of said chamber. The inlet conduit 36 communicates with the interior of the air intake duct 27 and, for that purpose, has an inlet end portion 38 constructed to fit snugly in an opening 39 which, as clearly seen in FIGURE 2, is disposed adjacent the screen-burner device 29 within said duct 27. As shown, the opening 39 and associated inlet end portion 38 of the inlet conduit 36 are positioned above and straddle said device 29 so that all the smoke arising from the burning lint tends to pass directly into said conduit, thence through the treating chamber 35.

In the illustrated arrangement, the screen-burner element 30 is made up of a plurality of comparatively short wires connected in parallel, so that the element has low electrical resistance. In order to insure adequate heating of this kind of element to ignite and burn lint, there is provided a transformer 40 connected with the terminal members 31 of said screen element in a manner to supply it with high current at reduced voltage. It will of course be understood that a transformer would not be needed if certain types of burner elements were employed. For example, an arrangement constructed with serpentine or coiled wires connected in series would have high electrical resistance, so that current could be supplied thereto at the customary 110–120 v. line voltage.

The manner in which the illustrated and herein described preferred embodiment operates will be more fully understood by referring to FIGURE 4 in which the motor 15, the clothes-drying heater 25, the screen-burner unit 29 with its transformer 40, and the treating chamber 35 with the catalytic unit 35*a* enclosed therein, are diagrammatically represented. These elements are adapted for electrical connection across power line L_1—L_2 through the agency of the switch 18. As represented, the mentioned elements are connected in parallel to one side L_1 of the line and to switch strips: the motor 15 being connected to switch strip 42; the dryer heater 25 being connected to switch strip 43; the primary of the transformer 40 being connected to switch strip 44; and the catalytic unit 35*a* being connected to switch strip 45. A switching contact arm 46 is connected to the other side L_2 of the line and is disposed to engage the contact strips to close the electrical circuit to the various mentioned elements in the appropriate sequence, which will be presently described.

In using the apparatus, clothes are placed in the receptacle or drum 12, and the control knob 19 is set to "On" position. This setting brings the switching arm 46 (FIGURE 4) in engagement with the contact strips 42 and 43 to effect energization of the motor 15 and heater 25. Thus the motor drives the clothes-containing drum for tumbling the clothes and activates the blower or fan 20 for circulating air through the drying enclosure, and the heater is energized to effect drying of the clothes.

Through continued function of the timer 18*a*, the contact arm 46 is brought to a position represented at A. In this position the contact arm breaks electrical contact with the strips 42 and 43, and thus deenergizes the motor 15 and the heater 25 to stop rotation of the drum and activation of the fan, and to terminate the drying function of the machine. At that point in the sequence of operation, the timer 18*a* moves contact arm 46 into engagement with the contact strip 45 to energize the catalytic unit 35*a*. This condition of operation continues until said unit attains the temperature necessary to produce the desired catalytic action. The time required to obtain that condition is determined by the time it takes for the switching arm to travel from position A to position B in response to operation of the timer 18*a*.

When the proper catalytic condition is obtained, the contact arm 46 engages the contact strip 44 to effect energization of the transformer 40 which, in turn, energizes the screen-burner element 30, the latter electrically linked to the secondary of said transformer. The energized burner element ignites the accumulated lint and causes it to burn, any disagreeably odorous smoke resulting from the burning lint passing into the chamber 35 and being treated therein to eliminate the odors and smoke prior to discharge of the vapors through the outlet conduit 37. Concurrent operation of the lint-burning element and of the vapor-treating unit continues for a predetermined period of time which corresponds to the time it takes the timer-controlled switching arm 46 to travel the distance between position B to position C.

Upon reaching said position C, the contact arm 46 leaves contact strips 43 and 45 and engages contact member 42*a* which, as represented at 47, is electrically linked to the contact strip 42. Thus the motor 15 is again energized to reestablish tumbling of the clothes and actuation of the fan for a limited time in order to provide for cooling of the machine and clothes therein. This cooling period lasts for a time which corresponds to the time it takes the switching arm 46 to travel from position C to "Off" position, when the entire machine shuts down.

As seen in FIGURE 1, a damper plate 48 is mounted in the fan intake duct 27, and a similar damper plate 49 is mounted at the outlet end of the fan discharge duct 28. These plates are hinged so that during a drying operation they swing to an upper position under the force of the air drawn through said duct 27 and duct 28 in response to the function of the fan 20. During burning of the lint when said fan is out of operation, the damper plates 48 and 49 gravitate to a lower position represented in broken lines in FIGURE 1, and thus serve to prevent smoke from back-flowing into the drying enclosure and from passing into the room in which the machine is installed.

It will be noted that the damper plate 49 is of a size to close completely the outlet end of the duct 28, whereas the damper plate 48 is constructed to provide a restricted open area 51. This restricted open area being disposed between the inlet which communicates with the warmer inside atmosphere and the outlet which communicates

with the cooler outside atmosphere, acts to bring about a draught or chimney effect which insures and enhances the flow of smoke into and through the treating chamber **35**.

Also as seen in FIGURE 1, provision is made for collecting and disposing of the ashes resulting from burning of the lint. For that purpose, a drawer or tray **50** is slidably supported beneath the screen-burner device **29** to catch the ashes and to be removed for periodically emptying its content.

From the foregoing description, it will be appreciated that the novel arrangement of this invention effectively provides for automatic disposal of lint which accumulates as a result of a clothes-drying operation. Although the invention has been shown and described with reference to a preferred embodiment, it will be recognized that the invention is not limited to that embodiment. For instance, the machine instead of being provided with an open system for circulating air to and from the outside of the cabinet, the machine could be supplied with a closed-type system which, as well known in the art, is adapted to recirculate the air through the drying enclosure, the air being cooled and dried prior to its return to said enclosure. It is to be understood that the invention contemplates such other structural variations as come within the scope of the subjoined claims.

I claim:

1. A fabric dryer comprising a drying enclosure provided with air inlet means and with an air outlet passage, a fan operable for circulating air through said enclosure and having an air discharge duct and an air intake duct, the latter communicating with said air outlet passage, a lint collecting device mounted in said intake duct and having means operable for burning the collected lint, conduit structure having an inlet end portion communicating with said intake duct adjacent to and above said device to carry off the products of combustion from said burning means, damper means interposed in the path of air circulating through said ducts and mounted for movement to and from an operative position wherein said damper means impedes the flow of air through said ducts and device, said damper means being movable from said position in response to air velocity during operation of said fan and being movable to said position when said fan is not operating and control mechanism having means for terminating the operation of said fan and thereafter initiating operation of said burning means.

2. A fabric dryer as set forth in claim 1, in which the mentioned damper means includes two damper plates, one of said plates being disposed in the mentioned discharge duct, the other of said plates being disposed in the mentioned intake duct between the mentioned outlet passage of the drying enclosure and the mentioned inlet end portion of the conduit structure, said other plate being constructed to provide a restricted open area between said outlet passage and said inlet end portion.

3. A fabric dryer as set forth in claim 1, in which means operable for altering the mentioned products of combustion is incorporated in the mentioned conduit structure.

4. A fabric dryer as set forth in claim 1, in which means operable for altering the mentioned products of combustion is incorporated in the mentioned conduit structure, the mentioned control mechanism having means for initiating operation of said altering means concurrently with termination of the operation of the mentioned fan.

5. A fabric dryer as set forth in claim 1, in which a heater is arranged in the mentioned drying enclosure to heat the air circulating therethrough, means for altering the mentioned products of combustion is incorporated in the mentioned conduit structure, the mentioned control mechanism having means for initiating operation of said altering means concurrently with termination of the operation of said heater and of the mentioned fan and prior to initiation of the operation of the mentioned burning means.

6. A fabric dryer as set forth in claim 1, in which a fabric-containing drum is rotatably mounted in the mentioned drying enclosure, an electric motor is drivingly coupled to said drum and to the mentioned fan, an electrically controlled heater is arranged in the mentioned drying enclosure to heat the air circulating therethrough, electrically operable means for altering the mentioned products of combustion is provided in the mentioned conduit structure, and the mentioned control mechanism includes a sequentially operated time switch for first energizing said motor and heater then concurrently deenergizing said motor and heater and energizing said altering means, thereafter energizing said burning means while continuing energization of said altering means, subsequently effecting concurrent deenergization of said altering means and burning means and energization of said motor to operate said drum and fan for a limited time to provide for cooling of said enclosure and drum, and finally effecting complete shutdown of the dryer.

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