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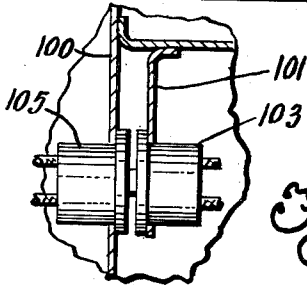
J. L. MILLER

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CLOTHES DRIER WITH LINT ELIMINATOR

Filed Nov. 22, 1957

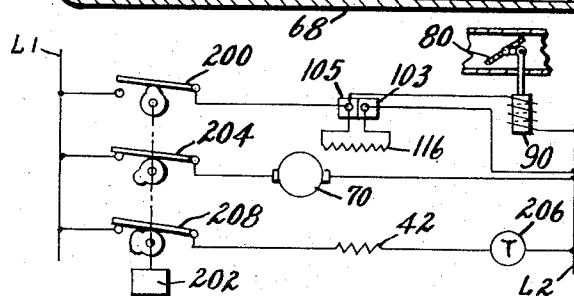
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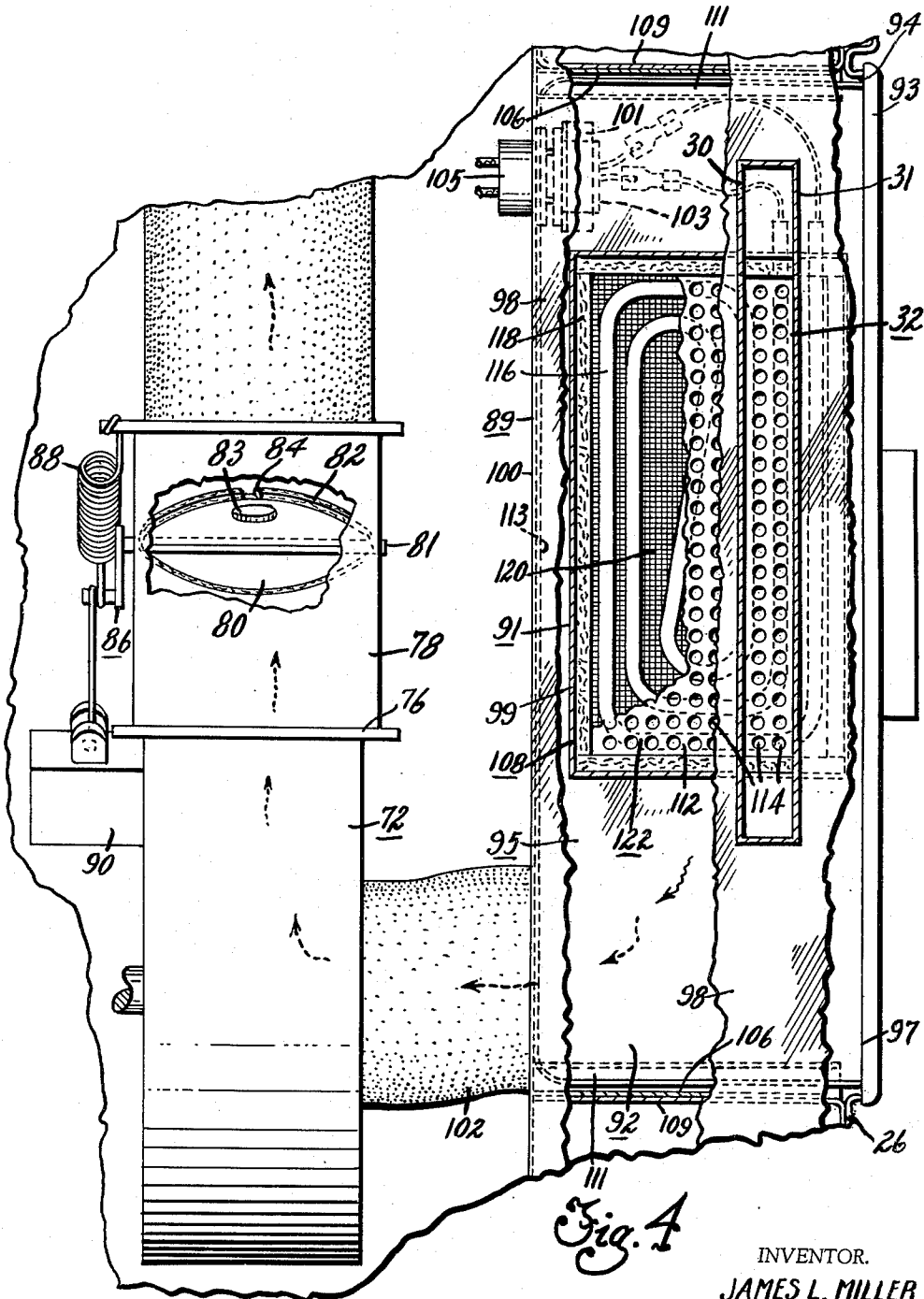


Fig. 4

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CLOTHES DRIER WITH LINT ELIMINATOR

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8 Claims. (Cl. 34—82)

This invention relates to a domestic appliance and more particularly to a clothes dryer having means for collecting and destroying lint evolved during the clothes drying operation.

Specifically, this invention is directed to an improved lint burning and smoke eliminating element.

The operation of clothes dryers has been attended by the evolution of lint from the clothes being dried. The collection of this lint on various surfaces in the laundry room presents a cleaning problem and gives rise to a serious objection to the use of automatic clothes dryers in the home. In the past, lint has been discharged into the outgoing air stream or has merely been collected on a screen or other device disposed in the path of air flow through the dryer. This device, of course, necessitates periodically removing the lint thus collected. A later advance in the art has proposed to burn this lint on the surface of the element utilized in collecting the lint, as more fully described in copending application, S.N. 635,635, filed January 23, 1957. In the arrangement there disclosed the lint burning element is energized at the same time as the catalytic element which consumes the products of combustion evolved during the lint burning procedure. It has been found that this system allows a small amount of smoke and odor to escape to the surrounding areas in the time period between the point where the lint begins to burn and the catalytic screen reaches a temperature where it is effective to consume the smoke and odor.

Accordingly, it is an object of this invention to collect lint within a dryer and to destroy the lint so collected in an improved manner by a burning process.

Another object of this invention is to adapt a combination lint collecting and burning arrangement with means for reducing the products of combustion during a lint burning process to substantially colorless and odorless products.

More particularly, it is an object of this invention to provide a combination lint burning and smoke eliminating means with a time delay between the points that the smoke eliminating element and the lint burning element become effective.

A more specific object is to provide such delay through the utilization of a lint collecting and burning plate having a greater mass than the element cooperating therewith to remove smoke and odor.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

FIGURE 1 is a front view, with parts broken away, showing a clothes dryer constructed in accordance with this invention;

FIGURE 2 is a sectional view taken along line 2—2 in FIGURE 1 disclosing means whereby the lint burning and smoke eliminating means may be removably electrically connected to the dryer;

FIGURE 3 is a vertical sectional view taken along line 3—3 of FIGURE 1;

FIGURE 4 is a sectional view, with parts broken away, taken substantially along the line 4—4 of FIGURE 3; and

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FIGURE 5 is a schematic wiring diagram illustrating one control system effective in practicing this invention.

In accordance with this invention as illustrated in FIG. 3, a dryer cabinet 10 encloses a rotating drum 12 having apertures 14 in a rear wall 16 thereof and an access opening 18 in a front wall 20. A door 22 is adapted to close an opening 24 in the front wall 26 of the dryer cabinet 10 and in line with opening 18 in the tumbling drum 12. A baffle 28 is disposed in the cabinet opening 24 and held in spaced relationship to the drum opening or collar 18 and door 22 by a spacer seal 40 thereby forming a passageway 38. Apertures 36 are formed in the baffle 28 in a manner to connect the passageway 38 to a front duct 32 having a rear wall 30 and a front wall 31. It is therefore evident that a substantially air-tight channel has been constructed for air flow from the moving drum 12 to the fixed duct 32 below. The seal 56 prevents leakage of air to the space between the drum 12 and its cabinet 10, while the seal 40, in addition to its spacing function, eliminates leakage to the outside. Felt has proved a satisfactory material for seal 56 and rubber has proved equally so for the spacer seal 40. However, it is recognized that many other materials can serve these purposes as well.

A heating element 42 is disposed adjacent an air intake opening 44 in the rear wall 46 of dryer cabinet 10. The heater 42 is enclosed in a housing 43 having an opening 45 and carried on a bulkhead 48 provided with an opening 50 in line with opening 45 for directing air to an annular duct 52 adjacent the rear wall 16 of the drum. Air flow is restricted to duct 52 by the action of a seal 54 disposed between a fixed collar 49 on the bulkhead 48 and the rotating drum wall 16. A second annular seal 56 is arranged about the opening 18 of the drum and provides similar air sealing characteristics between the rotating drum 12 and the fixed baffle 28. The front wall 26 of cabinet 10 is provided with a series of exhaust openings 58 disposed across the lower front of the cabinet and adapted to exhaust air to the outside from a duct 60 therebehind. A fan or blower 72 of conventional design circulates air through the drum 12 and supplies the exhaust air to duct 60.

The tumbling drum 12 is carried on a shaft 62 journaled in a bearing 64 and rotatably driven by a belt-and-pulley arrangement, shown generally at 66. Supported on a bottom wall 68 of cabinet 10 is a motor or prime mover 70 arranged to rotate the drum 12 through the pulley system 66. The fan or blower 72 includes impellers 73 and is adapted to be driven also by motor 70. The blower is provided with an intake opening 74 adapted to receive air from the tumbling drum by way of the front duct 32 and has an outlet 76 connected to one end of a damper chamber 78. Located within the damper chamber 78 is a damper 80 pivotally mounted on a shaft 81 having a felt sealing edge 82 and an air bypass aperture 83 or 84. The shaft 81 projects from the damper housing 78 to connect with an actuating lever arrangement 86 which retains the damper 80 in a normally open position through the biasing effect of spring 88. A solenoid 90 is supported adjacent the damper housing 78 and adapted to selectively actuate damper 80 for purposes more fully described hereinafter.

The lint burning and smoke eliminating element, shown generally at 91 and referred to broadly as the eliminator element, is carried in a slidably removable eliminator drawer 92. The drawer 92 is comprised of a front panel 93 adapted to close an opening 94 in the lower part of the cabinet front wall 26. To provide a support or carrier for the eliminator element 91, a shelf 95 is fastened in any suitable manner along one side 97 thereof to drawer panel 93 and graded toward an aperture 99 formed in the shelf to receive the element 91. A bracket 101 de-

pend from shelf 95 to support the male electrical connector 103 for the eliminator element 91 in a manner to facilitate cooperation between the male connector 103 and a female connector 105 fixedly mounted in a wall 100 of the drawer or lint eliminating chamber 89. Thus, it is seen that the eliminator element 91 is placed in condition to be electrically energized whenever the drawer 92 is completely inserted into chamber 89 through opening 94 of dryer cabinet 10.

The chamber 89 into which the drawer 92 is inserted is formed with a base or floor 59, a top wall 98 and a rear wall 100. The top wall 98 has an aperture 107 in communication with the front duct 32. This opening 107 affords access to the lint eliminating chamber 89 for the air being drawn from the tumbling drum 12 and distributes this air over the entire lint collecting surface 122 of the eliminator 91. Exhaust from the chamber 89 is effected by way of an opening 96 formed in the chamber wall 100 to receive one end of a flexible connector 102. The exhaust opening 96 is placed somewhat adjacent the blower 72 to facilitate the connection of the other end of the flexible connector 102 to the blower intake 74. With the air flow following a path from the front duct 32 to the blower 72 by way of chamber 89, it is apparent that the eliminator drawer 92 must be in place to activate the lint eliminating feature of this invention. It is equally necessary that a sufficiently airtight relationship be provided between the eliminator shelf 95 and the periphery of chamber 89. To provide these requirements channel brackets 106 are fastened along the side walls 109 of chamber 89 in a manner to support the shelf 95 in juxtaposition to wall 98. The eliminator drawer 92 is correctly positioned within the chamber 89 by placing sides 111 of shelf 95 in channel brackets 106 and sliding the drawer inwardly until the shelf side 113 presses into air sealing engagement with chamber wall 100 and the electrical connectors 103, 105 interfit. With the elements thus arranged, all of the lint filled air leaving the tumbling drum 12 is caused to pass through the opening 99 in the shelf 95 and thereby through the eliminator element 91 disposed therebetween.

The lint burning and smoke eliminating element or eliminator 91 will now be more fully described. The eliminator is cradled below the shelf aperture 99 in a box-like support structure 108 which surrounds the eliminator and has its upper edge 110 fastened securely to the periphery of shelf aperture 99. The fastening of the eliminator support box 108 may be accomplished in any conventional manner as by welding, so long as a relatively air-tight connection is established between box 108 and shelf 95. A ledge 115 is formed about the bottom periphery of box 108 to support a ceramic spacer 118 which in turn holds the eliminator element 91 in spaced relationship to the box. The lint collecting surface 122 is thereby located and retained in a plane parallel to that of shelf aperture 99 and adjacent thereto.

As arranged within the support box 108, the eliminator is comprised of a lint collecting and burning plate 112, a smoke and odor removal screen or filter 120 and a heating element 116 disposed therebetween. A plurality of apertures 114 are formed in plate 112 and sized to permit air flow therethrough without passing the lint entrained in the air. In this regard, a plurality of apertures approximately $\frac{5}{64}$ " in diameter and $\frac{7}{64}$ " apart has produced satisfactory results. Any conventional heating element 116 is secured adjacent plate 112 as by welding directly thereto or providing brackets (not shown) on the plate 112 to grippingly retain the heating element in juxtaposition thereto. The plate 112 is carried in a notch 117 in the ceramic spacer 118 and is thereby held in spaced relationship to the screen 120. Spaced from the collector plate heating element assembly is the catalyst screen or filter 120. This screen preferably is made of chromel or nichrome wire that is coated with a catalytic substance such as palladium or platinum. When a screen

of this nature is heated to its activating temperature, it has the ability to alter or consume smoke and odor from a gaseous medium being passed therethrough.

In accordance with the novel concepts of this invention, the perforated collecting plate 112 should be of greater mass than the catalytic screen or filter 120 disposed therebelow. In this manner and with heater 116 located between these elements, the screen 120 is permitted to warm to its activating or operating temperature prior to the time at which the collecting plate 112 is heated sufficiently to burn lint collecting on its top surface 122. With a given source of heat activating both the collector plate and the screen, the element with the greater mass will lag the other in coming up to temperature. Of course, it should be realized that the particular disposition of the collecting, heating and catalytic elements and the relatively greater mass of the collecting plate described hereinabove need not be considered as the only ways in which the catalytic screen can be made operative prior to the lint burning procedure. For instance, screen 120 could be heated from a separate source slightly in advance of the lint burning. Further, the catalytic screen could be continuously energized to obviate the problem which this invention solved. However, such continuous operation shortens the life of the catalytic element and hence is a less preferable approach to the problem.

The control circuit for the lint burning arrangement and for the clothes dryer will now best be understood with reference to the wiring diagram of FIG. 5. As illustrated therein, the lint burning heater 116 and the solenoid 90 are connected across power supply lines L_1 and L_2 and in series with a switch 200 actuated by a timer motor 202. The heater 116 is placed in condition for operation when the eliminator drawer 92 is placed in the cabinet 10 in a manner to interconnect electrical connectors 103 and 105. The prime mover 70 is connected in series with a timer operated switch 204 while the primary dryer heating element 42 and its controlling thermostat 206 are connected in series with another timer actuated switch 208. The timer operated switches are so sequentially arranged that upon setting of the timer to some predetermined timing period, the switches 204 and 208 are closed to energize the dryer heating element 42 and the prime mover 70 in accordance with conventional practice. Preferably, the switch 208 opens approximately five minutes before the opening of switch 204 at the end of the timing period in order that the tumbling drum 12 driven by prime mover 70 will be rotated for a period of time after deenergization of the heating element 42. Timer switch 200 preferably closes at the time the timer switch 208 opens, i.e. five minutes before the end of the drying cycle. Closure of switch 200 energizes the lint burning heater 116 and solenoid 90, the latter acting to close damper 80. With the energization of solenoid 90 to close damper 80 the air flow through the dryer and past the eliminator 91 is thereby reduced, while the heating element 116 is energized. A restricted amount of air must continue to circulate during the lint burning. One means of providing the reduced air flow is by way of an aperture 84 in the snugly fitting damper 80. Many other air reduction schemes will occur to the mechanic skilled in the art, as for instance, an interruption or notch 83 in the damper seal member 82 or merely a loosely fitting damper seal. The collector plate 112, to which the heater 116 is attached, will start to heat. At the same time, the catalytic screen 120 will heat, albeit more quickly due to the comparatively greater mass of the collector plate 112. When the surface 122 of plate 112 reaches the combustion temperature for the lint collected thereon, a burning process accompanied by smoke and odor ensues to consume the lint. But, by the time the lint starts to burn, the screen 120 has reached a temperature at which it is effective to remove the smoke and odor from the products of combustion being evolved. The

tumbling drum will continue to be rotated for approximately five minutes with the primary heating element 42 cut off and the lint burning thus accomplished during this period. It will be apparent that the timer actuated switch 200 might be closed at any other time during the drying cycle and need not necessarily be closed at the end of the drying cycle.

It should also be understood that the lint burning feature need not be controlled solely by the timer at a particular point in the drying cycle. For example, the energization of the lint burning arrangement may be made responsive to a reduction in air flow through the dryer as the surface 122 of plate 112 becomes clogged with lint and restricts air passage therethrough. Reference may be had, for a more complete disclosure in this regard, to the afore-mentioned copending application, Ser. No. 635,635.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. In combination, a lint collector and eliminator adapted to be supported in the air stream of a clothes dryer comprising a perforated plate for collecting the lint from said air stream, a heating element adjacent said plate to burn said lint, and a smoke altering means adjacent said heating element and downstream from said perforated plate in series air flow relationship to said perforated plate to alter the products of combustion during said burning; said perforated plate having a greater mass than said smoke altering means whereby said heating element is disposed in faster heat conducting relationship to said smoke altering means than said plate to activate said altering means before burning said lint.

2. In combination, a lint collector and eliminator adapted to be supported in the air stream of a clothes dryer comprising a means for collecting the lint from said air stream, a heating element adjacent said means to burn said lint, and a heat activated smoke altering means downstream from said collecting means in heat receiving relationship to said heating element and in series air flow relationship to said collecting means to alter the products of combustion during said burning; said lint collecting means having a greater mass than said smoke altering means whereby said heating element is disposed in faster heat conducting relationship to said altering means than said collecting means to activate said altering means before burning said lint.

3. In combination, a lint collector and eliminator adapted to be supported in the air stream of a clothes dryer having a drying cycle comprising means for collecting the lint from said air stream during one part of said cycle, means in heat transfer relationship to said collecting means for burning said lint during another part of said cycle, altering means downstream from said collecting means in series air flow relationship to said lint burning means to alter the products of combustion of said burning, and means including the relative masses of said collecting means and said altering means to activate said altering means to alter said products before said burning.

4. In combination, a clothes dryer including an outer cabinet, a tumbling drum having an imperforate peripheral wall rotatable in said outer cabinet, said tumbling drum having a rear perforated wall and a front access opening, heating means located adjacent said rear perforated wall, an air discharge duct communicating with the access opening of said tumbling drum, a blower having an air inlet connected with said duct and operable to pull air from said tumbling drum into said duct, and

lint collecting and burning means in said duct including a perforated plate for collecting said lint, a catalyst screen spaced downstream from said plate for consuming the products of combustion of said burning, and a heater attached to said plate between said plate and said screen for heating said plate to burn said lint and for heating said screen to consume said products; said perforated plate having a greater mass than said screen to cause said screen to become operative before said lint is burned.

5. In combination, a foreign matter collector and eliminator adapted to be connected to an air stream in air flow intercepting relationship comprising means for collecting foreign matter from said air stream, a heating element adjacent said means to burn said foreign matter, a heat activated altering means arranged in series air flow relationship to said collecting means and said heating element downstream from said collecting means to alter the products of combustion during said burning, said heating element being disposed between said collecting means and said altering means, and means including the relative masses of said collecting means and said altering means to activate said altering means before burning said foreign matter.

6. A clothes dryer including means defining a dryer chamber, lint elimination means comprising a lint collecting and burning element, a heat activated catalytic screen spaced from said collecting and burning element, heating means disposed between said element and said screen and adapted to activate said element and said screen, said burning element having a greater mass than said catalytic screen whereby the catalytic screen is activated prior to the activation of said burning element when the heating means is energized, and means for circulating heated air sequentially through the drying chamber, the collecting and burning element and the catalytic screen.

7. A clothes dryer including means defining a dryer chamber, lint elimination means comprising a lint collecting and burning element, a heat activated altering means spaced from said collecting and burning element, heating means disposed in heat transfer relationship to said element and said altering means and adapted to activate said element and said altering means, said burning element having a greater mass than said altering means whereby the altering means is activated prior to the activation of said burning element when the heating means is energized, and means for circulating air sequentially through the drying chamber, the collecting and burning element and the altering means.

8. A clothes dryer including means defining a dryer chamber, lint elimination means comprising a lint collecting and burning element, a heat activated catalytic screen spaced from said collecting and burning element, heating means disposed in heat transfer relationship to said element and said screen and adapted to activate said element and said screen, said burning element having a greater mass than said catalytic screen whereby the catalytic screen is activated prior to the activation of said burning element when the heating means is energized, and means for circulating heated air sequentially through the drying chamber, the collecting and burning element and the catalytic screen.

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