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CLOTHES DRYER INCORPORATING LINT DESTROYING MEANS

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3 Sheets-Sheet 1

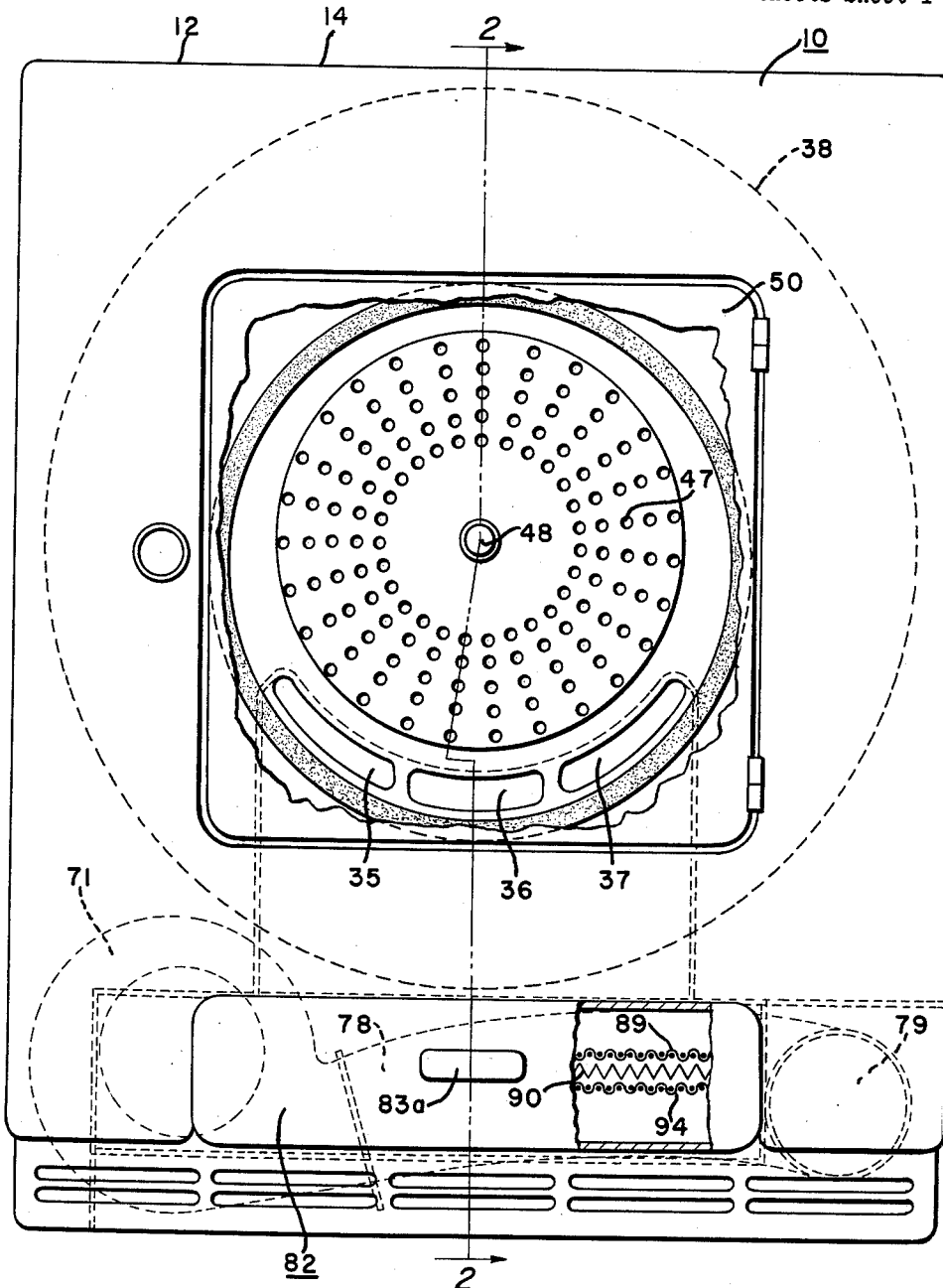


Fig. 1

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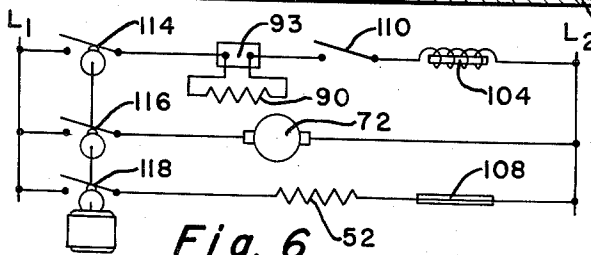
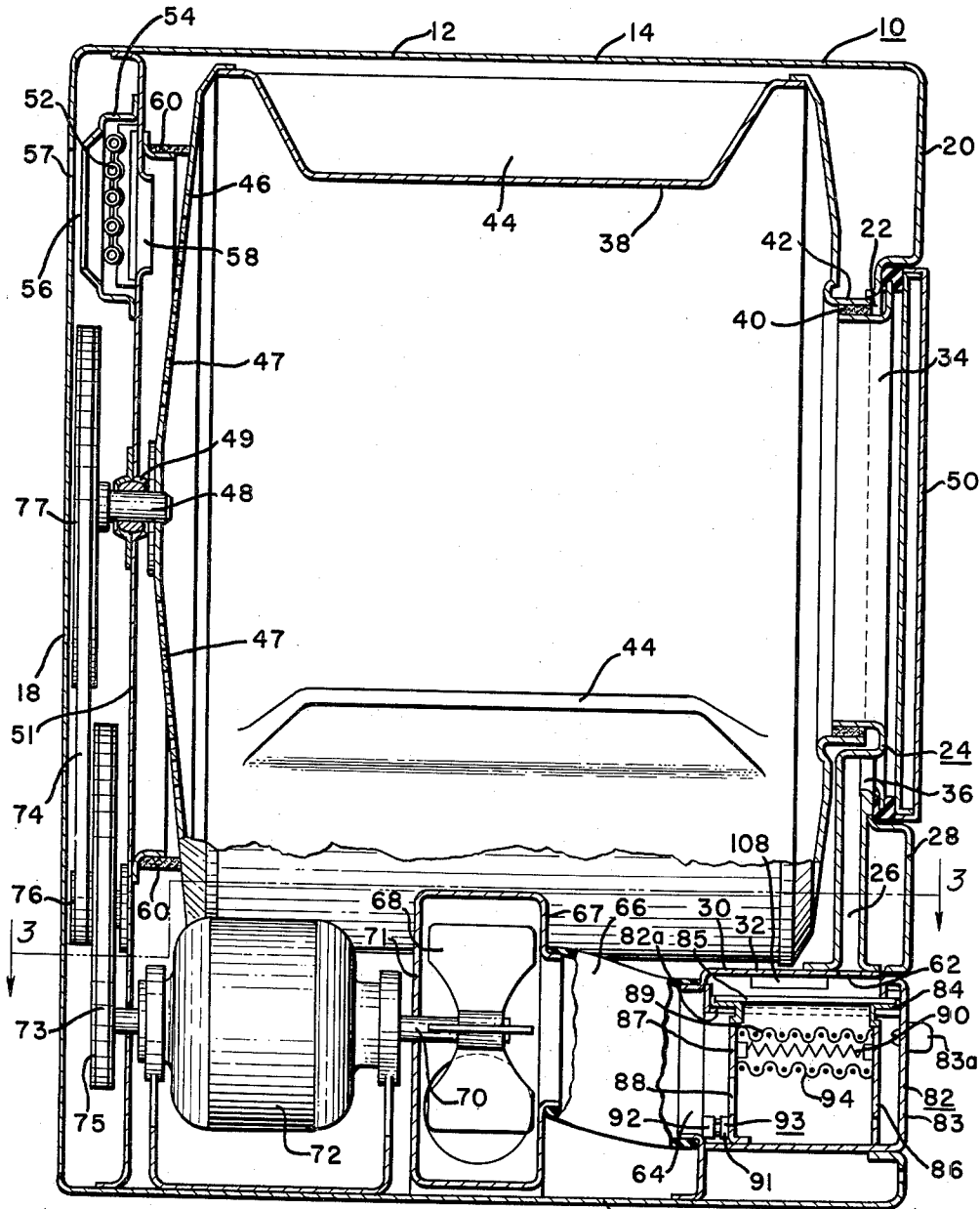
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3 Sheets-Sheet 3

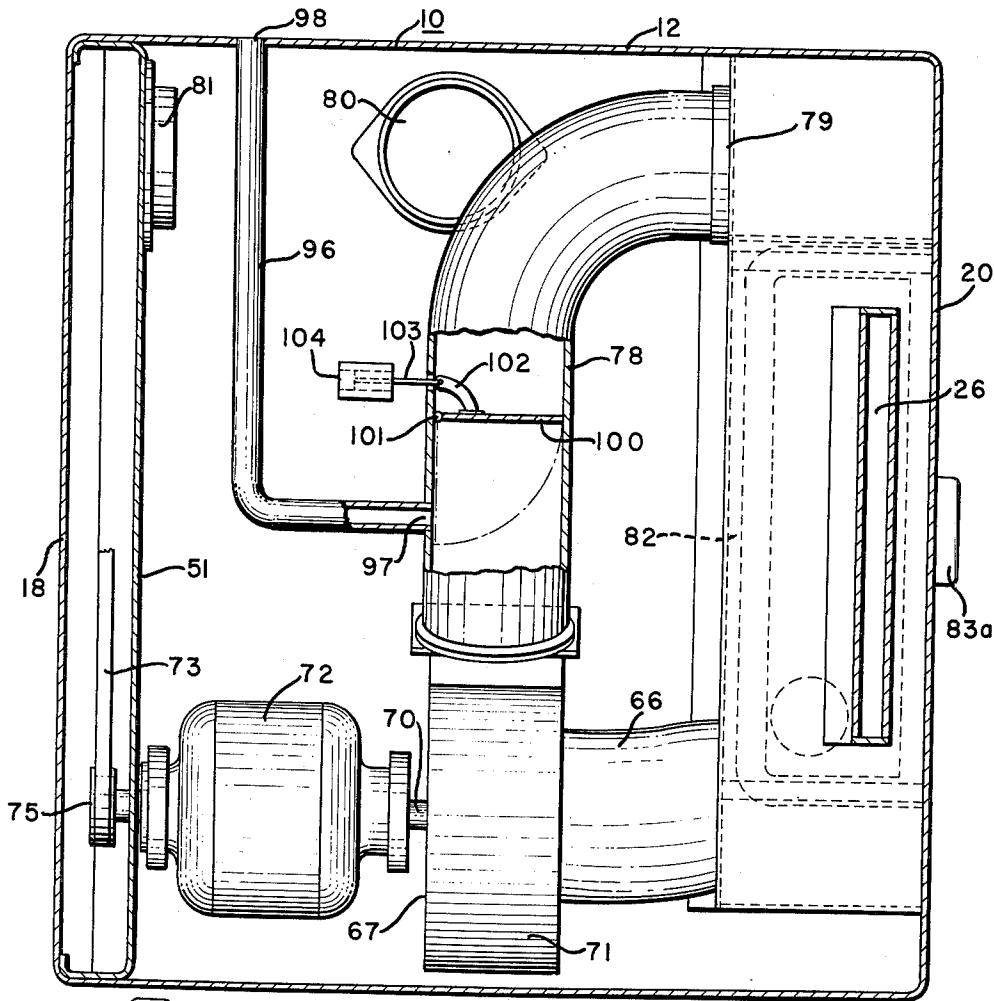


Fig. 3

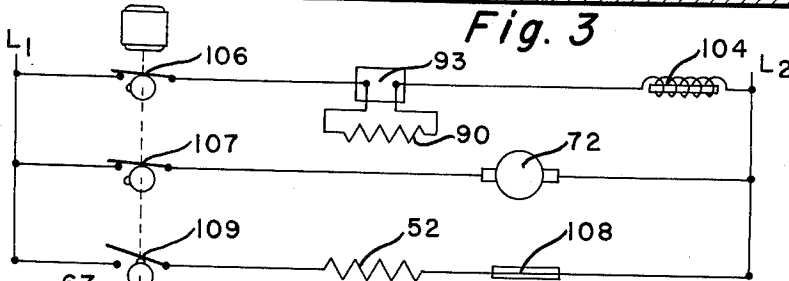


Fig. 4

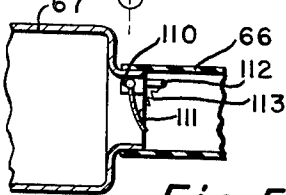


Fig. 5

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## CLOTHES DRYER INCORPORATING LINT DESTROYING MEANS

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15 Claims. (Cl. 34—44)

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.

One of the major difficulties encountered in present-day clothes dryers is the collection and subsequent disposal of lint that is evolved as an incident to the clothes drying operation. The usual method for collecting lint has been to provide a removable lint filter box that is disposed within the air flow path of air discharging from the drying chamber of the dryer, the filter box including a filter element for catching the lint. The filter box must be removed from the dryer and the lint disposed of periodically with such a device. The lint collecting in the lint box in many cases scatters and lodges on parts of the dryer and in some instances finds its way out of the dryer where it lodges in the room where the dryer is located.

In contrast to the above described method of removing lint, it is an object of this invention to collect lint within the dryer and also to destroy lint within the dryer by a burning process. The lint burning process includes collecting the lint on a suitable filter element located in the discharge air path of the dryer and then burning the lint by means of a heating element disposed closely adjacent the lint collecting filter.

Another object of the invention is to provide a lint burning arrangement for a clothes dryer wherein the products of combustion are changed to substantially colorless and odorless products by a suitable filter element.

Another object is to provide a lint burning arrangement for a clothes dryer wherein the flow of air through the lint burner is reduced when the lint burning is taking place.

Still another object is to provide a clothes dryer with a lint burner that is automatically rendered effective to destroy lint whenever the air flow through the dryer is reduced by a predetermined amount.

A further object is to provide a clothes dryer with a tumbling drum having a substantially imperforate peripheral wall, the air leaving the tumbling drum being passed through the lint burning arrangement of this invention.

Still another object is to provide a lint collecting and destroying box that is removably associated with a clothes dryer.

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, of a clothes dryer made in accordance with this invention;

FIGURE 2 is a vertical sectional view taken along line 2—2 of FIGURE 1;

FIGURE 3 is a sectional view, with parts broken away, taken along line 3—3 of FIGURE 2;

FIGURE 4 is a control circuit diagram of the clothes dryer of this invention;

FIGURE 5 is a modified air duct structure showing an air flow operated switch that may be used with the dryer shown in FIGURES 1, 2 and 3; and

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FIGURE 6 is a control circuit diagram employing the air flow operated switch shown in FIGURE 5.

The lint burning arrangement of this invention is shown for use with a clothes dryer generally denoted by reference numeral 10. The clothes dryer is provided with an outer cabinet 12 having a top wall 14, a lower wall 16, a rear wall 18 and a front wall 20 having a front access opening 22. A port plate generally denoted by reference numeral 24 and including a vertically extending conduit portion 26 is welded to a front panel member 28 and to the top wall 30 of an air box or lint collector housing 32. The port plate 24 has a flanged portion 34 fitting within the access opening 22 of the cabinet and is also provided with openings 35, 36 and 37 located below the flanged portion 34. The port plate 24 supports the forward or outlet end of tumbling drum or casing 38 through a seal 40 that is interposed between a flanged portion 42 of the tumbling drum and the flanged portion 34 of the port plate. The tumbling drum 38 is generally cylindrically shaped to form a drying chamber and is provided with inwardly extending tumbling vanes 44. The outer peripheral wall of the tumbling drum is imperforate. The rear wall 46 of the tumbling drum is perforated as at 47 to form an air inlet opening to the drum and is attached to a shaft 48 journaled within a spherical bearing 49. Access to the interior of the tumbling drum is afforded through the cylindrically shaped flanged portion 34 of the port plate 24 and this opening is covered by a door 50 that is pivotally secured to the cabinet 12 of the dryer.

The cabinet structure of the dryer includes a vertically extending bulkhead 51 that supports the bearing 49. An electric heating element 52 is secured to the bulkhead 51 and is enclosed by a housing 54. The housing 54 is provided with an air passage 56 in alignment with an air passage 57 formed in the rear wall 18 of the dryer and in alignment with a passage 58 formed in the bulkhead 51 of the dryer. The passages 56, 57 and 58 constitute an air inlet for the dryer. A felt seal 60 is secured to the bulkhead 51 of the dryer and abuts the rear wall 46 of the tumbling drum. The seal 60 circumscribes the perforated portion 47 of the rear wall of the tumbling drum.

The air box 32 is formed with a passage 62 in alignment with the passage 26 formed in the port plate 24. The air box 32 is open at 64, there being a flexible conduit or exhaust duct 66 encompassing the opening 64. The flexible conduit 66 is connected to a blower housing 67 of blower 71 that contains air impelling vanes 68 connected to a drive shaft 70. The drive shaft is driven by an electric motor 72 which also drives the tumbling drum through belts 73 and 74 and through pulleys 75, 76 and 77.

The outlet of blower 71 is connected with a pipe 78 which may be connected with outlet passages 79, 80 or 81 respectively located at the front, bottom or rear of the dryer 10. With this arrangement the blower 71 constantly exhausts air from the interior of tumbling drum 38, the air passing through the flanged member 34, through the passages 35, 36 and 37, downwardly through passage 26, through air box 32, and through flexible conduit 66 into the blower 71. Makeup air for the tumbling drum is supplied through passages 56, 57 and 58, the air passing through these passages being heated by heating element 52 and then passing through the rear perforated portion 47 of the tumbling drum 38.

The air box 32 contains a removable lint collecting and burning box generally denoted by reference numeral 82. This box comprises a box-like structure having a front wall 83 and a top wall 84 formed with an opening 85. The lint box 82 has a handle 83a which is grasped in removing the box from the dryer. A pair of upstanding

supports 86 and 87 are secured to the box-like structure. The support 87 is provided with an air passage 88 which permits flow of air from the conduit 26 formed in the port plate 24 to the flexible conduit 66. A metal or ceramic lint collecting screen 89 is supported between the supports 86 and 87. An electric lint burning heating element 90 is supported immediately below the screen 89. The heating element is preferably connected with a male plug 91 that interfits with a female plug 92 to provide an electrical connection for the heating element when the lint box 82 is slid into place in the dryer. The plugs 91 and 92 are designated as a whole by reference numeral 93 in FIGS. 4 and 6. A screen 94 is supported by supports 86 and 87 immediately below the electric heating unit 90. This screen preferably is made of Chromel or Nichrome wire that is coated with a catalytic substance such as palladium or platinum. The screen 94 operates as a smoke filter, smoke altering device or eliminator, as is more fully described hereinafter. With this arrangement the lint burning and collecting box 82 is removably secured within the air box 32, the top wall of the collecting box 84 being slidably supported in suitable guides 82a, as shown in FIG. 2. It is thus apparent that the lint box 82, the screen 89, the heating element 90, and smoke filter 94 may be removed as a unit to clean off any non-combustible products such as sand, metallic or glass particles, from screen 89 that might not be burned.

When the dryer is operated, the blower 71 continually pulls air downwardly through conduit 26 and through the screen 89, heating element 90 and through the smoke filter 94. The screen 89 is made of a sufficiently fine mesh so as to filter out any lint entrained with the air passing through the air box 32. This lint is effectively burned whenever electrical heating element 90 is energized. The process of burning is more of a charring action rather than burning with a flame, but the type of combustion depends on the material being burned. The products of combustion during the lint burning process pass through the catalytic coated filter element 94 on their way to the intake of blower 71. This catalytic element is heated by heating element 90 and the heated catalyst oxidizes the products of combustion so that the air leaving the catalytic element 94 is substantially colorless and odorless. The screened catalyst coated member 94 thus operates as a smoke filter or eliminator during the lint burning process. The filter element 94 is illustrated as a catalytic element, as one example only, and any suitable filter that eliminates either smoke or odors or both might be substituted for the filter element 94. The catalytic element might be also formed by coating a separate electric heating element with a catalyst or by coating heating element 90 with a catalyst.

It is desirable to reduce the flow of air through the collector box 82 when the lint burning process is taking place. To this end the discharge conduit 78 from the blower 71 is connected with a pipe 96 that intersects the pipe 78 at 97. The conduit 96 is of much smaller cross-sectional area than the pipe 78 and discharges exteriorly of the dryer 10 at 98. A damper 100 is fitted within the conduit 78 and is pivotally secured thereto at 101. A bellcrank arm 102 is connected to the damper and is also connected to a plunger 103 of a solenoid 104. The damper 100 normally overlies the intersection 97 of conduits 96 and 78, thus closing off conduit 96 and permitting flow of air outwardly through conduit 78. When the solenoid 104 is energized, the plunger 103 is pulled leftwardly in FIG. 3 to move the damper to the full-line position of FIG. 3 wherein the damper closes the discharge of air through conduit 78 and uncovers the intersection 97 of the conduits 96 and 78. The solenoid 104 is of the type wherein the solenoid plunger 103 is biased rightwardly in FIG. 3 by a spring (not shown) to normally hold the damper in a position covering conduit 96. With the damper closing off conduit 78, air discharging

from the dryer must pass through the conduit 96. Since the conduit 96 is of a greatly reduced cross-section the flow of air therethrough is greatly reduced, thereby bringing about a reduction of the flow of air through the lint burning box 82.

The control circuit for the lint burning arrangement and for the clothes dryer is shown in FIG. 4. As shown in this figure, the lint burning heater 90 and the solenoid 104 are connected cross lines  $L_1$  and  $L_2$  and in series with a timer actuated switch 105. The electric motor 72 is connected in series with a timer operated switch 107 while the heating element 52 and a thermostat 108 are connected in series with a timer operated switch 109. The timer operated switches are so sequentially arranged that upon setting of the timer to some predetermined timing period, the switches 107 and 109 are closed to energize the heating element 52 and the motor 72 in accordance with conventional practice. Preferably, the switch 109 opens approximately five minutes before the opening of switch 107 at the end of the timing period in order that the tumbling drum driven by motor 72 will be rotated for a period of time after deenergization of the heating element 52. The timer switch 106 preferably closes at the time the timer switch 109 opens, i.e. five minutes before the end of the drying cycle. The closure of switch 106 energizes the lint burning heater 90 and the solenoid 104. With the energization of solenoid 104 the damper 100 is moved to the full-line position of FIG. 3 to reduce the air flow through the dryer while the heating element 90 is energized to commence the burning of the lint collected on screen 89. The tumbling drum will then be rotated for five minutes after the heating element 52 is cut off and the lint burning will be accomplished during this time. It will be apparent that the timer actuated switch 106 might be closed at any other time during the drying cycle and need not necessarily be closed at the end of the drying cycle.

A modified arrangement for actuating the damper 100 and for energizing the lint burning heating element 90 is illustrated in FIGS. 5 and 6. With this arrangement an air flow operated micro-switch 110 is disposed within flexible conduit 66 adjacent the blower housing 67. The switch includes a vane operator 111 that is connected to fixed supporting pin 112 by a spring 113. The spring normally holds the switch 110 in a closed position. During operation of the dryer the air passing through flexible conduit 66 impinges on the vane 111 to hold the switch in an open position. The switch 110 as shown in FIG. 6 is connected in series with heating element 90, the solenoid 104, and timer actuated switch 114. The electric motor 72 is connected in series with timer actuated switch 116 while the heating element 52 and thermostat 108 are connected in series with a timer actuated switch 118. The timer actuated switches 116 and 118 operate in a manner identical with the operation of switches 107 and 109 shown in FIG. 4 in that the switches are simultaneously closed, but the switch 118 opens five minutes before the end of the drying cycle and before opening of switch 116. The timer actuated switch 114 preferably opens at the end of the drying cycle with the opening of switch 116. With this arrangement the circuit for the lint burning heating element 90 and the solenoid 104 is normally open as long as the air flow through the dryer is normal, due to the fact that the vane 111 moves the switch 110 to an open position when a sufficient volume of air is flowing through conduit 66. In the event the air flow is reduced a predetermined amount by lint collecting on screen 89 and clogging the air flow path, the switch 110 closes to energize solenoid 104 and heating element 90. The energization of solenoid 104 moves the damper 100 to the full-line position of FIG. 3 to reduce the air flow through the dryer and to burn the lint collecting on screen 89. When the lint is sufficiently burned so that the air flow through the dryer is back to some predetermined value, the vane operator 111 again opens switch 110 whereby

the solenoid 104 moves the damper to a position closing off conduit 96 and deenergizes the lint burning heater 90. With this arrangement the lint is only burned when sufficient lint collects on the screen 89 to reduce the air flow through the dryer. The lint burner 90 and solenoid 104 cannot be actuated when the dryer is not being used due to the fact that the timer operated switch 114 is opened at this time.

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

What is claimed is as follows:

1. A clothes dryer including a drying chamber, heating means for said chamber, an air inlet and an air outlet for said dryer communicating with said chamber, air impelling means for circulating air through said chamber from said inlet to said outlet, lint collecting means located between said inlet and outlet in the path of air circulating therebetween, means for burning the lint collected by said lint collecting means, and means for reducing the air flow between said inlet and outlet while said lint burning means is effective.

2. A clothes dryer including a chamber, heating means for said chamber, air inlet and outlet means associated with said dryer communicating with said chamber, air impelling means for circulating air between said inlet and outlet means and through said chamber, lint collecting means in the path of air being circulated between said inlet and outlet means, lint burning means operable to burn the lint collected in said lint collecting means, and means responsive to a reduction in air flow through said lint collecting means for setting said lint burning means into operation.

3. A clothes dryer having an air inlet and an air outlet, means defining an air flow path for said dryer connecting said inlet and outlet, a clothes receiving receptacle interposed in said air flow path, air impelling means for circulating air between said inlet and outlet through said receptacle, means for reducing the flow of air along said path, lint collecting means located in said flow path for collecting lint moving with said air, lint burning means for burning the lint collected by lint collecting means, and means responsive to a reduction in air flow along said air flow path for setting said lint burning means into operation and for operating said flow reducing means to reduce the air flow along said path.

4. A clothes dryer comprising, a rotatable tumbling drum, means for rotating said drum, air discharge passage means associated with said drum, first and second conduit means communicating with said discharge passage, said first conduit means being substantially smaller in cross-sectional area than said second conduit means, air impelling means for circulating air through said tumbling drum and through said passage means and conduit means, a damper for selectively blocking flow of air from said passage means to one of said conduit means while simultaneously permitting flow of air from said passage means into the other of said conduit means, lint collecting means located in said discharge passage means, means for burning the lint collected by said lint collecting means, and means for shifting said damper to a position wherein said first conduit means is open to said discharge passage means and wherein said second conduit means is blocked from said discharge passage means, whereby the air flow through said lint collecting means is reduced during the ignition and burning of said lint.

5. A clothes dryer including a drying chamber, heating means for said drying chamber, means defining an air flow path for said dryer with said chamber being located in said flow path for passing air through said chamber, air impelling means for circulating air along said flow path, a lint collecting means in said flow path, a lint burning means for burning the lint so collected, control means for varying the volume of flow of air moving along

said flow path, and a timer controlling the operation of said control means.

6. A clothes dryer comprising a casing defining a drying chamber and having an air inlet opening and an air outlet opening therein, a lint collector housing communicating with said air outlet, lint collector means in said housing, an air exhaust duct for receiving air from said housing, means for circulating heated air sequentially through said drying chamber, said housing, and said exhaust duct, means for burning the lint collected on said lint collector means, means for reducing the volume of air circulated past said lint collector means, and means for concurrently actuating said burning means and said air circulation reducing means.

7. The clothes dryer of claim 6 wherein said exhaust duct communicates with said inlet opening.

8. A fabric dryer comprising a casing defining a drying chamber and having an air inlet opening and an air outlet opening therein, lint collecting means communicating with said air outlet opening, an air exhaust duct for receiving air from said drying chamber and said lint collecting means, means for circulating heated air sequentially through said drying chamber, said lint collecting means and said exhaust duct, means for burning the lint collected on said lint collector means, means for reducing the volume of air circulated past said lint collecting means, and means for concurrently actuating said burning means and said air circulation reducing means.

9. A clothes dryer including a casing defining a drying chamber and having an air inlet and an air outlet, air impelling means for circulating air through said chamber from said inlet to said outlet, lint collecting means communicating with said air outlet and located in the path of air circulating from said chamber, means for burning the lint collected by said lint collecting means, and means synchronized with said burning means for reducing the air flow past said lint collecting means while said lint burning means is effective.

10. A fabric dryer including a casing defining a drying chamber and having a fluid medium inlet opening and a fluid medium outlet opening therein, lint collecting means communicating with said outlet opening, means for circulating a fluid medium sequentially through said drying chamber and into complete lint collecting relationship with said lint collecting means, means for reducing the fluid medium flow on said lint collecting means, means for burning the lint collected, and synchronizing means for operating said burning means only at a fixed interval during a period of reduced fluid medium flow on said lint collecting means.

11. A clothes dryer comprising a casing defining a drying chamber and having an air inlet opening and an air outlet opening therein, a lint collector housing communicating with said air outlet, lint collector means in said housing, an air exhaust duct for receiving air from said housing, means for circulating air sequentially through said drying chamber, said housing and said exhaust duct, means for burning the lint collected on said lint collector means, means for altering the products of combustion from said lint burning means, means for reducing the volume of air circulated past said lint collector means, and means for concurrently actuating said burning means and said air circulation reducing means.

12. The structure of claim 11 wherein said altering means comprises a catalytic screen in adjacent heat receiving relationship to said burning means.

13. A clothes dryer comprising a casing defining a drying chamber and having an air inlet opening and an air outlet opening therein, a lint collector housing communicating with said air outlet, lint collector means in said housing, an air exhaust duct for receiving air from said housing, means for circulating heated air sequentially through said drying chamber, said housing, and said exhaust duct, a first duct communicating with said exhaust duct, a second duct relatively smaller than

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said first duct and communicating with said exhaust duct, means located in one of said ducts for changing the flow path of said air through either said first or said second duct, means for burning the lint collected on said lint collector means, and means for concurrently actuating said burning means and for actuating said flow path changing means to cause a flow of said air through said second duct.

14. 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 through said tumbling drum into said duct, lint collecting means in said duct, lint burning means in said duct located adjacent said lint collecting means, means for actuating said

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lint burning means, and means synchronized with said actuating means for reducing the air pulled by said blower while said lint burning means is actuated.

15. The combination of claim 14 which further includes smoke altering means in said duct located adjacent said lint burning means.

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