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C. A. COBB ET AL.
AUTOMATIC LINT REMOVER

2,925,664

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3 Sheets-Sheet 1

Fig. 4

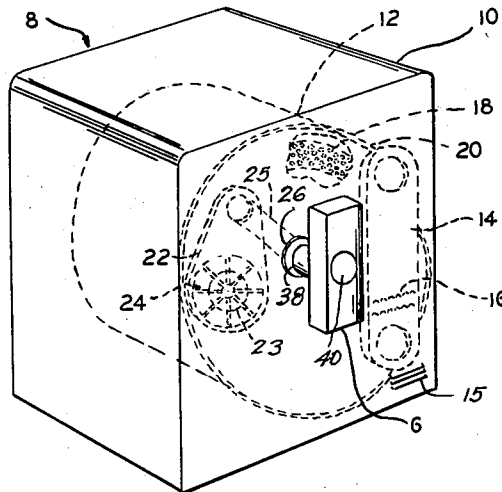
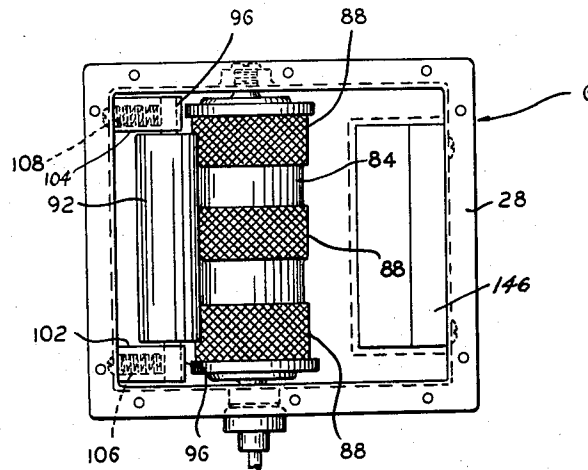


Fig. 1

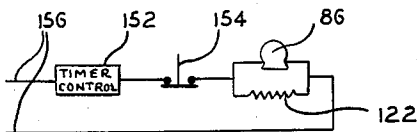


Fig. 5

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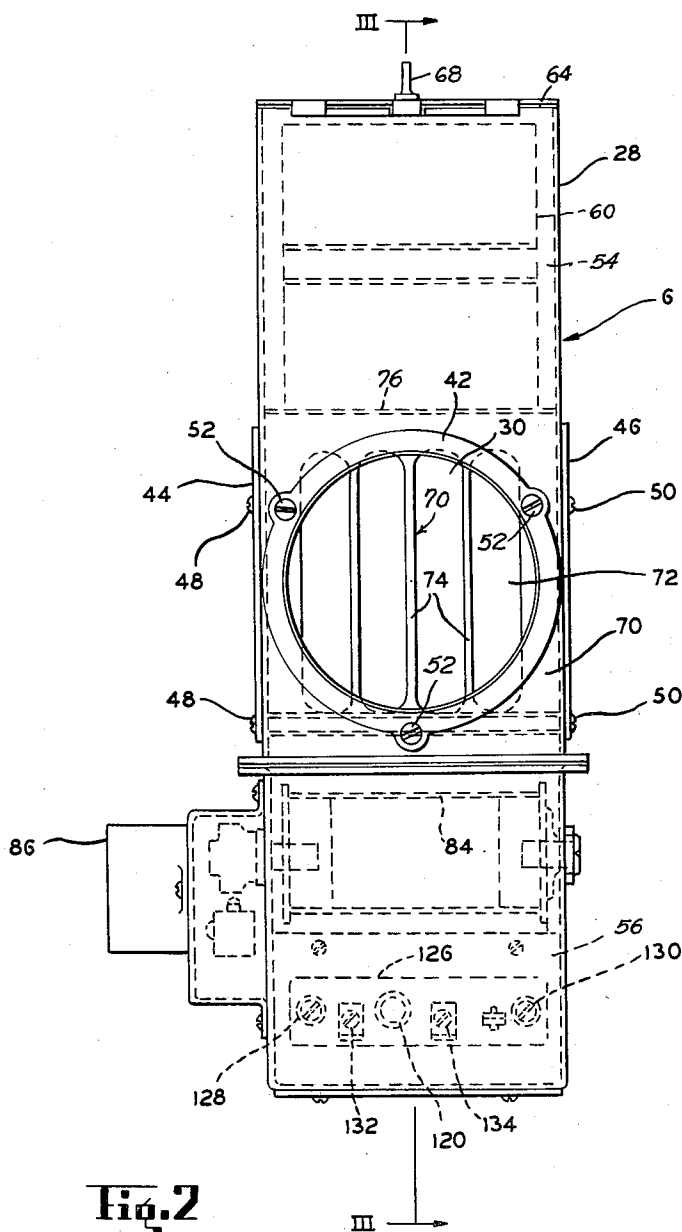
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3 Sheets-Sheet 2



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AUTOMATIC LINT REMOVER

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The present invention relates to improvements in devices for removing lint and the like from air and especially for removing lint from drying air that has been circulated through a domestic clothes drier.

In the drying of clothes in clothes driers a heated air is circulated through the drying chamber to evaporate the moisture therefrom. In its circulation, the air picks up lint from the drying clothing. This lint is objectionable in that it will adhere to surfaces contacted by the air when it is discharged from the machine and will be dropped as the velocity of the air is reduced making it highly undesirable to discharge air from a drier directly into a room. Further, the lint will contribute to the dust content of the air and will deposit unattractive and undesirable balls of fuzz and lint in the household and will even make it impractical to discharge the drying air into an attic or to an area outside of the house if the drier is vented to the outside.

Efforts to avoid the lint problem have included placing screens or filters in the air stream to filter the lint therefrom. These filters must be sufficiently porous so as to not require frequent cleaning and as such will pass much of the dust and lint into the air. The filters, however, require frequent changing and if the operator fails to remove and clean the filter, in time the flow of air through the drier will be stopped terminating the effective drying operation and frequently creating a dangerous situation in the overheating of the drier from failure to continue an air movement therethrough. Filters which are capable of automatically changing themselves or include automatic cleaning equipment still require disposal of the lint. Attempts have been made to remove the lint by combustion, but these devices have encountered difficulties and have not been fully satisfactory.

Accordingly, it is an object of our invention to provide an improved device for completely and satisfactorily removing lint from the drying air discharged from a domestic-type clothes drier and for automatically disposing of the lint.

Another object of the invention is to provide an improved lint-removing device which will automatically burn the lint that is removed from the air.

A further object of the invention is to provide an improved safe lint burning mechanism which will destroy the lint by combustion and will also remove the objectionable features of combustion including the heat, smoke, and odor which usually accompany such procedures.

A further object of the invention is to provide a lint-filtering device utilizing a porous membrane which is capable of effectively and completely removing lint from the drier air stream and which is easily operated and simple to refill with an additional supply of membrane material.

A general object of the invention is to provide a lint-removing device which will destroy the lint and remove membrane by combustion and which is simple, effective, and complete and provides a simple, reliable, automatic

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operating device capable of a long reliable operating life.

Other objects and advantages will become more apparent with the complete disclosure of our invention in the specification, claims, and accompanying drawings, in which:

Figure 1 is a perspective view of a domestic-type clothes drier illustrating certain interior elements in phantom view and illustrating the present embodiment of the lint-removing device attached thereto;

Figure 2 is a rear elevational view of the lint-removing device;

Figure 3 is a vertical sectional view of the lint-removing device taken along the line III—III of Figure 2;

Figure 4 is a horizontal sectional view taken along line IV—IV of Figure 3; and,

Figure 5 is a diagram of the circuit utilized for controlling the operation of the lint-removing device.

The lint-removing mechanism is shown at 6 in Figure 1 as attached to the cabinet 8 of a domestic-type clothes drier. It will be understood that although the lint-removing mechanism finds a special utility and obtains many advantages in this environment, its use is not restricted to the particular arrangement illustrated and described and its use and the preferred construction are presented as the preferred embodiment thereof for purposes of disclosing the invention.

In a clothes drier of the type shown, the mechanism is housed in a cabinet 10 which encloses a rotating drum 12 in which the clothes are tumbled while being exposed to a circulated, heated drying air. The drying air is applied to the clothes in the drum through an intake conduit 14 through which the air is drawn from inlet louvers 15 of the cabinet 10 and passed over a heating element 16. The air is admitted to the drying drum through an annular perforated area 18 in the rear wall of the drum. Closely adjacent this rear wall is a bulkhead 20 which seals the perforate area and which has an opening to admit air conducted through the conduit 14. The heated air is circulated within the drum 12 and leaves through bulkhead outlet 23 hence into fan scroll 22 then passes by the fan 24 which operates to draw the air through the entire system. The air is discharged from the fan through outlet conduit 25 and into an opening 26 in the back of the cabinet and this air stream is directed through the lint-removing apparatus shown generally at 6.

The lint-removing device is shown in greater detail in Figures 2, 3 and 4 and is enclosed in an enclosure or housing 28 which is illustrated as being rectangular in shape and formed of sheet metal or a like material or which may be formed of plastic or any other suitable substance. The housing 28 is provided with a conduit 30 extending therethrough which receives the air stream from the drier. The conduit inlet 32 is defined by an opening 34 in the housing 28 and the opening is surrounded by an annular ring 36 terminating in a flat flange 38 for purposes of connecting and supporting the housing 28 to the clothes drier cabinet or a like structure. The air discharges from the housing 28 through a discharge opening 40 which is surrounded by an annular ring 42 which may receive a pipe or the like for conducting away the discharged air stream and the combustion gases as will later be explained.

As is pictured in Figure 2, alternate side discharge openings are provided shown with cover plates 44 and 46 held in place against the housing by screws 48, 48 and 50, 50. For discharge of the air stream from the side of the housing, either of the cover plates 44 or 46 may be removed and placed over the discharge opening 40 with the ring 42 being removed by removal of the at-

tachment screws 52 and being attached to the opening which is used.

The housing 28 may be regarded as being divided into three chambers with the upper or supply chamber being shown at 54, the intermediate chamber, which is the air conduit, being shown at 30 and the lower chamber which includes the combustion zone and mechanism for handling and disposing of the lint and web being shown at 56.

For filtering the lint from the air, a porous webbing or membrane of combustible material is extended across the conduit 30 so that the air stream will be forced through the membrane material 58. The membrane material is continuously supplied from a supply roll 60 housed in the upper supply chamber 54. The roll of material 60 is supported on a shaft 62 which is removable from the roll and from the supply chamber for providing a new roll when the present one becomes exhausted or the said roll of material may be free floating in the supply chamber. For access to the supply chamber, a cover 64 is provided, which is hinged along its rear edge on a hinge pin 66 and which is latched at its front edge by latching member 68, which is flattened so as to be rotatable between locking and releasing positions.

The porous membrane material 58 is drawn downwardly across the conduit 30 and is supported therein by membrane supporting member 70. The membrane supporting member 70 is perforated to permit the air stream to flow through the porous material 58 and is illustrated in Fig. 2 as being provided with wide vertical slots 72 defined by vertical struts 74 between them. The membrane supporting member 70 is a vertical continuation of and integral with the upper divider member 76 and the lower divider member 78 which respectively separate the supply chamber 54 from the conduit 30 and the conduit 30 from the lower chamber 56. Ahead of the dividers 76 and 78, and on the opposing side of the membrane supporting member 70 are small baffles 80 and 82 above and below the conduit 30 to prevent the air stream, which enters the housing, from passing into the upper supply chamber and down into the lower chamber and restricts it to entering the conduit and passing through the membrane supported by the membrane supporting member 70. A leakage of air is permitted to pass into the lower chamber through slot 150 as will be explained.

The porous membrane material is pulled downwardly across the conduit 30 by take-up roll 84 coacting with pressure rolls 90 and 92. The take-up roll is driven at a slow rotation, on the order of one revolution per minute, by gear reduction motor 86 which is suitably secured to the housing 28. The gear reduction motor is electrically driven and is controlled in the circuitry in a manner which will be described later in connection with Figure 5. As illustrated in Figure 4, the take-up roll may be provided with knurled areas 88, 88 or other suitable areas of friction for positively drawing the porous material 58 downwardly. To insure good frictional contact between the material and the take-up roll 84, pressure rollers 90 and 92 press the membrane material 58 firmly against the surface of said take-up roller. The pressure rollers 90 and 92 are suitably supported on shafts 94 and 96 carried in slots 98 and 100 in projecting roll supporting brackets 102 and 104, as is shown in Figures 3 and 4. Compression springs 110 and 108, housed in the brackets 102 and 104 push outwardly on the ends of the shaft 96 to urge the upper roller 92 against the take-up roll 84, and similar springs 110 press against the ends of the shaft 94 to urge the lower roller 90 against the take-up roll 84.

It is to be noted that as the porous material 58 is drawn downwardly by the take-up roll 84, the lint 112 builds up on the surface of the membrane material 58. This material is loosely adhered to the membrane material and as it is carried downwardly it is flattened and compressed against the material in a compact flat sheet by the action of the pressure rollers 90 and 92. This

presents a compact adherent sheet of material suitable for combustion and which is delivered down into the combustion zone 114. In the event there is any tendency of the lint material to adhere to the pressure rollers 90 or 92, spring scrapers 116 and 118 bear against the lower surface of the rollers to remove any of the lint material therefrom. Lint which drops from the upper roller will be caught by the lower roller and again pressed against the membrane material 58 and material which drops from the lower roller drops down into the combustion zone 114 or to the general area of the zone where it will be consumed.

To cause an open flame ignition in the combustion zone 114 and insure the consumption of the combined membrane and lint by combustion, an ignition element 120 is provided. The ignition element has a coil 122 wound thereon and an electrical current is passed through the coil to provide suitable heat for burning the material. The combustion member 120 projects into the combustion zone 114 and is supported on a wall 124 within the housing with the base 126 suitably attached to the wall, as by screws 128 and 130, as shown in Figure 2. Terminals 132 and 134 are provided for the connection of wires for the supplying of electricity to the coil 122.

A shield 136 having an opening 137 extends above the combustion zone 114 to direct the fumes and smoke and products of combustion up through a passageway or conduit 138. This secondary conduit 138 leads upwardly from the combustion zone 114 to direct the products of combustion back into the air stream flowing through the conduit 30.

In the conduit 138 is a catalytic filament 140 of the type known to the art and this filament is operative to reduce the offensive and detrimental nature of the products of combustion and operates principally to lessen the smoke and odor emanating from the combustion zone 114.

As the combustion gases pass upwardly through the conduit 138, they enter the labyrinth chamber 142 which serves to cool the gases. The labyrinth chamber may be formed in various designs and is shown with a series of baffles 144 provided with openings 146 at opposing ends so as to cause the gases to pass upwardly through a tortuous path, whereby amounts of their heat are given up to the material from which the labyrinth chamber is constructed. After leaving the labyrinth chamber at the discharge end of the conduit 138, the gases pass into the air stream and are discharged through the opening 40. This opening may lead to the atmosphere of the room or to a special vent pipe to be conducted to a predetermined location.

It is to be noted that the lower baffle 82, adjacent the entrance of the conduit 30, is spaced slightly from the lint-coated membrane. This leaves a gap 150 through which a small amount of the air of the air stream passes. This air circulates down into the lower chamber 56 and through the burning zone 114 to carry the smoke and ashes of combustion upwardly and prevent them from depositing in the lower chamber.

The illustrated embodiment shows the ignition element 120 in the burning zone 114 as carrying a resistance wire 122 which may be the conventional Nichrome wire ribbon. The smoke and combustion gases then pass up through a catalytic filament 140. It is to be recognized that these elements may be replaced with a combined ignition-catalytic assembly using a resistance-platinum filament which heats and creates a flame that provides the primary combustion for the lint-coated membrane. The air flow through the combustion chamber will force the gaseous products of combustion with the residual ash through the resistance-platinum filament for secondary combustion and catalytic action which eliminates the smoke and odors from the incineration of the membrane and lint.

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As the combustion gases and ash pass upwardly through the cooling chamber 142, a screen may be provided, not shown in the drawings, to entrap ash particles, if desired. Further it will be recognized that in some instances where the gases are to be discharged directly to the out-of-doors or to a non-critical area, the catalytic unit may be omitted since the presence of the smoke odors and combustion ash will not be found undesirable. In some instances, the cooling chamber may also be omitted wherein the direct discharge of hot gases is not objectionable.

Since the lint removing device, as a whole, operates in combination with the drier mechanism, it may have an operative cycle concurrent with the operation of the drier. To operate the lint remover, the take-up roll 84 is rotated to draw the porous membrane 59 downwardly, and electricity is supplied to the coil 122 to cause combustion in the combustion zone 114.

As is illustrated in Figure 5, the motor 86 for driving the take-up roll 84 and the coil 122 for ignition of the lint and membrane are placed in circuit with the main timer control 152, which also operates the drier. Thus, whenever the drier is operated to circulate the heated drying air therethrough and discharge the air through the porous membrane of the lint remover, the membrane is being drawn downwardly and being burned as it enters the combustion zone 114.

On some occasions it may be desirable to temporarily stop the operation of the lint remover without stopping the drier or without having to reset the timer control 152. For these purposes a switch 154 is provided to temporarily break the electrical circuit formed by the supply leads 156, which feed electricity to the lint remover. The physical location of the switch 154 is illustrated in Figure 3 and the switch is shown provided with a plunger 158. The switch actuating plunger 158, when depressed, opens the switch to break the circuit to the motor 86 and heating element 122. In some instances, of course, it may be desirable to stop only the motor and circuitry may be arranged so that the ignition coil 122 remains in the circuit while the motor 86 is temporarily stopped. The switch 154 may be located where it can be operated manually, but as is shown in the preferred embodiment, is located to be conveniently stopped while a new supply roll 60 of porous membrane is being placed in the machine. When the membrane becomes exhausted, or nearly exhausted, a new roll is placed in the machine, and the leading end of the new roll is first attached to the trailing end of the previous roll. During this time the shaft 62 from the roll is removed and is wedged against the switch plunger 158 in the manner shown by the dotted line position of the shaft 62. In that position the shaft is located between a reaction surface 160, which is the inclined face of the divider panel 76. This reaction surface 160 is so spaced relative to the size of the shaft 62 that when the shaft is pressed between it and the switch plunger 158, the plunger will remain depressed. To again start the lint removing machine, the shaft 62 is removed and placed in the new spool after the ends of the membrane have been attached, and the roll is placed in the position shown by the roll 60 and the door 64 is again latched by the latch 68.

Although the operation of the mechanism will now be clear from the description of the structure and operation of the individual elements, a summary of the over-all operation will be helpful in appreciating the objectives and advantages of the lint-removing device. The mechanism is placed in operation as determined by the electrical circuit control which may be provided by the timer control 152 as illustrated in Figure 5. The timer control also operates the drier and the lint remover is operated during the time that a stream of lint-laden air issues from the drier.

The air enters the inlet 34 of the lint-removing device passing rearwardly through the conduit 30. The lint is

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filtered from the air by a porous membrane 58 which moves downwardly over slots 72, Figure 2. The membrane is supplied from a roll 60 and is drawn downwardly by a take-up roll 84 against which the membrane is pressed by presser rollers 90 and 92. The presser rollers are also provided to flatten the coating of lint 112 which is gathered in the membrane as it gradually moves downwardly. The flattened blanket of lint and membrane then moves downwardly into the combustion zone 114 wherein it is burned by flame caused by the ignition of the material by the igniting coil 122. The products of combustion are carried upwardly and combustion is aided by a stream of air which passes downwardly through the slot 150 and into the combustion zone. As the combustion products pass upwardly, they pass through a catalytic filament 140 which lessens the smoke and odor. The combustion products then move upwardly through a cooling chamber 142 and again enter the air stream flowing through the conduit 30 to be discharged through the opening 40 at the rear of the lint-removing device.

Continuous automatic operation of the lint-removing device is thus effected and will continue without attention from the operator.

Thus, it will be seen that we have provided a mechanism for removing lint and the like from a continuous air stream which meets the objects and advantages hereinbefore set forth. The device is well suited to reliable continuous operation with a domestic clothes drier or like appliance. The mechanism features an improved effective combustion procedure and structure for getting rid of the porous membrane and lint while avoiding the disadvantages and disagreeable effects which usually accompany a burning process. The arrangement disclosed by the invention permits the use of the mechanism in various critical circumstances and it can be used safely and reliably in the home.

We have, in the drawings and specification, presented a detailed disclosure of the preferred embodiments of our invention, but it is to be understood that we do not intend to limit the invention to the specific form disclosed but intend to cover all modifications, changes and alternative constructions and methods falling within the scope of the principles taught by our invention.

We claim as our invention:

1. A device for removing lint from the drying air circulated through a domestic clothes drier comprising a conduit positioned to receive a flow of lint-laden air from the drier, a continuous belt formed of a porous combustible material adapted to be moved across the conduit with the air passing therethrough with the lint collecting on the surface of the belt, means defining a combustion zone within said device receiving the belt and lint and wherein the lint and the belt are burned, and means for continuously moving the porous belt across the air stream in the conduit and directing the belt toward the combustion zone so that the lint and belt are converted to products of combustion.

2. A device for removing lint from the drying air circulated through a domestic clothes drier comprising a housing for the lint collecting mechanism, a conduit extending through said housing and adapted to receive the flow of air from the clothes drier, a continuing supply of a porous inflammable belt material adapted to be moved across said conduit with the air being filtered therethrough and the lint collecting on the surface of the belt material, a take-up roll in engagement with said belt and positioned adjacent the conduit to draw the belt across said conduit, means for driving the take-up roll in rotation, spring mounted roller means engaging the belt on the lint collecting side thereof and forcing the belt against the take-up roll to hold the belt in frictional engagement with the roll and flatten the layer of lint upon the belt, means defining a combustion zone positioned subsequent to the take-up roll to receive the belt with the lint thereon, means for igniting the belt and

the lint to reduce them to products of combustion, and a conduit directing the products of combustion into the air stream after it has passed through the porous belt.

3. In combination, a clothes drier having a drying chamber for removing moisture from clothes, means for moving a flow of drying air through the chamber, means for heating the air, a conduit positioned to receive the flow of lint-laden air after it has been circulated through the drying chamber, a porous combustible lint collecting surface associated with said conduit and accumulating lint that engages the surface, means defining a combustion zone positioned to receive the porous surface after it has received the lint, means moving the surface and lint collected thereon to a combustion zone, and ignition means in said combustion zone adapted to ignite the lint and surface and reduce them to products of combustion whereby they may be carried away with the air stream.

4. A device for removing lint from the drying air circulated through a domestic clothes drier comprising a conduit positioned to receive the flow of lint-laden air from the drier, means for continuously moving a porous combustible belt across the conduit to filter the lint from the air which passes therethrough, means defining a combustion zone positioned to receive the porous belt after it has received the lint, ignition means in the combustion zone to burn the lint-laden belt and reduce the lint and the belt to products of combustion, a second conduit leading between the combustion zone and said first conduit to direct the products of combustion to rejoin the air stream, and a catalytic element positioned in said second conduit and operable to remove the smoke and odor from the products of combustion before they join the air stream.

5. A device for removing lint from the drying air circulated through a domestic clothes drier comprising a passageway located to receive the flow of the lint-laden air from a drier, means for moving a length of porous combustible belt material across the passageway to filter the air and to receive a layer of lint thereon, means defining a combustion zone provided with ignition means for burning the lint and belt and positioned to receive the lint-laden belt after it crosses the passageway, a conduit leading from the combustion zone and communicating with the passageway at a location after the belt to direct the combustion gases from the belt back into the air stream, and means for cooling the gases positioned in said conduit to reduce the temperature of the products of combustion before they rejoin the air stream.

6. A device for removing lint from drying air circulated through a domestic clothes drier comprising means for confining the air stream discharged from the clothes drier, guide means associated with said confining means to direct a porous combustible belt across the air stream and filter the air stream to remove the lint therefrom, means for drawing the porous belt through said guide means, means defining a combustion zone provided with an ignition means and located to receive the lint-laden belt and reduce the lint and the belt to products of combustion, and a conduit having a labyrinth passageway therethrough communicating between the combustion zone and the air stream to cool the gases of combustion and to direct them from the combustion zone to rejoin the air stream.

7. A device for removing lint from the drying air after being circulated through the moist clothes of a domestic clothes drier comprising a conduit for receiving the air stream as it leaves the drying chamber of a clothes drier, means for continuously drawing a length of porous combustible membrane material across the conduit to filter the lint from the air stream, pressing means for flattening the lint against the membrane to cause it to adhere thereto, and ignition means positioned to

receive the membrane after the lint has been flattened thereon to burn the lint and membrane and reduce them to products of combustion.

8. A device for filtering lint from air used to remove moisture from fabric material in a domestic clothes drier comprising a conduit positioned to receive the lint laden air stream issuing from the clothes drier, a porous inflammable membrane suitable for filtering lint from the air stream, a power driven membrane feeding means positioned to continuously move the membrane across the air stream in the conduit, means operatively associated with the power driven feeding means and operative to discontinue the feeding means while a fresh supply of membrane is being provided to the device, and ignition means positioned to receive the membrane and lint thereon to burn the same and reduce them to products of combustion.

9. A device for removing lint from the drying air circulated through a domestic clothes drier comprising a conduit positioned to receive the lint-laden air stream from the drier, a power driven feeding means positioned to continuously move the length of porous membrane fed from a roll across the air stream through the conduit, an electrical circuit including a switch operatively connected to the feeding means, a switch operating member adapted when engaged to open the circuit to discontinue operation of the feeding means, an inclined panel member positioned opposite the switch operating member, and a removable roll supporting member, the diameter of said roll supporting member being such that it will operate the switch operating member when positioned in wedged relation between the inclined panel member and the switch operating member to thereby discontinue operation of the feeding means while a new membrane is being attached to the trailing end of the old membrane.

10. A device for removing lint from the drying air circulated through a domestic clothes drier comprising a conduit located to receive the air stream discharged from the clothes drier, means to move a porous combustible lint-filtering membrane across the conduit to filter the lint from the air, means defining a combustion zone positioned to receive the lint-coated membrane after it leaves the conduit, and means to direct a flow of air through the combustion zone to aid in supporting combustion of the lint and membrane and to carry away the ash and products of combustion.

11. In a fabric drying apparatus provided with a drying chamber and a conduit for exhausting lint laden air from said chamber, a porous combustible belt adjacent said conduit for separating air borne lint from air passing through said conduit, a lint combustion unit, and means for advancing said belt into said combustion unit for consuming said belt and separated lint by combustion.

12. In a fabric drying apparatus provided with a drying chamber and a conduit for exhausting lint laden air from said chamber, a porous combustible belt adjacent said conduit for separating air borne lint from air passing through said conduit, means including a combustion chamber for consuming said belt and separated lint by combustion, and means defining a labyrinth chamber communicating with said combustion chamber for exhausting combustion gases from said combustion chamber.

13. In a fabric drying apparatus provided with a drying chamber and a conduit for exhausting lint laden air from said chamber, a porous combustible belt adjacent said conduit for separating air borne lint from air passing through said conduit, means defining a combustion chamber, a combustion unit including a catalytic burner positioned within said combustion chamber for igniting said lint and belt, and means defining a labyrinth chamber communicating with said combustion chamber for exhausting combustion gases from said combustion chamber.

14. An automatic lint remover which comprises, a housing having an opening therein communicating with a clothes drier and receiving lint-laden air therefrom, means continuously moving an essentially porous combustible filter having a surface extending across said opening to filter lint from air which passes therethrough, and means downstream of said opening receiving and igniting the filter and lint thereon for reduction to products of combustion.

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