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3,291,467

CLOTHES DRYER WITH SLANTED COMBUSTION CHAMBER

Filed Nov. 2, 1964

2 Sheets-Sheet 1

FIG. 1

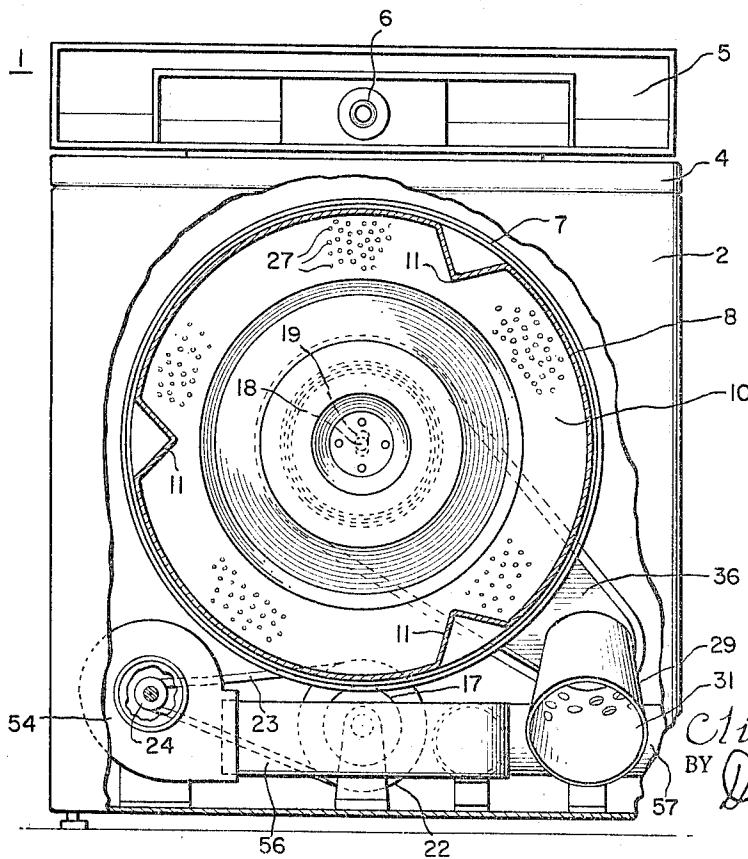
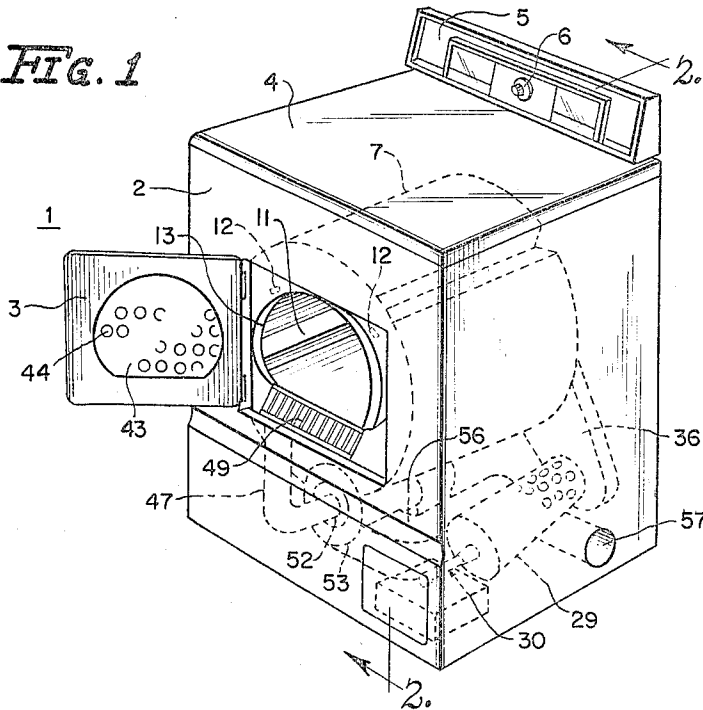


FIG. 3

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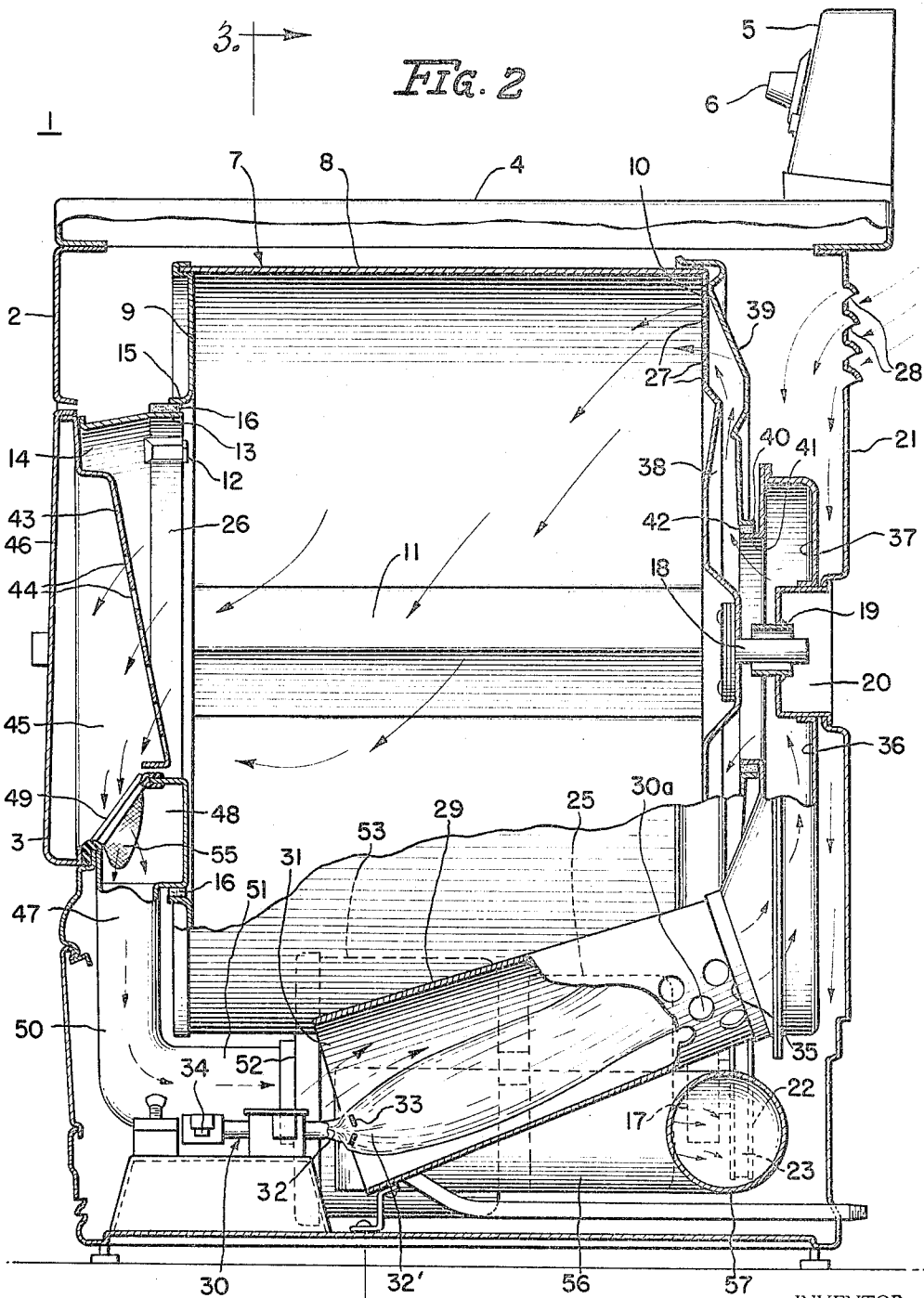
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2 Sheets-Sheet 2



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CLOTHES DRYER WITH SLANTED COMBUSTION CHAMBER

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5 Claims. (Cl. 263—33)

This invention relates to article drying machines, and more particularly to a construction for obtaining improved performance in clothes dryers.

It is an object of my invention to provide a gas clothes dryer construction wherein contact of the gas flame with the sides of the combustion chamber is minimized by providing a novel relationship of the gas burning apparatus and the combustion chamber.

A more specific object of my invention is to achieve the desired goal by slanting the combustion chamber upwardly with respect to the gas equipment so that a horizontally issuing flame, which normally bends upwardly, will travel at substantially the same slant as that at which the combustion chamber is provided.

Another object of my invention is to facilitate side venting of air from a dryer by the angular positioning of the combustion chamber.

In carrying out my invention in one form thereof, I provide a clothes dryer in which air passes into and out of a clothes receptacle through suitable inlet and outlet conduit means. The inlet conduit means has a first portion extending upwardly into communication with the receptacle, and a second portion formed as a substantially tubular combustion chamber. This chamber has one end positioned to receive a flame issuing horizontally from gas-operated heating means positioned below the receptacle, and its other end connected to the base of the first portion. The combustion chamber is slanted upwardly from the gas-operated means to the first position at an angle which is such as to minimize contact of the flame with the walls of the combustion chamber.

In addition, the upward slant of the second portion provides an adequate space below it so that the exhaust duct, through which air is led out of the dryer, may pass directly therebeneath. This facilitates greatly the provision of side venting in such dryers. It has been found that, for convenience to the users of such machines and for maximum economy to the manufacturer, dryers should be made so that the air may be vented therefrom either through the back or through the side.

The subject matter which I regard as my invention is particularly pointed out and distinctly claimed in the concluding portion of this specification. My invention, together with further objects and advantages thereof, may best be understood by reference to the following description taken in conjunction with the accompanying drawings.

In the drawings,

FIGURE 1 is a view in perspective of the improved clothes dryer of my invention;

FIGURE 2 is an enlarged view along line 2—2 in FIGURE 1; and

FIGURE 3 is a view along line 3—3 in FIGURE 2.

Referring now to the figures, the machine illustrated is a domestic clothes dryer generally indicated by the numeral 1. Dryer 1 is provided in the usual way with a cabinet 2 having a front door 3 to provide access to the interior of the cabinet for loading or unloading clothes. Provided on the top wall 4 of cabinet 2 is a control panel 5 which may, in the conventional way, include suitable controls generally indicated at 6. Controls 6 are used to cause the machine to start and proceed through a desired cycle of operation; since such controls are stand-

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ard and in virtually all clothes dryers presently available to the public, they will not be further explained herein.

Within cabinet 2 there is provided a clothes tumbling container, or drum, 7 mounted for rotation on a substantially horizontal axis. Drum 7 is substantially cylindrical in shape, having an outer cylindrical wall 8, a front wall 9, and a back wall 10. The outer wall 8 is imperforate over its entire length. On the interior surface of wall 8, and formed as part thereof if so desired, there are provided a plurality of clothes tumbling ribs 11 so that clothes are lifted up when the drum rotates and then tumble back down to the bottom of the drum.

The front of drum 7 is rotatably supported within outer casing 2 by a pair of suitable bearing pads 12 secured on a circular flange 13 forming the inner part of the loading opening 14 behind door 3. Preferably, one pad is positioned on each side of the top of the highest point on flange 13 so as to provide a stable support for the outwardly turned flange 15 formed at the inner end of drum wall 9. The remainder of the space between flanges 13 and 15 may be filled in any suitable way, such as by the felt shown at 16; this provides an air seal between flanges 13 and 15 preventing leakage of air therebetween.

The rear end of drum 7 is positioned on a drive roller 17 (FIGURE 3). To provide stability for the rear of the drum, and prevent it from tending to fall off to one side or the other of roller 17, the rear wall 10 of the drum is provided centrally with a stub shaft 18. Shaft 18 fits within a slot-like bearing 19 secured within a support 20 fastened to the back wall 21 of the dryer. Bearing 19 permits no free play of shaft 18 in a horizontal direction, but does allow for free play in the vertical direction so that the drum may move vertically in response to movements of the load therewithin. Thus, roller 17, stub shaft 18, and bearing 19 cooperate to support the rear end of drum 7.

As shown in FIGURE 3, roller 17 is connected to a pulley 22 which is driven through a belt 23 from a pulley 24. Pulley 24 is connected to the drive motor 25 shown in dotted outline in FIGURE 2 so as to be driven thereby. With the arrangement shown, the drum may rotate on a horizontal axis, with bearing pads 12 providing the front support, and with roller 17 providing the drive and cooperating with stub shaft 18 within bearing 19 to effect the rear support.

In order to provide for a flow of drying air through the clothes, drum 7 is provided with a central aperture 26 formed in its front wall 9 by flange 15. In the rear wall 10, there are a plurality of perforations 27 which, in the present case, are formed to extend around the rear wall in an annulus.

Dryer 1 is of the type which provides heated air to the interior of drum 7 through perforations 27. Suitable air inlet means for ambient air to enter cabinet 2 are provided. In the present case, these are illustrated as being in the form of louvered openings 28 formed in rear wall 21. The air then proceeds downwardly, as shown by the arrows in FIGURE 2. Part of it enters a combustion chamber 29, which will be further discussed herebelow, through tertiary air inlet openings 30, and another part proceeds on past the openings 30 to be drawn in through the substantially larger opening provided by end 31 of the combustion chamber.

A conventional in-shot gas burner, indicated by the numeral 30, has an outlet 32 which is positioned to issue a flame 32' in a generally horizontal direction. In the conventional way, a deflector plate 33 may be positioned in front of outlet 32; this fans out the flame so as to heat effectively a substantial part of the air entering combustion chamber 29 at end 31 thereof. It will be understood that the burner 30 receives a regulated supply of gas from

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a valve assembly (not shown) of the type conventionally used in gas-operated clothes dryers, this assembly in turn being connected to an appropriate source (also not shown) of gas. In the usual way, primary air is drawn into the burner at the inlet end 34 thereof; combustion occurs as a result of the mixing of this primary air with gas, and its ignition by any suitable means such as an appropriate pilot flame or spark (not shown).

The outlet end 35 of combustion chamber 29 is connected to an upwardly extending duct 36. Heated air which has passed through combustion chamber 29 is mixed with the tertiary air entering through openings 30a, and the mixture then passes upwardly through duct 36 as shown by the arrows. Duct 36 terminates in a circular portion 37 which is connected to an annular duct 38 leading to the ring of perforations 27. Duct 38 is formed by the rear wall 10 of the drum and a baffle member 39 rigidly secured thereto so as to rotate therewith. The inner end of baffle 39 terminates in a flange 40 which cooperates with an inturned flange 41 formed on portion 37 so as to provide a rotating seal. A suitable material, such as the ring of felt shown at 42, is provided to effect the sealing function between flanges 40 and 41.

It will be seen that upwardly extending duct 36 and combustion chamber 29 constitute inlet duct means for leading the heated air to the drum so that it may be used in order to effect a clothes drying function.

The door 3 has a baffle 43 secured thereon. Baffle 43 is provided with openings 44 which permit the passage of air but preclude clothes tumbling within drum 7 from passing into the space 45 between the outer panel 46 of door 3 and the baffle 43. An outlet duct 47 has a top portion 48 communicating through an opening 49 with the space 45. Duct 47 then extends downwardly as shown at 50, and rearwardly as shown at 51, to the inlet 52 of a blower shown in dotted outline at 53. As also shown in FIGURE 3, the blower may be of the centrifugal type having a scroll housing 54. Returning for an instant to the inlet 49 to duct 47, a suitable lint trap 55, which may comprise a relatively fine mesh bag, is preferably positioned so as to be seated upon the edges of the opening 49.

As previously explained, the passage for the air, after it has passed over the clothes, extends downwardly from opening 49 through duct 47 to blower 53. From blower 53, the air is expelled through an outlet conduit 56. For various installations, it may be desirable to provide the outlet 56 so that it expels the air from the dryer either from the rear of the dryer or from the side thereof. Where the air is to be expelled from the side, as shown in the present case, conduit 56 extends to an opening 57 in the side of the dryer cabinet, and the air is exhausted from the machine at that point. It will be understood that an appropriate vent to the exterior of the building may be connected to opening 57 is so desired.

It can thus be seen that the complete air flow includes introduction of air to the cabinet through openings 28. Primary air then enters opening 34 and is used for the ignition of flame 32, secondary air passes in the direction of the arrows in through end 31 of combustion chamber 29, and tertiary air passes into the combustion chamber at the other end thereof through openings 30a. The heated air then passes upwardly through duct 36, and then it is led through the annular conduit 38 to perforations 27. From the perforations 27 the air passes in a generally axial direction through the rotating drum 7, and leaves the drum through the holes 44 in baffle 43. The air then passes downwardly through lint trap 55 and duct 47 to blower 53, and then is expelled from the machine through duct 56 and opening 57.

An important feature of my invention lies in the positioning of combustion chamber 29 so that it is slanted upwardly at an angle to the horizontal from the inlet end 31 to the outlet end 35 thereof.

While various angles of slant may be selected, I have

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found that in the particular dryer construction used in a line of dryers manufactured by the General Electric Company, assignee of the present invention, an angle of 21 degrees to the base provides optimum results. It will, however, be recognized that, with other different dryer designs, somewhat different angles will be desirable; in any event, the precise angle can be readily tailored to any particular design in the light of the purposes of the invention as described herein.

One important purpose for the angular relationship of the combustion chamber to the horizontally issuing flame 32 is to minimize, as much as possible, contact by flame 32 with the walls of the combustion chamber. It has been found that where such contact occurs before combustion is complete, the possibility of generating carbon monoxide (which is undesirable) is increased. The angular relationship brings such contact to virtually zero; this is a result of the fact that the strong upward draft created both by duct 36 and by the suction of blower 53 results in a natural tendency for the flame to angle upwardly even though it issues horizontally. With the slanted position of the combustion chamber, the position of the flame is such that it tends to remain centered in the combustion chamber. This has the added advantage that the combustion chamber remains cooler and therefore radiates less heat to the surrounding parts, such as the cabinet for instance.

Another important reason for tilting the combustion chamber upwardly is the need to provide a purchaser of a clothes dryer with his option as to whether it will be vented from the rear or from the side. The slant of the combustion chamber 29 is made sufficient so that there is space beneath it for the passage of an exhaust duct if side venting is desired. In this manner, the option of either rear venting or side venting is provided to the user in a highly economical fashion.

While in accordance with the patent statutes I have described what is at present considered to be the preferred embodiment of my invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is therefore aimed in the appended claims to cover all such equivalent variations as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A clothes drying machine comprising:

- (a) a clothes receptacle;
- (b) gas-operated heating means arranged for a flame to issue substantially horizontally therefrom, said heating means being positioned below said receptacle;
- (c) inlet and outlet conduit means leading respectively to and from said receptacle, said inlet conduit means including first and second portions;
- (d) said first portion extending upwardly into communication with said receptacle;
- (e) said second portion being formed as a substantially tubular combustion chamber having one end positioned to receive the flame from said heating means and its other end connected to the base of said first portion;
- (f) said combustion chamber having its axis and walls slanting up at an angle from said heating means to said first portion thereby to minimize contact of the flame with the walls of said combustion chamber.

2. A clothes drying machine comprising:

- (a) a cylindrical clothes receptacle mounted for rotation on a nonvertical axis;
- (b) gas-operated heating means arranged for a flame to issue substantially horizontally therefrom, said heating means being positioned below said receptacle;
- (c) inlet and outlet conduit means leading respectively to and from said receptacle at the ends thereof, said inlet conduit means including first and second portions;

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- (d) said first portion extending upwardly into communication with one end of said receptacle;
 - (e) said second portion being formed as a substantially tubular combustion chamber beneath said receptacle having one end positioned to receive the flame from said heating means and its other end connected to the base of said first portion; 5
 - (f) means for rotating said clothes receptacle and for circulating air from said inlet conduit means to said receptacle and through said outlet conduit means; 10
 - (g) said combustion chamber having its axis and walls slanting up at an angle from said heating means to said first portion thereby to minimize contact of the flame with the walls of said combustion chamber. 15
3. The apparatus defined in claim 2 wherein said first portion extends up into communication with said receptacle at the rear thereof and said outlet conduit means communicates with said receptacle at the front thereof, said combustion chamber extending substantially in a front-to-back direction beneath said receptacle and extending upwardly from the front toward the back thereof. 20
4. A clothes drying machine comprising:
- (a) a cabinet;
 - (b) a cylindrical clothes receptacle mounted for substantially horizontal rotation in said cabinet; 25
 - (c) gas-operated heating means arranged for a flame to issue substantially horizontally therefrom, said heating means being positioned beneath said receptacle;
 - (d) inlet and outlet conduit means leading respectively to and from said receptacle at the rear and front thereof within said cabinet, said inlet conduit means including first and second portions; 30
 - (e) said first portion extending upwardly into communication with the back of said receptacle; 35
 - (f) said second portion being formed as a substantially tubular combustion chamber having its front end within said cabinet positioned to receive the flame from said heating means and its rear end connected to the base of said first portion; 40
 - (g) means for rotating said receptacle and for circulating air from said inlet conduit means to said receptacle and through said outlet conduit means;
 - (h) said combustion chamber slanting up at an angle

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- from said heating means to said first portion thereby to minimize contact of the flame with the walls of said combustion chamber;
 - (i) said outlet conduit means extending into communication with an opening formed in the side of said cabinet and passing directly beneath the rear end of said combustion chamber.
5. A clothes drying machine comprising:
- (a) a cabinet;
 - (b) a cylindrical clothes receptacle mounted for substantially horizontal rotation in said cabinet;
 - (c) inlet and outlet conduit means leading respectively to and from said receptacle at the rear and front thereof within said cabinet, said inlet conduit means including first and second portions; said first portion extending upwardly into communication with the back of said receptacle;
 - (d) said second portion being formed as a substantially tubular member having its rear end within said cabinet connected to the base of said first portion, its front end extending forwardly thereof and terminating in an air-receiving opening;
 - (e) means for rotating said receptacle and circulating air through said inlet conduit means to said receptacle and out through said outlet conduit means;
 - (f) heating means positioned beneath said receptacle relative to said second portion so that air passing into said second portion is heated by said heating means;
 - (g) said second portion having its axis and walls slanting up at an angle from its front to its back;
 - (h) said outlet conduit means extending into communication with an opening formed in the side of said cabinet and passing directly beneath the rear end of said second portion of said inlet conduit means.

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