

Nov. 29, 1955

R. E. PFLEIDER

2,724,906

CLOTHES DRYER

Filed Aug. 25, 1952

Fig. 1

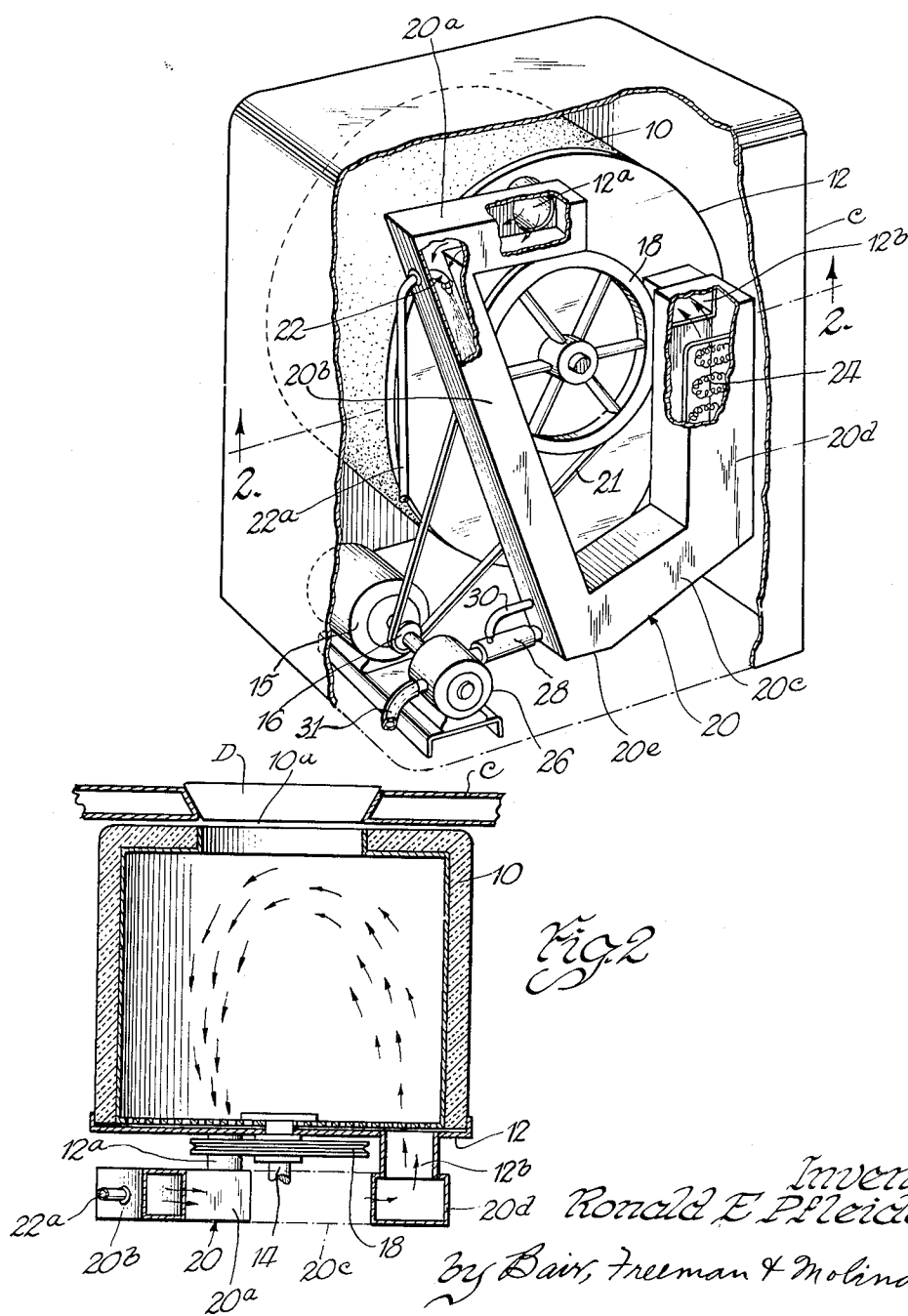


Fig. 2

Inventor
Ronald E. Pfeider
by *Bair, Freeman & Molinare*
Atty.s.

1

2,724,906

CLOTHES DRYER

Ronald E. Pfeider, Minneapolis, Minn., assignor to Franklin Transformer Manufacturing Company, Minneapolis, Minn., a corporation of Minnesota

Application August 25, 1952, Serial No. 306,102

5 Claims. (Cl. 34-75)

This invention relates to an improved clothes dryer of the type having a closed air system.

In accordance with one feature of the present invention, a clothes dryer is provided which has a closed air system embodying only the interior of the clothes tumbling drum and a duct mechanism located only in back of the drum. With this arrangement, the air ducts are short, of simple and readily manufactured conformation, require relatively small space, and do not demand space-consuming cabinet constructions. Moreover, a reversed or looped air flow through the drum is achieved which gives rise to particularly effective exposure of the clothes to the drying air stream.

In accordance with a further feature of the present invention, the clothes dryer is provided with a water collecting sump and a suction type drain pump and yet distasteful sucking noises and clogging from lint or for other reasons are avoided. Briefly, this is accomplished by the use of a breather pipe extending from the pump inlet to a portion of the air passage above the normal fluid level.

It is therefore a general object of the present invention to provide an improved clothes dryer.

Another object of the present invention is to provide an improved clothes dryer utilizing air ducts located only in back of the tumbling drum.

Still another object of the present invention is to provide an improved clothes dryer wherein the air is doubly exposed to the clothes during the course of its travel through the drum.

It is yet another object of the present invention to provide an improved clothes dryer using a water discharging pump and wherein annoying sucking sounds are avoided.

Further, it is an object of the present invention to provide an improved clothes dryer with a solent water discharging pump and in which the pump suction pressure is automatically and greatly increased in the event that the normal pump entrance passage is clogged by lint or otherwise.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims. My invention itself, however, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following description taken in connection with the accompanying drawings, in which:

Figure 1 is a perspective view from the rear of a clothes dryer constructed in accord with the principles of the present invention; and,

Figure 2 is a fragmentary cross-sectional view through axis 2-2, Figure 1, showing the air flow in the tumbling drum.

Referring now to Figure 1 of the drawings, the clothes dryer consists of a housing or casing C of sheet metal or similar material. A clothes tumbling drum 10 is suitably supported within this housing for rotation about a horizontal axis. This drum carries suitable heat insulation on its outer periphery to minimize heat losses from the drum. It is open at both ends and at its front end registers with a suitable access door D in the housing C through which clothes can be loaded into the drum. When the

2

access door D is closed, the interior of the drum is sealed against air flow except through the rear open end and a minor leakage about the open front end 10a of the drum 10.

A fixed imperforate baffle plate or member 12 is mounted adjacent to the rear end of the drum 10 and in registry therewith to seal the same against air flow. If desired, this plate may include bearing elements to receive the stub shaft 14 to carry and support the clothes tumbling drum 10. This baffle plate has a pair of spaced openings, 12a and 12b, through which air travels into and out of the drum 10 in a manner described in further detail hereafter.

Clothes tumbling rotations are imparted to the drum 10 by the motor 15 which drives the drum through pulleys 16 and 18 and the belt 21. Preferably this motor is of the squirrel cage induction type, thus giving a substantially constant speed characteristic, and the pulleys are of such diameter that the clothes in the drum 10 adhere to the periphery thereof during part of their orbit of travel and fall freely within the drum during the remainder of their orbit of travel. It has been found that with the speed thus fixed at the optimum value, particularly effective clothes drying takes place at all loads of the dryer.

The openings 12a and 12b of the baffle plate 12 are connected by a duct indicated generally at 20. This duct includes, in order, a horizontal portion 20a, a nearly vertical leg portion 20b, a nearly horizontal well or sump portion 20c, and a vertical leg portion 20d. The drying air circulates through this duct and in an U-shaped or looped path through the drum 10, this air flow being in the direction of the arrows in Figures 1 and 2.

The upstream end of the leg portion 20b of the duct 20 has an aspirator jet unit indicated generally at 22. This unit is supplied with water through a suitable supply pipe 22a and directs the same in a spray down the duct. This spray entrains the air and thereby imparts motion thereto. It also cools the air to condense moisture therefrom so that when the air reaches the bottom of duct 20b, it is saturated, but cold, and contains only a very limited quantity of moisture per unit volume. The duct portion 20d contains an electric heater 24 which, when energized by suitable means (not shown), reaches an elevated temperature and heats the air travelling through the duct. Since the air entering the bottom of duct portion 20d is cool, though saturated, it contains little evaporated water. The same quantity of moisture per pound of air is contained in the heated air leaving duct portion 20d and, because of the elevated temperature, and greatly increased capacity to contain moisture, the air is very dry and has a low relative humidity. It is consequently a highly effective clothes drying medium.

The well or sump portion 20c of the duct 20 removes the droplets of moisture from the air entering this duct. This moisture removal occurs because of the abrupt change in direction of the air as it leaves duct 20b and enters duct 20c. Since the water droplets are heavy, and do not partake of this abrupt change in direction, they collect at the lowermost part 20e of the duct portion 20c where they are pumped away as described in further detail hereafter.

The collected water is withdrawn from the part 20e of the duct 20c by the pump 26 which is driven by the motor 15 as shown. The intake of the pump is connected to the duct by the pipe 28. The outlet of the pump is connected to a suitable drain (not shown) by the discharge pipe 31.

The pump 26 is preferably of a type capable of producing a suction pressure at its intake to remove all the water possible from part 20e of the duct. It is also preferable to provide a pump capable of producing a substan-

tial outlet pressure to discharge water through pipe 31 to an elevated reservoir. It is a characteristic of the pump 26, particularly if it produces a substantial vacuum pressure, to develop loud and disagreeable sucking noises in the pipe 28 due to the irregular flow of water. In accordance with one aspect of this invention these noises are avoided.

In accordance with the present invention, a breather pipe 30 is connected respectively to the part 20e of the duct 20 and to the intake of the pump 26. The connection to the duct 20 is located immediately above the normal water level in the portion 20e of the duct so that ordinarily no water is drawn through the pipe. It has been found that this breather pipe eliminates the undesirable noises otherwise associated with operation of the pump 26, even if the pump develops a substantial suction pressure.

Moreover, the breather pipe 30 acts to overcome the tendency of the main outlet pipe 28 to clog with lint, especially if it is connected just above the normal water level in the duct part 20e. This effect is believed to be due to the fact that when the pipe 28 clogs and water is drawn through pipe 30, a large suction pressure is developed which is much greater than that which can be tolerated in normal operation. This great pressure acts to break any clogging of the pipe 28, at which time the water level is reduced to the normal value and the pipe 30 is freed of all water and the suction pressure reduced to normal.

In a clothes dryer constructed in accord with the present invention the following structure was used:

Pipe 30-----	3/8" inner diameter. 8" long.
Pipe 28-----	1" inner diameter. 4" long.
Pump 26-----	20" of mercury maximum suction pressure.

The pipe 30 was connected to the pipe 28 at a point 1 inch from the discharge end of the pipe 28 and 3 inches from the intake end of that pipe.

The air circulating paths within the drum 10 are shown in Figure 2. It will be noted that the air follows a generally U-shaped or looped path, entering through the opening 12b and discharging through the opening 12a. It has been found that with this general air flow configuration, together with rotation of the drum 10 at a speed to cause the clothes to drop freely during part of their orbit of travel, the clothes are exposed to the drying air in a particularly effective manner and the drying promptly achieved.

While I have shown and described a particular embodiment of the present invention it will, of course, be apparent that various modifications and alternative constructions can be made without departing from the true spirit and scope of the invention. I therefore intend by the appended claims to cover all modifications and alternative constructions falling within their true spirit and scope.

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

1. In a clothes dryer, a clothes tumbling drum having an open end, means to rotate the drum to tumble clothes therein, a fixed imperforate baffle member positioned adjacent the open end of the drum to prevent air flow therethrough, the baffle member having a pair of openings adjacent to and within the periphery of the drum, means defining an air duct extending between the openings and having substantially straight vertical leg portions, an intermediate sloping substantially straight well portion, means to inject a cooling liquid in a downwardly directed spray in one of the vertical leg portions of the duct, means defining a drain for the well portion near the bottom of said one leg portion, and a heater in the other leg portion.

2. In a clothes dryer: a clothes tumbling drum having an open end; means to rotate the drum to tumble clothes therein; a fixed imperforate baffle member positioned adjacent the open end of the drum to prevent air flow therethrough, the baffle member having a pair of openings adjacent to and within the periphery of the drum; means defining an air duct extending between the openings and having substantially vertical leg portions and an intermediate well portion; means to inject a cooling liquid in a downwardly directed spray in one of the vertical leg portions of the duct; a heater disposed in the other leg portion of the duct; and means defining a drain for condensed moisture from the intermediate well portion of the duct.

3. In a clothes dryer: a clothes tumbling drum having an open end; means to rotate the drum to tumble clothes therein; a fixed imperforate baffle member positioned adjacent the open end of the drum to prevent air flow therethrough, the baffle member having a pair of openings adjacent to and within the periphery of the drum, one of the openings being adjacent the top portion of the drum; means defining an air duct extending between the openings, the duct having a substantially straight vertical portion extending from said one opening to a point below the drum, a well portion at the end of the said vertical portion, and a second vertical portion extending from the well portion to the other opening; means to inject a cooling liquid in a downwardly directed spray in said substantially straight vertical portion of the duct and from a point near the upper end thereof; means defining a drain for the well portion; and a heater in the other leg portion.

4. In a clothes dryer: a clothes tumbling drum; means to rotate the drum to tumble clothes therein; cover means for the drum including a plate substantially perpendicular to the axis of the drum and containing a pair of spaced openings; means defining an air duct extending between the openings, the duct having a substantially straight vertical portion extending from one opening to a point below both openings, a well portion at the end of said vertical portion, and a second vertical portion extending from the well portion to the other opening; means to inject a cooling liquid in a downwardly directed spray in said first vertical portion of the duct and from a point near the upper end thereof; means defining a drain for the well portion of the duct; and a heater in the other leg portion of the duct.

5. In a clothes drier having a drum compartment, a closed duct system disposed behind the drum compartment comprising a pair of substantially vertical leg portions which communicate with the drum compartment at their upper ends and which join at their lower ends to define a sump, means to inject cooling water in a downwardly directed spray in one of said vertical leg portions, heating means in said other leg portion, a pump, means defining an outlet pipe from the sump to the pump, and a breather pipe extending from said outlet pipe to one of said vertical leg portions above the normal water level.

References Cited in the file of this patent

UNITED STATES PATENTS

357,363	Booraem -----	Feb. 8, 1887
1,705,263	McIlvaine -----	Mar. 12, 1929
2,301,803	Davis -----	Nov. 10, 1942
2,451,692	Pugh -----	Oct. 19, 1948
2,453,859	Pugh -----	Nov. 16, 1948
2,589,284	O'Neil -----	Mar. 18, 1952
2,590,295	Constantine -----	Mar. 25, 1952
2,600,210	Constantine -----	June 10, 1952
2,607,209	Constantine -----	Aug. 19, 1952
2,609,186	Anderson -----	Sept. 2, 1952
2,619,736	Geldhof -----	Dec. 2, 1952
2,644,245	Hammell et al. -----	July 7, 1953
2,654,160	Peterson -----	Oct. 6, 1953