Jan. 29, 1957 R. L. DUNKELMAN 2,779,305

AUDIBLE SIGNALLING MEANS FOR CLOTHES DRYER LINT TRAPS

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FIG. 2

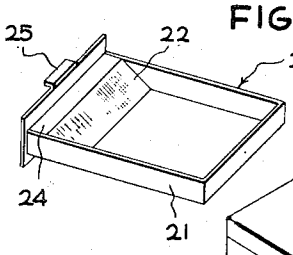


FIG. 1

FIG. 5

FIG. 4

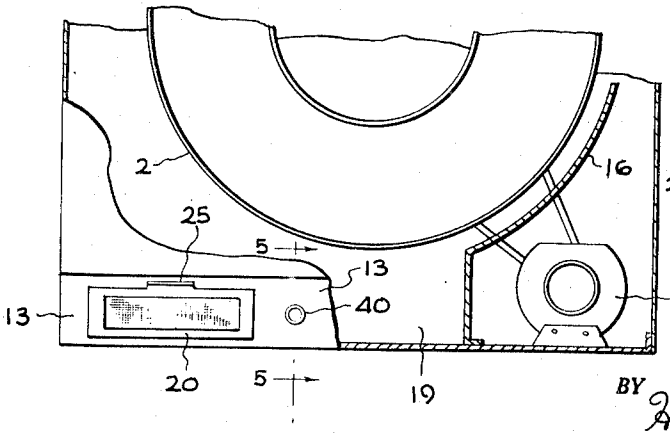
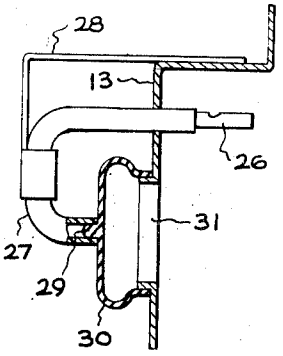


FIG. 3



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AUDIBLE SIGNALLING MEANS FOR CLOTHES DRYER LINT TRAPS

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2 Claims. (Cl. 116—112)

My invention relates to clothes drying machines of the type in which heated air is circulated through the clothes container and more particularly to such machines including lint separators for removing lint from the air stream leaving the clothes container.

Lint separators or traps are customarily included in domestic clothes drying machines so that quantities of lint will not be blown into the surrounding room during the drying operation. However, after a machine has been used for a greater or lesser period of time, the separator or trap usually becomes so clogged with lint as to interfere with the proper operation of the machine. The clogging of the separator restricts the air flow therethrough and thus interferes with the air circulation throughout the entire machine. As a result the machine can not operate to dry clothes with its normal efficiency.

The lint separators or traps are therefore ordinarily constructed that they may be cleaned out by the operator. For example, they are sometimes constructed in the form of a removable drawer. A problem is created though in that the operator is ordinarily not immediately aware of it when the separator becomes so clogged as to need cleaning. The operator may very well run the machine for another time after the separator is clogged before she realizes it, resulting in a load of improperly dried clothes. To obviate this difficulty means have been provided heretofore for automatically notifying the operator of the clogging of the lint separator. For example, an electric buzzer has been used for that purpose. These means have, however, all been relatively expensive to produce and assemble within the machine, and for that reason have not enjoyed widespread use.

Accordingly, it is a primary object of my invention to provide a new and improved, but yet inexpensive arrangement for use in a clothes dryer for producing an audible signal upon the clogging of the clothes dryer lint trap.

Another object of my invention is to provide audible signalling means for indicating the clogging of a clothes dryer lint trap, which signalling means are operated by the flow of air therethrough and are responsive to air pressures created within the dryer by the clogging of the lint trap.

In carrying out my invention I provide a clothes dryer having a clothes container and means for circulating a stream of heated air through the container. A lint trap is suitably mounted for removing lint from the air leaving the container; and by my invention an audible whistle means is provided for indicating a clogged condition of the lint trap. This whistle means is of the type which is operated by the flow of air therethrough, and it is arranged so that it is responsive to the pressure conditions within the dryer. The whistle means is normally inactive when the lint trap is not clogged, but it produces an audible signal in response to the changed pressure conditions created within the dryer when the trap does become clogged with lint. Thus a signal is automatically produced to warn the operator that the trap should be emptied.

The features of my invention which I believe to be novel are pointed out with particularity in the appended claims. My invention itself, however, both to its organization and method of operation, may be best understood by reference to the following description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a perspective view of a clothes dryer including audible signalling means embodying my invention in one form thereof, the view being partially broken away and partially in section to illustrate details of construction;

Fig. 2 is a perspective view of the lint trap included in the dryer of Fig. 1;

Fig. 3 is a fragmentary sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 is a fragmentary front elevational view of a clothes dryer including another embodiment of my audible signalling means; and

Fig. 5 is a fragmentary sectional view taken on the line 5—5 of Fig. 4.

Referring now to Fig. 1, I have shown therein a clothes dryer 1 incorporating one embodiment of my improved audible signalling means. The dryer includes a rotatable drum or basket 2 which is mounted for rotation about a generally horizontal axis. The basket 2 is disposed within an outer enclosing cabinet structure 3, and aligned openings 4 and 5 are provided respectively in the front walls of the basket and the cabinet structure for the loading and unloading of clothes from the basket. The openings 4 and 5 are flanged as shown to prevent clothes from dropping down between the basket and the cabinet. A door 6 hingedly mounted on the cabinet closes the opening 5 during operation of the machine.

For rotating the basket 2 during the operation of the dryer there is provided an electric motor 7 which is connected to the basket by a suitable belt drive 8. The pulleys (not shown) mounting the belt are so arranged that the basket 2 is driven at a suitable speed for tumbling articles of clothing placed therein. The basket 2 preferably includes upstanding ribs on the inner surface thereof to aid in producing the tumbling action. Besides the basket 2, the motor 7 also serves to drive air moving means for circulating a stream of air through the basket during the operation of the machine. The air moving means comprises a centrifugal blower 9 which is driven from the motor 7 by means of a direct coupling 10. The blower 9 draws in air from the surrounding room through a conduit 11 which leads from a screened air inlet opening 12 in the toeboard 13 of the cabinet.

The air drawn in by the blower 9 is discharged through an opening 14 at the top thereof into a space 15 which is separated from the rotating basket by a baffle 16. As shown, the baffle 16 extends upwardly from the base of the machine to a point in the general vicinity of an electrical heating element 17 mounted at the top of the machine, the baffle 16 being curved arcuately around the perforated side wall 18 of the basket for a portion of its length. The air discharged from the blower 9 flows upwardly through the space 15 and passes outwardly therefrom across the electrical heating element 17. The heated air still under pressure from the blower then flows downwardly through the foraminated cylindrical wall 18 of the rotating basket. The heated air moves through the basket and the articles of clothes being tumbled therein, extracting moisture from the clothes during its passage, and next passes into a collecting chamber 19 lying beneath the basket 2 on the opposite side of the baffle 16 from the space 15. From the chamber 19 the air is discharged out of the cabinet into the surrounding room through an appropriate lint trap structure 20 mounted in the toeboard 13.

The heated air in moving through the basket 2, of course, picks up appreciable lint from the clothes being

tumbled, and the purpose of the lint trap or separator 20 is to remove substantially all of this lint from the exhaust air before it leaves the dryer. Although my invention is not limited to any particular form of lint trap or separator, one suitable trap is shown in Fig. 2 by way of example. This trap comprises a removable drawer 21 which slides into and out of the toeboard 13. The drawer is open across its top for the entry of air, but includes a slanted screen 22 through which the air must flow in leaving the machine. The screen 22 filters the lint from the air so that it collects in the drawer 21, and when sufficient lint has been collected, the drawer may be slid out of the machine and emptied by the operator. Preferably and as shown in Fig. 1 the front of the lint trap through which the air passes from the slanted screen 22 is provided with a second screen 23, both for decoration and for removing still more lint from the air. The air flows from the screen 22 to the screen 23 through a closed passageway formed by the sides of the drawer 21 and a removable cover or top plate 24 (see Fig. 2). A suitable handle 25 mounted on the front of the trap provides for the removal of the trap from the machine.

As the dryer 1 operates there is a continuous build-up or collection of lint within the trap 20. After the machine has operated for a greater or lesser period of time depending upon the type of clothes being dried, sufficient lint collects within the trap to clog the screen 21. The clogging of the screen 21 restricts the air flow therethrough and thus interferes with the proper air circulation throughout the entire machine. As a result the machine can not operate properly so that it is ineffective to dry clothes in the normal expected period of time. It is, therefore, desirable that the lint trap be removed and emptied so as to return the machine to its proper operation.

In order to notify the operator of the clogged condition of the lint trap, new and improved audible signalling means are provided in the machine 1. This audible signalling means according to my invention comprises whistle means which are normally ineffective to produce a signal or a whistling noise but are rendered effective to produce such a noise by reason of the clogging of the lint trap. In Fig. 3 there is shown one embodiment of this whistle means. In this embodiment a whistle 26 is mounted so that its intake is from the chamber 19 within the dryer and its exhaust is to the room outside the dryer. In other words the inlet to the whistle is on the upstream side of the lint trap 20 and its discharge is on the downstream side of the lint trap.

The whistle 26 is supplied with air from the exhaust air collecting chamber 19 by means of a tube 27 which is rigidly formed in the shape shown (Fig. 3). The tube 27 protrudes through the toeboard 13 of the machine 1 and it mounts the whistle 26 at its outer end. The tube itself is mounted by means of a suitable bracket 28 fixedly attached to the dryer casing. The inner or intake end of the tube 27 is normally closed by a nipple or boss 29 formed on a resilient diaphragm 30. The diaphragm 30 is secured around an aperture 31 in the toeboard 13 so that one side of the diaphragm is exposed to the room air pressure and the other side of the diaphragm is exposed to the pressure within the chamber 19. The diaphragm is resilient and during the normal operation of the dryer when the lint trap 20 is not clogged, the diaphragm assumes the shape shown wherein the nipple 29 closes off the inlet to the tube 27. Thus no air flows through the tube 27 and the whistle 26 and no signal is produced.

However, as the lint trap clogs up so as to interfere with the exhaust air flow from the dryer, a pressure builds up within the collecting chamber 19. As the lint trap continues to clog, this pressure continues to rise due to the operation of the blower until it becomes higher than the room air pressure, for example as much as 0.24 inches of water higher in one suitable dryer. The diaphragm 30 is, of course, exposed to room air pressure on its one side through the aperture 31 and it is exposed to the pressure within the chamber 19 on its other side. When the pressure within the chamber 19 becomes high enough due to the clogging of the lint trap, it causes a flexing of the diaphragm 30 toward the toeboard 13. This flexing of the diaphragm in response to the increased pressure within the chamber 19 pulls the nipple 29 out of the end of tube 27 and opens the tube to chamber 19. As a result air flows from the higher pressure chamber 19 through the tube 27 and the whistle 26 to the surrounding room, and an audible signal or whistling noise is produced by the whistle in the process. This audible signal notifies the housewife that the lint trap is clogged and should be removed from the machine and emptied.

The audible signal produced by the whistle continues until the dryer is shut off and the lint trap emptied. Then diaphragm 30 due to its internal resilience moves the nipple 29 back into tube 27, closing the tube. This prevents the whistle from being blown when the machine is placed back in operation. The pressure in chamber 19 with the lint trap empty is not high enough to flex the diaphragm toward the toeboard and the whistle remains inoperative. Thus the signal which is automatically produced when the lint trap becomes clogged is in effect automatically "turned off" by the emptying of the trap.

In Figs. 4 and 5, I have shown an alternate embodiment of my invention as applied to a clothes dryer. For simplicity and ease of understanding, elements in Figs. 4 and 5 similar to those Figs. 1–3 have been indicated by the same reference numbers. In the dryer of Fig. 4 air is circulated through the rotating basket 2 in the same manner as in the dryer 1. The air is drawn into the machine by a blower 9 and is directed to a heating element at the top of the basket by means of a baffle 16. The air flows downwardly across the basket from the heating element, extracting moisture from the clothes being tumbled therein, and is collected in a suitable chamber 19 on the opposite side of the baffle 16 from the blower 9. From the chamber 19 the air is exhausted out of the machine through a suitable lint trap 20.

In order to indicate a clogged condition of the lint trap there is provided whistle means embodying my invention in an alternate form thereof. This whistle means comprises an orifice type whistle 40 which is mounted in the toeboard 13 of the machine. The whistle element 40 comprises a tube 41 having its intake connected to the exhaust air collecting chamber 19 and having its outlet exhausting into the room surrounding the dryer (see Fig. 5). Intermediate the ends of the tube an orifice 42 is provided for producing a whistling noise whenever air flows through the tube at a predetermined rate.

The tube 41 and the orifice 42 are so designed that the air flow therethrough during the normal operation of the machine is ineffective to produce a signal. In other words when the lint trap is not clogged and the pressure in chamber 19 is not appreciably higher than the room air pressure, the whistle means 40 does not produce a noise. However, when the lint trap 20 clogs up so that pressure builds up within the chamber 19, an increased air flow is caused through the whistle means. The higher the pressure, the higher is the air flow through the whistle. The orifice 42 is so designed that when this flow reaches a predetermined rate, it then creates an audible signal or whistling noise. This audible signal, of course, warns the operator that the lint trap should be emptied. The pressure with the chamber 19 at which the whistle produces the signal may obviously be varied by changing the design of the whistle.

After the lint trap is emptied in response to the signal, the machine can be placed back in normal operation. There is then no appreciable pressure differential across the lint trap and no signal is produced by the whistle 40. Just as the signal is produced automatically

when the trap becomes clogged, the emptying of the trap automatically stops it.

From the above it will be seen that I have provided new and improved, but yet very inexpensive means for producing an audible signal to warn of the clogging of a clothes dryer lint trap. The means comprises whistle means which is blown by the changed pressure conditions within the dryer resulting from the clogging of the trap. Specifically, in both of the illustrated embodiments the whistle means is blown by the increased pressure across the lint trap itself. Whenever the pressure on the upstream side of the lint trap increases to a predetermined level above the room air pressure on the downstream side of the trap, an audible signal is produced. In one embodiment the signal is produced by the opening of the whistle intake by a flexible diaphragm, and in the second embodiment the signal is produced through the design of a continuously open whistle so that it is effective to produce a signal only when the intake pressure rises to the predetermined level. With either embodiment a loud, clear signal is produced to warn the operator that the lint trap should be emptied.

In both of the above described embodiments I have shown my invention as applied to a dryer having a pressure type air circulation system. That is, I have shown the invention in a dryer in which the lint trap is downstream from the blower or other air moving means. It will be obvious, however, that the invention can be utilized equally well in dryers having a suction type system in which the lint trap is upstream of the blower. In a suction system, just as in a pressure system, the pressure conditions within the dryer change as the lint trap becomes clogged and restricts the air flow therethrough. These changed pressure conditions may be utilized equally well in the suction system to actuate the whistle means for notifying the operator. Thus it will be understood that I contemplate the use of my whistle means in both types of dryer systems, pressure and suction.

While in accordance with the patent statutes, I have described what at present are considered to be the preferred embodiments of my invention, it will be obvious to those skilled in the art that various changes and modifications may be made thercin without departing from

my invention and I, therefore, aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

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

1. In a clothes dryer, a clothes container, air heating means, air moving means for circulating air over said heating means and through said container for drying the clothes therein, a lint trap for removing lint from the air leaving said container, whistle means having its intake connected on the upstream side of said lint trap, and a pressure responsive, resilient diaphragm arranged to respond to the pressure on the upstream side of said lint trap, said diaphragm normally assuming a first position and flexing to a second position in response to the pressure on the upstream side of said lint trap rising above a predetermined level, said diaphragm shutting said intake of said whistle means in said first position and opening said intake when in said second position, whereby said whistle means is operated to produce a signal when said lint trap clogs sufficiently to cause the upstream pressure to reach said predetermined level.

2. In a clothes dryer, a clothes container, air heating means, air moving means for circulating air over said heating means and through said container for drying the clothes therein, a lint trap for removing lint from the air leaving said container, a whistle connected across said lint trap, and a pressure responsive diaphragm element controlling the operation of said whistle, the opposite faces of said diaphragm element being subjected respectively to the pressures on the upstream and downstream sides of said lint trap, said diaphragm element normally closing the entrance to said whistle and being flexed to open said entrance when the pressure differential across said lint trap reaches a predetermined level due to the clogging of said trap.

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