CLOTHES DRYING BLOWER WITH LINT STRIPPING DEVICE

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ABSTRACT OF THE DISCLOSURE

A clothes drying tumbler equipped with a blower for circulating a heated air during the drying operation has a nozzle for directing a fluid as of air or dry steam to exert a forward thrust onto the blower fan to remove the lint which collects on the leading edges of the fan blades. A flat nozzle is used and is positioned so that it is in line with each blade as the blade passes midway through the fluid stream. The fluid pressure to the nozzle is turned on at the end of each drying operation from the time the electric current is cut off from the drive motor to the time the blower is coasted to a near stop.

In air blowers used with drying tumblers the moist lint lodges on the leading edges of the fan blades under pressure of the air stream and after the lint dries it becomes stuck to the edges. As a result there is gradual build up of lint which reduces the efficiency of the blower and which also unbalances the blower causing heavy vibration.

Although others have attempted to use air nozzles to blow lint from the fan blades, these attempts have not been very successful because the nozzles have not been correctly positioned. I have found that a thin fluid stream from a flat nozzle is preferable and that the fluid stream should be directed so that it will be parallel with each fan blade as the fan blade passes midway through the fluid stream. In this way the fluid stream lifts the lint free from the underside of the blade as the blade moves to a midposition in the fluid stream and it lifts the lint from the top side of the blade as the blade passes out of the fluid stream. It is necessary however to apply the fluid stream for only a short period during each drying operation and this is done while the fan blade is coasting to a stop after the drive motor is cut off from the power supply.

An object therefore of the invention is to provide an improved lint stripping device for air blowers of clothes drying equipment.

A further object of the invention is to provide such lint stripping device which is markedly more efficient and effective than the comparable lint stripping devices of the prior art.

In the description of my invention reference is had to the accompanying drawings of which:

FIG. 1 is a perspective view of a clothes drying tumbler equipped with a heater and blower at its right side;

FIG. 2 is a diagrammatic view of the tumbler and blower-heater arrangement;

FIG. 3 is a side perspective view of the blower-heater equipment as seen from the line 3—3 of FIG. 1;

FIG. 4 is a view of the air blower as seen from the rear of FIG. 3, parts of the housing being broken away to show the fluid nozzles for removing the lint from the fan blades;

FIG. 5 is a right-hand view of the air blower and fluid nozzle shown in FIG. 4;

FIG. 6 is a view of the fluid nozzle per se;

FIG. 7 is a schematic circuit diagram of the control circuits for the drier blower and lint stripping device using a centrifugal switch; and

FIG. 7a is a schematic circuit diagram of an alternative control circuit using a timer switch.

A clothes dryer of a large industrial type comprises a rectangular tumbler housing 10 (FIGS. 1 and 3). The tumbler housing 10a has inclined partition walls 11 at the corners (FIG. 2) and bridging walls 12 at its left and right sides between the partition walls to form a nearly cylindrical tumbler casing. In the top right-hand partition wall is an inlet opening 13 and in the lower right-hand partition wall is an exit opening 14. The latter is coupled by a duct 15 to a blower 16. The outlet of the blower is coupled via a duct 17 and return duct 18 to the inlet opening 13 of the tumbler casing. Feeding into the return duct 18 is a heated air supply generally indicated at 19. An exhaust stack 20 leads from the junction between the ducts 17 and 18 to the atmosphere. A damper 21 is in the return duct 18, permitting the air to be either completely exhausted or partially recirculated.

Inside the tumbler casing is a perforated cylinder 22 journalled for rotation about its center 23 on peripheral rollers (not shown) to constitute a drying tumbler for the clothes being dried. The tumbler 22 is rotated at a slow speed by a suitable motor not shown. Clothes are placed in and removed from the tumbler by a suitable end opening not herein shown. This drying tumbler is preferably of the construction shown in Curtis Pat. No. 3,382,387, dated May 14, 1968, to which reference may be had as to details.

The heater-blower unit 106 (FIGS. 2 to 5) has an inlet opening 24 registering with the duct 15 of the tumbler housing 10a. This inlet opening leads into a blower fan 25 mounted on a journal shaft 26. The shaft 26 extends off to the right of the heater blower unit as seen in FIG. 3 and is journalled in bearings 27 (FIG. 4). Coupled to the shaft 26 is a drive motor 28 shown in FIG. 3. This drive motor rotates the fan in a direction of the arrow 29 (FIG. 5) typically at about 2000 to 2500 r.p.m.

The blower fan comprises two spaced arcuate side walls 30 and 31 secured to hubs 32 on the shaft 26. Secured to these side walls is a series of equidistantly spaced blades 33 each mounted on a line tangent to a common circle about the shaft 26 as a center, this circle being a geometric one indicated by dotted lines 34 in FIG. 5. The blades extend obliquely from an outer concentric geometric circle 35 inwardly towards tangent points on the circle 34 in the direction of forward advance of the blower fan but the blades are at the tangent points on the inner circle. Thus, the inner edges 36 of the blades are leading as the fan is driven in the forward direction of the arrow 29. When the blower fan has a considerable axial length as is herein shown it is provided with an intermediate reinforcing annular plate 37 (FIG. 4).

During the forward rotation of the blower, air is drawn into the center from the tumbler via inlet opening 24 and is propelled outwardly by the fan blades into the expanding blower ducts 38 surrounding the fan, and from there into duct 17. During this operation the outwardly propelled air is led via the duct 17 back into the tumbler. During this operation of the blower the wet lint particles lodge onto the leading edges 36 of the fan blades. As the lint builds up and dries it forms heavy encrustations across the leading edges 36 which become stuck to the blades. This lint build-up creates air turbulence with a resultant reduced lower efficiency, and it also unbalances the blower to create heavy vibration since the blower is driven at a relatively high speed. It is
therefore important that the lint build-up be removed at regular intervals to preserve the blower efficiency and to reduce wear and tear. It is sufficient however if the lint is removed once during each drying operation as before explained.

I have found that a flat fluid nozzle such as is shown in FIG. 6 is particularly effective in removing the lint from the leading edges of the fan blades provided the nozzle is properly directed to exert a forward thrust onto the fan blades. For maximum efficiency, the nozzle is positioned so that the fan blades will be parallel with the fluid stream from the nozzle when each blade passes midway through the fluid stream. Further, the flat nozzle is so oriented that the fluid stream is parallel with the fan blade when the blade is in the midposition. When the nozzle is so positioned, the fluid stream strikes the underside of each blade to loosen the lint from the bottom of the blade as the blade moves to the midposition, and it strikes the upper side of each blade to loosen the lint at the top of the blade as the blade is moved out of the fluid stream. The lint encrustation on the leading edge of a blade is thus progressively loosened and thrown free from the blade into the air stream in a lint trap (not shown). When the blower fan is divided into two sections by the intermediate reinforcing annular plate 37 at least one nozzle 39 is provided for each section as shown in FIG. 4. The nozzles are connected by a conduit 42 to a transverse pipe 41 mounted at its ends in the side walls of the housing 18. This pipe is plugged at one end and is coupled at the other end to a pressure source 43 as from any compressed air line between 70 and 125 p.s.i.

Since a lint removing fluid stream as of air or dry steam need be used for only a short period during each batch drying operation, I provide a control circuit which activates the nozzles only after the drive motor is cut off as shown in FIG. 7. The drive motor 28 for the blower fan is connected by leads wires 44 via one pole a of an on-off switch 45 to terminals 46 to be connected to a 110 volt A.C. source not shown. The switch 45 has a second pole b connected by a tie line 47 to one side of the power line, which makes connection as the motor switch is thrown to off position to a line 48 connected via a centrifugal switch 49 and coil 50 of a solenoid valve V and line 51 back to the other side of the power line. The solenoid valve is connected in the pressure line 41 between the nozzles and the pressure source 43. The centrifugal switch 49 is normally open and is operatively connected to the shaft 26 as indicated at 52 so that it is closed when the blower is rotating. When the blower coasts to a near stop this switch is again opened.

From the above description it will be apparent that upon closing the motor switch 45 to start the blower fan rotating the circuit to the solenoid valve V is opened at the pole 45b of the start-stop switch. As the blower fan comes up to speed the centrifugal switch 49 is closed but with no effect at the moment. However, when the motor switch 45 is shut off to disconnect the motor 28 from its power supply the switch 45b closes and activates the solenoid valve V to supply pressure to the nozzles 39. As the blower coasts to a stop a speed is reached where the centrifugal switch 49 is opened to shut off the valve V. The time from the moment the motor switch is returned to stop position to the time when the solenoid valve is closed is typically about 75 seconds. This is a sufficient period of activation of the nozzles 39 to dislodge and remove the lint encrustations from the leading edges of the blower fan.

In the alternative embodiment shown in FIG. 7A a centrifugal switch 49 is replaced by a timer switch 52. When timer switch 45 is in off position as shown in FIG. 7A a circuit through the timer T is completed via leads 53 to hold timer switch 54 open. When start switch 45 is moved to start position to start the drive motor 28 the current to timer T is cut off resetting switch 54 to closed position.

When start switch is again shifted to off position current flows via switch 54 to open valve V and timer T is activated to cause switch 54 to be opened after a time-out interval, typically 75 seconds, whereby to shut off the valve.

The particular embodiment of my invention herein shown and described is intended to be illustrative and not limiting of my invention since the same is subject to changes and modifications without departure from the scope of my invention which I endeavor to express according to the following claims.

I claim:
1. In a clothes dryer: the combination of a casing, a rotatable tumbler in said casing, means for circulating air through said tumbler casing including a blower fan having a series of blades positioned parallel to the journal axis of the fan, said blades leading from equidistant points on a circle about said axis as a center, means for rotating said fan in an advance direction wherein the inner edges of said blades are leading, said blades tending to collect lint from the air stream on and across said leading edges, a fluid pressure source, and a nozzle connected to said fluid position to disconnect said rotating means from its power source, and means controlled by said start-stop switch for turning off said pressure source when said control switch is returned to off position to disconnect said rotating means from its power source, and means controlled by rotation of said fan for turning off said pressure source as said fan is coasted to a stop.
2. In a clothes dryer: the combination of a casing, a rotatable tumbler in said casing including a blower fan having a series of equidistantly spaced blades in inclined relation to their path of travel, means for rotat-
6. The clothes dryer set forth in claim 1 wherein said blower fan is divided into a plurality of sections along its journal axis, including a plurality of nozzles of which there is at least one for each of said sections for blowing lint from the leading edges of the fan blades.

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