

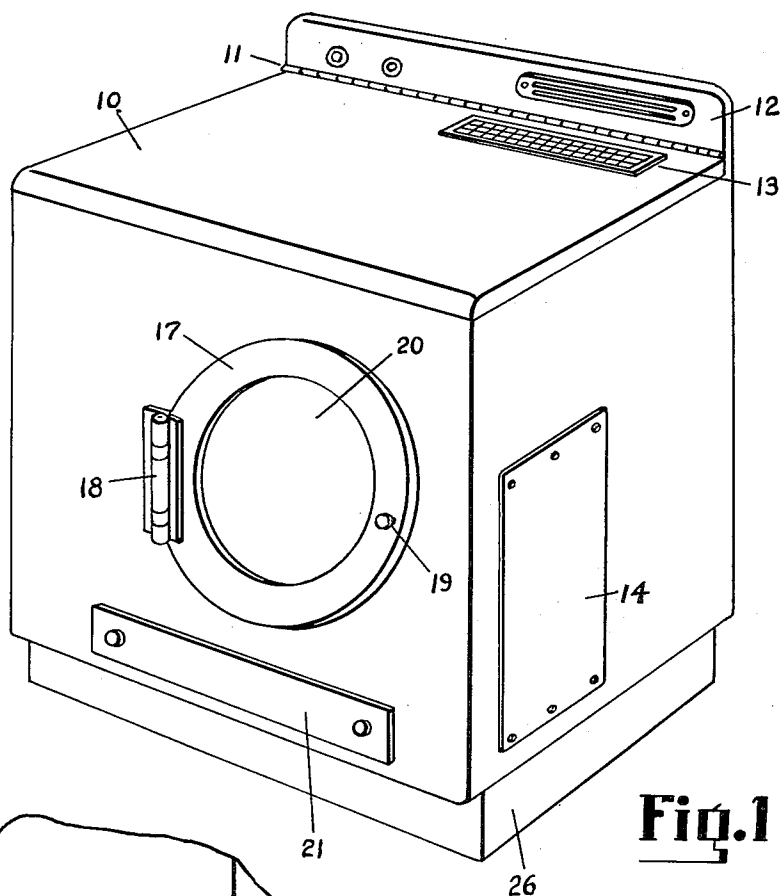
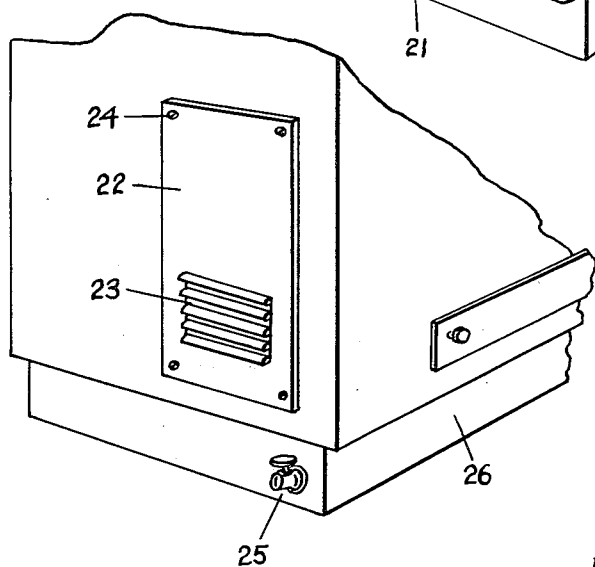
Nov. 20, 1962

A. A. GIUFFRE
CLOTHES DRYING DEVICE

3,064,358

Filed Feb. 17, 1958

3 Sheets-Sheet 1



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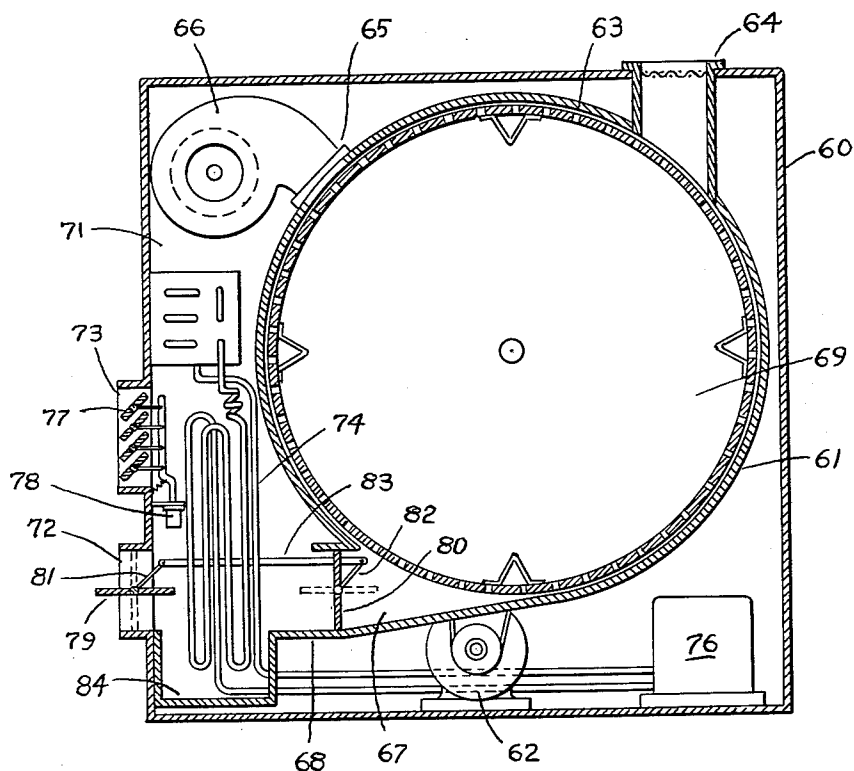


Fig. 5

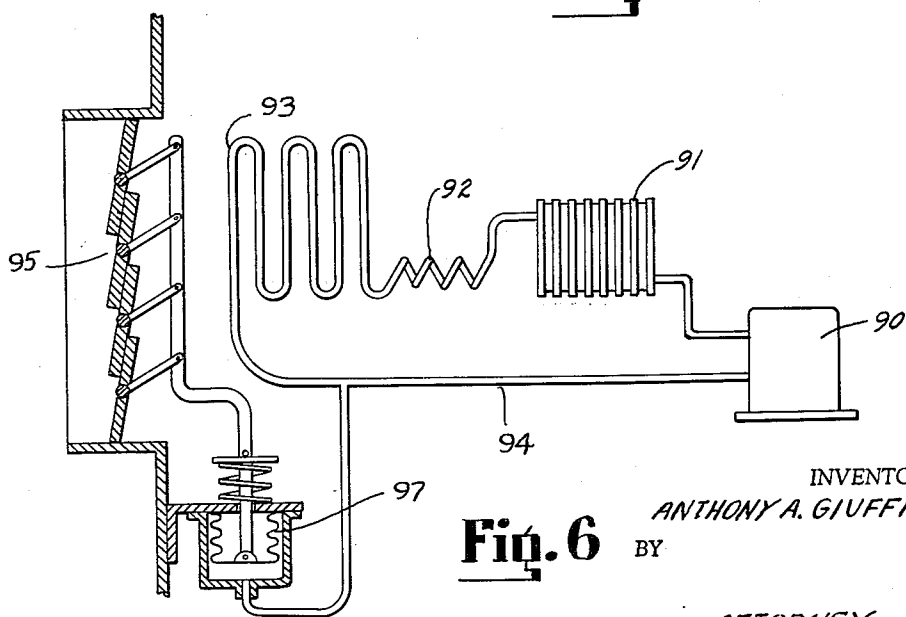


Fig. 6

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CLOTHES DRYING DEVICE

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Filed Feb. 17, 1958, Ser. No. 715,792

1 Claim. (Cl. 34-54)

My invention relates to clothes driers, and more particularly to a clothes drier employing a refrigerant and air circulation for the drying of the clothes.

An object of my invention is to provide a clothes drier in which blowers circulate filtered air past an evaporator, an expansion valve, and a condenser coil through which a refrigerant is conveyed by means of a compressor unit, and forcing the dry air into a perforated enclosure in which a revolving cylinder supporting the clothes is disposed.

Another object of my invention is to provide a device of the character described that accommodates the condensation and moisture, and deposits it conveniently for draining.

In the process of drying moist clothes it is customary to direct heated air produced by either an open flame or a heating element directly onto the clothes during a tumbling or agitation operation. The heating systems are expensive in that they consume large amounts of gas or electricity. The invention of this application, on the other hand, requires little power and depends on the proper dehumidification of air circulated through the drier for operation.

Another object of the invention is to provide novel control means for a refrigerant cycling system in a dehumidifying apparatus.

The device is simple in construction, and provides a compact, self-contained unit.

Other and further objects of my invention will become more apparent as the description proceeds when taken in conjunction with the drawings in which:

FIGURE 1 is a perspective view of the exterior of the unit;

FIGURE 2 is a fragmentary view in perspective of a portion of the unit enclosure showing the louvre plate;

FIGURE 3 is a vertical cross-section of the unit;

FIGURE 4 is a top view of the unit with the cover removed;

FIGURE 5 is a sectional illustration of a further embodiment; and

FIGURE 6 is a diagrammatic view of a typical cycling system utilized in the invention.

Similar characters of reference indicate corresponding parts throughout the several views, and referring now to the same the outer enclosure is shown constructed of solid walls, and an upwardly extending control panel. The upper end of the enclosure is provided with a cover 10 which is hingedly attached at 11 to the control panel section shown as 12. A filtered exhaust port 13 extends through the cover 10 for the ventilation of the main compartment of the unit. A side cover 14 provides access to the compressor 15. This side cover 14 is attached to the wall of the enclosure by screws 16, or in any other convenient manner. A door 17, which is hingedly attached to the front of the enclosure at 18, is provided with a latch 19. This door 17 may also be provided with a transparent member 20 so that the processing of the clothes may be observed from the outside of the enclosure.

A drawer 21, open at its top, is arranged to extend into the enclosure for receiving lint or the like, which may be separated from the clothes during the drying process.

A louvre panel 22 is provided with a plurality of louvre blades 23. This panel 22 is attached to the enclosure 24. A drain cock 25 is disposed at the bottom of the en-

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closure and controls the draining of condensation which accumulates during the drying operation.

The entire enclosure is shown resting on a base portion 26. The enclosure is provided with vertical partitions 27 and 28 to define a main compartment 29 and two auxiliary compartments 30 and 31 at opposite sides of the main compartment.

Within the auxiliary enclosure or compartment 30 is the drying unit, which consists of an evaporator coil 32, a capillary or expansion valve 33, and a condenser coil 34. All these coils are connected in series by tubes 35 and 36. A conventional compressor unit 15 is mounted at the bottom of the auxiliary compartment 31 and a drive motor 37 is mounted at the top of the same compartment on the inner face of its enclosure wall.

A tubular feed line 38 extends from the compressor 15 to the evaporator coil 32, and a return line 39 leads from the condenser coil 34 to the compressor 15.

Within the upper portion of the auxiliary compartment 30 is a pair of blowers 40 and 40' driven by an electric motor 41. These blowers 40 and 40' convey the air from the upper end of the compartment through tubes 43, 43' terminating in downwardly opening hoods 42 and 42'. The tubes 43 extend through the partition 27 separating the auxiliary compartment 30 from the main compartment 29.

At the bottom of the auxiliary compartment 30 is an air inlet which permits the air to enter the auxiliary compartment 30. This opening is provided with a conventional filtering unit 44. The air entering the compartment 30 at opening 45 is controlled by a baffle assembly consisting of the louvre blades 23 pivotally mounted in the frame 22, and connected to one another by links 46 which are actuated by a pivoting lever 47 connected to a rod 48 engaging a piston in a conventional pressure responsive element 49 which may be connected in the pressure line leading from the compressor to the condenser so as to open the blades when the pressure in the line reaches a predetermined amount.

A stationary perforated cylinder 50 is attached to the inside of the outer wall of the enclosure by bolts 51 or in any other convenient manner, and a revolving perforated cylinder 52 concentrically mounted at its rear end on a stub shaft 53 suitably attached at 54 to the inside face of the enclosure. The front end of the cylinder 52 is open in registering relation with the hinged door 17. A pulley 55 is attached to the closed end of the revolving cylinder 52, and has a belt 56 trained thereabout and extending to a drive pulley 57 mounted on the shaft of the drive motor 37 in the enclosure 31. The belt 56 extends through the partition 28 separating the main compartment 29 from the auxiliary compartment 31.

Inside of the revolving cylinder 52 the surface has conventional baffles 58 projecting inward therefrom. The open front end of the inside cylinder 52 is adjacent the hinged door 17 to permit the insertion in, and removal of clothes from the revolving cylinder 52 when the door 17 is opened. The partitions 27 and 28 have inwardly inclined opposed wall portions 27' and 28' below the fixed cylinder 51 which extend from said partitions to form a hopper 59 communicating with a drip pan area. Said drip pan area has a filtered outlet 61 which permits the moisture from the drying cylinder to drip into a condensation tray 62 at the bottom of the auxiliary compartment 30 from which the liquid is drained through a tube 63 having a valve or drain cock 25. The drawer 21, previously mentioned, normally extends into the drip pan area 60.

The use and operation of the machine will be manifest from the above description. The air from the blowers 40 and 40' is directed by hoods 42 and 42' through the per-

forated fixed cylinder 51 and revolving cylinder 52, and is discharged from the filtered opening 13. The machine incorporates the principle of dehumidification including the chilling by a refrigerant, immediately followed by the condensation of the refrigerant in the compartment 30 through which the air is introduced for the clothes drying process, whereby the air is dehumidified without material change in its final temperature when it contacts the clothes.

FIGURE 5 illustrates a further embodiment of the invention.

In FIGURE 5 an outer enclosure is shown at 60. A rotatable drum 61 is supported within the enclosure and is adapted to be rotated by a motor 62. In this form of the invention, a main compartment is divided by a generally cylindrical shell 63 which surrounds the drum 61. The shell 63 has an outlet 64 leading to the top of the enclosure 60, an inlet 65 communicating with a blower 66 and an outlet passage 67 at the lower portion of the shell. A lower portion 68 of the shell is extended to the side wall of the enclosure 60 on the same side as the blower 66. Thus, the enclosure is divided into a main compartment 69 where drying of clothes may occur, an auxiliary compartment 70 on one side of and beneath the shell 63 and a dehumidifying compartment 71 on the other side of the shell. Suitable baffle means (not shown) may adjoin the outlet 64 to completely close off the compartment 70 to the compartment 71.

In this form of the invention, the side wall of the enclosure adjoining the dehumidifying compartment 71, is provided with two exterior air inlet openings 72 and 73. The lower opening 72 is generally horizontally aligned with the outlet 67.

An evaporator coil 74 is positioned in the dehumidifying compartment 71. The coil 74 may be so disposed that its lower extremity is adjacent the opening 72 and the upper extremity is adjacent to the opening 73. A condenser 75 is positioned above the evaporator and in the line of flow of air from the area adjacent the evaporator to the blower or blowers. A motor compressor unit 76 is positioned in the compartment 70 and is adapted to cycle a volatile refrigerant 74 through the condenser 75 and then to the evaporator 74.

The opening 73 as a series of dampers 77 which are controlled by a pressure responsive linkage 78 as in the form of the invention illustrated in FIGURES 3 and 4. The damper assembly 77 is adapted to regulate the inflow of air through the opening 73.

In this embodiment of the invention, a damper 79 is adapted to selectively open and close the opening 72 and a damper 80 is adapted to selectively open and close the passageway 67. The dampers 79 and 80 may be connected for movement together as by means of crank arms 81 and 82, respectively, which are in turn connected by means of a link 83. The arrangement is such that when the damper 79 is opened, as illustrated in FIGURE 5, the damper 80 is closed as is seen in FIGURE 5, while closing of the damper 79 is attended by opening of the damper 80. Any suitable manually actuated handle may be employed to selectively actuate the dampers in unison between these positions. A drain 84 may be positioned beneath the evaporator 74.

In this embodiment of the invention, the drier may be utilized as a dehumidifier for the atmospheric air in the area surrounding the unit. When the unit is used as a clothes drier, the baffle 79 is moved to the closed position, with an attendant opening of the baffle 80. During continuous operation of the motor compressor unit 76, the refrigerant is cycled through the condenser and evaporator. The inflow of atmospheric air is controlled in response to the pressure of the refrigerant in the condenser. Thus, when used as a clothes drier, the blower 66 will circulate warm dehumidified air through the clothes in the drum 61, and through the compartment 71 where the circulating air is cooled and dehumidified by the evapo-

rator, then heated by the condenser 75 before redelivery through the blower 66 to the drum.

On the other-hand, when it is desired to use the unit for dehumidification of the surrounding atmosphere, the damper 79 is moved to the open position, and the damper 80 is moved to the closed position. During operation of the blower 66 and motor compressor unit 76, exterior air may then flow in through the opening 72, be cooled and dehumidified by the evaporator 74, warmed by the condenser, before delivery into the space within the drum 61. Since the damper 80 is closed at this time, the air will simply be delivered through the outlet 64 and into the surrounding atmosphere. During this type of operation, the motor 62 may be idle so that the drum 61 is stationary. Thus, the unit may be used interchangeably as a clothes drier and as a room dehumidifier.

FIGURE 6 is a diagrammatic showing of a typical refrigerant circulating system along with the control means for the inflow of exterior air. As shown in FIGURE 6, the motor compressor unit is illustrated at 90 and is adapted to deliver refrigerant under pressure to the condenser 91. The refrigerant may be led from the condenser to a capillary tube 92 and then to an evaporator coil 93. The return or low side of the system is shown by the conduit 94 which returns the refrigerant from the evaporator to the motor compressor unit. In FIGURE 6 the damper assembly for the control of the inflow of exterior air is designated at 95 and is shown as controlled by a negative pressure responsive bellows actuated linkage 96. The bellows 97 is subjected to the pressure conditions on the low side of the refrigerant cycling system. The arrangement is such that when the suction in the conduit 94 increases (which is equivalent to an increase in the pressure in the line from the condenser to the evaporator) the damper assembly is opened to admit additional quantities of exterior air.

In each form of the invention shown herein, the drying unit employs an evaporator, condenser and motor unit in one compartment of the unit. The circulation of air through the unit is such that the air in circulation first passes the evaporator where it is cooled and dehumidified and then passes the condenser where the air absorbs the heat given off by the condenser during the refrigerating process. When the pressure in the line from the condenser to the evaporator builds up above a predetermined maximum the damper assembly 23 in FIGURE 3 or 77 in the form of the invention shown in FIGURE 5, is opened so as to bring in atmospheric air and thus reduce the temperature of the condenser and the pressure in the line. A build up in the pressure in the condenser line is accompanied by an increase in the temperature in the condenser, and by using the controlled inflow of atmospheric air, the temperature and pressure may be held within safe limits, during continuous operation of the motor compressor unit. The exact level in the temperature or pressure at which the damper assembly is opened may vary from system to system but it may be determined in any given system at just what pressure and temperature the damper assembly should be fully opened. At lesser pressure, the dampers may only be partially opened so as to admit a lesser quantity of atmospheric air per unit time. The operation of the damper assembly insures self-regulation of the pressure conditions in the refrigerant cycling unit.

Whereas I have shown and described an operative form of the invention, it should be understood that this showing and description thereof is to be taken in an illustrative or diagrammatic sense only. There are many modifications to the invention which will fall within the scope and spirit thereof and which will be apparent to those skilled in the art. The scope of the invention should be limited only by the scope of the hereinafter appended claim.

I claim:

In a dehumidifying unit, a housing and a rotatable drum supported within said housing, a shell enclosing

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said drum so as to divide said housing into a compartment on one side of said drum, a compartment on the other side of said drum, and a compartment within the shell, a blower assembly in the compartment on said one side of the drum for delivering air under pressure into the compartment within the shell, and for thereby circulating air through said drum and through said one compartment, a refrigerant evaporator and condenser located in said one compartment, said shell having an opening in the lower portion thereof to allow communication between said one compartment and the interior of said shell, said evaporator and condenser being positioned so that the air in circulation may pass over the evaporator and then pass the condenser so as to be dehumidified by the evaporator and then heated by the condenser before delivery to the blower assembly, refrigerant cycling means for cycling refrigerant through said condenser and evaporator, air inlet and baffle means for admitting atmospheric air into said one compartment, and

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a pressure responsive bellows responsive to the pressure in the refrigerant cycling line between the evaporator and the refrigerant cycling system, said bellows being adapted to open said baffle means in response to the attainment of a predetermined negative pressure in said line.

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