Jan. 7, 1958 K. R. CLINE 2,818,719

COMBINED WASHING AND DRYING APPARATUS

Filed May 19, 1952 2 Sheets-Sheet 1

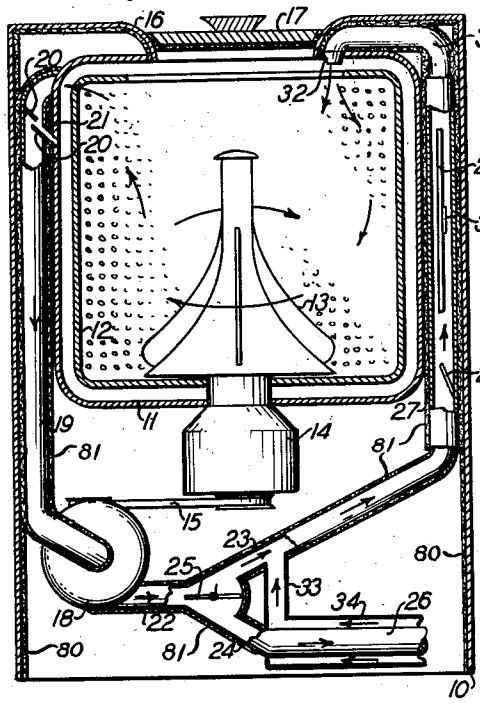


FIG. 1

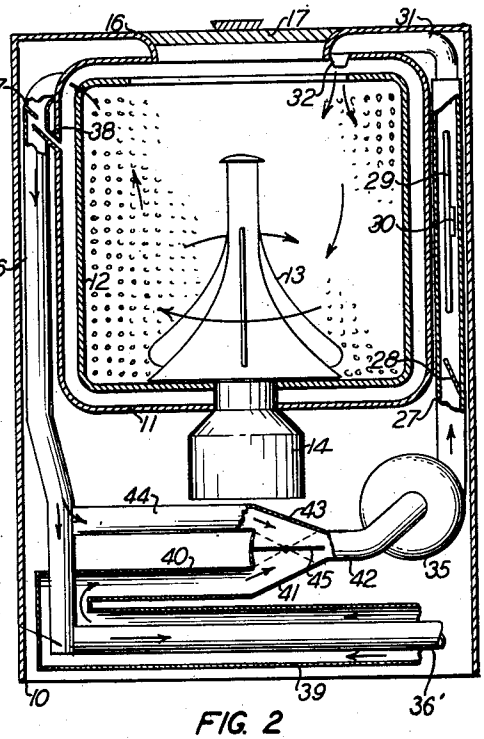


FIG. 2

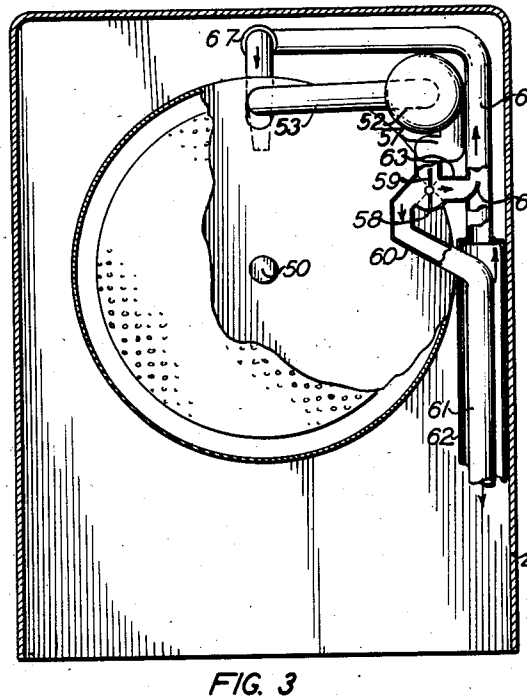


FIG. 3

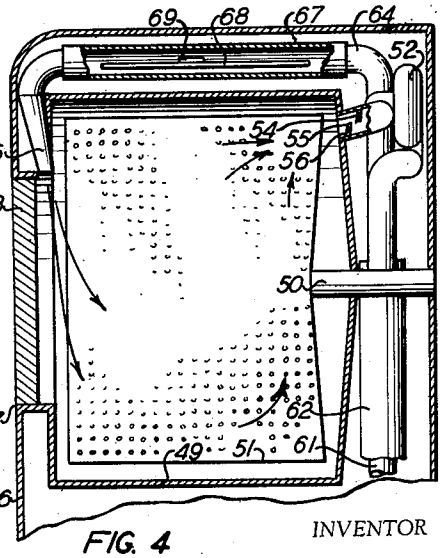


FIG. 4

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Jan. 7, 1958 K. R. CLINE 2,818,719

COMBINED WASHING AND DRYING APPARATUS

Filed May 19, 1952 2 Sheets-Sheet 2

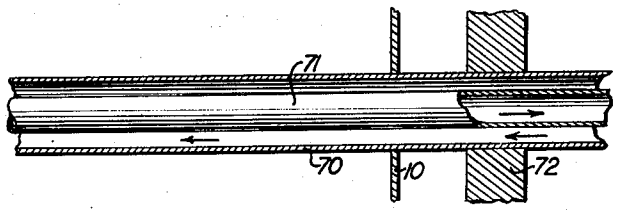


FIG. 5

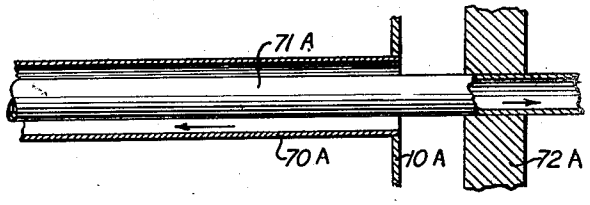


FIG. 6

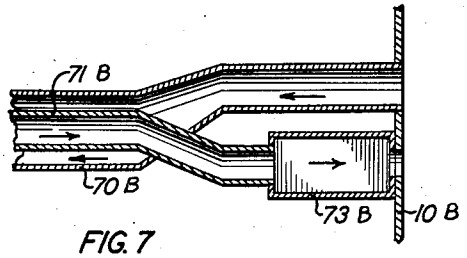


FIG. 7

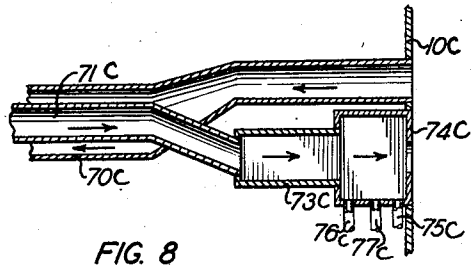


FIG. 8

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COMBINED WASHING AND DRYING APPARATUS

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Application May 19, 1952, Serial No. 288,733

14 Claims. (Cl. 68—19)

This invention relates to the treating of textiles and more particularly to a combined apparatus for washing and drying such textiles.

The apparatus of this invention is designed primarily for use in the home and is intended to replace the conventional separate washing machine and drying machine. The combining of these two machines into a single apparatus results in a material saving in space and at the same time provides a combined apparatus which may be economically manufactured and sold at a reasonable price. This combined apparatus efficiently performs both the operation of washing and thereafter drying clothes or other textile articles which may be received therein and in fact the drying apparatus is combined with a washing machine without materially changing the design of the latter whereby the original washing action is completely retained.

Heretofore numerous attempts have been made to combine washing machines and drying machines but these in general have resulted in rather cumbersome devices which were not particularly efficient and in which neither the washing nor the drying were satisfactorily accomplished. The apparatus of the instant invention is intended to be housed in a cabinet no larger than the present conventional washing machine and in fact the drying apparatus may be conveniently installed in the present washing machine cabinets without material alteration thereof.

It is therefore an object of this invention to provide a combined washing machine and drying apparatus which may be economically constructed and housed in the present conventional washing machine cabinet.

It is a further object of the invention to provide a combined washing machine and drying apparatus in which the heat contained in the moist air withdrawn from the washing and drying chamber is utilized to heat the fresh air being drawn into the apparatus for drying purposes.

Another object of the invention is to provide a combined washing machine and drying apparatus in which the drying air may be recirculated through the washing and drying chamber until the desired temperature is attained at which time a portion of this air may be exhausted and this portion made up by fresh air drawn in from exteriorly of the cabinet.

A still further object of the invention is the provision of a combined washing machine and drying apparatus in which all of the operation may be manually or automatically controlled, in which the air for drying may be either taken from outside the building or from inside the room in which the apparatus is located and in which the moist air may be either discharged exteriorly of the building or into the interior thereof.

A further object of the invention is the provision of a combined washing machine and drying apparatus in which means is provided for condensing the moisture out of the air discharged therefrom in order that such air will be comparatively dry when discharged into the room.

Further objects and advantages of the invention will be apparent from the following description taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a longitudinal sectional view showing the drying apparatus of this invention installed in a conventional washing machine;

Fig. 2, a longitudinal sectional view similar to Fig. 1 but showing a modified form of drying apparatus also installed in the conventional washing machine cabinet;

Fig. 3, a transverse sectional view showing a drying apparatus installed in the conventional cabinet of a different type of washing machine;

Fig. 4, a fragmentary longitudinal sectional view showing the drying apparatus installed in a conventional washing machine cabinet as in Fig. 3;

Fig. 5, a fragmentary sectional view showing one method of connecting the drying apparatus of this invention whereby fresh air is taken from exteriorly of the building and moist air is also discharged exteriorly thereof;

Fig. 6, a view similar to Fig. 5 but showing a method of connecting the drying apparatus of this invention whereby fresh air is received from inside of the building and the moist air from the drying apparatus is discharged exteriorly of the building;

Fig. 7, a fragmentary sectional view showing a method of obtaining fresh air from inside of the building and discharging moist air interiorly thereof and incorporating a lint trap in such discharge conduit; and

Fig. 8, a view similar to Fig. 7 but showing condensing means for removing moisture from air discharged from the drying apparatus.

With continued reference to the drawing there is shown in Fig. 1 a housing **10** which may form a cabinet within which is mounted a tub **11**. Rotatably mounted within the tub **11** is a spinner basket **12** and mounted within this basket for suitable motion is an agitator **13**. Driving mechanism for both the spinner basket **12** and agitator **13** is contained in a drive housing **14** disposed below the tub **11** and this mechanism may receive its power through a belt **15** connected with a drive motor not shown. The cabinet **10** may be provided at the top thereof with an access opening **16** which is normally closed by a lid **17** to permit the insertion or removal of clothes or other fabric articles from the spinner basket **12**.

The drying apparatus of this invention may comprise a blower **18** mounted within the cabinet **10**, blower **18** being driven from the drive motor through suitable driving means including a clutch not shown which may be actuated to start or stop the blower **18** at will. Of course, if desired, a separate motor may be provided for driving the blower **18** and this would be preferable where the drying apparatus was to be installed in existing washing machines since this would preclude the necessity for making a driving connection between the existing drive motor and the blower **18**. By the use of a separate blower motor it is not necessary to consider the location of the regular driving motor when positioning the drying apparatus in the washing machine since no connections between the regular drive motor and drying apparatus will be necessary. Connected to the intake of the blower **18** is an air outlet conduit **19** leading to the interior of the tub **11** adjacent the upper end thereof. Conduit **19** may be provided interiorly thereof with baffles **20** and a drain connection **21** to the interior of tub **11** to prevent liquid from passing through the conduit **19** into the blower **18**. Any liquid in the air being drawn into the conduit **19** will be diverted by the baffles **20** to the drain passage **21** from where this liquid will return to the tub **11**.

The discharge from blower **18** is connected through a conduit **22** with a Y-connection forming a valve chamber and having arms **23** and **24**, the passage of air from con-

duit 22 to either of these arms 23 and 24 being controlled by a valve 25 of the butterfly type or any other valve which may be suitable for this purpose. Arm 24 of the Y-connection extends to a discharge conduit 26 which may lead exteriorly of the cabinet 10 and if desired may be connected to the outside of the building in which the washing and drying apparatus is housed in order that the moist air will be discharged out of doors rather than within the launry room. The arm 23 connected to discharge 22 leads to a heating chamber 27 and disposed within the lower portion of this chamber is a valve 28 which may be manually adjusted to control the flow of air through the heating chamber 27 and eventually to the interior of the basket 12 and tub 11. Disposed within heating chamber 27 is an electrical heating element 29 which may be of sufficient size and wattage capacity to heat the air to the desired temperature and in order to prevent overheating a thermal safety device 30 may be incorporated as part of the heating element 29, this safety device serving to shut off the electric current supply to the heating element 29 in case of overheating thereof. Connected to the upper end of heating chamber 27 is an air inlet conduit 31 which terminates in an injection nozzle 32. If desired nozzle 32 may be adjustable to direct a stream of heated air emanating therefrom to any part of the interior of basket 12 and tub 11.

Also connected to the arm 23 which leads to the heating chamber 27 is a conduit 33 connected to a casing 34 which surrounds the discharge conduit 26. This forms an intake conduit and a heat exchanger in which the air passing through the casing 34 is heated by the warm moist air being discharged through conduit 26. In this manner much of the heat withdrawn from the tub 11 is utilized to warm the fresh air being drawn into the drying apparatus, thus reducing the quantity of electricity needed to heat the air by means of the heating element 29.

In operation after completion of the washing cycle the water is withdrawn from the tub 11 and the spinner basket 12 is caused to revolve at a rapid rate to extract all of the water possible from textile articles disposed within the basket 12. Upon completion of this spinning operation the blower 18 is started and the heating element 29 is energized, the butterfly valve positioned so that air from blower 18 will pass through conduit 22 and arm 23, through the heating chamber 27 and the inlet conduit 31 to be directed into the interior of basket 12 by nozzle 32. Since the basket will continue to rotate the clothes therein will be agitated and the warm air emanating from nozzle 32 will serve to dry the contents of the basket 12. The moist air arising from such articles will pass through outlet conduit 19 into the blower 18 and be recirculated. Upon this air reaching a sufficiently high temperature butterfly valve 25 will be either automatically or manually adjusted to cause a portion of the warm moist air being withdrawn from the basket 12 through the outlet conduit 19 to pass outwardly through the discharge conduit 26 this discharged air being replaced by fresh air drawn in through the intake conduit or casing 34 and the conduit 33 into the arm 23 and thence through the heating chamber 27. As stated above this fresh air passing through the casing 34 is warmed by the moist air being discharged through the conduit 26. This operation will continue until the clothes or other fabric articles are sufficiently dried at which time they may be removed from the basket 12 through the access opening 16 in the cabinet 10.

The above described form of the invention may be termed a vacuum drying system since the interior of tub 11 and spinner basket 12 is directly connected to the intake of blower 18. Consequently a negative pressure exists in the tub 11 and any fresh air is drawn in due to this negative pressure. This results in faster drying of the contents of the basket 11 since the moisture in the articles will vaporize at a lower temperature.

As shown in Fig. 1 the inner surface of the housing or cabinet 10 may be covered with a layer of heat and sound insulation 80 and likewise conduits 19, 22, 23, 31 and heating chamber 27 may be covered with heat insulation 81 in order to increase the efficiency of the apparatus. While the insulation 80 and 81 is only shown in Fig. 1 of the drawing, it is of course to be understood that such insulation may be utilized in the other forms of the invention to be described below if such insulation is deemed desirable.

In Fig. 2 there is shown a similar form of drying apparatus combined with a washing machine but in this case a positive pressure is utilized within the tub 11 and spinner basket 12 and moist air is expelled therefrom due to this positive pressure. In this form of the invention the structure of the washing machine is identical to that described above in connection with Fig. 1 and a blower 35 is provided in which the discharge thereof is connected directly to the heating chamber 27 in which the heating element 29 is disposed as in the previously described form, this air passing through such chamber and an air inlet conduit 31 to nozzle 32 which as before may be directed in such a manner that the air emanating therefrom will flow to any desired part of the basket 12 and tub 11.

Air is discharged from the basket 12 and tub 11 through an air outlet conduit 36 connected to the tub 11 adjacent the upper end thereof there being baffles 37 disposed within this conduit similar to baffles 20 as described above and a drain passage 38 connects from this outlet conduit 36 adjacent the baffles 37 to the interior of tub 11 to prevent water from passing outwardly through the conduit 36. Conduit 36 passes downwardly along side the tub 11 to a discharge conduit 36' extending through a casing 39 which provides an air intake conduit. Casing 39 is connected through a conduit 40 with one arm 41 of a Y-connection forming a valve chamber, the common end of this Y-connection being connected through a conduit 42 with the intake of blower 35. The other arm 43 of the Y-connection is connected through a conduit 44 with the outlet conduit 36 and the flow of air either through conduits 40 or 44 into the blower 35 is controlled by valve 45 of the butterfly or other suitable type.

In operation after the completion of the washing cycle the blower 35 is started and the heating element 29 is energized at which time air will be blown through the heating chamber 27 and the nozzle 32 into the interior of the basket 12 and the tub 11. At the same time butterfly valve 45 is adjusted to permit air to flow from tub 11 through the outlet conduit 36 and the conduit 44 to the intake of blower 35. This causes a complete recirculation of the air until such time as the temperature thereof rises to the desired value. At this time butterfly valve 45 will be either manually or automatically adjusted to cause the air discharged from the tub 11 to pass through conduit 36 and through the discharge conduit 36' at which time air flowing into intake conduit 39 from externally of the housing or cabinet 10 will be heated due to the heat contained in the moist air flowing from the tub 11 and such fresh heated air will pass through the blower 35 and into the tub 11. Depending upon the temperature desired the butterfly valve 45 may be adjusted to either obtain part of the circulated air from externally of the cabinet 10 or may provide for a mixture of this fresh air and the air passing through the outlet conduit 36 to flow to the intake of blower 35. This operation will continue until the clothes or other fabric articles are sufficiently dry at which time they may be removed from the basket 12 through the access opening 16.

It will be seen that in the above described form of the invention a positive pressure will always be present within tub 11 and that the air blast emanating from nozzle 32 will tend to agitate the articles within the basket 12 and further hasten the drying thereof.

A still further form of the invention is shown in Figs.

3 and 4 in which a washing machine has a horizontal tub and spinner basket employed as opposed to the vertical tub and spinner basket in the form above described. In this form of the invention a cabinet 46 may be provided and an access opening 47 may be normally closed by a suitable door or closure 48. Disposed within the cabinet 46 is a tub 49 and mounted within this tub for rotation about a horizontal axis on a shaft 50 is a basket 51 which is utilized to both wash the clothes and other fabric articles and to spin the same for the purpose of extracting all excess water contained within these clothes after the washing operation.

In this form of the invention the drying apparatus may well comprise a blower 52 connected by an air outlet conduit 53 with the interior of the tub 49 adjacent the upper side thereof. Conduit 53 is inclined from the intake of the blower 52 toward its connection to the tub 49 in order that liquid collecting therein will drain back into the tub 49 and this conduit 53 may well be provided internally thereof with baffles 54 and 55 which further assist in preventing passage of water from tub 49 to the blower 52. Baffle 55 may be provided with a drain opening 56 adjacent the bottom thereof in order to permit drainage of any water collecting in the conduit 53 into the tub 49.

The discharge of blower 52 is connected through a conduit 57 to a valve chamber 58 in which is disposed a valve 59 of the butterfly or other suitable type. Connected to chamber 59 is a discharge conduit 60, a portion 61 of which is disposed within a housing 62 forming an air intake conduit. Portion 61 and housing 62 terminate exteriorly of the cabinet 46 and provide a heat exchanger in which air flowing through the intake conduit 62 is heated by the warm moist air flowing through the discharge conduit 61.

Also connected to valve chamber 58 is a conduit 63 which is connected to an air inlet conduit 64 leading to a nozzle 65 disposed adjacent the front of the cabinet 46, this nozzle 65 being directed in such a manner that air emanating therefrom is directed into the interior of spinner basket 51. It will be evident that the flow of air through the nozzle 65 or the nozzle 32 produces additional turbulence whereby the air may intimately contact the clothes for more effectively drying the latter. Inlet conduit 64 is also connected to the casing or intake conduit 62 and may receive warm fresh air therefrom. In order to prevent blowback in the casing 62 a baffle 66 may be provided adjacent the conduit 63 in order to direct air from the blower 52 upwardly into the conduit 64 and prevent passage of such air downwardly through the casing 62.

Connected in the inlet conduit 64 is a heating chamber 67 in which is disposed a heating element 68 provided with a thermal overheating safety device 69 similar to that described above in connection with Figs. 1 and 2. It will thus be apparent that air passing through the intake conduit 64 will be heated by the element 68 prior to being discharged through the nozzle 65 into the interior of the spinner basket 51.

In operation after completion of the washing cycle the valve 59 is adjusted to such a position that upon starting of the blower 52 air will be drawn from the interior of basket 51 and discharged through conduit 63 and into inlet conduit 64 at which time it will be heated by the heating element 68 until the desired temperature is reached. At this time valve 59 is adjusted in such a manner that a portion or all of the air withdrawn from the basket 51 through outlet conduit 53 will be discharged through conduit 60 and the portion 61 thereof within the casing 62, this heated air serving to heat fresh air passing upwardly through the casing 62 and into the interior of the basket 51 through the nozzle 65. This operation will result in complete drying of the fabric articles or clothes disposed within the spinner basket 51 which of course will be rotated to agitate such clothes or other articles.

Various methods or systems may be utilized for connecting the air supply and discharge for drying purposes to the apparatus of this invention and several alternative methods are shown in Figs. 5 to 8. In Fig. 5 the air intake conduit or casing 70 and the air discharge conduit 71 are arranged in concentric relationship and pass through the cabinet 10 and through the wall 72 of the building in which the apparatus is situated. This results in obtaining fresh air from the outside and also in discharging warm moist air to the atmosphere.

In Fig. 6 an alternative structure is disclosed in which the intake conduit or casing 70A passes through the cabinet 10A and obtains air from the room in which the apparatus is located, the discharge conduit 71A being arranged concentrically thereof and passing through the exterior wall 72A of the building to discharge air to the exterior thereof.

In Fig. 7 both the intake and the discharge are connected through the cabinet 10B to the room in which the apparatus is located, the discharge conduit 71B however, having disposed therein a lint trap 73B which serves to collect any lint which may be present in the air stream and prevent such lint from being distributed throughout the room in which the apparatus is located.

Fig. 8 illustrates a method similar to Fig. 7 but in addition thereto incorporates a condenser 74C in the form of a heat exchanger which receives air from the lint trap 73C, this heat exchanger 74C being cooled by a water inlet 75C, a water discharge line 76C and provided with a drain 77C. In operation with warm moist air passing through the discharge conduit 71C and the lint trap 73C into the condenser 74C, the cool heat-exchanging surfaces thereof will lower the temperature of such air and cause condensation of the moisture therein, this condensation collecting as water and being drained off through the drain connection 77C. This results in relatively dry lint free air being discharged into the room in which the aparatus is located.

It is further contemplated that the air utilized in the drying operation in connection with this invention will be heated to a sufficient temperature to sterilize the clothing being dried or other means such as a sterilamp may be utilized. Of course automatic thermostatic control means will be incorporated which will prevent such temperature arising to a point where lint or other inflammable particles might tend to catch fire. It has been found that such temperature should be of the order of 160° to 180° F. and actually this will be below the flash point of particles or other material in the apparatus. This feature of course, also insures that any lint, dirt or other material which may remain in the washer will also be sterilized and will thus prevent the growth of bacteria, fungus, etc., in the machine.

It is contemplated that when desired the heating element 29 or 68 as the case may be, may be positioned between the heating chamber and the tub in order to provide heat both for heating and maintaining the temperature of the water in the tub and for heating the air passing through the heating chamber. This will result in a higher efficiency during the washing cycle since the water may be maintained at a relatively high temperature and will not cool down during this operation. Also if desired this heating element may be utilized to heat cold water to proper washing temperature. In this case the heating element may or may not be thermostatically controlled depending on the particular installation and the wishes of the user.

It will be seen that by the above described invention there has been provided a relatively simple and economical combined washing and drying apparatus which will occupy substantially the same space as the conventional washing machine and yet which provides in addition to such washing machine a highly efficient drying apparatus which results in combining the complete laundry operation in one machine. Suitable automatic controls may of course be provided and these will permit a complete washing, rinsing, extracting and drying cycle without any at-

tention whatsoever from the operator except placing the articles to be washed therein, setting of the necessary controls and removal of the washed and dried articles therefrom. This results in a material saving both in labor and space and since the entire apparatus comprises one integral unit the same may be economically constructed in order to provide a combined washing and drying apparatus at a material saving in cost over what might be expected were these machines constructed separately.

It will be obvious to those skilled in the art that various changes may be made in the invention without departing from the spirit and scope thereof and therefore the invention is not limited by that which is shown in the drawings and described in the specification but only as indicated in the appended claims.

What is claimed is:

1. Washing and drying apparatus comprising a closed tub having an opening for the insertion of clothes, a cover to close said opening, a basket within said tub for receiving fabric articles to be washed and dried, a blower, an air outlet conduit communicating with said tub adjacent the upper portion thereof and connected to the intake of said blower, said air outlet conduit having a downwardly extending portion, spaced baffles in said downwardly extending portion of said outlet conduit, drain means adjacent the lowermost baffle providing communication between said outlet conduit adjacent said lowermost baffle and said tub whereby water passing into said outlet conduit will be trapped by said baffles and returned to said tub through said drain means, an air inlet conduit terminating at one end in a nozzle for directing air into said tub, a heating chamber in said inlet conduit, a heating element disposed in said chamber, a thermal safety device in said chamber operably connected to said heating element for preventing a rise in temperature above a predetermined value, the opposite end of said inlet conduit being connected to a valve chamber, a conduit connecting said valve chamber and the discharge of said blower, a discharge conduit connected to said valve chamber and terminating exteriorly of said apparatus, an intake conduit communicating with the atmosphere and surrounding said discharge conduit in spaced relation thereto to form a heat exchanger, means connecting said intake conduit and said inlet conduit and a butterfly valve disposed in said valve chamber for selectively directing air from said blower to said inlet conduit or to said discharge conduit.

2. Washing and drying apparatus comprising a closed tub having an opening for the insertion of clothes, a cover to close said opening, a basket within said tub for receiving fabric articles to be washed and dried, a blower, an air outlet conduit communicating with said tub adjacent the upper portion thereof and connected to the intake of said blower, an air inlet conduit for directing air into said tub, a heating chamber in said inlet conduit, a heating element disposed in said chamber, the opposite end of said inlet conduit being connected to a valve chamber, a conduit connecting said valve chamber and the discharge of said blower, a discharge conduit connected to said valve chamber, an intake conduit communicating with the atmosphere and surrounding said discharge conduit in spaced relation thereto to form a heat exchanger, means connecting said intake conduit and said inlet conduit and valve means disposed in said valve chamber for selectively directing air from said blower to said inlet conduit or to said discharge conduit whereby all of the air may be recirculated, part of the air may be recirculated or none of the air may be recirculated.

3. Washing and drying apparatus comprising a closed tub having an opening for the insertion of clothes, a cover to close said opening, a basket within said tub for receiving fabric articles to be washed and dried, a blower, an air inlet conduit terminating at one end in a nozzle for directing air into said tub, a heating chamber in said inlet conduit, a heating element disposed in said chamber, a thermal safety device in said chamber operably connected to said heating element for preventing a rise in temperature above a predetermined value, the opposite end of said inlet conduit being connected to the discharge of said blower, an air outlet conduit communicating with said tub adjacent the upper portion thereof and connected to a valve chamber and a discharge conduit, said outlet conduit having a downwardly extending portion, spaced baffles in said downwardly extending portion of said outlet conduit, drain means adjacent the lowermost baffle providing communication between said tub and said downwardly extending portion of said outlet conduit whereby water passing into said outlet conduit will be trapped by said baffles and returned to said tub through said drain means, a conduit connecting said valve chamber and the intake of said blower, an intake conduit communicating with the atmosphere and surrounding said discharge conduit in spaced relation thereto to form a heat exchanger, means connecting said intake conduit and said valve chamber and a butterfly valve disposed in said valve chamber for selectively directing air to said blower intake from said outlet conduit or from said intake conduit.

4. Washing and drying apparatus comprising a closed tub having an opening for the insertion of clothes, a cover to close said opening, a basket within said tub for receiving fabric articles to be washed and dried, a blower, an air inlet conduit terminating at one end in a nozzle for directing air into said tub, a heating chamber in said inlet conduit, a heating element disposed in said chamber, the opposite end of said inlet conduit being connected to the discharge of said blower, an air outlet conduit communicating with said tub adjacent the upper portion thereof and connected to a valve chamber and a discharge conduit, a conduit connecting said valve chamber and the intake of said blower, an intake conduit communicating with the atmosphere and surrounding said discharge conduit in spaced relation thereto to form a heat exchanger, means connecting said intake conduit and said valve chamber and valve means disposed in said valve chamber for selectively directing air to said blower intake from said outlet conduit or from said intake conduit.

5. Washing and drying apparatus comprising a closed tub having an opening for the insertion of clothes, a cover to close said opening, a basket within said tub for receiving fabric articles to be washed and dried, a blower, an air inlet conduit terminating at one end in a nozzle for directing air into said tub, a heating chamber in said inlet conduit, a heating element disposed in said chamber, the opposite end of said inlet conduit being connected to the discharge of said blower, an air outlet conduit communicating with said tub adjacent the upper portion thereof and connected to a valve chamber and a discharge conduit, a conduit connecting said valve chamber and the intake of said blower, an intake conduit communicating with the atmosphere and surrounding said discharge conduit in spaced relation thereto to form a heat exchanger, means connecting said intake conduit and said valve chamber and valve means disposed in said valve chamber for selectively directing air to said blower intake from said outlet conduit or from said intake conduit.

6. Washing and drying apparatus comprising a closed tube having an opening for the insertion of clothes, a cover to close said opening, a basket within said tub for receiving fabric articles to be washed and dried, a blower, an air inlet conduit for directing air into said tube, a heating chamber in said inlet conduit, the opposite end of said inlet conduit being connected to the discharge of said blower, an air outlet conduit communicating with said tub and connected to a valve chamber and a discharge conduit, a conduit connecting said valve chamber and the intake of said blower, an intake conduit communicating with the atmosphere and being disposed in

heat exchange relationship to said discharge conduit, means connecting said intake conduit and said valve chamber and valve means disposed in said valve chamber for selectively directing air to said blower intake from said outlet conduit or from said intake conduit.

7. Washing and drying apparatus comprising a closed tub having an opening for the insertion of clothes, a cover to close said opening, a basket within said tub for receiving fabric articles to be washed and dried, a blower, an air inlet conduit for directing air into said tub, means for heating air in said inlet conduit, the opposite end of said conduit being connected to the discharge of said blower, an air outlet conduit communicating with said tub and connected to a valve chamber and a discharge conduit, a conduit connecting said valve chamber and the intake of said blower, an intake conduit communicating with the atmosphere, means connecting said intake conduit and said valve chamber and valve means disposed in said valve chamber for selectively directing air to said blower intake from said outlet conduit or from said intake conduit.

8. Washing and drying apparatus comprising a closed tub having an opening for the insertion of clothes, a cover to close said opening, a basket within said tub for receiving fabric articles to be washed and dried, an air inlet conduit terminating at one end in a nozzle for directing air into said tub, a heating chamber in said inlet conduit, a heating element disposed in said chamber, an air outlet conduit communicating with said tub adjacent the upper portion thereof and having a downwardly extending portion, spaced baffles in said downwardly extending portion of said outlet conduit, drain means adjacent the lowermost baffle and providing communication between said downwardly extending portion of said outlet conduit and said tub whereby water passing into said outlet conduit will be trapped by said baffles and returned to said tub through said drain means, a blower connected to said inlet and outlet conduits for circulating air through said inlet and outlet conduits, an air intake from the atmosphere to said inlet conduit, valve means for selectively directing air from said outlet conduit for recirculating air passing through said outlet conduit or for supplying fresh air from the atmosphere through said air intake and means for transferring heat from air passing through said outlet conduit to fresh air supplied to said inlet conduit.

9. Washing and drying apparatus comprising a closed tub having an opening for the insertion of clothes, a cover to close said opening, a basket within said tub for receiving fabric articles to be washed and dried, an air inlet conduit terminating at one end in a nozzle for directing air into said tub, a heating chamber in said inlet conduit, a heating element disposed in said chamber, an air outlet conduit communicating with said tub adjacent the upper portion thereof, a blower connected to said inlet and outlet conduits for circulating air through said inlet and outlet conduits, an air intake from the atmosphere to said inlet conduit, valve means for selectively directing air from said outlet for recirculating air passing through said outlet conduit or for supplying fresh air from the atmosphere through said air intake and means for transferring heat from air passing through said outlet conduit to fresh air supplied to said inlet conduit.

10. Washing and drying apparatus comprising a closed tub having an opening for the insertion of clothes, a cover to close said opening, a basket within said tub for receiving fabric articles to be washed and dried, an air inlet conduit for directing air into said tub, means for heating air in said inlet conduit, an air outlet conduit communicating with said tub, a blower connected to said inlet and outlet conduits for circulating air through said inlet and outlet conduits, an air intake from the atmosphere to said inlet conduit, valve means for selectively directing air from said outlet conduit for recirculating air passing through said outlet conduit or for supplying fresh air from the atmosphere through said air intake and means for transferring heat from air passing through said outlet conduit to fresh air supplied to said inlet conduit.

11. Washing and drying apparatus as defined in claim 7 in which said discharge conduit terminates in a lint trap and a condenser, cooling means for said condenser and a drain connected to said condenser whereby water vapor in the air flowing through said discharge conduit will be condensed and drained from said condenser to dry such air.

12. Washing and drying apparatus as defined in claim 10 in which said outlet conduit terminates in a lint trap and a condenser, cooling means for said condenser and a drain connected to said condenser whereby water vapor in the air flowing through said outlet conduit will be condensed and drained from said condenser to dry such air.

13. A combination washing and drying apparatus comprising a closed tub having an opening for the insertion of clothes, a cover for said opening, said tub being of a size in which a sufficient quantity of water may be held for washing clothes, a basket rotatably mounted in said tub for spin drying the clothes after washing, an inlet substantially above the water line of the tube for the admission of drying air into said basket and tub, an outlet above the water line of the tub for the removal of moist air from said tub and basket, means for inducing a vacuum in said tub through said outlet thereby causing air to forcibly pass into said tub and basket through said inlet and into direct contact with clothes therein, and means for heating the air prior to its admission into the tub and basket, and means for reclaiming heat from moist air withdrawn through said outlet for heating a portion of the air being admitted through said inlet into the tub and basket.

14. The invention according to claim 2 in which a nozzle is provided at the end of the air inlet conduit for accurately directing a confined stream of air on the fabric articles.

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