

Sept. 22, 1953

V. E. RIMSHA ET AL

2,652,708

COMBINED CLOTHES WASHER AND DRIER

Filed Jan. 6, 1949

3 Sheets-Sheet 1

Fig. 1

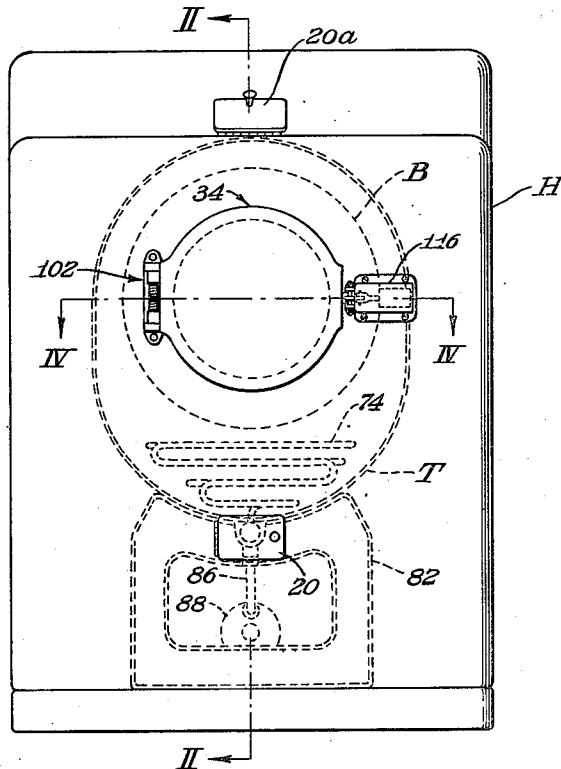
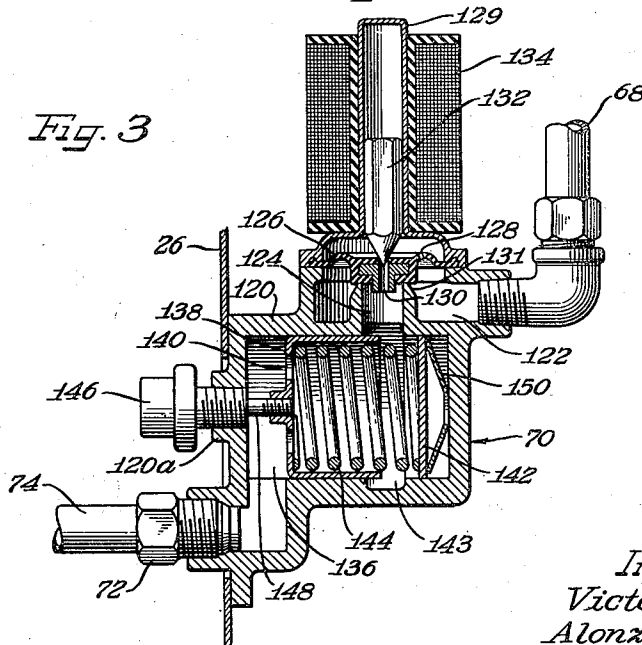


Fig. 3



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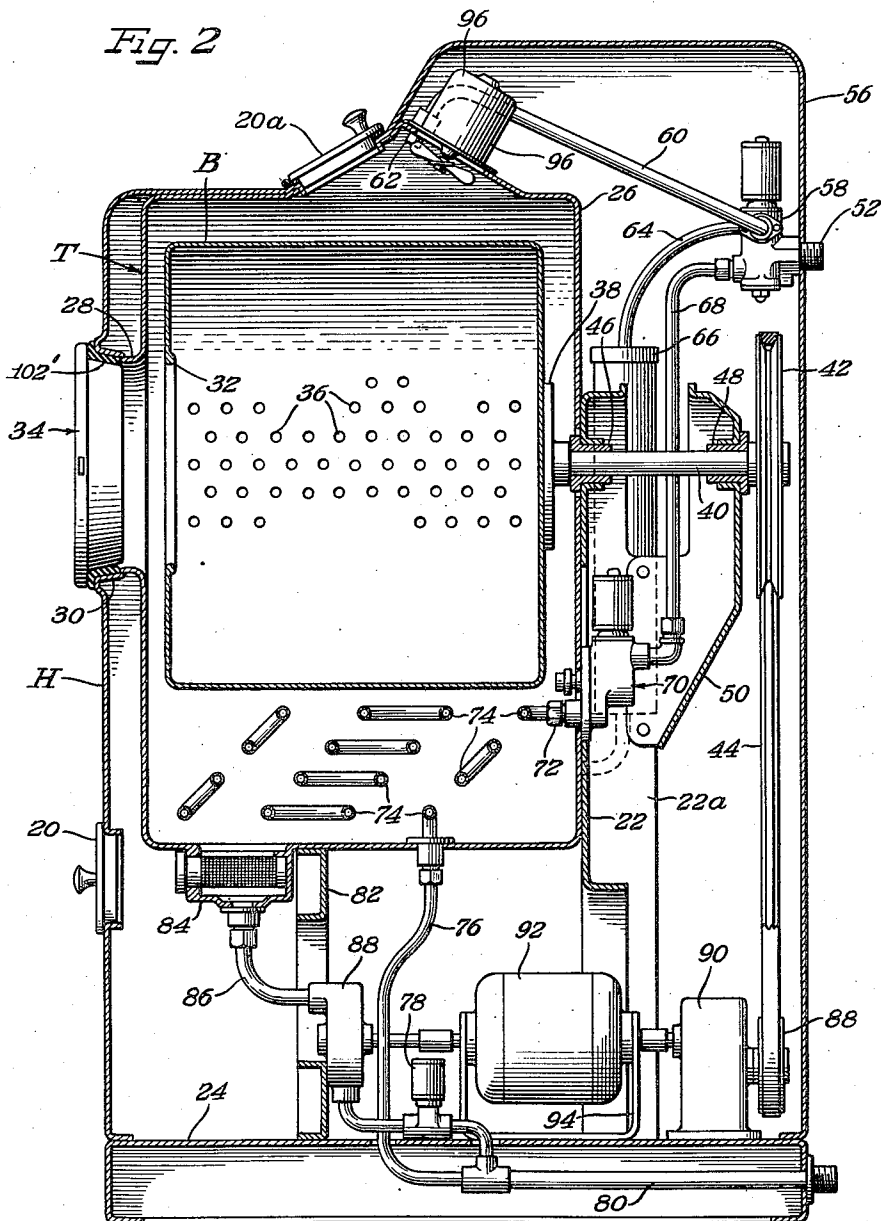
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Fig. 4

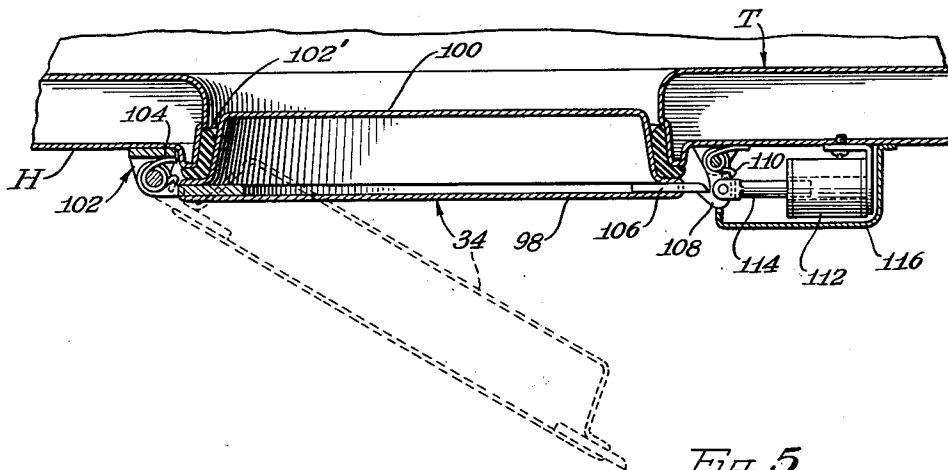
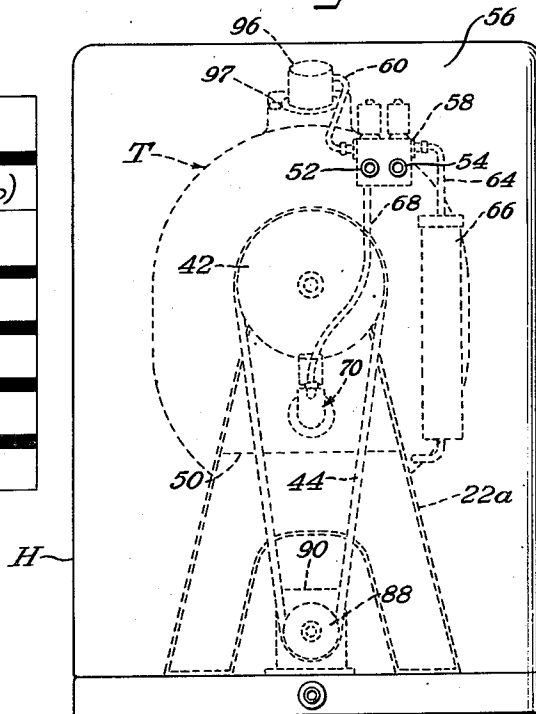


Fig. 6

	WASH	PRELIMINARY DRY	FINAL DRY
ROTATE BASKET	(MEDIUM SPEED)	(HIGH SPEED)	(LOW SPEED)
FILL TUB			
HEATER			
DRAIN			
BLOWER			
OPEN DOOR			

Fig. 5



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UNITED STATES PATENT OFFICE

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COMBINED CLOTHES WASHER AND DRIER

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4 Claims. (Cl. 68—20)

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Our invention relates to home laundering machines and more particularly to a home laundering machine having improved elements to maintain the wash water in a warm condition and to dry the clothes therein.

In automatic laundering machines adapted for home use, it is desirable to provide a complete automatic laundering cycle to wash and dry the clothes. In one form of unit, the clothes are first washed by disposing them in a basket and rotating that basket to tumble the clothes while the same are in contact with the warm soapy water retained in a suitable tub. This operation is continued for the time necessary to clean the particular clothes involved at which time automatic control elements drain the water from the tub and spin the basket at high velocity. This latter operation creates centrifugal forces which drain most of the water out of the clothes to accomplish a preliminary drying action.

In accordance with the present invention, the superficial or preliminary drying operation associated with spinning the clothes basket is supplemented by a complete drying operation achieved by blowing warm air over the clothes. Moreover, at the close of the preliminary drying operation the door to the laundering machine is automatically opened to provide a passageway for the spent or damp drying air and, in addition, to prepare the machine for removal of clothes by the operator.

In home laundering machines of the foregoing type there is always a considerable drop in temperature of the wash water from the time washing is first started until the time washing is finished. Since this wash water has a considerable heat content and, in addition, contains soap, it is desirable in the interest of economy to use it as completely as possible before discharging it. In accordance with the present invention this loss of heat by the wash water is overcome without loss of soap and heat by automatic heating elements disposed in the tub. Further in accord with the present invention the automatic heating elements not only compensate for heat lost by the wash water but, in addition, serve to heat the drying air during final drying operations.

It is therefore a general object of the present invention to provide an improved home laundering machine.

Another object of the present invention is to provide an improved home laundering machine in which elements are provided to compensate

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for the heat losses of the wash water during washing operation.

Further, it is an object of the present invention to provide automatic elements operative to maintain the wash water at a warm temperature during washing operation and automatically to maintain the heated air during the final drying operation at a higher temperature.

Further, it is an object of the present invention to provide a laundering machine in which electrically operable elements execute all the various operations.

It is yet another object of the present invention to provide an improved home laundering machine wherein passages are provided for the egress of spent air during the air drying operation.

The novel features which we believe to be characteristic of our invention are set forth with particularity in the appended claims. Our invention itself, however, both as to its organization and method of operation may best be understood by reference to the following description taken in connection with the accompanying drawings, in which:

Figure 1 is a front elevational view of a complete home laundering machine utilizing the principles of the present invention;

Figure 2 is a vertical cross-sectional view through the axis II—II, Figure 1;

Figure 3 is an enlarged view of the thermostatic control element of Figure 2 with parts in cross-section;

Figure 4 is a fragmentary horizontal cross-sectional view through the axis IV—IV, Figure 1;

Figure 5 is a rear view of the laundering machine of Figure 1; and

Figure 6 is a chart illustrating the cycle of operation of the machine of the present invention.

In the laundering machine of Figure 1 there is shown an outer housing H in which is disposed an inner housing or tub T. The latter housing defines a cylindrical chamber of somewhat elliptical cross-section in which is disposed the clothes basket B. As is best shown in Figure 2, the outer housing H is of sheet metal construction and has a number of access openings 20 and 20a to enable inspection and adjustment of the elements mounted interiorly thereof. The latter opening also provides a convenient aperture through which soap may be introduced into the wash water.

A web or baffle plate 22 extends across the rear end of the housing H and is welded or otherwise

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fastened to a base plate 24 upon which the housing H is mounted. A sheet metal plate 26 which forms the tub T is welded or otherwise attached to the baffle plate 22 at its rear end and to the housing H at its upper end. Further support for the tub T is derived from a channel beam 82 which is bent as shown in Figure 1 to sustain the tub.

The plate 26 has a forwardly extending annular lip 28 in mating engagement with a rearwardly extending annular lip 30 of the housing H. These two lips define a throat through which clothes may be inserted into the basket B, the latter having a corresponding opening 32 in alignment with the throat defined by the lips 28 and 30. A door 34 closes the throat defined by the lips 28 and 30 to prevent splashing of fluid during washing operation.

The basket B is of cylindrical shape with a circular cross-section and has a plurality of openings 36 through which water, but not the clothes, may pass freely. The basket B is mounted on a flanged hub 38 which is press-fitted or otherwise attached to a shaft 40. At its opposite end this shaft carries a pulley 42 upon which a belt 44 rides. As this belt is driven, the entire basket B is rotated and clothes disposed therein are tumbled. Warm wash water is contained in the bottom of the tub T so that as the clothes are tumbled they are dipped into this warm wash water and dirt is removed therefrom.

The shaft 40 is supported by two spaced bearings 46 and 48. The former bearing is mounted in a suitable opening in the baffle or web 22 and the latter is mounted on a support bracket 50 which is supported by a flange section 22a of the baffle 22.

Sources of warm and cold inlet water are connected to couplings 52 and 54 (Figure 5) which are mounted on a rear panel 56 of the housing H and which form part of an inlet temperature control valve 58. This valve may be any one of several fluid mixing valves of the type well known in the art and which are capable of mixing quantities of fluid from two sources of different temperatures to form an outlet fluid flow of predetermined temperature. This outlet fluid travels through a pipe 60 to a spray nozzle 62 located on the upper portion of the plate 26 which defines the tub T. A pipe 64 carries fluid from the valve 58 to a float chamber 66.

The valve 58 contains elements selectively operable to cause fluid flow through one or both of pipes 60 and 64 in accord with the energization of pre-selected electric circuits. Fluid flow through pipe 60 operates to spray the clothes within the basket B, whereas fluid flow through pipe 64 simultaneously with flow through pipe 60 acts to fill the lower portion of the tub T to the level required for clothes washing operations. A float operated switch (not shown) is included within the float chamber 66 and contains electrical contact elements operative to deenergize the appropriate circuit in valve 58 to discontinue fluid flow through the pipes 64 and 60 when the fluid level in the tub T reaches a predetermined height.

A pipe 68 leads directly from the hot water inlet of valve 58 to a temperature control valve 70. This valve defines a fluid passageway from the pipe 68 to a coupling 72 to which is connected a heating coil 74. The opposite end of this heating coil extends through the bottom of the tub T to a pipe 76 and an outlet pipe 80.

A drain sump 84 is formed on the lower portion

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of the tub T and is connected to a pipe 86. This pipe is in fluid communication with a pump 88 which in turn communicates with the outlet pipe 80 through a solenoid operated valve 78. When the pump 88 is operated by a motor 92, water is pumped from the sump 84 to the drain pipe 80.

The belt 44 is driven from a pulley 88 which is mounted on a shaft extending from a gear box 90 which in turn is driven by the electric motor 92. The latter motor is mounted on a U-shaped bracket 94 and drives both the gear box 90 and the pump 88.

The gear box 90 includes electric elements (not shown) which may be selectively energized to control the speed ratio between the motor 92 and the pulley 88. This structure may be any one of the mechanisms for the purpose well known in the art.

A motor-operated blower 96 is mounted on the upwardly extending portion of the plate 26 which defines the tub T. This plate has suitable perforations or openings 97 (Figure 5) to permit passage of air into the chamber defined by the tub T when the motor of blower 96 is energized.

As is best shown in Figure 4, the door 34 comprises a front panel 98 and a rear panel 100 mounted in spaced relationship and forming a lip portion which tightly engages an annular rubber insert 102' to close the tub T. One end of the door 34 is supported on a hinge 102 and has a coil spring 104 which biases the door toward the open position shown on the dotted lines of Figure 4. A tongue 106 extends from the opposite end of the door 34 and is held by a latch 108 to retain the door closed against the bias of spring 104. This latch is pivotally supported from the housing H and has a spring 110 biasing it to the catching position relative to the tongue 106. A solenoid 112 is mounted in spaced relationship to the latch 108 and a solenoid plunger arm 114 is pivotally attached at one end to the latch 108 and at the other end extends within the solenoid 112. Thus, when the solenoid 112 is energized, the plunger arm 114 is retracted against the biasing spring 110 and disengages latch 108 to release the door 34 for movement under the bias of spring 104 to the open position shown in the dotted lines of Figure 4. A cover 116 extends over the solenoid 112, the latch 108, and the elements associated therewith.

It is the function of the temperature control valve 70 to control the flow of fluid to the pipe forming the heating coil 74. The construction of this valve may best be understood by reference to Figure 3 which is a greatly enlarged view of this valve with elements broken away to expose the interior to view. As will be evident from this figure, the valve 70 includes a cast housing 120 defining an annular chamber 122 in fluid communication with the interior of pipe 68. In addition, an inner chamber 124 is formed within the chamber 122, thus defining an annular lip across which a flexible diaphragm 126 extends. This diaphragm contains a small opening 128 in communication with the chamber 122 and a somewhat larger opening 130 in communication with the chamber 124. A drawn sheet metal plate 129 is attached to the housing 120 adjacent the overlapping peripheral portions of the diaphragm 126 to hold the latter in position and define a fluid-tight chamber within which a plunger 132 may move. A solenoid 134 encircles the extending portion of the cap 129 to control the position of the plunger 132.

As is well known to those skilled in the art,

when current flows in the solenoid 134 the plunger 132 is lifted and the opening 130 is uncovered. Since fluid flows out from the region above the diaphragm 126 at a faster rate than it can enter through bleeder hole 128, the pressure in the chamber above the diaphragm 126 drops, thus causing the fluid pressure on the underside of the diaphragm to lift diaphragm 126 to a spaced position relative to an annular seat 131 defined by the cavities 124 and 122 and permitting the fluid to flow over that seat and into the passage 124 of the valve. On the other hand, when solenoid 134 is de-energized, the plunger 132 descends to cover the opening 130, thereby permitting fluid pressure to build up above the diaphragm 126 due to fluid flow through hole 128. The diaphragm thereupon closes against the lip 131.

The chamber 124 is in communication with a temperature control chamber 136. This chamber snugly receives a shiftable cup-shaped valve member 138 which has a plurality of openings 140 permitting fluid flow to the coupling 12 and the heater 74.

The cup-shaped valve member 138 coacts with a flat valve seat member 142 to close an annular channel 143 to obstruct fluid flow from the chamber 124 to the chamber 136. A spring 144 is interposed between these members to bias them to spaced positions relative to each other.

The position of the cup-shaped valve member 138 is controlled by a thermostatic control element 146 which extends beyond the wall 26 of the tub T for exposure to fluid contained within that tub. This element may be any one of various elements well known in the art and which experiences an increased dimension with increased temperature. In the specific element shown, a movable arm 148 shifts to the right relative to a forward wall 120a of the housing 120 when the temperature of the element 146 increases, thereby pushing the cup-shaped valve member 138 to the right and diminishing fluid flow to the chamber 136.

A disk spring 150 forms a resiliently deformable seat against which the valve seat member 142 rests and thereby restores the valve seat 142 to its initial position, if the temperature of the fluid in tub T becomes excessive and causes the valve member 38 to shift the valve seat 142 to the right (as viewed in Fig. 3).

From the foregoing description it will be evident that the control valve 70 includes a solenoid 134 which may be energized or deenergized to control the supply of hot water to coil 74 and, in addition, a temperature responsive element 146 operable in response to the fluid temperature in the tub T to control the supply to heater 74 in accord with the temperature of that element.

When the tub T is filled with water the element 146 partakes of the temperature of that water and controls the fluid flow through the chamber 136 to maintain that water at a predetermined temperature. When the tub T is empty, the element 146 acts to control the flow of fluid through the heater 74 to maintain the temperature of that element at a similar predetermined temperature. Thus, the heater 74 is automatically actuated to maintain either the washing fluid or the drying air at predetermined temperature.

Figure 6 shows a typical laundering cycle that may be executed by a machine constructed in accord with the principles of the present invention. The door 34 is first opened and the clothes inserted therein. Following this, the door 20a is

opened and soap admitted to the tub T. The automatic washing operation is then commenced.

During the washing operation the electrically energized gear box 90 is energized to drive the basket B at a medium rate of speed to tumble the clothes contained therein. At this time the temperature control valve 58 is energized to permit fluid flow through the tube or pipe 64 and the pipe 60 to fill the tub T, this filling operation being discontinued when the fluid level in float chamber 66 reaches the selected level. Simultaneously, the heater valve 70 is energized to cause hot water flow through coil 74 in such quantities as to maintain the temperature of the fluid at the desired value.

The foregoing conditions continue to exist for the predetermined time necessary to wash the clothes contained in the basket B. This may be accomplished by a suitable timer mechanism (not shown).

Following the clothes washing operation, the drain solenoid 78 is energized to permit pump 88 to pump water out of the tub T. If desired, the valve 58 may be energized for a short period to pass water through the pipe 60 for the short period of time required to rinse clothes contained within the tub T. As soon as the fluid level in tub T is below the level of basket B, as may be indicated by suitable float mechanism contained in the float chamber 66, the gear box 90 is energized to cause rotation of the basket B at a relatively high velocity and for a time period sufficient for preliminary drying action.

Upon completion of the preliminary drying operation, the gear box 90 is energized to cause relatively low speed rotation of the basket B. Simultaneously, the drain solenoid 78 and the heating control valve 70 are energized, as well as the blower 96. In addition, the solenoid 112 is energized to release the latch 108 and open the door 34. At this time air is blown by blower 62 through the tub T and out the door 34, this air being heated by the heater 74. Finally, after the time period required for the clothes to dry, the laundering cycle is complete and the entire unit is de-energized.

The foregoing control operation may be accomplished by the use of various devices well known in the art. One simple and effective method is to use cams operative to close and open switches as required to energize the valves and other elements in the desired time sequence and which are mounted on a common shaft for rotation by a timing motor which is energized at the beginning of the cycle.

It will be apparent from the foregoing description that the laundering machine of the present invention is capable of not only using the wash water more effectively by maintaining it at a predetermined effective washing temperature but, in addition, operates effectively to dry the clothes contained within the basket B by heating the air therein and blowing it over the clothes. Moreover, the door 34 not only forms an access door by which clothes may be added to or removed from the laundering machine but, in addition, forms an opening for egress of drying air from the unit.

While we have shown a particular embodiment of our invention, it will, of course, be understood that we do not wish to be limited thereto since many modifications, both in the elements employed and the cooperative structure disclosed, may be made without departing from the spirit

and scope of our invention. We, of course, contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of our invention.

We claim as our invention:

1. In an automatic laundering machine of the type having a clothes receiving door and a perforate clothes containing basket therein having a clothes receiving opening in registry with said door, the improvements comprising a spring connected between said casing and door and operative to open and hold said door open, a latch upon said casing, an interengaging connection between said latch and door for holding said door closed against said spring, a solenoid including a coil having an armature retractable therein upon energization of said coil, a pivotal connection between said armature and latch for moving the same to released position upon energization of said coil, a blower positioned within said casing adjacent said basket, to inject drying air into said basket, a motor, drive connections from said motor to said basket to rotate said basket at a relatively low speed for washing, a higher speed for preliminary drying and a relatively low speed for final drying, a drain, a solenoid operated valve controlling the flow of water through said drain, and means effective to operate said blower, energize said valve-operating solenoid to open said drain valve and energize said latch-operating solenoid to open said door upon completion of the preliminary clothes drying operation.

2. In an automatic laundry machine of the type having a casing, a clothes receiving door in a wall thereof, a perforate clothes containing basket journaled within said casing, a blower within said casing and having communication with said basket a motor for driving said blower, a spring connected between said casing and door and biasing said door to an open position, a tongue on said door, a retractable catch pivotally mounted on said casing for engagement with said tongue, to hold said door in a closed position against the action of said spring, a solenoid mounted on said casing and including a magnet coil and an armature pivotally connected with said catch and effective to move said catch to a released position upon energization of said solenoid and electrical connections between said blower and said solenoid to simultaneously energize said solenoid and said motor for driving said blower at the completion of a preliminary drying operation, to open said door and establish an air outlet passageway and circulation of air through said door for a final drying operation.

3. In a combination laundering machine and drier, a casing having a tub therein, said casing having an opening for clothes, said opening leading into said tub, a perforate wall clothes container journaled for rotation within said tub and

having a clothes receiving opening therein registering with said opening in said casing, a motor, means driven by said motor for rotatably driving said clothes container, a blower mounted on said tub to force air through said tub and the perforate wall of said clothes container and out of the clothes receiving opening thereof, a door hinged to said casing and closing the opening thereinto, spring means urging said door into an open position, a retractable latch member holding said door in a closed position, and a solenoid controlling operation of said latch means and operable to release said latch means and allow said door to open upon operation of said blower, and establish a circulation of air through said clothes container and out said door.

4. In a combination laundering machine and drier, a casing having a tub therein, said casing having an opening for clothes, said opening leading into said tub, a perforate wall clothes container journaled for rotation within said tub and having a clothes receiving opening therein registering with said opening in said casing, a door hinged to said casing to close said opening therein, spring means urging said door into an open position, a latch on said casing and engageable with said door for holding said door closed, a blower within said casing directing a stream of hot air thereinto through the perforate wall of said clothes container and out of said door, power means operable upon operation of said blower to release said latch to allow said door to open, a heating coil within said tub for circulating heating fluid to heat the water therein for washing, and the air therein for drying, a valve on the outside of said tub controlling the passage of heating fluid to said coil, and a temperature responsive element extending within said tub and having an extensible plunger operatively connected with said valve for controlling operation thereof in accordance with the temperature within said tub.

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