

June 24, 1969

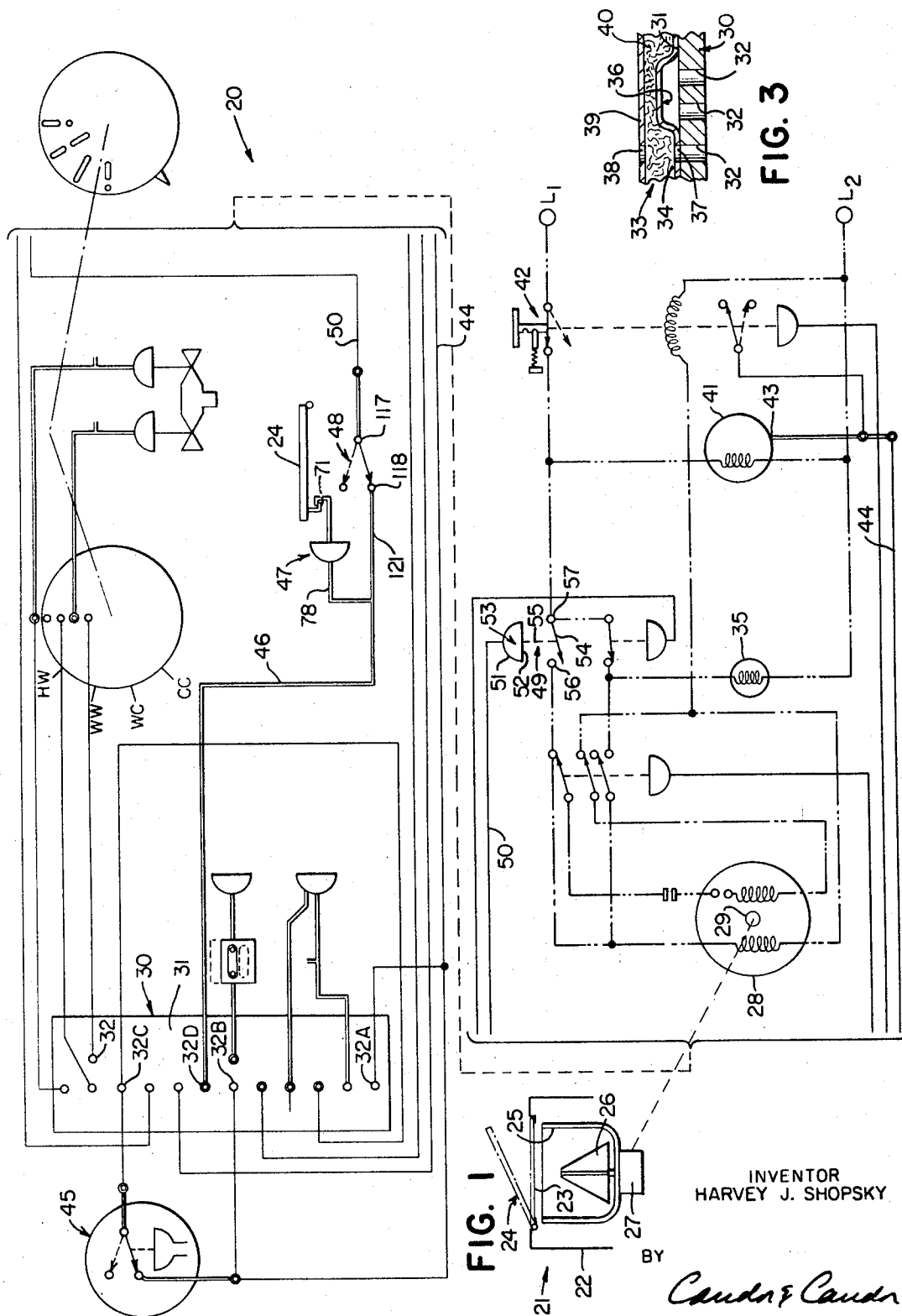
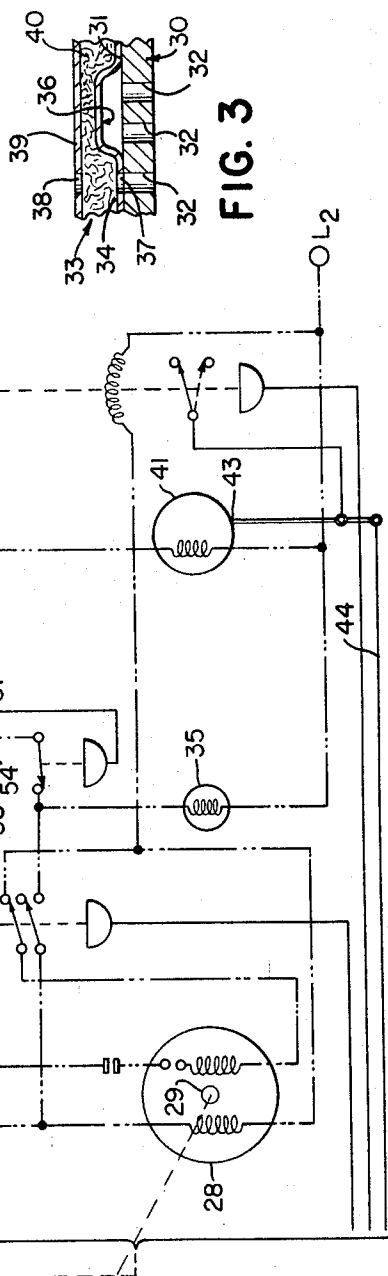
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3,451,233

WASHING MACHINE HAVING DOOR LATCH CONTROL MEANS

Filed Aug. 24, 1967

Sheet 1 of 5



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Sheet 2 of 5

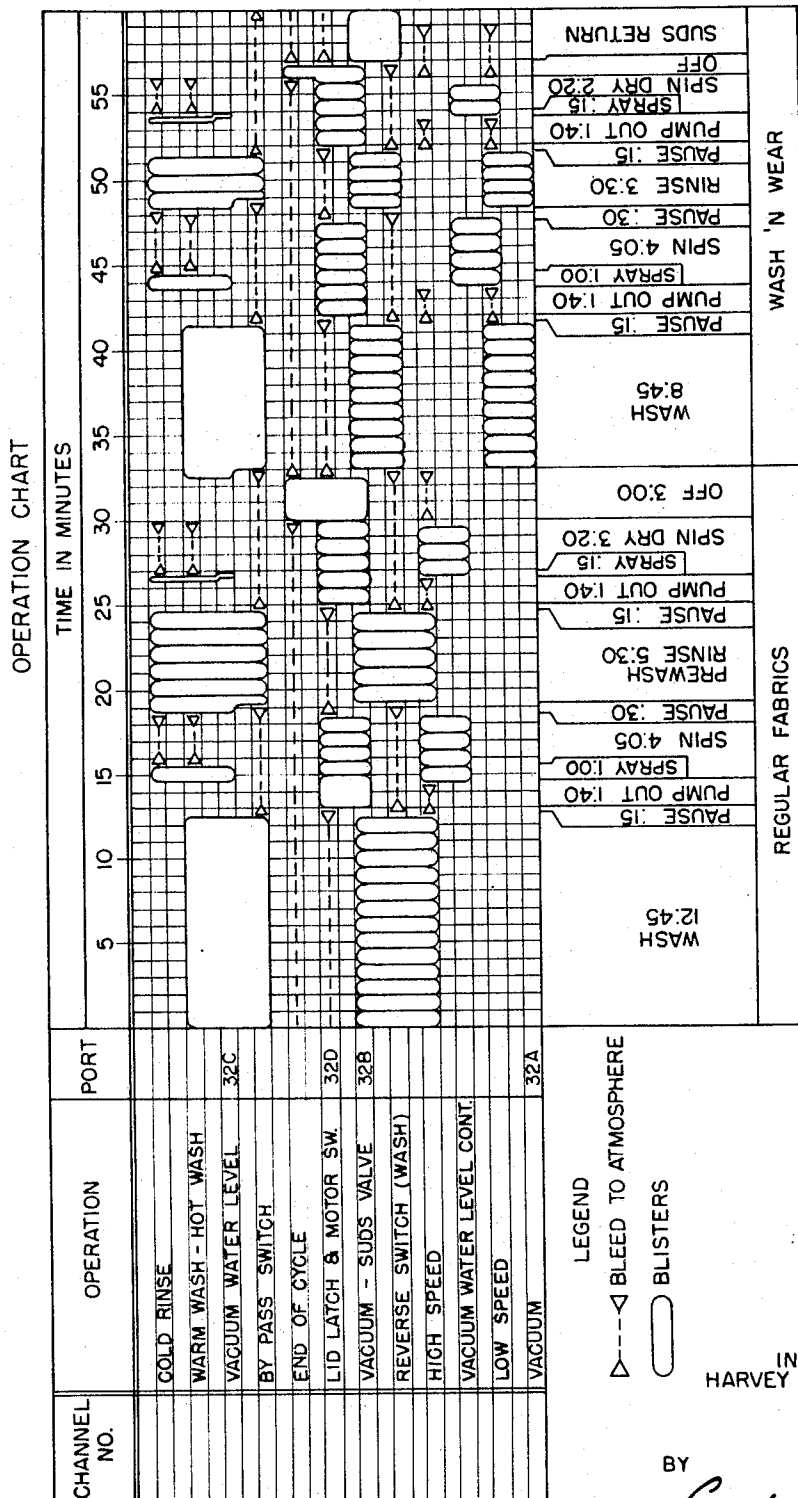


FIG. 2

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Sheet 3 of 5

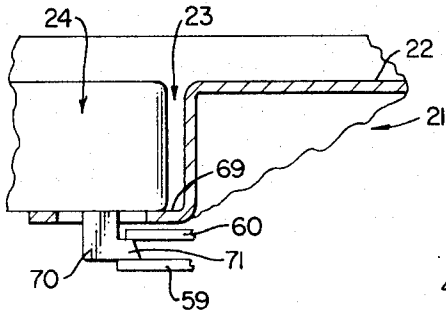


FIG. 4

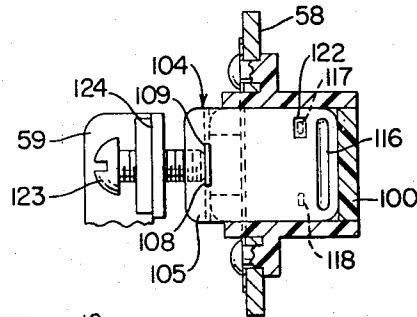


FIG. 7

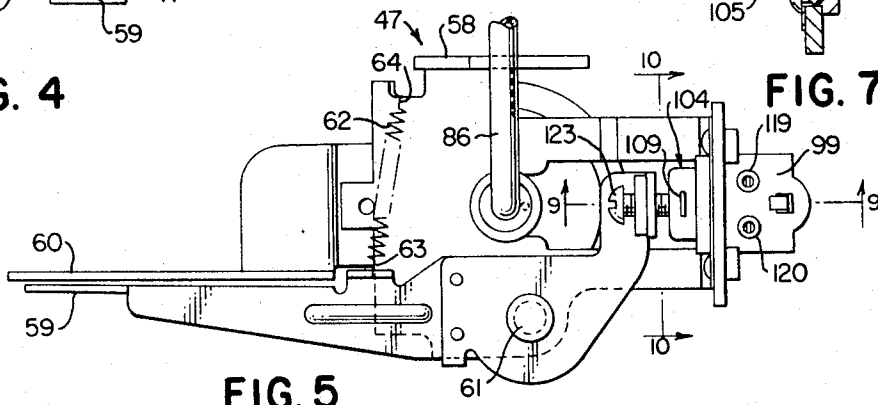


FIG. 5

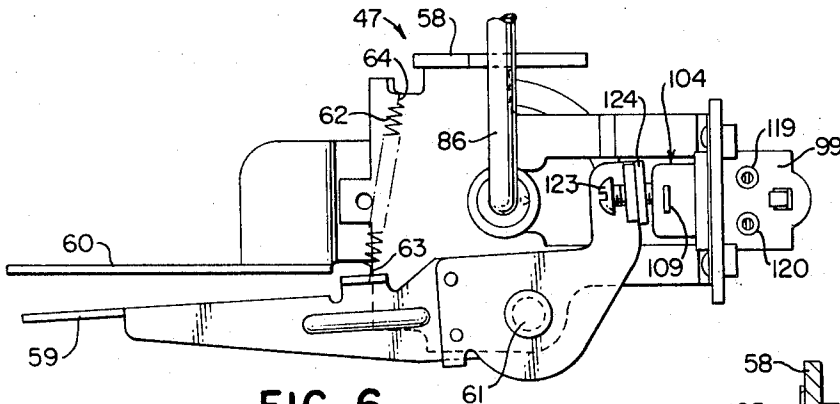


FIG. 6

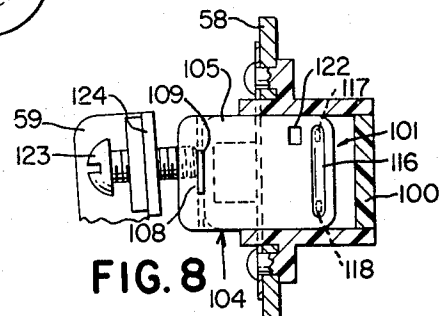


FIG. 8

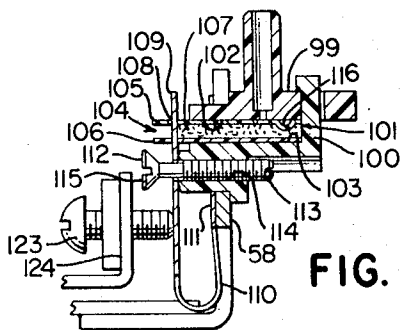


FIG. 9

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Sheet 5 of 5

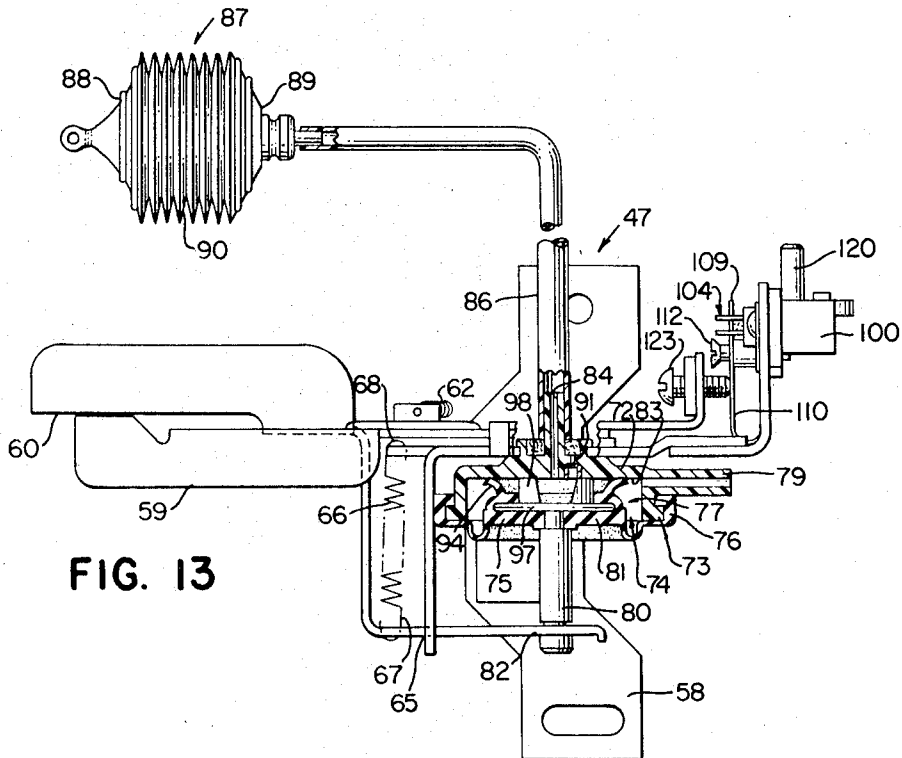


FIG. 13

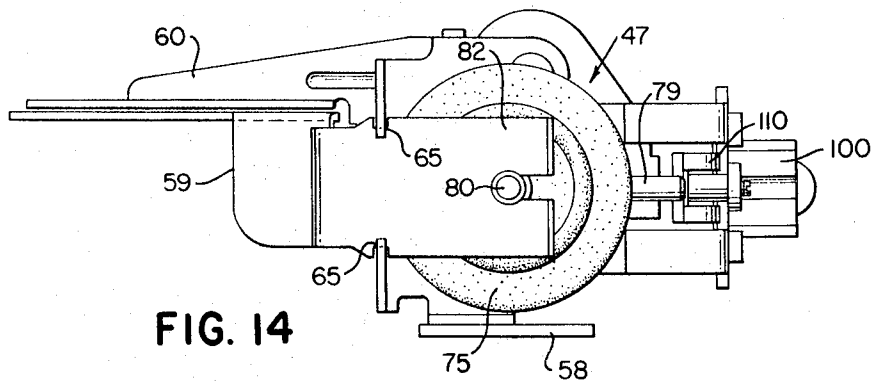


FIG. 14

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WASHING MACHINE HAVING DOOR LATCH CONTROL MEANS

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Int. Cl. D06f 33/10, 37/28, 37/42

U.S. Cl. 68—12

13 Claims

ABSTRACT OF THE DISCLOSURE

This disclosure relates to a pneumatic control system for a washing machine or the like wherein the washing compartment cannot be spun unless the door or lid means for the machine is in its closed position, the pneumatic control system positively moving a latch member to its latching position to hold the door means in its closed position before pneumatically operating the mechanism for spinning the washing compartment. The actuator means that moves the latch member to its latching position has means for delaying movement of the latch member to its unlatching position after the pneumatic signal to the actuator has been terminated by automatic or manual means, such delaying means comprising a suction cup means on the flexible diaphragm of the pneumatically operated actuator and an accumulator in combination therewith.

This invention relates to an improved pneumatic control system for a washing machine or the like as well as to improved pneumatically operated actuator means therefor or the like.

It is well known that control systems for a washing machine or the like are so constructed and arranged that the access door or lid means of the washing machine must be disposed in its closed position before the control means will effect spinning of the washing compartment for centrifuging moisture from the wet laundry therein, such prior known control systems also moving a latch member to its latching position to positively lock the door or lid means in its closed position during the spinning operation.

Accordingly, one feature of this invention is to provide an improved pneumatic control system for effecting such latching of a lid or door means for a washing machine or the like.

Another feature of this invention is to provide such a pneumatic control system wherein the latch member will be delayed in its movement to its unlatching position after the termination or interruption of the spinning operation to insure that the spinning washing compartment will have ceased spinning or at least have its spin speed reduced to a safe level.

Another feature of this invention is to provide a pneumatically operated actuator for controlling such a latch means or the like wherein the actuator has means for delaying the deactuation thereof even though the pneumatic signal for actuating the same has been terminated or interrupted.

Accordingly, it is an object of this invention to provide an improved pneumatic control system for a washing machine or the like, the control system having one or more of the novel features set forth above or hereinafter shown or described.

Another object of this invention is to provide an improved pneumatically operated actuator means for such a control system or the like, such actuator means having one or more of the novel features set forth above or hereinafter shown or described.

Other objects, uses and advantages of this invention are

apparent from a reading of this description which proceeds with reference to the accompanying drawings forming a part thereof and wherein:

FIGURE 1 is a schematic view illustrating the control system of this invention.

FIGURE 2 is a schematic view illustrating the cycles of operation of the control system of FIGURE 1.

FIGURE 3 is a fragmentary cross-sectional view illustrating the main program means for the control system of FIGURE 1.

FIGURE 4 is a fragmentary, cross-sectional view of the washing machine apparatus utilizing the control system of FIGURE 1, FIGURE 4 illustrating the door or lid means thereof in its latched position.

FIGURE 5 is a side view of the improved latch means for the apparatus of FIGURE 4.

FIGURE 6 is a view similar to FIGURE 5 and illustrates the latching structure in another operating position thereof.

FIGURE 7 is an enlarged, fragmentary view, partially in cross-section and illustrates part of the latching structure of FIGURE 5 in the operating position of FIGURE 5.

FIGURE 8 is a view similar to FIGURE 7 and illustrates the same structure in the operating condition of FIGURE 6.

FIGURE 9 is a fragmentary cross-sectional view taken on line 9—9 of FIGURE 5.

FIGURE 10 is a cross-sectional view taken on line 10—10 of FIGURE 5.

FIGURE 11 is a right hand end view of the structure illustrated in FIGURE 12.

FIGURE 12 is a cross-sectional view taken on line 12—12 of FIGURE 11.

FIGURE 13 is a view similar to FIGURE 12 and illustrates the latching structure in its latching position.

FIGURE 14 is a bottom view of the structure illustrated in FIGURE 13.

While the various features of this invention are hereinafter described and illustrated as being particularly adaptable for providing a latching mechanism for a washing machine or the like, it is to be understood that the various features of this invention can be utilized singly or in any combination thereof to provide control structure for other devices as desired.

Therefore, this invention is not to be limited to only the embodiment illustrated in the drawings, because the drawings are merely utilized to illustrate one of the wide variety of uses of this invention.

Referring now to FIGURE 1, the improved control system for this invention is generally indicated by the reference numeral 20 and is illustrated as controlling the operation of a domestic washing apparatus or machine generally indicated by the reference numeral 21 in FIGURE 1.

The washing machine 21 includes a frame means or casing 22 having an opening 23 in the top wall thereof adapted to be opened and closed by a lid or door means 24 in a manner well known in the art to provide access means to a conventional washing compartment means 25 having a conventional agitator means 26 therein. The washing compartment means 25 is adapted to be spun for a centrifugation operation in a manner well known in the art when suitable transmission means 27 are driven in a particular direction by a reversible electrical motor means 28, the transmission means 27 also being adapted to operate the agitator 26 in a manner well known in the art when the electrical motor means 28 has its output shaft 29 driven in the opposite direction.

The control system 20 includes a reading head 30 having a reading surface 31 interrupted by a plurality of spaced ports 32 adapted to be interconnected together in

3

certain relationships when a program member 33, FIGURE 3, has its flexible reading sheet 34 moved over the reading surface 31 by a suitable timer motor 35. The reading sheet 34 has a plurality of open ended channels 36 formed in the side thereof that engages the reading surface 31 of the reading head 30 so that the same is adapted to fluidly interconnect two or more adjacent port means 32 in the manner illustrated in FIGURE 3 when a particular blister means 36 is aligned with the particular port means 32. Similarly, the reading sheet 34 has aperture means 37 passing therethrough and adapted to be aligned with the ports 32 in the manner illustrated in FIGURE 3 to fluidly interconnect the atmosphere to that particular port means 32 because air can enter the program member 33 through an opening means 38 formed in a rigid backing member 39 of the program member 32 to be filtered by intermediate porous compressible means 40 and enter the aperture means 37 in the aligned port means 32 as will be apparent hereinafter.

An electrically operated vacuum pump 41 is adapted to be placed across electrical power source leads L¹ and L² in FIGURE 1 when a main on-off electrical switch 42 of the apparatus 21 is moved to the closed position illustrated in FIGURE 1, the vacuum pump 41 having its inlet 43 interconnected to a flexible conduit means 44 or the like leading to port means 32A, 32B and 32C of the reading head 30. A water level control 45 is located intermediate the vacuum source 41 and the port 32C whereby the same only interconnects the port 32C to the vacuum source 41 when the water level control device 45 senses that the water level in the washing compartment 25 is below a particular amount as illustrated in full lines in FIGURE 1 and will prevent fluid communication between the vacuum source 41 and the port 32C when the level control 45 is moved to the dotted line position of FIGURE 1 by the water level in the washing compartment 25 exceeding a certain level in the manner well known in the art.

When the program member 33 is being moved by the timer motor 35 relative to the reading head 31, certain blister means 36 of the reading sheet 34 will bridge the port 32B with another port 32D to effect a spinning operation of the washing compartment 25 at the proper time sequence in the operation of the control system 20 as fully illustrated in FIGURE 2.

The port 32D of the reading head 30 is interconnected by flexible conduit means 46 or the like to a pneumatically operated lid or door latch actuator means 47 of this invention as well as to a valving mechanism 48 forming part of the lid-latch structure in a manner hereinafter described, the valve means 48 also being fluidly interconnected to a pneumatically operated electrical switch means 49 by flexible conduit means 50 or the like.

The pneumatically operated electrical switch means 49 includes a housing means 51 carrying a flexible diaphragm 52 to define a chamber 53 therebetween fluidly interconnected to the passage means 50, the flexible diaphragm 52 being mechanically interconnected to an electrical switch blade 54 by interconnection means 55 in a manner well known in the art. In this manner, the switch blade 54 is pulled upwardly in FIGURE 1 to electrically bridge contact means 56 and 57 and place the electrical motor 28 across the power source L¹ and L² in such a manner that the motor shaft 29 will be driven in the proper direction to cause the transmission means 27 to spin the washing compartment 25 only when the chamber 53 of the actuator means 49 is evacuated in a manner hereinafter described. Conversely, when the chamber 53 of the pneumatically operated actuator 49 returns to atmospheric conditions in a manner hereinafter described, the switch blade 54 is moved away from the contact means 56 so that the motor means 28 cannot be operated in a direction to cause the transmission means 27 to spin the washing compartment 25.

Thus, the switch means 54 must be in a closed posi-

4

tion to effect spinning of the washing compartment 25 and such closing of the switch means 54 only occurs when the chamber 53 of the actuator means 49 is effectively interconnected to the vacuum source 41 in the manner hereinafter described.

The particular details of the lid-latch structure 47 and valving means 48 will now be described and reference is made to FIGURES 4-14.

As illustrated in FIGURE 5, the lid-latch means 47 includes suitable frame structure 58 to be secured to the frame means or casing 22 of the apparatus 21 adjacent the opening means 23 thereof and pivotally carries a pair of lever means or arms 59 and 60, the arm 59 being pivotally mounted to the frame structure 58 by pivot means 61 and normally being urged in a clockwise direction by a tension spring 62 having one end 63 interconnected to the arm 59 at a point to the left of the pivot point 61 in FIGURE 5 and another end 64 secured to the stationary frame means 58. The arm 60 provides a latching means for the door means 24 and is pivotally mounted to the frame means 58 at a fulcrum point 65, FIGURE 12, and is normally urged in a clockwise direction in FIGURE 12 by a tension spring 66 having one end 67 secured to the arm means 60 at a point to the left of the fulcrum point 65 in FIGURE 12 and the other end 68 secured to the stationary frame means 58.

When the pneumatically operated latch mechanism 47 is in its deactivated position as illustrated in FIGURE 12, the latch arm 60 is in a laterally spaced position relative to the arm 59 so that when the door means 24 is moved to its closed position in FIGURE 4 against a peripheral flange means 69 of the casing 22, a suitable arm 70 or the like carried by the door 24 will have an outwardly directed tongue 71 thereof pushed downwardly on the arm 59 to move the same from the position illustrated in FIGURE 5 to the position illustrated in FIGURE 6 for a purpose hereinafter described. With the mechanism 47 now disposed in the position illustrated in FIGURE 6 and when pneumatically actuated in a manner hereinafter described, the latch member 60 will move from the position illustrated in FIGURE 12 to the position illustrated in FIGURE 13 so that the left hand end of the latch member 60 will move over the tongue 71 of the door means 24 whereby the door means 24 cannot be moved to an open position as the latch member 60 will positively hold the same in its closed position until the latch arm 60 is again moved to the position illustrated in FIGURE 12 and, thus, from over the tongue 71 of the door arm means 70 to permit opening of the door means 24.

The latching mechanism 47 includes a substantially cup-shaped housing member 72 carried by the frame means 58 and has an outwardly directed peripheral flange 73 at the open end 74 thereof. A flexible diaphragm 75 has its outer periphery 76 snap fitted to the flange means 73 of the housing means 72 in the manner illustrated in FIGURE 12 to define a chamber 77 therewith that is adapted to be fluidly interconnected to the conduit means 46 by having a branch portion 78, FIGURE 1, thereof telescoped onto an outwardly extending hollow nipple means 79 of the housing means 72 whereby the chamber 77 of the actuator means 47 is adapted to be fluidly interconnected to the port 32D of the reading head 30 for a purpose hereinafter described.

The flexible diaphragm 75 carries an actuating post 80 extending from the exterior side 81 thereof and being suitably secured to the right hand end 82 of the latch arm means 60 to cause pivotal movement of the latch member 60 relative to the fulcrum point 65. In particular, when the chamber 77 of the actuator means 47 is disposed in its deactivated position illustrated in FIGURE 12 by normal atmospheric conditions existing within the chamber 77 as will be apparent hereinafter, the latch member 60 is disposed in the position illustrated in FIGURE 12 because of the tension spring means 66. However, when the

chamber 77 of the actuator means 47 is evacuated to cause the diaphragm 75 to move to the operating position illustrated in FIGURE 13 by the resulting pressure differential across the diaphragm 75, the upward movement of the diaphragm 75 pivots the latch member 60 to its latching position as illustrated in FIGURE 13 in opposition to the force of the tension spring 66 and maintains the same in the latching position of FIGURE 13 until the chamber 77 is again returned to atmospheric conditions as will be apparent hereinafter.

The housing means 72 has a flat interior end wall 83 centrally interrupted by a passage means 84 passing through an outwardly extending nipple means 85 that telescopically receives a flexible conduit means 86 leading to the interior of a fluid accumulating means 87.

The accumulator means 87 illustrated in the drawings comprises a flexible bellows construction having opposed ends 88 and 89 spaced from each other by conventionally corrugated side wall means 90 whereby the bellows construction or accumulator means 87 is normally in the expanded condition illustrated in FIGURE 12 when a normal atmospheric condition exists in the interior thereof. However, when the interior of the bellows construction or accumulator means 87 is evacuated in a manner hereinafter described, the bellows construction 87 collapses to the condition illustrated in FIGURE 13 for a purpose hereinafter described.

The end wall means 83 of the housing 72 has a passage means 91 also passing therethrough in offset relation to the passage means 84 and is adapted to interconnect the chamber 77 to the exterior of the device 47, the passage means 91 having a restriction or orifice means 92 therein to limit the degree of fluid communication between the chamber 77 and the exterior of the housing means 72 to provide a controlled bleed means in a manner hereinafter described. The fluid communication between the interior of the housing 72 and the exterior thereof at the passage means 91 is filtered by suitable filter means 93 carried by the housing means 72.

The flexible diaphragm 75 carries a suction cup construction 94 on the interior side 95 thereof with the open end 96 of the suction cup means 94 facing the wall means 83 of the housing 72 while being disposed outboard of the passage means 84 and 91 for a purpose hereinafter described.

The actuating post 80 carried by the diaphragm 75 has a backup plate means 97 disposed against the interior 95 of the diaphragm 75 within the suction cup means 94 and has outwardly directed abutment members 98 extending toward the wall means 83 of the housing means 72.

The valve means 48 carried by the actuator means 47 is best illustrated in FIGURES 5-9 and includes two housing members 99 and 100 suitably secured together and being carried by the frame means 58 of the mechanism 47, the housing members 100 and 99 cooperating together to define a slot means 101 having opposed flat surfaces 102 and 103 to receive a valve member 104 therebetween. The valve member 104 comprises a pair of flexible flat sheets 105 and 106 having a compressible material 107 disposed therebetween to urge the sheets 105 and 106 into respective sealing engagement with the flat surfaces 102 and 103 of the housing members 99 and 100 while permitting sliding movement therebetween.

The left hand ends of the sheets 105 and 106, as illustrated in FIGURE 9, respectively have slot means 108 passing therethrough and respectively receiving an end of an arm 109 of a C-shaped leaf spring means 110, the other end or arm 111 of the spring 110 being secured to the frame means 58 whereby the spring means 110 continuously tends to urge and move the sheets 105 and 106 and porous compressible material 107 to the left in FIGURES 7, 8 and 9. However, such leftward movement of the valve member 104 is controlled by a stop member 112 having an end 113 threaded in a threaded bore 114

of the housing member 100 and an enlarged end 115 extending to the left of the spring arm 109 to limit outward movement thereof to the left whereby the stop means 112 can be adjusted relative to the housing means 99, 100.

The sheet 105 of the valve means 104 has a closed ended channel means 116 formed in the side thereof facing the surface 102 of the housing member 99 and is adapted to bridge a pair of port means 117 and 118 interrupting the surface 102 of the housing member 99 and leading respectively to outwardly directed hollow nipple means 119 and 120 on the housing member 99 when the valve means 104 is moved to the position illustrated in FIGURE 8 in a manner hereinafter described. The port means 117 has the nipple means 119 thereof fluidly interconnected to the conduit means or passage means 50 leading to the chamber 53 of the previously described actuator means 49 while the port 118 of the housing member 99 has its nipple means 120 fluidly interconnected to a branch port 121 of the previously described conduit means or passage means 46 that leads to the chamber 77 of the actuator means 47 and to the port 32D of the reading head 30.

The sheet means 105 of the valve means 104 also has an aperture 122 passing therethrough and adapted to be aligned with the port means 117 in the housing member 99 when the valve means 104 is disposed in the position illustrated in FIGURES 7 and 9 to fluidly interconnect the atmosphere to the conduit means or passage means 50 leading to the chamber 53 of the actuator 49 for a purpose hereinafter described.

The arm means 59 of the latch mechanism 47 carries a threaded adjusting member 123 on the right hand end 124 thereof which is adapted to abut the leg or arm end 109 of the spring means 110 to move the valve means 104 to the position illustrated in FIGURES 7 and 9 when the arm means 59 is permitted to move to the position of FIGURE 5 by the tension spring means 62 if the door means 24 of the machine 21 is in an open position. With the arm means 59 disposed in the position illustrated in FIGURE 5, it can be seen that the valve means 104 is interconnecting the atmosphere to the chamber 53 of the actuator 51 to prevent the switch arm 54 from closing the contact means 56 and 57. Conversely, when the arm means 59 is pivoted to the position illustrated in FIGURE 6 by the door means 24 of the machine 21 being disposed in its closed position, the adjusting member 123 at the end 124 of the arm means 59 permits the spring means 110 to move the valve means 104 to the position of FIGURE 8 and fluidly interconnect the ports 117 and 118 of the housing member 99 together whereby the chamber 53 of the actuator 49 will be fluidly interconnected to the previously described passage means 46 leading to the port 32D of the reading head 30.

The operation of the control system 20 utilizing the actuator means 47 and valve means 48 of this invention in combination with the washing machine 21 will now be described.

When the washing machine 21 is turned on by the operator closing the main switch means 42 to place the timer motor 35 and vacuum pump 41 across the power source leads L¹ and L², the timer motor 35 begins to move the main program member 33 relative to the reading head 30 and have the blister means 36 and aperture means 37 thereof sequentially and respectively interconnect various ports together and interconnect the atmosphere to other ports thereof in a predetermined sequence as illustrated by the time operation chart of FIGURE 2. Assuming that a regular fabrics cycle of operation has been selected by the operator and during the time that the program member 33 is moving from the zero time position of FIGURE 2 to its 13 minute position of FIGURE 2, the atmosphere is connected by suitable aperture means 37 of the main program member 33 to the port means 32D of the reading head 30 whereby the chamber 77 of the actuator 47 is in the deactuated condition of FIGURE 12. If the lid or door

means 24 of the washing machine 21 is disposed in its closed position as illustrated in FIGURE 4, the arm means 59 is in the position of FIGURE 6 to permit the valve member 104 of the valve means 48 to be in the position illustrated in FIGURE 8 and fluidly interconnect the passage means 46 with the passage means 50 leading to the chamber 53 of the actuator 49. However, since the atmosphere is interconnected to the port 32D of the reading head 30, the chamber 53 of the actuator 49 is at atmospheric condition and the switch blade 54 is in the open position illustrated in FIGURE 1 to prevent the motor means 28 from spinning the washing compartment 25. Also, since the chamber 77 of the actuator 47 is at atmospheric condition as illustrated in FIGURE 12, the latch member 60 is not latching the door means 24 in its closed position during this period of operation.

However, at the thirteen minute position in the cycle of operation of the apparatus 21 as illustrated in FIGURE 2, blister means 36 of the main program member 33 begin to and continuously fluidly interconnect the vacuum source port 32B of the reading head 30 to the port 32D from the thirteen minute operation continuously through the eighteen and one-half minute position illustrated in FIGURE 2 whereby the vacuum source 41 is now effectively interconnected to the conduit 46 leading to the chamber 77 of the actuator 47 and to the chamber 53 of the actuator 49. However, the evacuation of the chamber 77 of the actuator 47 and the evacuation of the chamber 53 of the actuator 49 cannot immediately take place to effect movement of the diaphragm 52 of the actuator 49 in an up direction in FIGURE 1 to close the switch blade 54 or to cause movement of the diaphragm 75 of the actuator 47 upwardly from the position illustrated in FIGURE 12 to the position illustrated in FIGURE 13 until the accumulator 87 is evacuated to a condition somewhere between its expanded condition of FIGURE 12 and its collapsed or emptied position of FIGURE 13 in a manner herein-after described.

When the accumulator 87 has been partially collapsed to a condition somewhere between the positions illustrated in FIGURES 12 and 13 by the vacuum means 41, the resulting pressure differential across the diaphragm 75 causes the diaphragm 75 to move upwardly from the position illustrated in FIGURE 12 to the position illustrated in FIGURE 13 and move the latch member 60 to its full latching position as illustrated in FIGURES 4 and 13. As the diaphragm 75 of the actuator 47 is being pulled upwardly by the vacuum source 41 evacuating the chamber 77, the suction cup means 94 of the diaphragm 75 is pressed against the flat wall means 83 of the housing 72 in the manner illustrated in FIGURE 13 by the pressure differential across the diaphragm 75. However, the abutment means 98 of the backup plate 97 prevents complete collapse of the suction cup means 94 against the wall means 83 so that a controlled amount of air can be constantly pulled into the system through orifice 91 and pass under the lip 96 of the diaphragm cup 94 to be evacuated by the pump 41 from the chamber 77. Also, when the lip 96 of the cup engages the surface 83, the lip 96 acts as a one-way valve that permits fast final evacuation of the accumulator 87 to the condition illustrated in FIGURE 13.

Simultaneously, with the evacuation of the chamber 77 of the actuator 49 in the above manner, the evacuation of the chamber 53 of the actuator 49 is taking place whereby the subsequent pressure differential across the diaphragm 52 of the actuator 47 causes the same to move upwardly from the position illustrated in FIGURE 1 to place the switch blade 54 across the contact means 56 and 57 and cause the motor means 28 to operate its output shaft 29 in a direction for spinning the washing compartment 25 whereby the washing compartment 25 will continue to spin as long as the actuator 49 is in its actuated position. If desired, a speed control transmission means can be disposed between the shaft 28 and transmis-

sion means 27 to prevent full speed of spin of the compartment 25 until the water level control 45 senses a drop of water level below a predetermined amount.

Of course, it is to be understood that if the door means 24 is not in its closed position at this time, the lever 59 of the mechanism 47 will be in the position illustrated in FIGURE 5 so that the valve member 104 will be in the position illustrated in FIGURE 7 to prevent the conduit 46 from being interconnected to the conduit means 50. Thus, with the door 24 in its open position, the actuator 49 cannot be actuated and a spinning operation of the washing compartments 25 will not take place.

However, since the door means 24 is in its closed position, the latch member 60 is moved to its latching position by the actuation of the actuator 47 in the manner previously described so that once the spinning operation of the washing compartment 25 takes place in the above manner, a person cannot open the door 24 and, thus, be injured by the spinning washing compartment 25.

The washing compartment 25 continues to spin in the above manner until the eighteen and one-half minute interval in the cycle of operation is reached where the blister means 36 of the program member 33 no longer interconnect the port means 32B in the reading head 30 with the port means 32D and suitable aperture means 37 of the program member 33 are now placed in communication with the port means 32D to permit the atmosphere to be interconnected to the chamber 77 of the actuator 47 and to the chamber 53 of the actuator 49. With the atmosphere now interconnected to the chamber 53 of the actuator 49, the diaphragm 52 of the actuator 49 moves downwardly to the position illustrated in FIGURE 1 to move the switch blade 54 away from the contact means 56 and terminate the spinning operation of the washing compartment 25.

However, even though the atmosphere is now interconnected to the chamber 77 of the latching actuator 47, so that a pressure differential no longer exists across the complete diaphragm 75 thereof, the diaphragm 75 of the actuator 47 remains in the position illustrated in FIGURE 13 because of the suction cup means 94.

In particular, when the suction cup means 94 is fastened to the wall means 83 of the housing means 72 by the previously described pressure differential being placed across the diaphragm 75, both passage means 84 and 91 in the housing member 72 were still in fluid communication with the suction chamber created between the suction cup means 94 and the housing wall 83. Even though the passage means 91 leading to the atmosphere was continuously permitting air to enter into the suction chamber between the suction cup means 94 and wall 83 of the housing means 72 at a controlled rate, such bleed air was continuously being removed by the pump 41 so that the accumulator 87 remained completely collapsed until the pump 41 was disconnected from the chamber 77. Thus, even though the switch 49 is now opened, the relatively large accumulator 87 maintains a suction condition between the suction cup means 94 and wall 83 after the eighteen and one-half minute time interval until the controlled bleed means 91 bleeds the vacuum in the accumulator 87 to a level where the spring 67 overpowers the suction cup means 94 to break the suction between the suction cup means 94 and the wall 83.

Thus, until the level of the vacuum in the accumulator 87 is reduced to a level by the controlled bleed means 91 to permit the spring 66 to pull the diaphragm 75 downwardly to the position illustrated in FIGURE 12, the suction cup means 94 of the diaphragm 75 remains fastened to the wall means 83 of the housing 72 to maintain the latch member 60 in its latching position and prevent the operator or the like from opening the door or lid means 24 for a predetermined time period after the motor means 28 has been deenergized by the actuator 49. In this manner, the latch member 60 will not move to its unlatching position until the washing compartment 25 has ceased to spin from just the inertia thereof after the

motor means 28 has been turned off by the actuator means 49 in the manner previously described.

The delay bleed-down time of the accumulator 87 can be varied depending upon the volume of the accumulator 87 and its natural spring of return to its non-collapsed condition, the spring rate being the greater factor. The accumulator 87 tends to maintain a certain signal level as it bleeds down due to its spring rate whereby this signal level has to be above the unlatching level of the spring 66.

Therefore, it can be seen that the actuator means 47 of this invention has a time delay in the deactuation thereof from the position illustrated in FIGURE 13 back to the position illustrated in FIGURE 12 even though the chamber 77 has been returned to normal atmospheric condition, such time delay means being accomplished by the accumulator means 87 and/or suction cup means 94.

Also, the actuator means 47 will provide unlatching delay any time during the spin period whether the machine is programmed off or is shut off manually by the operator, and thus allows the spin basket 25 to coast to a stop (depending on designed time delay) before the operator can open the access door or lid 24.

Therefore, it can be seen that this invention not only provides an improved pneumatic control system for a washing machine or the like, but also this invention provides an improved actuator means for such a system or the like.

While the form of the invention now preferred has been disclosed as required by the statutes, other forms may be used, all coming within the scope of the claims which follow.

What is claimed is:

1. In a washing machine or the like having a door means and a movable latch means for holding said door means in its closed position when said latch means is in its latching position, the improvement comprising a first pneumatically operated actuator for moving said latch means to its said latching position when said actuator is actuated to one of its operating positions, said first actuator having a chamber, a pneumatic source, first passage means for interconnecting said source to said chamber of said first actuator to actuate said actuator to its said one operating position, second passage means leading to a chamber of a second actuator, and means operated by said door means to interconnect said second passage means to said first passage means only when said door means is in its closed position whereby said first passage means is only interconnected to said chamber of said second actuator when said door is in its closed position.

2. In a washing machine or the like as set forth in claim 1, means for interconnecting said pneumatic source to said first passage means.

3. In a washing machine or the like as set forth in claim 2, said last-named means comprising a program controlling means that interconnects said source to said first passage means in a predetermined cycle of operation of said machine.

4. In a washing machine or the like as set forth in claim 1, motor means for driving a movable part of said machine, said second actuator only actuating said motor

means for driving said part when said door operated means interconnects said first passage means to said second passage means.

5. In a washing machine or the like as set forth in claim 4, electrical switch means for interconnecting said motor means to an electrical power source to energize said motor means, said second actuator controlling said switch means.

6. In a washing machine or the like as set forth in claim 1, said door operated means comprising a valve means that interconnects said first passage means to said second passage means when said door means is in its closed position and that disconnects said first passage means from said second passage means when said door means is in an opened position.

7. In a washing machine or the like as set forth in claim 6, said valve means having means for interconnecting said second passage means to the atmosphere when said door means is in its opened position.

8. In a washing machine or the like as set forth in claim 6, said valve means comprising a reading head having two ports interrupting a reading surface thereof and being respectively in fluid communication with said first and second passage means, and a reading sheet movable over said reading surface and having means for fluidly interconnecting said two ports together when said door means is in its closed position, said reading sheet having means for interconnecting the port in communication with said second passage means to the atmosphere when said door is in its open position.

9. In a washing machine or the like as set forth in claim 8, spring means operatively interconnected to said reading sheet to tend to move the same to its position for interconnecting said atmosphere to said second passage means.

10. In a washing machine or the like as set forth in claim 8, lever means operatively interconnected to said reading sheet to move the same relative to said reading head, said lever means being moved by said door means.

11. In a washing machine or the like as set forth in claim 1, said first actuator having means for delaying the return of said latch means to its unlatched position for a predetermined time after said chamber is disconnected from said pneumatic source.

12. In a washing machine or the like as set forth in claim 11, said delaying means including a suction cup means.

13. In a washing machine or the like as set forth in claim 12, said delaying means including an accumulator means.

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