

May 17, 1960

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2,936,892

SOLENOID OPERATED LID LATCH SYSTEM

Filed Aug. 1, 1956

3 Sheets-Sheet 1

Fig. 1

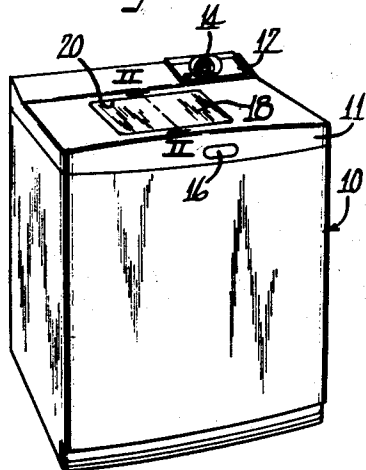


Fig. 3

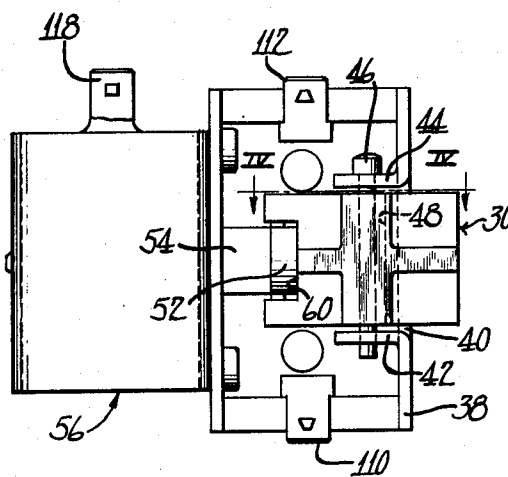
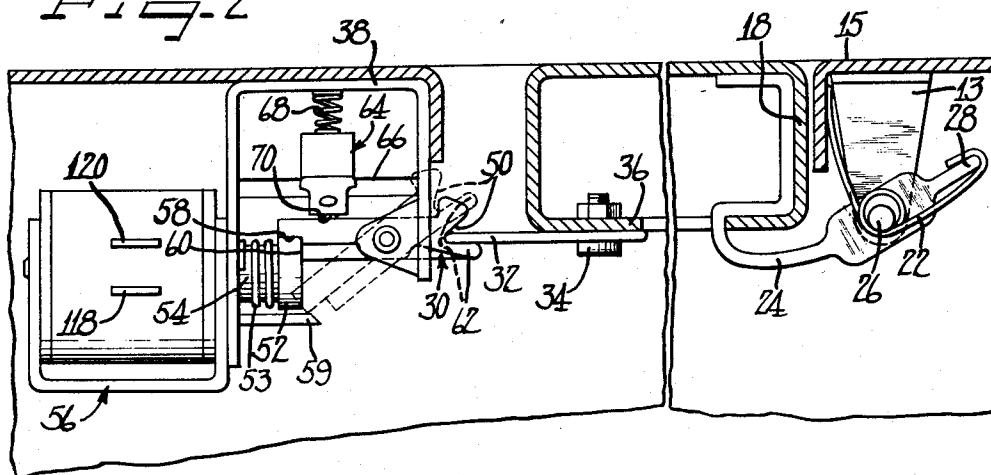


Fig. 2



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3 Sheets-Sheet 2

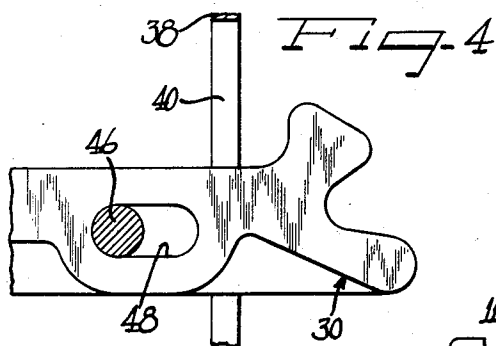


FIG. 5

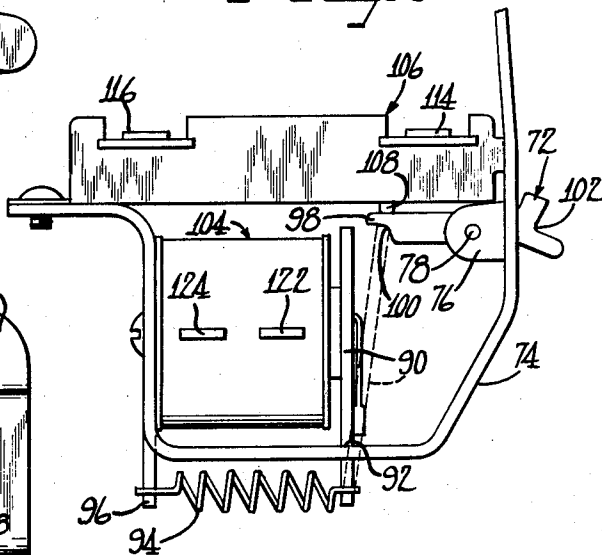


FIG. 6

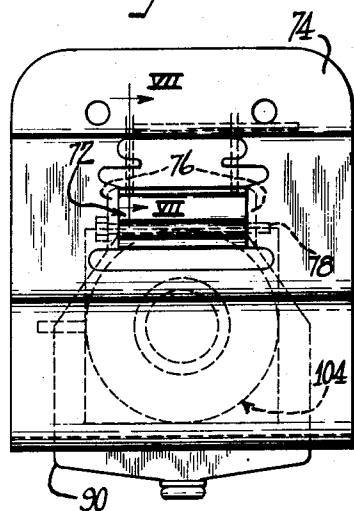
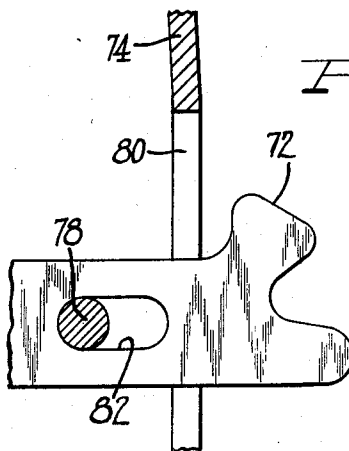


FIG. 7



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3 Sheets-Sheet 3

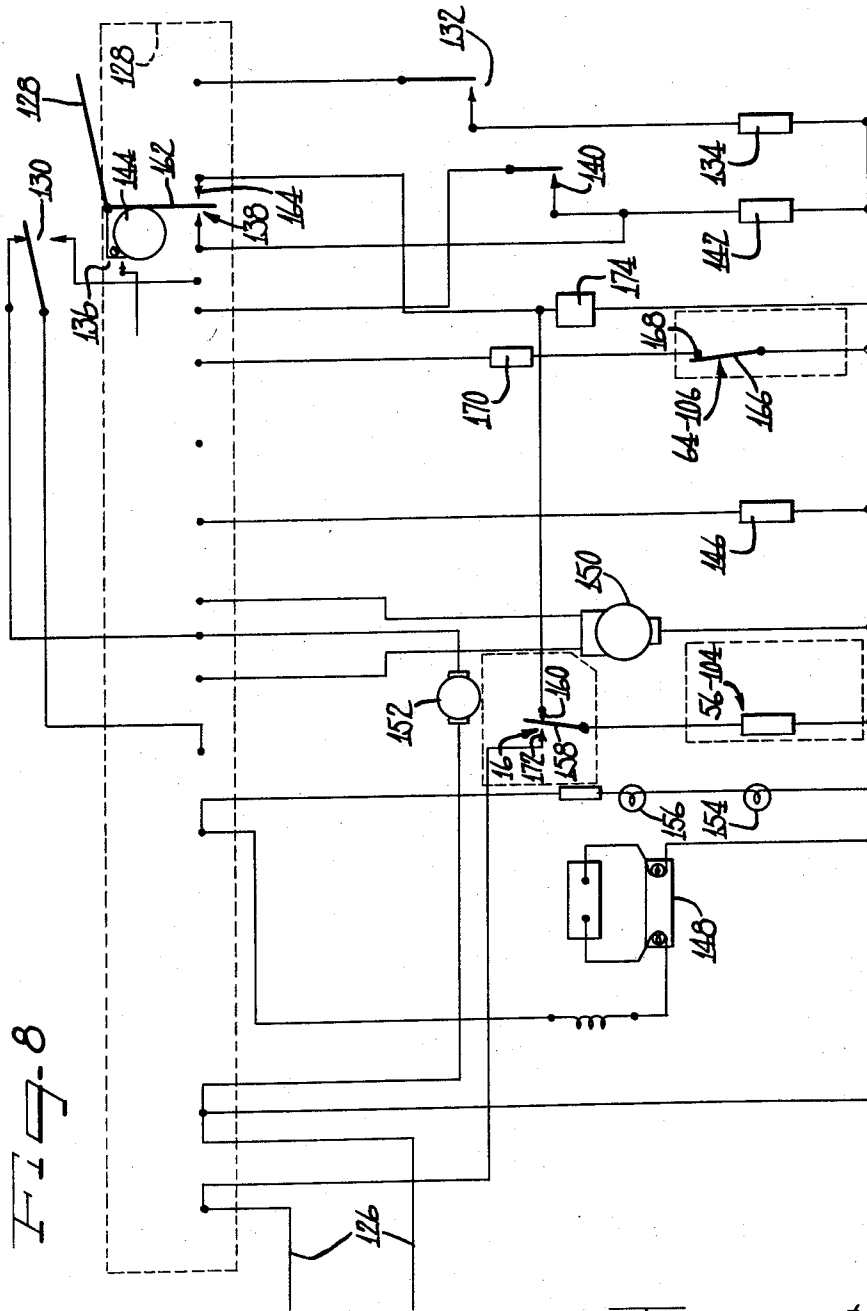


FIG. 8

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1

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SOLENOID OPERATED LID LATCH SYSTEM

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10 Claims. (Cl. 210—146)

The present invention relates to improvements in latches and related control systems for use with appliances.

This invention contemplates use in an appliance such as a domestic type home laundry which is provided with a cabinet or housing having a door opening therein surrounded by the door frame and that it is to be closed or opened by a moving door which is latched in closed position during operation of the appliance and which may be released to move to open position for access to the interior of the appliance. The appliance, if of the home laundry type, contains operating mechanism including a tub for retaining the washing fluid and an agitator within the tub which may be perforated and may be spun at certain points in the cycle of operation to centrifugally force the washing fluid from the clothing being washed. The operating mechanism is controlled by a time-cycle device which sequentially operates switches to mechanically and electrically cause the various laundering functions to be performed.

It is an object of the invention to provide an improved latch construction for holding a door in closed position or releasing the door which is expressly suitable for use on a home appliance of the domestic laundry type.

Another object of the invention is to provide a door holding latch of improved construction which will hold the door firmly and securely avoiding looseness and rattles of the door and which is capable of continuous and reliable operation throughout the life of the appliance.

Another object of the invention is to provide an improved latch construction which is of simple and effective design and which can be easily manufactured and assembled with a minimum of cost and effort.

Another object of the invention is to provide a door closing system wherein the safety of operation is greatly improved for a home appliance which has operating parts within the cabinet.

A still further object of the invention is to provide an improved arrangement for automatically controlling the operation of functional elements within a home appliance cabinet, dependent on the position of the door latch.

A further object of the invention is to provide an improved door control system capable of use with a home laundry mechanism wherein operation of the washing mechanism is terminated immediately when the door is released.

A still further object of the invention is to provide an improved door control arrangement for an electrical appliance wherein the door is electrically controlled and may be opened at any point during the cycle of operations and also will automatically open at the end of the cycle of operations.

Other objects and advantages will become more apparent with the teaching of the invention and the complete disclosure of the preferred embodiment in the following specification and claims taken in connection with the accompanying drawings, in which:

Figure 1 is a perspective view of a home appliance

2

cabinet of the type with which the present invention finds utilization;

Figure 2 is a sectional line taken along line II—II of Figure 1 and illustrating the details of construction of the door holding latch;

Figure 3 is a plan view of the latch of Figure 2, taken from the bottom of the latch;

Figure 4 is a fragmentary sectional view taken along line IV—IV of Figure 3;

Figure 5 is a view similar to Figure 2 illustrating another embodiment of the latch;

Figure 6 is an end elevational view of the latch of Figure 5;

Figure 7 is a fragmentary sectional view taken along line VII—VII of Figure 6; and,

Figure 8 is a circuit diagram showing schematically the electrical circuitry for operating the mechanism and the door holding latch arrangement.

While the present invention finds particular utility and advantages in use with a domestic home appliance, such as an automatic laundering machine, it is to be understood that certain features of the invention may be adapted and used to advantage in other environments and the invention is not to be limited to use with any one structure, although, for the sake of clarity of description, the structure and operation will be described in connection with a home laundering machine.

In a laundering machine of the type shown in Figure 1, the operating mechanism is housed by a cabinet 10 formed of a smooth finish and painted sheet metal with a control panel 12 in a convenient place, such as at the top of the machine. The control panel supports a main control knob 14 which may be dialed by the operator to determine the various factors of operation, such as water quantity, water temperature and the particular portion of the operational cycle may be selectively chosen by virtue of the control knob being connected to the switch operating cam shaft. The particular design of an automatic control for the machine will not be described in detail since a design of any desirable type may be chosen and forms no part of this invention. The cabinet front 11 may be provided with a push button 16 which, in accordance with the teachings of the present invention, electrically controls the door operating latch.

The top of the cabinet 10 is provided with an opening which is shown in Figure 2 covered by the closed door 18. The opening provides access into the interior of the cabinet and is usually formed by removing a section of metal from the top of the cabinet and rolling or bending the surrounding metal to form a door frame 20 against which the door is fitted in closed position. The door 18 is maintained in closed position by a latch assembly shown in its various forms in Figures 2 through 6, and the latch is operated by the operator through the push button 16 and also through the time cycle mechanism, as will be explained. The door may be provided with a handle for moving to open position when released by the latch, but, as shown, is provided only with a door opening spring, shown at 22 in Figure 2, so that the door will automatically move to open position when released by the latch. The door 18 may be supported in any suitable hinge arrangement 24 which is supported by the hinge bracket 13 fixedly secured to the top member 15, hence pivotally supported at 25, and provided with an extension 28 to which the door closing spring is attached.

The interengaging elements for holding the door in closed position, or releasing it to be moved to open position by the spring 22, comprise the latch 30 and the striker or keeper 32. The latch 30 and striker 32 are mounted so their paths of movement intersect. The striker 32 is shown attached to the door 18 by a bolt 34 which extends through the inner flange 36 of the door.

3

The latch 30 is pivotally supported on a U-shaped frame member 38 which may be welded or otherwise suitably attached to the door frame or the cabinet portion beside the door. Although the striker 32 is shown attached to the door and the latch 30 is carried on the door frame, their positions may be reversed in some instances as will be apparent to those skilled in the art. The U-shaped frame member 38 contains a slot 40, as shown in Figures 3 and 4, through which extends the latch. Supporting brackets or ears 42 and 44 are bent inwardly adjacent the slot 40, as shown in Figure 3, and through the brackets extends the pivotal support pin 46 for pivotally carrying the latch 30. The pin extends through an elongated slot 48 in the pivotal latch member and this slot permits longitudinal movement of the latch 30 towards the striker 32, as well as pivotal movement.

For receiving the striker 32, the outer end of the latch is provided with a striker-receiving notch 50 in which the striker is locked when the latch is in striker-holding position, as is shown in Figure 2.

To prevent the latch member 30 from being pivoted to striker-release position, which is in a counter-clockwise direction, as is shown in Figure 2, the latch is held by a dog 52. The dog 52 is attached to the plunger 54 of a solenoid 56, and the dog is spring held in the position shown in Figure 2. In this position of the dog 52, a small projection or holding element 58 extends over the top of the dog thereby preventing the latch 30 from moving pivotally to the striker-release position. Beneath the holding element 58 on the latch, is a flat pressure surface 60 which is engaged by the dog 52 and the spring 53 of the solenoid 56 pushes the said dog toward the latch to force the latch to the right, as shown in Figure 2, to force the latch member against the striker 32. This pushes the striker firmly in the base of the notch 50, and firm engagement between the latch 30 and striker 32 insure that the parts will not rattle due to vibration of the appliance during operation. This pressure also serves to take up play which may be present in the door hinge and forms a firm steady gripping means for holding the door 18 in closed position.

When the solenoid 56 is energized, the dog 52 is pulled away from the holding element 58 and the latch 30 is permitted to pivot when the striker pushes outwardly with the movement of the door. The latch will then swing to the dotted line position of Figure 2, against a bar 59. When the latch is in the door-release position, which is the dotted line position of Figure 2, the door may again be swung shut. The striker will engage the retaining notch 50, striking the lower ledge 62 adjacent the retaining notch and forcing the latch to be pivoted back to the solid line position of Figure 2. Up to this time, the latch 30 has been prevented from being accidentally swung back to the lock position because the dog 52 has blocked this movement. Forcible pivotal movement of the latch 30 to the striker-retaining position will, however, push the dog 52 back against its spring 53 and permit the latch 30 to be pivoted back to its solid line position of Figure 2. When in that position, it will automatically be locked by the dog 52 moving beneath the holding element 58 on the latch. The dog 52 will also automatically engage the surface 60 to force the latch longitudinally toward the striker holding the members in close holding engagement.

It is to be noted that a switch member 64 is supported within the U-shaped frame 38 in a position to be operated by the latch 30. In the present embodiment the switch is positioned to be engaged by the latch when it is in its striker-holding position. The body of the switch is movably supported in a cross member 66 in the frame 38 and a coil compression spring 68 urges the switch toward engagement with the latch 30. The switch has a plunger 70 which is depressed by the latch 30 when in the striker-retaining position and which is released by the latch when it pivots to the striker release position.

4

The switch 64 functions as a safety element and is electrically connected to operating parts of the laundry machine in such a manner so that the operation of these parts is immediately terminated when the latch is released and begins pivoting toward striker-release position. Thus, even before the door is opened, the operating parts will have been stopped by the operation of the switch 64. In the form herein described, the switch is connected to the drive for the fluid extractor for the machine, and the details of operation will be described later.

In Figures 5, 6 and 7, a modification of the preferred embodiment described in connection with Figures 2, 3 and 4, is shown. In this construction, a striker of the same design as in Figure 2 may be utilized, and the latch member 72 is pivotally supported on a carrying frame 74. The frame has ears 76—76 bent inwardly to receive a pivotal pin 78 on which the latch 72 is supported. The frame 74 has a slotted opening 80 through which extends the latch for pivotal movement between the striker retaining-position, as is shown in Figures 5 and 7, and a striker-release position wherein the latch pivots to free the striker. The latch 72 contains a slotted opening 82 which permits longitudinal movement of the latch as well as pivotal movement, and the longitudinal movement permits intimate engagement between the latch and striker to take up any freedom which may exist between these members.

The latch is held in its striker-retaining position by a pivotally mounted dog 90 which is carried in a slotted opening 92 in the base of the frame member 74. A coil tension spring 94 is connected to the lower end of the dog and is also connected to a bracket 96 to urge the dog to pivot to the dotted line position of Figure 5, wherein the dog 90 is in latch-holding position. The inner end 98 of the latch may be provided with a boss 100 which prevents the dog 90 from being pivoted past the inner end 98 of the latch by action of the spring 94. This boss 100 also permits the dog 90 to push the latch 72 longitudinally to the left, as is shown in Figure 5, to seat the striker firmly in the notch 102 of the latch.

The dog 90 is moved to latch release position by an electromagnet 104 which is operative through circuitry that will later be described.

The latch also operates a switch 106 which is positioned so that its plunger 108 is engaged by the inner end 98 of the latch when the latch is in striker-retaining position. The switch plunger 108 is depressed in this position and when the dog 90 is pivoted by action of the electromagnet 104 to the solid line position of Figure 5, the plunger 108 is released to operate the switch 106. The switch 106 is wired similar to the switch 64 in Figure 2, in order to terminate operation of certain elements of the automatic machine to safeguard the operator and to stop the operation of these elements immediately when the door is released.

The control switch 64 is connected to the operating circuit by terminals 110 and 112, shown in Figure 3, and the corresponding switch 106 of Figure 5 is connected to the operating circuit by terminals 114 and 116. The terminals for connecting the solenoid 56 to the operating circuit are shown at 118 and 120 in Figures 2 and 3, and the terminals for the electromagnet which performs a corresponding function are shown at 122 and 124 in Figure 5.

The circuitry for operating the automatic laundry machine is shown diagrammatically in Figure 8 with the power being supplied through the lines 126. A large portion of the operating circuit is known to the art and therefore need not be described in great detail. For simplifying the description, the convention is adopted of showing the leads to the elements that are operated by the cams of the timer as connected to a panel board 128 and these leads are sequentially connected in the circuit across the power supply 126 at the proper time of operation. The filling of the laundry machine with fluid is

controlled by a number of elements including a water level selector switch 130, a temperature control switch 132 controlling a hot water control solenoid 134, and subsequent fluid supply operations such as rinsing are controlled by the integral spray cam and switch 136, a cam controlled switch 138, a control switch 140 and a mixed water control solenoid 142. For the sake of simplicity of description, the operating cams are not illustrated with the exception of the cam 144 which is illustrated because it functions to open the door at the end of the time controlled cycle. Also controlled in timed relationship to the other operating elements, is an agitator control solenoid 146, a fluorescent-type light 148, and a main drive motor 150 which may be used to drive the agitator and the pumps or the other operating elements of the machine. The timer motor 152 is also connected across the circuit during the time of operation and drives the switch operating cams including cam 144. Other auxiliary elements may be connected in this circuit, such as an additional light source 154 and a sanitizing lamp 156.

The solenoid 56, or the electromagnet 104 which controls the latch for releasing the door is shown in the circuit as controlled by the push button switch 16. The push button switch is provided with a movable switch arm 158 which normally engages a terminal 160. This terminal is not supplied with electricity until the end of the time controlled cycle, and, therefore, the lid switch solenoid 56 is normally not energized until the end of the cycle. At the end of the cycle, the movable switch arm 162 of switch 138 is moved by the cam 144 against the terminal 164 to complete the circuit through the push button switch to the lid switch solenoid 56. This will automatically draw the dog 52, of Figure 2, away from the latch, permitting it to pivot to striker-release position and permitting it to release the plunger 70 of the switch 64. The switch 64 is shown in the circuit as closed with the movable contact 166 engaging the fixed contact 168. When this closed switch is released and opened, the circuit is broken through the extractor controlled solenoid 170, thereby immediately terminating operation of the extractor. As above referred to, in a laundry machine of this type, a tub is provided for containing the washing fluid and a basket is contained within the tub and may be perforated. When the fluid is to be extracted from the clothing, the extractor is driven at high speeds to centrifugally force the water out of the clothes. This, of course, presents a dangerous condition to the operator if he contacts the whirling extractor when the door is opened. With the arrangement above described, the switch 64 or the switch 106 which controls the extractor is opened immediately when the lid is released, thereby preventing the operator from coming into contact with the extractor when the extractor is operating at high speeds. This immediate opening of the extractor control switch also avails time for the extractor to slow down before the door is fully opened.

In the normal course of events of operation of a laundry machine of this type, the extractor will not be operating at the end of the cycle and therefore the opening of the lid switch 64 is not of primary importance except to insure that the circuit is broken to the extractor control solenoid 170. The function of the lid switch 64 is more important if the lid or door is opened during the operation of the extractor at some time previous to the completion of the cycle of the machine. This occurs when the lid is automatically opened by operation of the push button 16. If the push button is depressed the movable switch arm 158 will be pressed against the contact 172 of the switch. This will complete the circuit through the lid switch solenoid 56 or through the lid switch electromagnet 104, to release the latch member and permit the lid to be open. Again the lid switch 64 or the lid switch 106 is immediately released and the circuit is broken to the extractor control solenoid 170 to insure that the washing

machine extractor (not shown) will not continue operation to represent a dangerous condition to the operator. Although the preferred embodiment illustrates the control switch 64 or the control switch 106 as connected in circuit with the extractor control solenoid 170, it may be arranged to terminate the operation of other dangerous elements within the machine as soon as the lid is released.

When the door to the appliance is again closed, the plunger of the switch 64 or of the switch 106 is again depressed and the switch will be closed completing the circuit to the extractor control solenoid 170 and permitting continued operation of the machine.

Although the overall operation of the machine will now be apparent from the details of the structure and operation of the individual elements of the system, a summary of operation will be helpful in understanding the features, objects and advantages of the invention. With reference to Figure 2, the door 18 carries a striker 32 which is held in the retaining notch 50 of the latch member 30. The latch member is maintained in striker-retaining position by a dog 52 engaging a holding element 58 on the latch 30. The dog 52 also presses against a surface 60 to force the latch tightly against the striker 32 and this movement is permitted by the slot 48 which surrounds the pivotal support pin 46. The latch 30, in the striker retaining position, also depresses a plunger 70 of the switch 64.

When the door is to be released, the solenoid 56 is energized withdrawing the dog 52 from its position and permitting the latch 30 to pivot from the solid line position to the dotted line position which is the striker-release position for the latch. This releases the plunger of the switch 64.

The latch is remotely controlled by a push button switch 16 which permits opening the door at any time. The door, however, is also opened automatically at the end of the cycle by the switch 138, as is shown in the circuit diagram of Figure 8. When the solenoid 56 is energized by depressing the push button switch 16, the lid switch is immediately opened as soon as the latch is released, and this automatically breaks the circuit to the extractor control solenoid 170 causing the extractor to stop rotating. It may be desirable to alert the operator as to the termination of the cycle and to inform him audibly that the door has opened and this may be accomplished by the provision of a signal means, such as a buzzer 174 which is placed in the circuit at the same time that the door is released by the latch.

Thus, the door is remotely operated by electrical means and can be opened at any time during the cycle of operations, and will operate automatically at the termination of operation of the machine.

Upon the release of the door latch and before the door opens, the latch operated switch automatically stops operation of the extractor to prevent injury to personnel.

Thus, we have provided an improved solenoid operated lid latch system which meets the objectives and advantages hereinbefore set forth and provides an improved reliable operating system well adapted for use with automatically operated home appliances. The latch is rugged and simple in operation and will have an operating life equal to that of the appliance. The latch structure acts co-operatively with the control switch arrangement to insure proper operation of the machine and the entire assembly is simply combined with existing systems.

We have, in the drawings and specification, presented a detailed disclosure of the preferred embodiments of our invention, but it is to be understood that we do not intend to limit the invention to the specific forms disclosed but intend to cover all modifications, changes and alternative constructions and methods falling within the scope of the principles taught by our invention.

We claim as our invention:

1. A latch combination for retaining a door member in closed position relative to a door frame member com-

prising a striker attached to one of said members, a latch, a pivotal support pivotally supporting the latch on the other of said members for movement in a path intersecting the path of movement of the striker, an elongated slot in the latch receiving the pivotal support and permitting longitudinal movement of the latch toward the striker, said pivotal support permitting pivotal movement of the latch between a striker-release position and a striker-holding position, a dog means for engaging the latch and preventing movement of the latch to said striker-release position, and a latch moving means positioned to engage the latch and move it toward the striker with said slot moving laterally of said pivotal support, said dog means and said latch moving means being electrically operated to release the latch and permit the door to move to open position.

2. A latch combination for retaining a door member in closed position relative to a door frame member comprising a striker attached to one of said members, a latch, a support pivotally supporting the latch on the other of said members for movement about a path intersecting the path of movement of the striker, the outer end of said latch being recessed to receive the striker, the inner end of said latch having a holding element, a dog positioned to be projected in holding relationship with said holding element to prevent pivotal movement of the latch and positioned to move toward the latch to engage the inner end of the latch forcing it toward the striker, an elongated slot in said latch permitting movement of the latch on said pivotal support in the direction of the striker, and motor means connected to move the dog toward the latch to urge it into locking engagement with the striker and connected to move the dog away from the latch to release it and permit the door to move to open position.

3. A latch combination for co-operating door and door frame members comprising, a striker attached to one of said members, a latch engageable with said striker and pivotally mounted on the other of said members in a lost-motion connection to accommodate translatable movement of said latch toward and away from said striker in addition to arcuate movement of said latch between striker-holding and striker-release positions, bias means urging said latch toward said striker-release position, movable means selectively engageable with said latch for maintaining said latch in said striker-holding position against said striker when said door member is moved into a closed position in said door frame member, and electrical means for moving said movable means away from said latch to permit said bias means to move said latch toward said striker-release position and allow relative movement between said door and door frame members.

4. A latch combination for co-operating door and door frame members of a machine comprising, a striker attached to one of said members, a latch pivotally supported by means of a lost-motion connection to the other of said members, a recess in said latch for receiving and retaining said striker upon movement of said door member into a closed position in said door frame member, a switch controlling an operation of said machine and positioned adjacent said latch, bias means urging said switch toward an open position and urging said latch about said connection toward a striker-release position in which said striker is released from latching engagement with said latch, movable means engageable with said latch for urging said latch toward said striker when said door is moved into said closed position and for blocking pivotal movement of said latch to cause said latch to maintain said switch in a closed position, and electrical means for moving said movable means out of engagement with said latch to permit said bias means to pivot said latch toward said striker-release position and simultaneously open said switch to terminate said operation of said machine.

5. A latch combination for co-operating door and door frame members comprising, a striker attached to one of

said members, a latch engageable with said striker and provided with an elongated slot, means pivotally mounting said latch on the other of said members by means of said slot to accommodate translatable movement of said latch toward and away from said striker in addition to arcuate movement of said latch between striker-holding and striker-release positions, bias means urging said latch toward said striker-release position, movable means selectively engageable with said latch for maintaining said latch in said striker-holding position against said striker when said door member is moved into a closed position in said door frame member, and means for moving said movable means away from said latch to permit said bias means to move said latch toward said striker-release position and allow relative movement between said door and door frame members.

6. A latch combination for co-operating door and door frame members of a machine comprising, a striker attached to one of said members, a latch pivotally supported on the other of said members and including a recess for receiving and retaining said striker upon movement of said door member into a closed position in said door frame member, a switch controlling an operation of said machine and positioned adjacent said latch, bias means urging said switch toward an open position and urging said latch toward a striker-release position in which said striker is released from latching engagement with said latch, movable means engageable with said latch for blocking pivotal movement of said latch and causing said latch to close said switch, and means for moving said movable means out of engagement with said latch to permit said bias means to pivot said latch toward said striker-release position and simultaneously open said switch to terminate said operation of said machine.

7. A latch combination for co-operating door and door frame members comprising, a striker attached to one of said members, a latch provided with a recess for receiving and retaining said striker upon movement of said door member into a closed position in said door frame member, a stepped portion in said latch, a longitudinal slot in said latch intermediate said recess and said stepped portion, a pivot pin mounted on the other of said members and extending through said slot to provide a lost-motion pivotal connection for said latch and accommodate both arcuate and translatable movements of said latch on said pivot pin, bias means urging said latch out of latching engagement with said striker, movable means engageable with said stepped portion for blocking pivotal movement of said latch and for urging said latch longitudinally on said pivot pin toward said striker when said door is moved into said closed position, and electrically operated means for moving said movable means out of engagement with said stepped portion to permit said bias means to pivot said latch out of latching engagement with said striker.

8. The invention set forth in claim 7 further including a switch positioned adjacent said latch and in which said bias means also urges said switch into an open position.

9. The invention set forth in claim 7 in which said movable means is a plate member mounted for pivotal movement between said latch and said electrically operated means.

10. The invention set forth in claim 9 in which spring means is connected to said plate member to bias said plate member toward said latch and away from said electrically operated means.

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