April 10, 1962 J. A. FAY 3,028,870

DISHWASHER WITH DOOR AND TIMER SWITCH INTERLOCK

Filed May 15, 1959 2 Sheets-Sheet 1

FIG. 1.

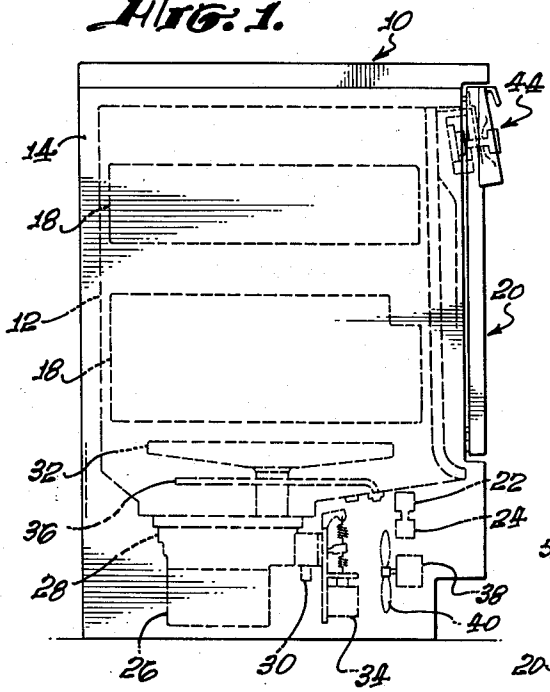


FIG. 3.

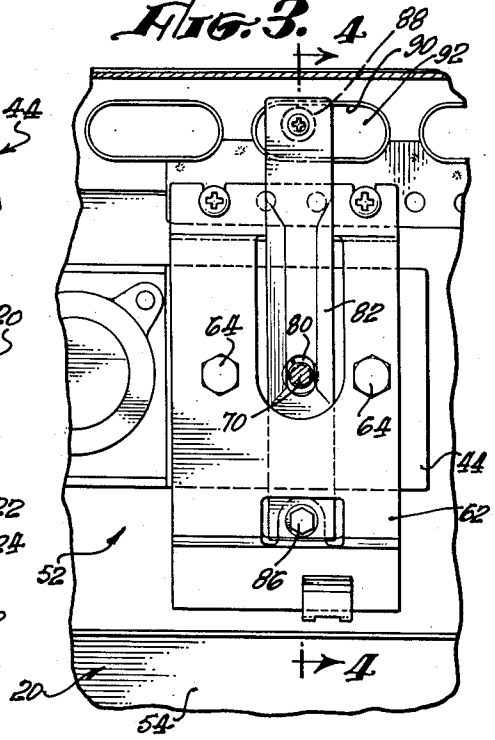
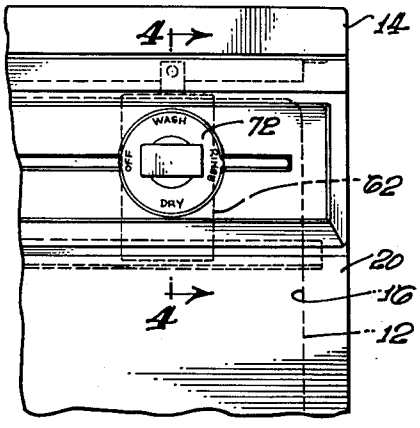


FIG. 2.



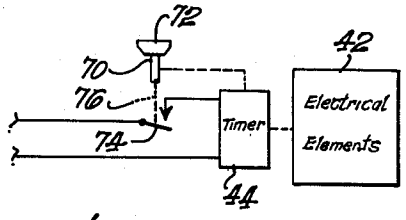


FIG. 7.

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FIG. 4.

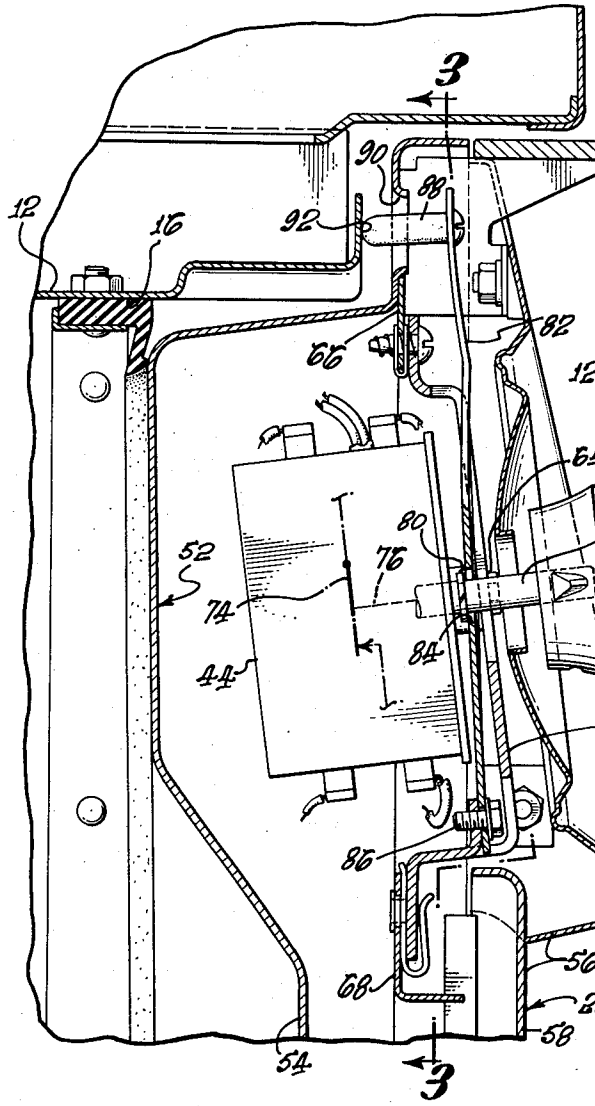


FIG. 5.

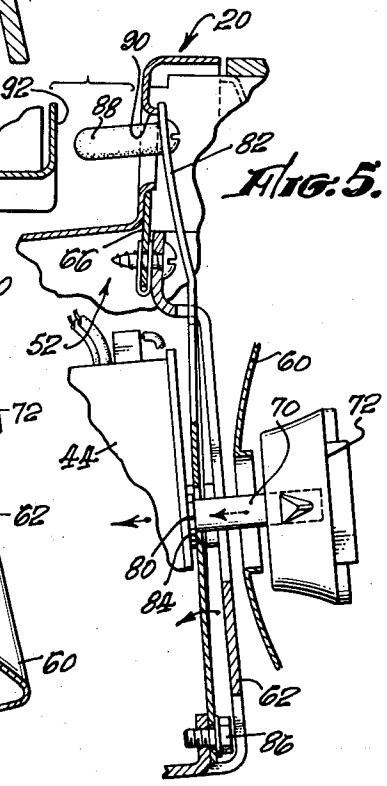
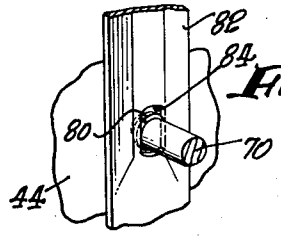


FIG. 6.



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3,028,870
DISHWASHER WITH DOOR AND TIMER SWITCH INTERLOCK

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2 Claims. (Cl. 134—58)

The present invention relates in general to an apparatus which includes a housing having a door and which includes electrical equipment and a main switch responsive to the position of the door to de-energize the electrical equipment when the door is opened.

The present application discloses subject matter which is claimed in co-pending patent application Serial No. 835,725, filed August 24, 1959, by Hans Jordan and me, and assigned to the same assignee as this application.

A primary object of the invention is to provide an apparatus of the foregoing character wherein the switch is opened automatically upon opening of the door, but is merely rendered closable by closing of the door, it being necessary to close the switch manually to re-energize the electrical equipment upon closing of the door. With this construction, two operations are necessary to re-energize the electrical equipment after the door has been opened, viz., the door must be closed and, additionally, the switch must be closed manually. Thus, the invention provides an important safety feature in that the electrical equipment positively cannot be energized inadvertently, something which can occur readily with a conventional door switch that is adapted to be closed automatically upon closure of the door.

While, as hereinbefore suggested, the invention has general utility in that it is applicable to any apparatus having electrical equipment which is to be de-energized, i.e., rendered incapable of being energized, upon opening of a door associated with the apparatus, it has particular utility in connection with washing apparatus and, more especially, dishwashers. For convenience, the invention will therefore be considered herein in conjunction with dishwashers and, more particularly, a dishwasher of the front loading type, i.e., a dishwasher which includes a housing or tub having a doorway at the front thereof, the door of such dishwasher preferably being pivotable downwardly from a closed position wherein it closes the doorway in the tub to a generally horizontal open position. The dishwasher elected for consideration herein includes various electrical elements for washing, rinsing and drying dishes within the tub and includes a timer having means for operating the electrical elements in timed sequence and having a main switch controlling the electrical elements, as by being connected in series therewith, or effectively connected in series therewith. Preferably, the timer is mounted on, or, more accurately, within, the door of the dishwasher and includes a shaft connected to the main switch and reciprocable between open and closed positions to open and close the main switch. A dishwasher having the foregoing characteristics is disclosed in detail in the co-pending applications of Horace E. Karig, Serial No. 482,239, filed January 17, 1955, and Serial No. 625,685, filed December 3, 1956, and in the co-pending application of Bertram Given and Walter Peglow, Serial No. 625,398, filed November 30, 1956, which are assigned to the same assignee as the present application and the disclosures of which are incorporated herein by reference.

An important object of the invention is to provide a dishwasher of the foregoing nature which includes: switch opening means connected to the main switch for opening it in response to movement of the door from its closed position toward its open position; interengageable means

on the tub and the door for rendering the switch opening means inoperative to open the main switch in response to movement of the door into its closed position, but incapable of closing the main switch; and manual actuating means connected to the main switch and operable to close the main switch when the switch opening means is rendered inoperative by the interengageable means mentioned.

Another object is to provide a structure of the foregoing character wherein the switch opening means includes resilient means engaging the timer shaft and biasing it toward its open position to bias the main switch open, this resilient means being rendered inoperative by the interengageable means mentioned when the door is closed. Consequently, the main switch is opened automatically upon opening of the door because of the action of the resilient switch opening means on the timer shaft, but the interengageable means on the tub and the door merely renders the main switch closable when the door is closed, without actually closing the main switch, by rendering the resilient switch opening means ineffective. Consequently, the dishwasher is not automatically restarted, or placed in condition for starting, by closure of the door, it being necessary to perform the additional manual operation of closing the main switch, which is accomplished by moving the timer shaft axially from its open position to its closed position.

Thus, the invention provides an important safety feature in that two operations are required to cause the dishwasher to start, one being closing of the door and the other being manual closing of the main switch by moving the timer shaft axially to its closed position.

The foregoing objects, advantages, features and results of the present invention, together with various other objects, advantages, features and results thereof which will be evident to those skilled in the art to which the invention relates in the light of this disclosure, may be attained with the exemplary embodiment of the invention which is described in detail hereinafter and which is illustrated in the accompanying drawings, wherein:

FIG. 1 is a side elevational view of a dishwasher which embodies the invention;

FIG. 2 is an enlarged, fragmentary front elevational view of the dishwasher;

FIG. 3 is a further enlarged, fragmentary view duplicating a portion of FIG. 2, but with parts removed to reveal internal structure;

FIG. 4 is a further enlarged, sectional view taken along the arrowed lines 4—4 of FIGS. 2 and 3, the door of the dishwasher being shown in its closed position in FIG. 4;

FIG. 5 is a view duplicating a portion of FIG. 4, but with the door of the dishwasher moved out of its closed position toward its open position;

FIG. 6 is a fragmentary perspective view illustrating a portion of a switch opening means of the invention; and

FIG. 7 is a highly simplified diagrammatic view of the electrical circuit of the dishwasher illustrating the manner in which the invention is incorporated therein.

Since the dishwasher which is shown in the accompanying drawings and in which the present invention is shown as embodied for illustrative purposes is fully described in the various co-pending applications hereinbefore mentioned, it will be described only briefly herein and only to the extent necessary to provide a complete disclosure of the present invention.

Referring particularly to FIGS. 1 and 2 of the drawings, the dishwasher is designated generally by the numeral **10** and includes an inner housing constituting a dish chamber or tub **12**, the latter being shown as enclosed by an outer housing or cabinet **14** in the particular construction illustrated. The dishwasher **10** is pro-

vided at the front thereof with a doorway 16 through which the dishwasher may be loaded with dishes to be washed, rinsed and dried and through which it may be unloaded after these operations have been completed. The dishes may be placed in or on racks 18 movable forwardly through the doorway 16 for ready accessibility. The doorway 16 is closed by a door 20 when the dishwasher 10 is in operation, the door being hinged adjacent its lower edge, in a manner not specifically shown, for pivotal movement between an upper, generally vertical, closed position wherein it closes the doorway, and a lower, generally horizontal, open position.

The dishwasher 10 includes various electrical elements which cooperate to carry out the dish washing, rinsing and drying operations mentioned. Such electrical elements are shown as including: a solenoid 22 for operating a valve 24 by means of which water is introduced into the tub 12 prior to the washing and rinsing operations; a motor 26 which drives a pump 28 for pumping water from the tub 12 either to a drain 30 at the end of each washing and rinsing operation, or to an impeller 32 during each washing and rinsing operation, the impeller spraying the water, which may be conditioned by suitable detergents or other additives, upwardly over dishes carried by the racks 18 during the washing and rinsing operations; a solenoid 34 for operating a drain valve, not shown, which connects the outlet of the pump 28 either to the drain 30, or to the impeller 32; and a heater 36 which performs a heating function in connection with the washing and rinsing water and the air used to dry the dishes after washing and rinsing. The electrical elements of the dishwasher 10 may also include such things as: a motor 38 driving a fan 40 for flowing air between the tub 12 and the cabinet 14, and through the door 20, during drying of the dishes as disclosed in the earlier co-pending Karig application mentioned; indicators, not shown, for indicating the particular operation being performed by the dishwasher at any point in it operating cycle; and the like.

The foregoing electrical elements, which are designated generally by the block 42 in FIG. 7 of the drawings, are controlled by a timer 44 which operates the various electrical elements in timed sequence to carry out the washing, rinsing and drying operations in the proper order, all as disclosed in detail in the aforementioned co-pending Karig applications. Consequently, the interconnections between the electrical elements 42 and the timer 44 are merely shown diagrammatically in FIG. 7. The timer 44 is conventional so that, except for those portions thereof which are necessary to the present invention, it is merely shown diagrammatically in FIG. 7 and in elevation elsewhere, it being understood that the timer is provided with the usual contacts connected to the various electrical elements and the usual cams for operating the electrical elements in the proper sequence, such cams being driven by the timer motor.

As best shown in FIGS. 4 and 5, the timer 44 is mounted on the door 20 within a compartment 52 formed by horizontally spaced inner and outer walls 54 and 56 of the door. In the construction illustrated, the outer wall 56 includes a lower panel 58 and an upper escutcheon 60. The timer 44 is suitably supported within the compartment 52 in a rigid manner, as by means of a supporting bracket 62. As shown, the timer 44 is connected to the bracket 62 by screws 64, FIGS. 3 and 4, which extend through the bracket into the timer housing, the bracket itself being shown as rigidly secured to frame members 66 and 68 rigidly connected to the inner wall 54 of the door 20.

The timer 44 includes a shaft 70 which projects forwardly through the escutcheon 60 and which is provided with a control knob 72 forwardly of the escutcheon. As is conventional, this control knob may be provided with indicia, or may cooperate with indicia on the escutcheon 60, indicating the point in the operating cycle at which the dishwasher 10 is operating.

As is well known in the art, the timer 44 includes a motor which drives the shaft 70 through one revolution, or at least a part of one revolution, for each operating cycle of the dishwasher 10. The timer motor, as is conventional, also drives the cams, or equivalent means, for energizing the various electrical elements of the dishwasher 10 at the proper points in the operating cycle. For example, the timer 44 may be of the construction disclosed in Patent No. 2,549,025 to K. O. Sisson, or Patent No. 2,561,348 to G. W. Dunham, or Patent No. 2,703,347 to A. R. Constantine, or Patent No. 2,806,095 to W. E. Stilwell, Jr.

In addition to being rotatable about its axis, the timer shaft 70 is axially reciprocable between an inner, or rearward, position, hereinafter referred to as its open position, and an outer, or forward position, hereinafter referred to as its closed position. The timer 44 includes a main switch 74 which is connected to the timer shaft 70, as indicated diagrammatically by the dotted line connection 76 in FIGS. 4 and 7, the main switch being open when the timer shaft 70 is in its inner or open position and being closed when the timer shaft is in its outer or closed position. The open position of the timer shaft 70 is shown in FIG. 5 and the closed position thereof is shown in FIG. 4, the open position also being shown in FIG. 7.

As indicated in FIG. 7, the main switch 74 controls the entire electrical circuit of the dishwasher 10 so that the dishwasher is completely inoperative when the main switch is open. In other words, the main switch 74 controls all of the electrical components of the dishwasher 10, including the electrical elements represented by the block 42 in FIG. 7 and the timer 44 itself. This is preferably accomplished simply by connecting the main switch 74 in series in the electrical circuit, as shown in FIG. 7. However, the main switch 74 may control the entire circuit in other ways equivalent to connecting it directly in series.

The timer shaft 70 is provided thereon with an annular shoulder or flange 80, shown as a snap ring disposed in an annular groove in the shaft, one side of which is engageable with the housing of the timer 44, as shown in FIG. 5, to prevent inward movement of the timer shaft beyond its open position. The other side of the flange 80 is engageable by a cantilever leaf spring 82 having therein an elongated aperture 84 through which the timer shaft 70 extends. One end of the leaf spring 82 is rigidly anchored, as by securing it to a portion of the timer bracket 62 by a screw 86. The other end of the leaf spring 82 carries a stop 88 which projects rearwardly through an aperture 90 in the inner wall 54 of the door 20 and which is engageable with a stop 92 on the tub 12, i.e., rigidly connected to the tub.

Operation

When the door 20 is in its closed position, as shown in FIG. 4, the stop 88 on the leaf spring 82 engages the stop 92 on the tub 12 to hold the leaf spring away from the housing of the timer 44 far enough to permit the timer shaft 70 to be pulled outwardly into its closed position to close the main switch 74, as shown in FIG. 4 of the drawings. Under such conditions, the electrical circuit of the dishwasher 10 is operative so that the timer 44 causes the dishwasher to run through its operating cycle.

Whenever the door 20 is moved out of its closed position toward its open position, either between operating cycles, or during an operating cycle, the stop 88 on the leaf spring 82 disengages the stop 92 on the tub 12, as shown in FIG. 5, to permit the leaf spring to move the timer shaft 70 inwardly into its open position to open the main switch 74, thereby completely de-energizing the dishwasher 10. As will be apparent, this occurs upon a very slight opening movement of the door 20 so that

spilling of water is prevented, even if the impeller **32** happens to be in operation.

When the door **20** is subsequently closed, the stop **88** on the leaf spring **82** merely re-engages the stop **92** on the tub **12** to make it possible to move the timer shaft **70** outwardly to its closed position, without, however, so moving the timer shaft. Before the dishwasher **10** can be started, or restarted, after closing the door **20**, it is necessary to perform the further operation of manually pulling the timer shaft **70** outwardly into its closed position to close the main switch **74**.

With this construction, it is impossible to start the dishwasher **10** inadvertently with the door **20** open since starting the machine under such conditions would require deliberate outward movement of the timer shaft **70** in opposition to the action of the leaf spring **82**. Furthermore, with the door open, it is necessary to perform two different operations to start, or re-start, the dishwasher **10**, these being closing of the door **20** and subsequent pulling of the timer shaft **70** outwardly into its closed position to close the main switch **74**. Thus, the present invention eliminates any possibility of spilling water from the tub **12**, even if the door is opened or closed with the control knob **72** set in a position corresponding to the washing or rinsing portions of the operating cycle.

Although an exemplary embodiment of the invention has been disclosed herein for purposes of illustration, it will be understood that various changes, modifications and substitutions may be made in connection with some or all of the elements of the combination which comprises the invention without departing from the spirit of the invention, as defined by the claims which follow.

I claim:

1. In combination: a housing structure having a doorway and a door structure moveable relative to said housing structure between an open position and a closed position closing said doorway; electrically operable means for processing articles within said housing structure; a timer on one of said structures for controlling said electrically operable means and including a main switch having a moveable switch element moveable between closed and open positions; said timer further including a manually operable control member adjacent said moveable switch element for controlling the position of said moveable switch element; and means responsive to movement of the door structure from closed to open position to move said moveable switch element into its open position if the position of said control member, prior to said movement of said door structure from closed to open position, was such as to place said switch element in its closed position; the means last mentioned comprising a mechanical element on one of said structures adjacent said timer and engageable with the other structure when said door structure is closed and moveable in response to said movement of said door structure from closed to open position to move said moveable switch element into its open position if the position of said control member, prior to movement of said door structure from closed to open position, was such as to place said switch element in its closed position; said mechanical element being directly engageable with said control member and being spring biased in a direction to engage said control member and cause it to move said moveable switch element into its open position if the position of said control member, prior to movement of said door structure from closed to open position, was such as to place said switch element in its closed position, said mechanical element being moveable against spring bias, in response to closing of said door structure, to forceably hold it out of engagement with said control member.

2. The combination set forth in claim 1 wherein said control member is provided thereon with an annular shoulder and wherein said mechanical element is engageable with said annular shoulder.

References Cited in the file of this patent

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