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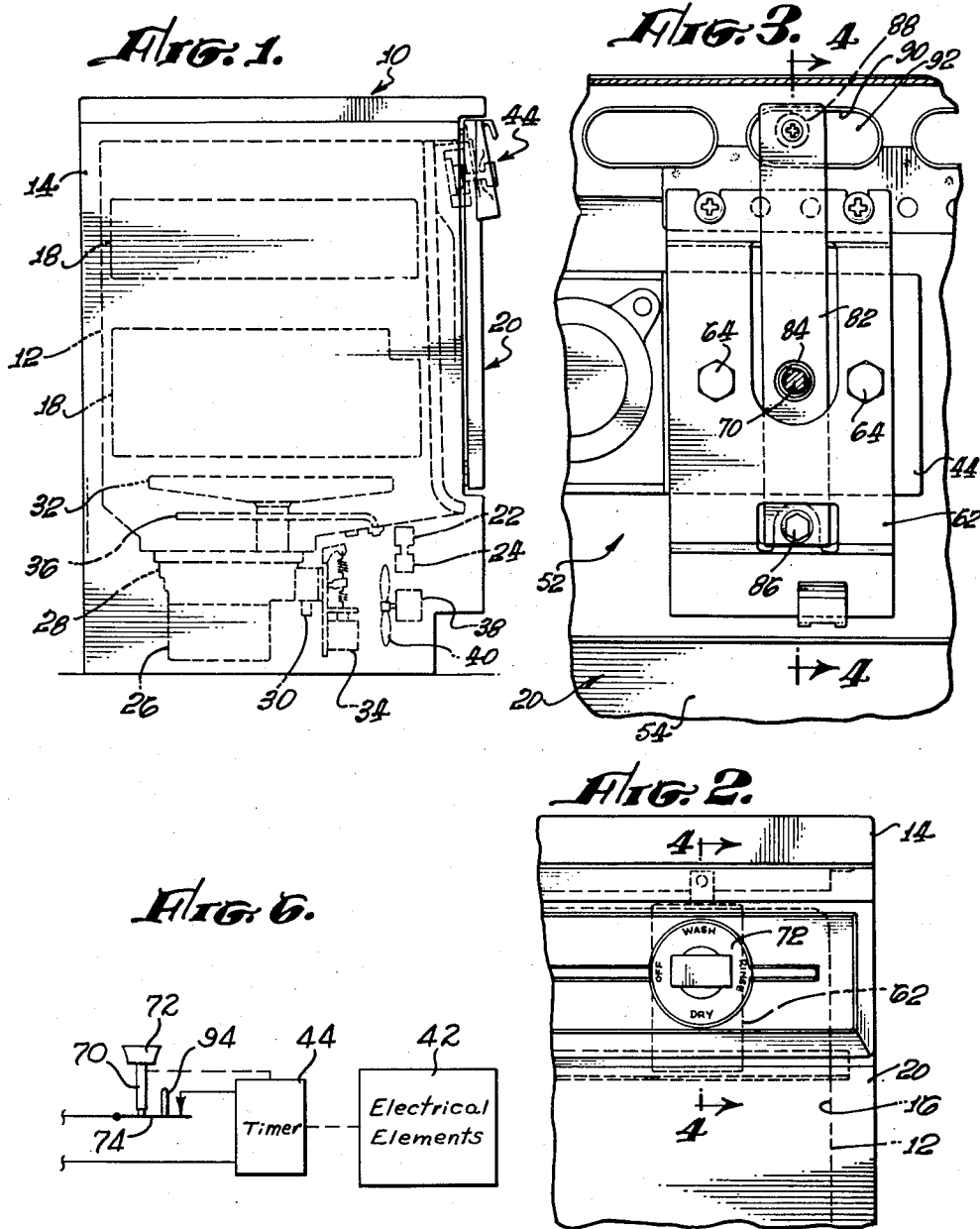
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DISHWASHER WITH DOOR ACTUATED MEANS FOR OPERATING TIMER SWITCH

Filed Aug. 24, 1959

2 Sheets-Sheet 1



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Fig. 4.

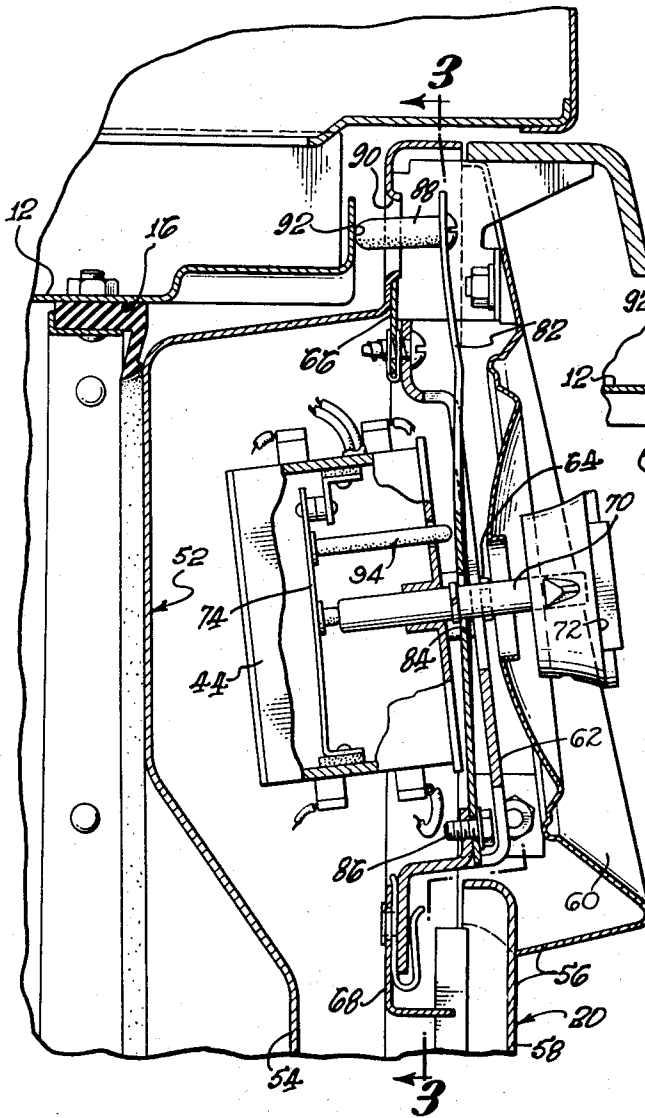
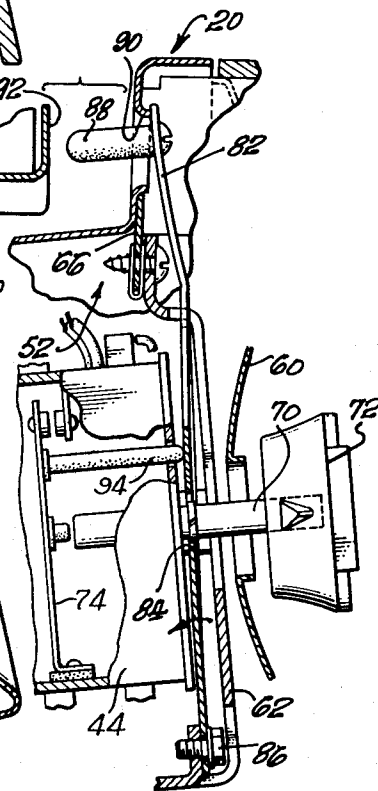


Fig. 5.



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DISHWASHER WITH DOOR ACTUATED MEANS FOR OPERATING TIMER SWITCH

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4 Claims. (Cl. 134—58)

The present invention relates in general to an apparatus comprising a housing having a door and comprising electrical equipment which must be de-energized automatically upon opening of the door, if not otherwise de-energized prior to opening of the door, so as to prevent various undesirable consequences which may result from opening of the door with the electrical equipment in operation.

The present application claims subject matter disclosed in co-pending application Serial No. 813,521, filed May 15, 1959 by John A. Fay, one of the applicants herein, both applications being assigned to the same assignee. More particularly, the invention relates to an apparatus of the foregoing character wherein the electrical equipment comprises and is controlled by a timer which includes a main switch in series with, or effectively in series with, the electrical equipment.

A primary object of the invention is to provide an apparatus of the nature hereinbefore outlined which includes means responsive to movement of the door from its closed position toward its open position for automatically opening the main switch mentioned, i.e., the main switch of the timer of the apparatus.

With the foregoing construction, no independent shut-off switch operable by the door is required, the main switch of the timer performing both its usual function and the function of the independent, door-operated shut-off switch characteristically employed in an apparatus of this kind. Consequently, the present invention eliminates one switch, thereby reducing the cost of manufacturing the apparatus, reducing service problems, and the like, which is an important feature of the invention.

Another object is to provide an apparatus having the foregoing characteristics wherein the timer is carried by the door, thereby simplifying opening of the main switch of the timer upon opening of the door. However, the timer may also be carried by the housing if desired.

Another object is to provide an apparatus which includes resilient means carried by the door and engaging the main switch for opening the main switch upon movement of the door out of 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 described in detail hereinafter and 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; and

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FIG. 6 is a highly simplified diagrammatic view of the electrical circuit of the dishwasher illustrating the manner in which the invention is incorporated therein.

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 copending applications of Horace E. Karig, Serial No. 482,239, filed January 17, 1955, and now Patent No. 2,918,068, 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.

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 now to FIGS. 1 and 2 of the drawings in particular, 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 provided 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 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 its operating cycle; and the like.

The foregoing electrical elements, which are designated generally by the block 42 in FIG. 6 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. 6. 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. 6 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. 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.

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.

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 engageable by the timer shaft 70, 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 timer shaft 70 is shown in its closed position in FIGS. 4, 5 and 6.

As indicated in FIG. 6, 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. 6 and the timer 44 itself. This may be accomplished simply by connecting the main switch 74 in series in the electrical circuit, as shown in FIG. 6. However, the main switch 74 may control the entire circuit in other ways equivalent to connecting it directly in series.

The main switch 74, in addition to being operable by the timer shaft 70 in the foregoing manner, is also operable independently of the timer shaft by a cantilever leaf spring 82. In the particular construction illustrated, the timer shaft 70 extends through the leaf spring 82, interengagement between the timer shaft and the leaf spring being prevented, however, by providing the leaf spring with an enlarged aperture 84 so that the leaf spring and the timer shaft are freely movable relative to each other. 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. Intermediate its ends the leaf spring 82 is engageable with the forward or outer end of a pin 94 the inner or rearward end of which is engageable with the main switch 74, the pin 94 being shown as mounted on the main switch 74 for convenience in the particular construction illustrated. As will be apparent, when the leaf spring 82 is in the position shown in FIG. 4 of the drawings, it disengages the outer end of the pin 94 to permit the main switch 74 to close, assuming that the timer shaft 70 is in its forward or closed position. Conversely, when the leaf spring 82 is in the position of FIG. 5, it acts through the pin 94 to open the main switch 74, irrespective of the position of the timer shaft 70.

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 timer 44 far enough to disengage, or substantially disengage, the pin 94, thereby permitting the main switch 74 to close, provided that the timer shaft 70 is in its outer or closed position. 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 pin 94 inwardly into what can be termed its open position so as to open the main switch 74, thereby completely de-energizing the dishwasher 10. This action occurs irrespective of whether the timer shaft 70 is in its open position, or its closed position. As will be apparent, the leaf spring 82, acting through the pin 94, opens the main switch 74 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 re-engages the stop 92 on the tub 12 so that the main switch 74 may close, if the timer shaft 70 is in its outer or closed position. Consequently, the dishwasher 10 is automatically re-started, or readied for re-starting, depending upon whether the timer shaft 70 is in its closed position or in its open position.

As hereinbefore pointed out, utilizing the main switch 74, with which the timer 44 is conventionally provided

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as the door-actuated shut-off switch eliminates the independent door-actuated, shut-off switch characteristically employed in prior apparatuses of this type. The resultant elimination of one which has important advantages, as hereinbefore pointed out. With the timer 44 mounted in the door 20, the foregoing result is achieved very simply with the leaf spring and pin arrangement 82 and 94, which is another important feature.

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 incorporated therein without departing from the spirit of the invention, as defined by the claims which follow.

We 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 struc-

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ture 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.

2. The combination set forth in claim 1 wherein said mechanical element is directly engageable with said switch element and is spring biased in a direction to engage said switch element and is moveable against said spring bias, in response to closing of said door structure, to forcibly hold it out of engagement with said switch element.

3. The combination set forth in claim 2 wherein said timer and said mechanical element are mounted on said door structure; said mechanical element comprising a cantilever leaf spring the free end portion of which engages said housing structure upon closing said door structure to forcibly move and hold it out of engagement with said switch element.

4. The combination set forth in claim 1 wherein said switch element is spring biased toward closed position; said control member and said mechanical element each having a portion moveable thereby into abutting engagement with said switch element to move the same to open position against the action of its spring bias.

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