Jan. 11, 1966 J. M. HARROFF 3,229,061

DISHWASHER DOOR INTERLOCK SWITCHING MEANS

Filed Dec. 11, 1963 2 Sheets-Sheet 1

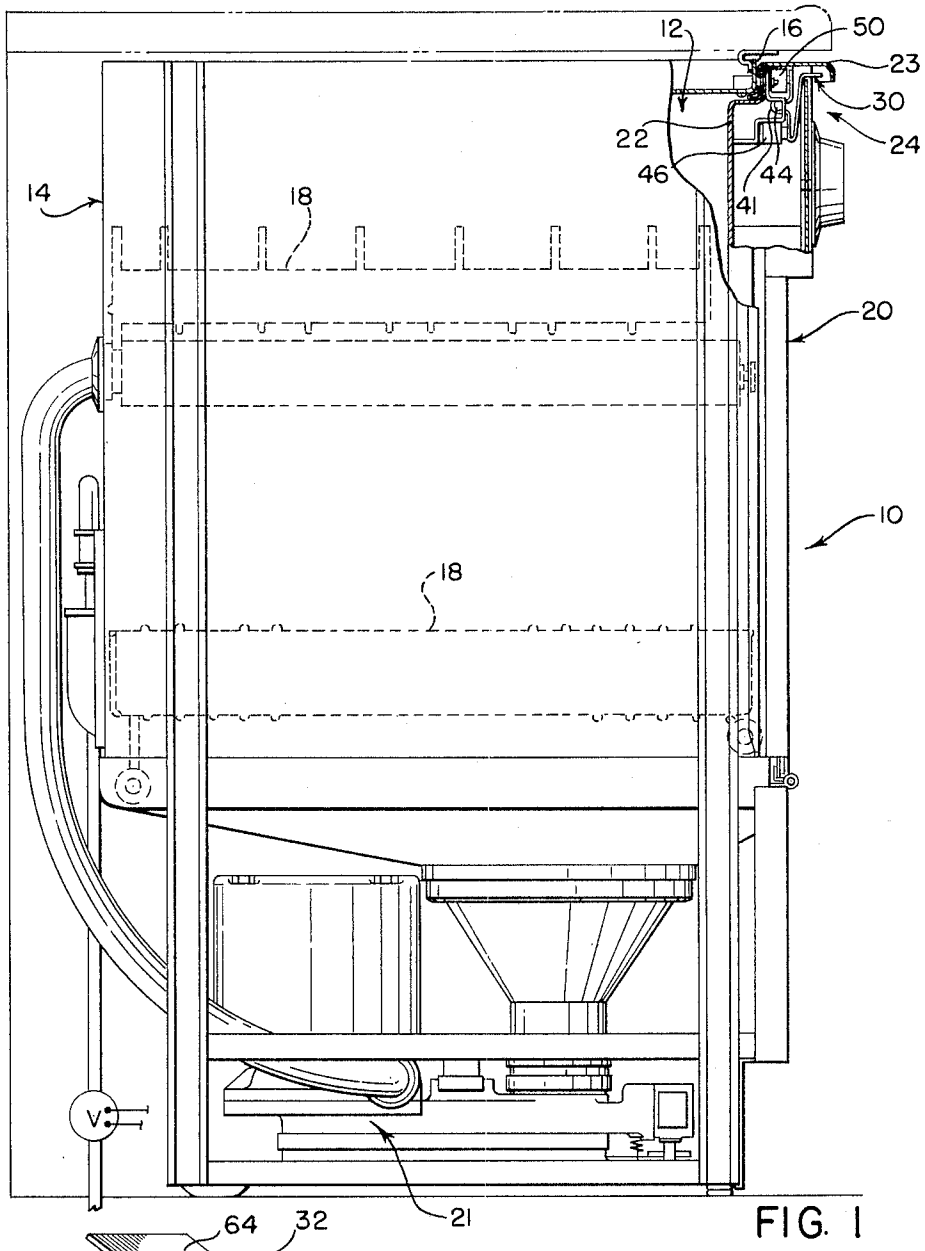


FIG. 1

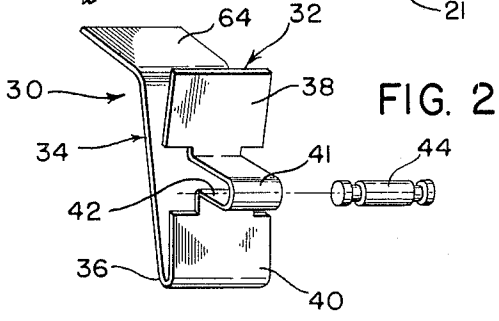


FIG. 2

INVENTOR.
JERRY M. HARROFF

BY
Tilberry & Body
ATTORNEYS

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DISHWASHER DOOR INTERLOCK SWITCHING MEANS

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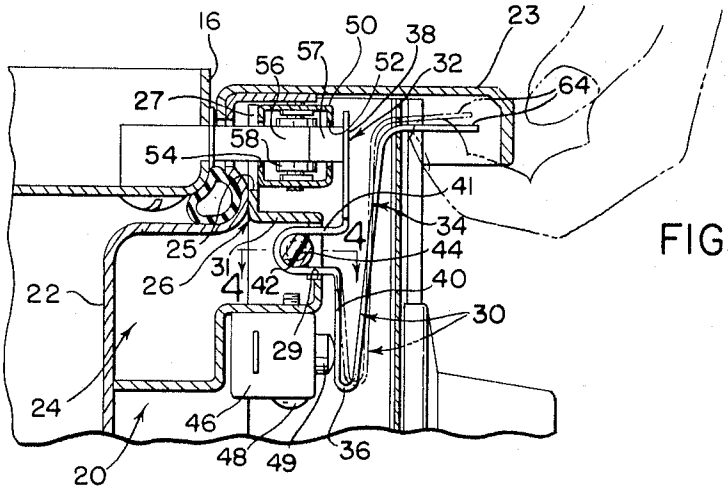


FIG. 3

FIG. 5

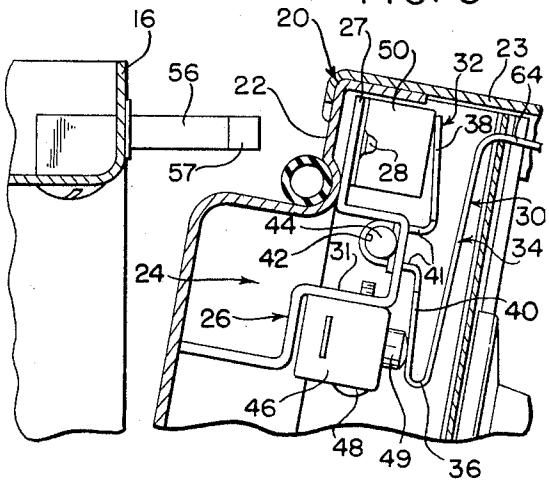
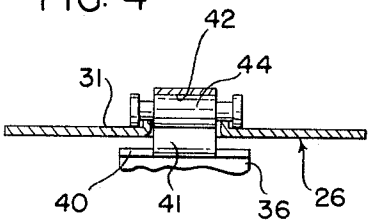


FIG. 4



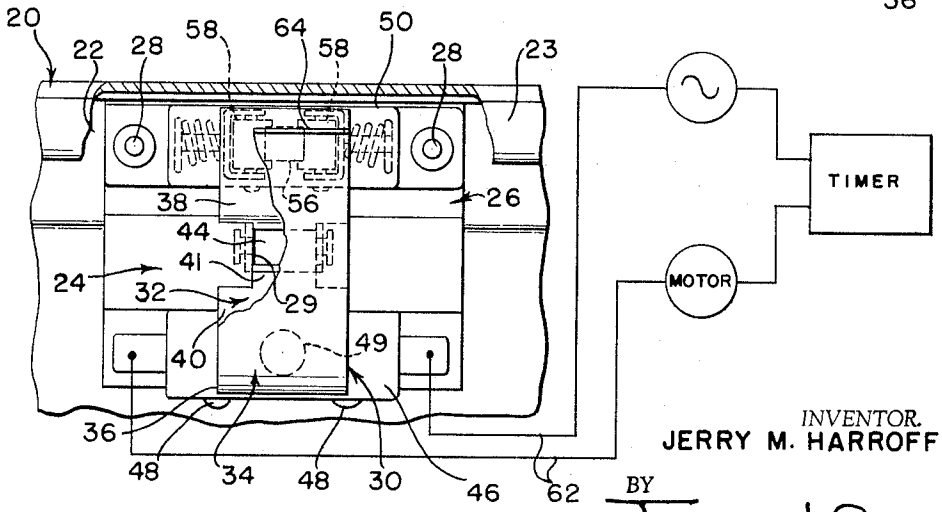


FIG. 6

INVENTOR.
JERRY M. HARROFF

BY Tilbury & Body

ATTORNEYS

United States Patent Office 3,229,061 Patented Jan. 11, 1966

3,229,061
DISHWASHER DOOR INTERLOCK SWITCHING MEANS

Jerry M. Harroff, Salem, Ohio, assignor to Mullins Manufacturing Corporation, Salem, Ohio, a corporation of Ohio

Filed Dec. 11, 1963, Ser. No. 329,653
5 Claims. (Cl. 200—61.62)

The present invention relates to dishwashing machines and the like, and more particularly, to a door switch interlock assembly.

Generally in electrical appliances such as washing and drying machines, where doors are provided for gaining access to the working chamber, a door switch arrangement is provided for rendering the electrical equipment in the appliance energizable once the door is closed, and which also serves to de-energize the electrical equipment in the event the door is opened during the operation of the appliance. Although the fundamental purpose for such a switching arrangement is, of course, to protect the operator of the appliance from bodily harm, a still further purpose is served in the case of front loading washing appliances where, but for the door interlock switch, the adjacent floor area would be flooded if the door were opened during the operation of such an appliance.

However, in the case of front loading dishwashing machines and the like, the above referred to door interlock switch arrangement has not been completely satisfactory from the standpoints of safety or convenience. For if the doors of such machines are abruptly opened during operation, both the operator and portions of the surrounding area will be wetted by a certain amount of the water which was in mid-air, and thus impossible to stop by merely de-energizing the electrical equipment. The safety hazard becomes apparent when it is realized that the temperature of the water in such machines is sufficiently high to cause painful injury.

In view of the foregoing hazards which the standard door interlock arrangements fail to overcome, it is a principal and significant object of the present invention to provide a new and novel door interlock switch which enables the operator of the machine to open the door at any time with complete safety and without danger of flooding the immediate area.

Another object of the present invention is to provide an interlock switch assembly which is of simple, durable construction, easily maintained and quickly installed.

The interlock switch assembly of the present invention which is preferably mounted in the door of an automatic dishwasher or the like, serves to place the electrical equipment of the machine in an energizable condition when the door of the machine is closed. In addition the switch assembly is provided with means which enables the operator to de-energize the electrical equipment while the door is in its closed position.

The interlock switch assembly of the present invention which operates in the foregoing manner consists of a flexible element movably mounted on the dishwasher door and a switch responsive to the movement of the element for either de-energizing the electrical equipment of the machine or for placing the equipment in an energizable condition.

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:

FIGURE 1 is a side view in elevation of a dishwasher, of the front loading type, with portions broken away and sectioned to illustrate the location of the assembly of the present invention;

FIGURE 2 is a perspective view of a pair of elements which form part of the assembly of the present invention;

FIGURE 3 is a fragmentary view in side elevation of the switch means of the present invention being manually operated;

FIGURE 4 is a view taken along line 4—4 of FIGURE 3;

FIGURE 5 is a fragmentary view somewhat similar to FIGURE 3; and

FIGURE 6 is a front view in elevation of the switch of the present invention with parts broken away, other parts shown in phantom and a highly simplified diagrammatic view of the electrical circuit to which the switch is connected.

While the various features of this invention are hereinafter illustrated and described as being particularly adaptable and useful in a dishwasher or the like, it is to be understood that the various features of this invention can be utilized as an interlock switch 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 for this invention.

Referring now to the drawings and more particularly FIGURE 1, an automatic dishwasher is shown and generally designated by the numeral 10, and includes an inner dish chamber 12, enclosed by an outer housing or cabinet 14, which cabinet 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. In order to close doorway 16 when the dishwasher 10 is in operation, a door 20 is provided which includes a panel 22 and a handle bar 23, the door being hinged adjacent its lower edge for pivotal movement between an upper, generally vertical, closed position wherein it closes the doorway, and a lower, generally horizontal, opened position.

Dishwasher 10 further includes various elements such as a pump 21 and a heater (not shown) and various solenoids, which cooperate to carry out the dishwashing, rinsing and drying operations. The foregoing electrical elements, along with others that may be required, are controlled by a conventional timer which operates the various elements in timed sequence to carry out the above referred to operations in the proper order. Since neither the timer nor any of the electrical elements referred to form a part of the present invention they are not shown in detail nor will their operation be described.

With particular reference now to FIGURES 1, 3 and 5, the interlock switch assembly of the present invention is indicated generally by the numeral 24 and is preferably mounted on panel 22 of door 20 immediately below handle 23 by means of a bracket 26.

Bracket 26, which is in the form of a flanged channel, is provided with an aperture 25 in flange 27 and an aperture 29 in channel portion 31.

The various elements of which assembly 24 is comprised, are mounted on bracket 26, flange 27 of which is secured to panel 22 by means of screws 28.

The primary actuating element of switch assembly 24 is a leaf spring 30, generally V-shaped in form, and con-

sisting of a pair of flat arms 32, 34 which converge and are joined together at apex 36.

Leaf spring 30 is mounted for pivotal movement in and with respect to bracket 26 by means of a narrow strip portion 41 which is formed intermediate opposite end portions 38, 40 of arm 32. This strip portion 41 is bent to form an open loop 42 which is received in aperture 29 of bracket 26 and is secured therein for facilitating pivotal movement of spring 30 by means of a lever pin 44 journaled in loop 42. Lever pin 44, which is of sufficient length to span aperture 29, rests with its opposite end portions in engagement against the inner surface on opposite sides of the aperture within channel portion 31 of bracket 26.

In addition to leaf spring 30, the interlock switch assembly 24 of the present invention also includes a switching element 46 which is secured by screws 48 to the lower side wall of the channel portion 31 of bracket 26.

Switching element 45 is electrically speaking, normally open and actuable to its closed position upon depression of a spring biased plunger 49 which projects outwardly from element 46 and rests in engagement with a side of end portion 40 of arm 32.

On the side of channel portion 31 opposite switching element 46 a housing 50 is secured to flange 27 by means of screws 28 which, as previously indicated, also serve to attach bracket 26 to panel 22. On two of its sides housing 50 is provided with a pair of oppositely disposed apertures 52, 54 which are in alignment with aperture 25 in flange 27 thereby forming a continuous opening at this point through panel 22 and housing 50. As best shown in FIGURE 3, this continuous opening through panel 22 and housing 50 is for the purpose of receiving a doorway mounted outwardly projecting shaft 56 when door 20 is raised into its closed position against doorway 16. In order that door 20 may be snugly yet releasably held in its closed position against doorway 16, shaft 56 is provided with an enlarged tip 57 at its unattached end which is received between and projects through a pair of spring biased elements, such as rollers 58, in housing 50. Thus when door 20 is in its closed position a positive, although reasonable, outward pull on door handle bar 23 is required in order to enable rollers 58 to be withdrawn around the enlarged tip of shaft 56.

As previously indicated leaf spring 30 is mounted for pivotal movement on bracket 26 by means of pin 44 and is further supported by means of the engagement between plunger 48 of element 46 and end portion 40 of arm 32. In order that the interlock switch assembly 24 of the present invention may be responsive to the opened and closed positions of door 20, arm 32 is provided with an appropriate bend at strip 41 for enabling end portion 38 to rest in engagement against housing 50 when the door is in its opened position, as shown in FIGURE 5, and against tip 57 of shaft 56 when the door is in its closed position, as shown in FIGURE 3.

The nature and extent of the bends provided in strip 41 adjacent portions 38 and 40 should be such that switching element 46 is not actuated into its closed condition until the closing of door 20. That is, leaf spring 30 will be in a relaxed position until the door is closed whereupon it will assume a flexed position. More particularly, when door 20 is in its open position the position of arm 32 should be such that end portion 38 rests against housing 50 and end portion 40 rests against, but does not depress plunger 48. However when door 20 is moved into its closed position shaft 56 should then extend through the continuous opening provided through panel 22 and housing 50 and press against end portion or actuating surface 38 causing arm 32 to pivot about pin 44 depressing plunger 48 thereby electrically closing switching element 46.

The operation of the interlock switch assembly 24 as described thus far is such that when switching element 46 is connected through conductors 62 in series with the electrical components of dishwasher 10, it will serve to render such components energizable when door 20 is closed and will further de-energize such components in the event door 20 is opened during the operation of the dishwasher.

Since it is sometimes either necessary or otherwise desirable to open door 20 of the dishwasher while it is in operation, a manually actuable lever arm 34 is provided for on assembly 24 to stop the flow of water before the door is opened thereby eliminating the escape of water in suspension when the door is opened.

As shown in FIGURES 3 and 5, arm 34 is joined to arm 32 at apex 36 and is provided with an outwardly projecting flange 64 at its opposite end adjacent the underside of handle bar 23 on door 20. Although flange 64 is shown in the illustrative views as being substantially of the same width as arm 34, it may in fact be of any desired width.

With reference now to the operation of the interlock switch assembly 24 of the present invention reference will be made to FIGURE 3 wherein door 20 is shown in its closed position and wherein it is assumed that dishwasher 10 is in operation.

As is apparent from the foregoing description the closing of door 20 against doorway 16 placed the electrical components of the machine in an energizable condition due to the resulting pressed engagement between the tip of shaft 56 and arm portion 38 which caused the pivoting about pin 44 of arm 32 and the depression of plunger 48 by arm portion 40 thereby actuating switching element 46 into its closed position.

In order to stop the water flow in dishwasher 10 by means of assembly 24 before opening the door, it is only necessary to manually press flange 64 upwardly, as illustrated in FIGURE 3, toward the underside of handle bar 23 to the position shown by the broken lines. As the drawing illustrates the upward pressure against flange 64 while causing arm 34 to move in a backward direction toward door panel 22 has also caused apex 36 and arm portion 40 to pivot about the lower portion of strip 41 in a forwardly direction away from door panel 22. As a result of this forward movement by arm portion 40 the actuating pressure it exerted against plunger 48 is released and switching element 46 assumes its normally open condition thereby de-energizing the electrical components in the machine which in turn stops the flow of water therein. With flange 64 held in the position shown by the broken lines, door 20 may be pulled open by means of handle 23 since the water in suspension within chamber 12 settled shortly after the release of plunger 48 stopped the flow of water. Once the door is opened flange 64 may be released since, with shaft 56 no longer in pressed engagement against arm portion 38, plunger 48 of switching element 46 will not be depressed by arm portion 40.

The foregoing description of the structural arrangement of assembly 24 is an exemplary embodiment of the present invention for purposes of illustration, and as such it should 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 a domestic appliance having a housing defining a compartment with a doorway and a door movable relative to said housing between an open and closed position, operating means including an electrical circuit for energizing said operating means and a switch having normally open contacts to de-energize said operating means located in the path of movement of said door, the improvement comprising: a spring element engageable with the switch having a flexed position when the door is closed and a relaxed position when opened and including a switch actuating portion operable to bias said switch contacts closed in the flexed position; means operable upon closing said door for moving said spring element from the relaxed position to the flexed position; and manual release means for biasing said switch actuating portion away

from said switch contacts thereby de-energizing said operating means while said spring element is still in the flexed position and prior to opening said door.

2. The improvement as set forth in claim 1 wherein the switch and spring element are mounted on said door for movement therewith and said means operable for moving said spring element is fixedly mounted on said housing for engagement with said spring element when said door is closed.

3. The improvement as set forth in claim 2 wherein said operable means for moving said spring element is a fixed abutment and said spring element includes an actuating surface engageable with said abutment in the closed door position.

4. A domestic appliance comprising a housing defining a compartment and a doorway thereto; a door movable in said doorway relative to said housing between an open and closed position; operating means including an electrical circuit for energizing said operating means; a switch member mounted on said door having normally open contacts for de-energizing said operating means; a spring element pivoted on said door adjacent said switch member including an actuating surface and a switch actuating

portion an opposite sides of said pivot; abutment means mounted on said housing being engageable with said actuating surface upon closing of the door and being operable therewith for biasing said switch actuating portion to close said switch contacts energizing said operating means; and manual release means for biasing said switch actuating portion away from said switch member allowing said contacts to open while said spring element is still in a flexed position thereby shutting off said operating means prior to opening said door.

5. A domestic appliance as set forth in claim 4 wherein said spring element is a V-shaped leaf spring the apex of which corresponds to said switch actuating portion and one leg portion of which corresponds to said manual release means.

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BERNARD A. GILHEANY, *Primary Examiner.*

CHARLES A. WILLMUTH, *Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,229,061 January 11, 1966

Jerry M. Harroff

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the grant, lines 2 and 3, and in the heading to the printed specification, lines 5 and 6, for "a corporation of @hio", each occurrence, read -- a corporation of Delaware --.

Signed and sealed this 21st day of November 1967.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents