

Oct. 5, 1965

W. H. YAKE

3,210,490

LATCH MECHANISM INCLUDING SWITCH MEANS

Filed June 24, 1963

4 Sheets-Sheet 1

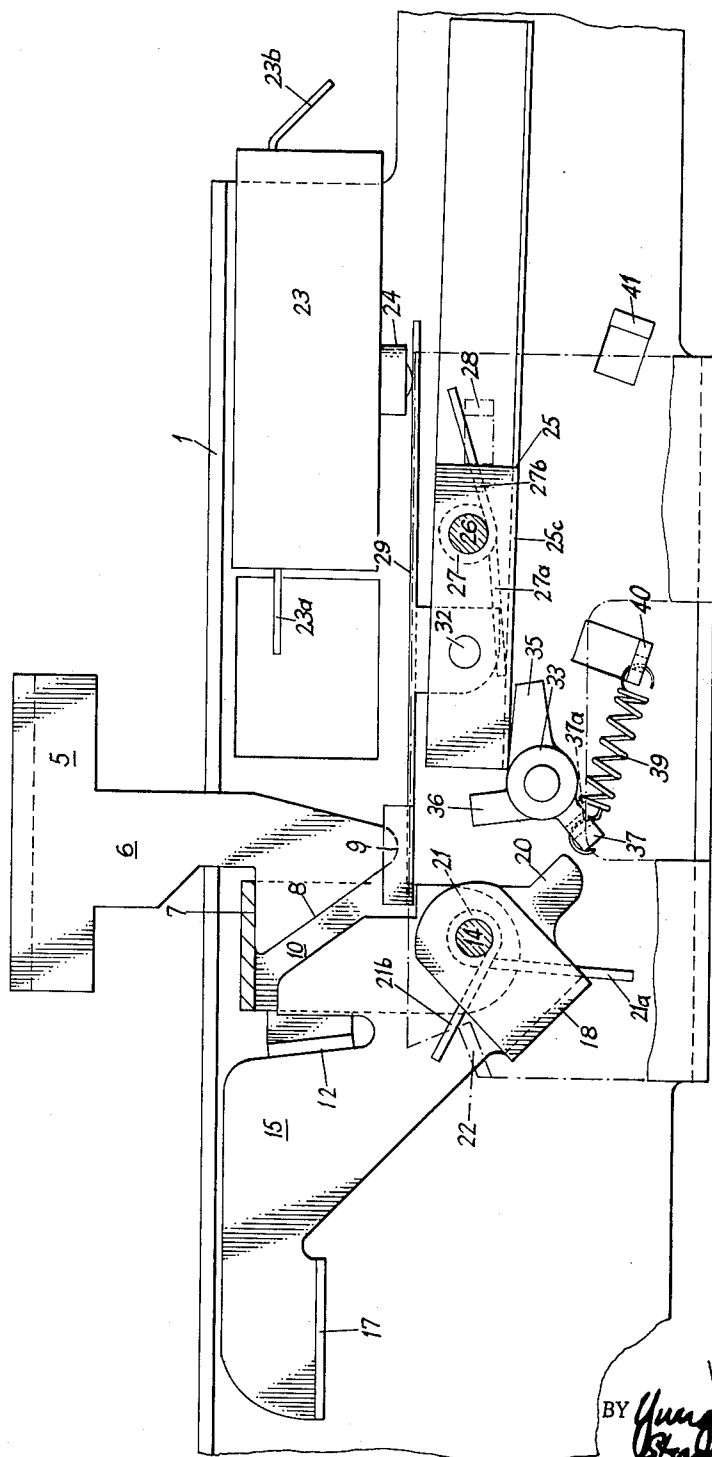


Fig. 1

INVENTOR
WILLIAM H. YAKE,
BY *Youngbit, Melville,
Straw & Foster,*
ATTORNEYS.

Oct. 5, 1965

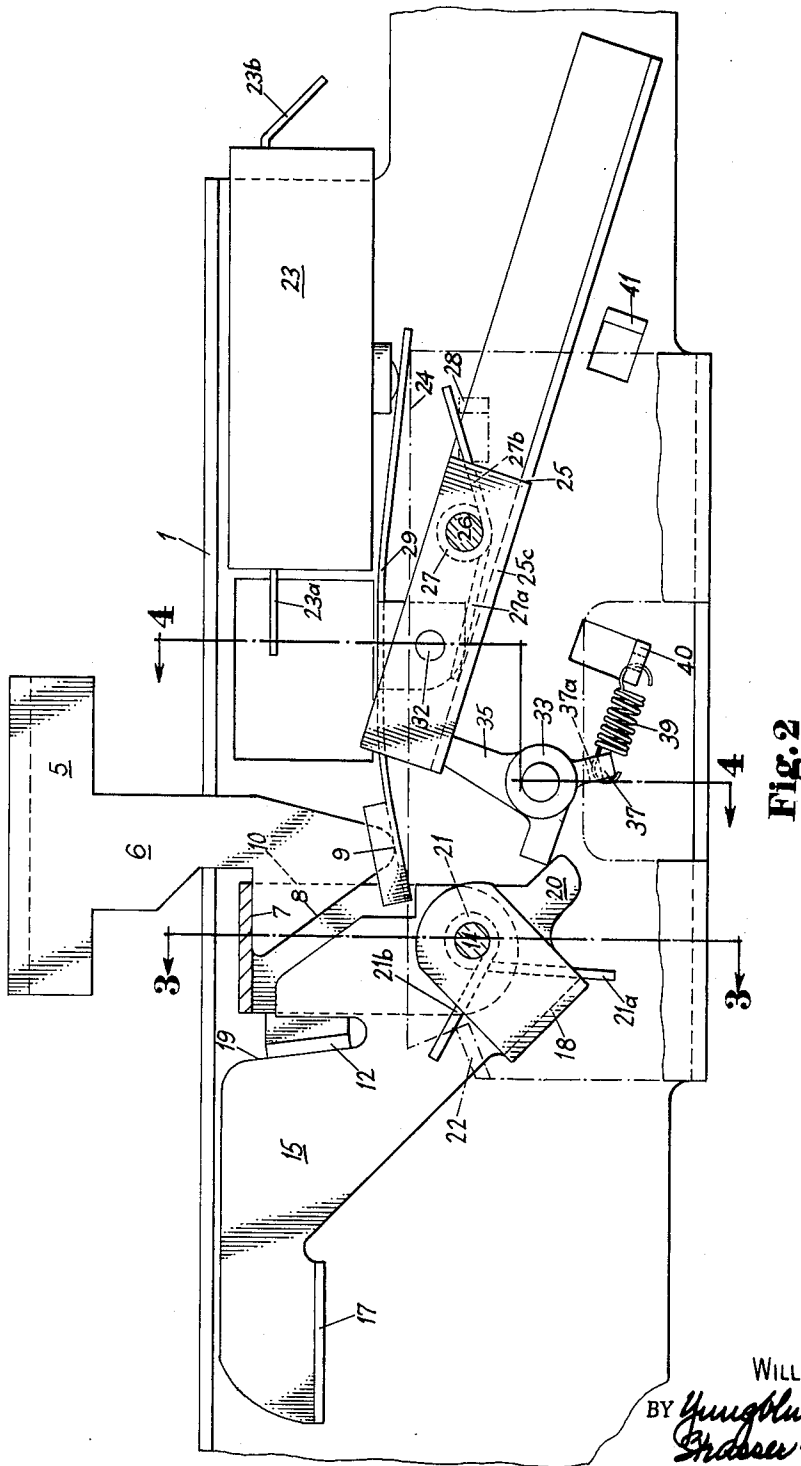
W. H. YAKE

3,210,490

LATCH MECHANISM INCLUDING SWITCH MEANS

Filed June 24, 1963

4 Sheets-Sheet 2



INVENTOR.
WILLIAM H. YAKE,
BY *Youngblut, Melville,
Shaw & Foster*
ATTORNEYS.

Oct. 5, 1965

W. H. YAKE

3,210,490

LATCH MECHANISM INCLUDING SWITCH MEANS

Filed June 24, 1963

4 Sheets-Sheet 3

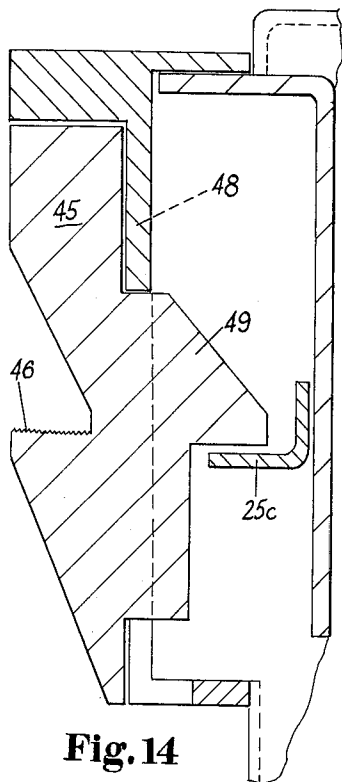


Fig. 14

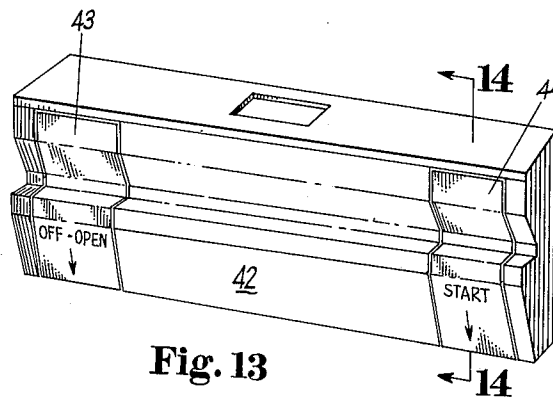


Fig. 13

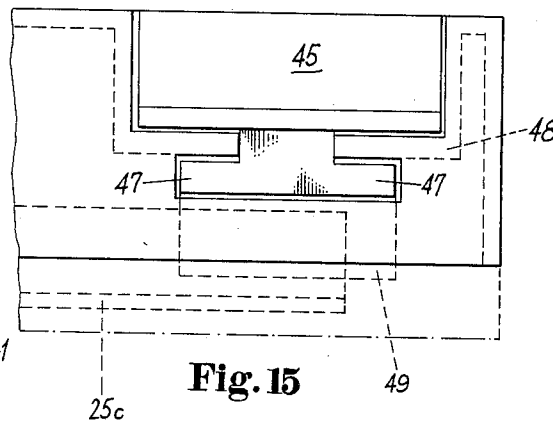


Fig. 15

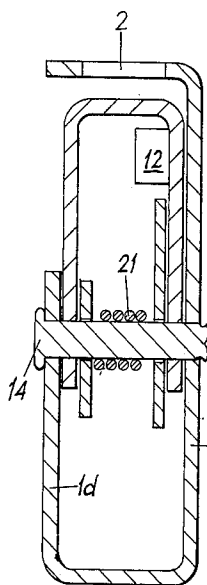


Fig. 3

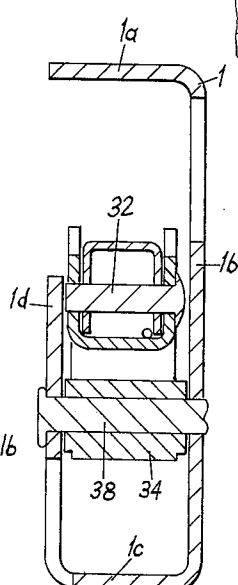


Fig. 4

INVENTOR
WILLIAM H. YAKE,
BY *Yungblut, Melville,
Grassie & Foster,*
ATTORNEYS.

Oct. 5, 1965

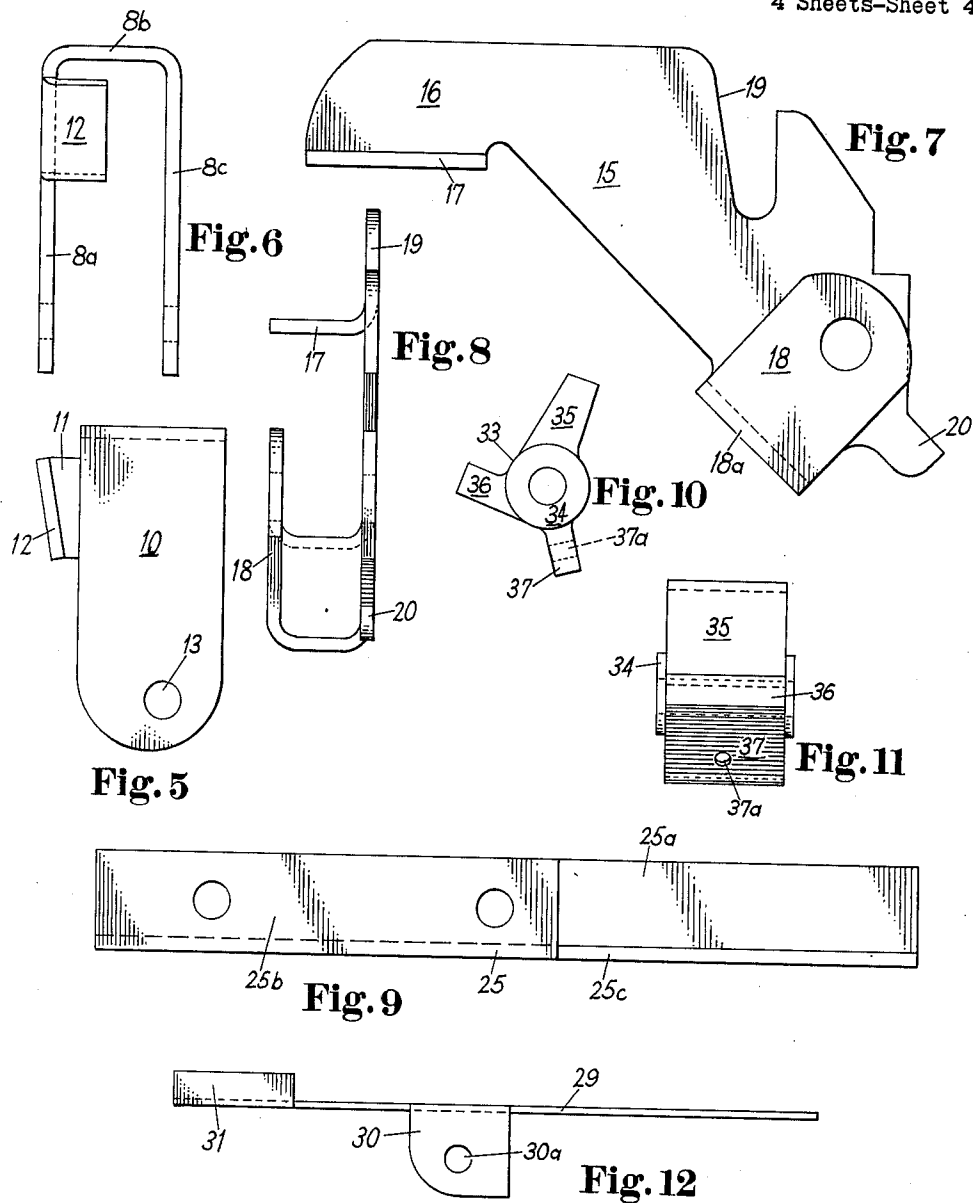
W. H. YAKE

3,210,490

LATCH MECHANISM INCLUDING SWITCH MEANS

Filed June 24, 1963

4 Sheets-Sheet 4



INVENTOR
WILLIAM H. YAKE,
BY *Yungblut, Melville,
Gasser & Fowler,*

ATTORNEYS.

1

3,210,490

LATCH MECHANISM INCLUDING SWITCH MEANS

William H. Yake, Connersville, Ind., assignor to Design and Manufacturing Corporation, Connersville, Ind., a corporation of Indiana

Filed June 24, 1963, Ser. No. 289,906

10 Claims. (Cl. 200—50)

This application relates to door latch devices, particularly those which incorporate or actuate a switch mechanism. Such devices, while not confined thereto, are of particular utility in connection with certain types of household appliances, such as washing machines and dishwashers, where it is desired that an operating mechanism will be rendered inoperative or stopped when a door is open, and for so long as the door remains in the open condition.

In many instances the door of an appliance has itself been arranged to actuate a switch. This has, among others, the disadvantage that the switch will be moved to the "On" position as soon as the door is closed. This is undesirable because once the apparatus has been set to perform a certain cycle of operations, a closure of the door will initiate the cycle or cause a resumption of it.

It is an object of this invention to provide a switch and latch mechanism which will function in the following ways:

(a) The apparatus controlled by the switch cannot be operated unless the door is closed, but

(b) The closing and latching of the door does not operate in and of itself to close the switch or energize the apparatus,

(c) The starting of the apparatus or the resumption of a cycle is effected by a separate element which must be actuated by the operator, and

(d) In an important aspect of the invention, there will be a time delay between the actuation of the switch to an "off" position and the actual release or unlatching of the door so that the apparatus may approach a quiescent condition before the door is actually opened.

(e) Should the starting element be moved into the actuated position prior to closure of the door, the element will be released to the non-actuated position by the closure of the door.

(f) The starting element will not remain in the "on" position unless the door is fully closed, thus affording a protective feature.

It is an object of the invention to provide a latch device which does not require handles or similar projections extending well in front of the wall of the appliance.

It is an object of the invention to provide a switch and latch mechanism of such character that it can be operated by two controls, which controls may be in the nature of push buttons, plungers, or slides, making possible the provision of an escutcheon device having improved aesthetic qualities, as hereinafter explained.

It is also an object of the invention to provide a latch and switch structure which is inexpensive to construct and which is not likely to come out of adjustment.

These and other objects of the invention, which will be set forth hereinafter or will be apparent to one skilled in the art upon reading these specifications, are accomplished by that certain construction and arrangement of parts of which an exemplary embodiment will now be described. Reference is made to the accompanying drawings wherein:

FIG. 1 is a longitudinal sectional view of the latch and switch device with the parts in a position in which the door is closed and in the latched position with the operating elements in the "off" position.

2

FIG. 2 is a similar view showing the parts in a relationship such that the door is closed and latched, the operating elements being in the "on" position.

FIG. 3 is a sectional view through the latch device taken along the section line 3—3 of FIG. 1.

FIG. 4 is a sectional view taken along the section line 4—4 of FIG. 1.

FIGS. 5 and 6 are respectively front and side elevations of a bolt member.

FIGS. 7 and 8 are respectively front and side elevations of a bolt arm member.

FIG. 9 is a front elevation of a lever means having to do with the actuation of a switch.

FIGS. 10 and 11 are respectively front and side elevations of a follower member.

FIG. 12 is a front elevation of a switch actuating arm.

FIG. 13 is a perspective view of one form of escutcheon.

FIG. 14 is a sectional view of an actuating button taken along the section line 14—14 of FIG. 13.

FIG. 15 is a fragmentary bottom view of the right hand bottom end of the escutcheon of FIG. 13.

The device of this invention will be described in connection with a top opening dishwashing machine, it being understood, however, that this does not constitute a limitation on the invention. Neither the walls nor the lid or door of the dishwashing machine have been illustrated herein since these may take any suitable form. The latch and switch mechanism about to be described will be built into a wall of the appliance.

The latch will have a housing 1 which can take various forms. One way of forming the housing is illustrated in FIGS. 3 and 4 wherein it will be seen that the housing is made of a sheet metal member bent or formed to provide a top 1a, a rear portion 1b, a bottom 1c, and a front portion 1d. An advantage of this hollow form of housing is that while protecting the parts, it forms, as to its front and back walls, a means for mounting stub shafts as hereinafter described, which stub shafts will be maintained normal to the plane of the back wall of the housing. The housing may be cut away in parts to provide passage for electrical wires or to give access to certain parts, and this does not constitute a limitation on the invention. The end portions of the housing may be of any form desired and this also does not constitute a limitation. There will be means for fastening the housing to or, generally, inside the front wall of the appliance, which means are not shown, and which may be any desired, such as bolts, screws and the like. It is also possible to weld the housing to a wall member. The housing will be provided with an opening 2 for the passage of the strike next to be described.

The strike is an element to be latched, and will generally be fastened to the door of the appliance, for which purpose a base 5 is provided which may have been suitable shape. Otherwise the strike has an elongated portion 6, part of which is to enter the latch mechanism and be engaged therein. The elongated portion is characterized by a latching surface 7, a slantwise disposed surface 8 which is employed to depress the bolt, and a nose 9 which will engage a switch arm later described.

The bolt is indicated generally at 10 and is detailed in FIGS. 5 and 6. It may advantageously be made of a strap-like piece of metal formed or bent into a U-shape with a rear leg 8a, a base 8b, and a front leg 8c. A tongue 11 of metal extends from the rear leg 8a and is bent over as at 12 so as to provide a tine for engagement by the bolt arm, the tine being spaced from and lying somewhat aslant to the axis of the bolt. The legs of the bolt are perforated, as at 13, so that the bolt may be pivoted to a stub shaft 14, as shown in FIG. 3.

A bolt arm detailed in FIGS. 7 and 8 is also pivoted

to the same stub shaft. It has a body 15 constituting a rear wall. The body has an extension 16, the lower edge of which is bent up, as at 17, to provide a ledge for engagement by a plunger, push button or the like. An elongated extension of the bolt arm is bent over, as at 18, so as to provide a U-shaped configuration having a base 18a. The body 15 is provided with a notch 19 and also with a detent 20.

The distance between the body 15 constituting, so to speak, the back wall of the bolt arm, and the bent over portion 18 constituting, so to speak, the front wall of the bolt arms, is less than the distance between the legs 8a and 8c of the bolt, so that the bolt arm may be pivoted to the same stub shaft 14 as has been described above for the bolt 10. Also, around the stub shaft 14, there is a torsion spring 21, one leg 21a of which engages an edge of the base portion 18a of the bolt arm, the other leg 21b engaging a stop 22 struck in from the front wall 1d of the housing. Thus, the arm bolt is biased for a pivotal movement about the stub shaft 14 in the clockwise direction, and by reason of the engagement of the line 12 on the bolt 10 with the left-hand edge of the notch 19, the bolt 10 will also be biased for rotation in a clockwise direction. It should be noted, however, that there is no spring bias acting directly upon the bolt 10, and that if the bolt arm 15 is caused to turn in the counterclockwise direction by reason of downward pressure exerted upon the ledge 17, there will be a substantial arc of counterclockwise movement of the arm bolt before the ledge 12 is engaged by the right-hand edge of the notch 19 and pulled in the counterclockwise direction to release the strike latching surface 7.

The housing 1 is shown as containing a switch 23 having an actuating plunger 24. The switch body is fastened to the housing 1 in any suitable way and is connected into the circuitry of the appliance, terminal wires 23a and 23b being indicated for the purpose. The arrangement of the switch is such that if the actuating plunger 24 is pushed inwardly of the switch body (upwardly in FIG. 1), the electrical circuit through the switch will be established.

A member 25, hereinafter called the "lever," is detailed in FIG. 9. It is a member which has a back wall 25a, a front wall 25b throughout a portion of its length, and a base or ledge portion 25c. Thus, throughout a portion of its length, it is substantially U-shaped in cross section. It is pivoted intermediate its length on a stub shaft 26 engaged in the front and rear walls of the housing. About this stub shaft there is a torsion spring 27, one leg 27a of which bears against the base 25c of the left-hand end of the lever, and the other leg 27b of which bears against a stop 28 struck inwardly from a wall of the housing. The action of the spring is to bias the lever 25 for rotation in a counterclockwise direction to that position shown in FIG. 1 and hereinafter called the "horizontal position."

A spring arm member is illustrated in FIG. 1 at 29 and is detailed in FIG. 12. It consists of a strip of flexible metal. Near the center of the strip two ears 30 are bent downwardly and perforated as at 30a. At the left-hand end of the switch arm, a pair of ears, one being shown at 31, are bent upwardly to form a trough-like configuration for engagement by the nose 9 of the strike. The switch arm 29 is pivoted to the lever 25 toward the left-hand end of the latter element. The distance between the ears 30 of the switch arm is less than the distance between the legs 25a and 25b of the lever so that the ears of the switch arm may be placed inside the U-shaped portion of the lever and pivoted thereto by a stub shaft 32 shown most clearly in FIG. 4.

The latch also includes an element 33, which is hereinafter called the follower and which is detailed in FIGS. 10 and 11. There are various ways in which the follower may be fabricated. It is most conveniently made as a casting or molding of nylon, for example, having a hub portion 34, an arm 35 extending in one radial direction, a second arm 36 extending in another radial direction, and

a third arm 37. These arms, as illustrated, are approximately 120° apart. The follower is pivoted on a stub shaft 38 extending between the front and rear walls of the housing.

The follower arm 37 is provided with a perforation 37a, and in biasing the follower for counterclockwise rotation, it is most convenient to engage the end portions of a tension spring 39 between the arm 37 and a member 40 struck up from a portion of one of the walls of the housing.

FIG. 1 illustrates the relationship of parts when the lever 25 is in the horizontal position as aforesaid. In this position it has so lowered the pivot point of the switch arm 29, i.e. the stub shaft 32, that the plunger 24 of the switch will not be moved inwardly or upwardly, despite any engagement there may be between the nose 9 and the switch arm. Assuming the strike to be in the latch position as illustrated, the switch will be in the "off" position. The strength of the spring 27 is greater than the strength of the spring 39, so that the follower will be and remain in the position shown in FIG. 1. The arm 36 of the follower will be out of contact with the detent 20; and it will be evident that it is possible to latch and unlatch the door of the appliance any number of times without starting the electrical mechanism, by simply operating the bolt arm 15 by downward pressure on the ledge 17 thereof. There are many circumstances in which this feature is highly desirable, and a single example will suffice. In the use of a dishwashing machine by small families, it may be desired to open the door and place the tableware used at breakfast in the racks of the machine. But since such tableware may not fill the racks, it would be uneconomical to carry through a washing operation after breakfast. Instead, the housewife may wish, after lunch, to open the door of the appliance and introduce that tableware which was used at lunch, again shutting and latching the door without initiating a washing cycle. It may even be desired to introduce the tableware used at the evening meal, if the capacity of the racks is sufficient, before the cleaning operations of the dishwashing machine are started.

To close the switch and to start the electrical mechanism, it will be necessary to move the lever to the position shown in FIG. 2. When the lever is moved to this position, the follower is released, and the prop arm 35 will come into the position shown in FIG. 2 where it will prevent a return of the lever 25 to the horizontal position. At the same time, the arm 36 of the follower comes against the detent 20 of the bolt arm.

This sequence of operations does not necessarily result in the movement of the switch 23 to the "on" position. It will not do so even though the pivot point 32 of the switch arm has been raised to the position shown in FIG. 2 unless the nose 9 of the strike engages the left-hand end of the switch arm and depresses it as shown. It may be noted that the body of the switch arm 29 is flexible and resilient; but sufficient pressure cannot be exerted upon the plunger 24 of the switch to close the switch unless the pivot point 32 has been raised as indicated, and unless the left-hand end of the switch arm is depressed as described.

If the lever 25 is moved to the position shown in FIG. 2 at a time when the door is not closed, and the nose of the strike is not engaging the trough at the left-hand end of the switch lever, the switch will not be actuated to closed positions for reasons which will be evident. Closing the door when the lever 25 is in the position shown in FIG. 2 will not start the mechanism for the reason that closing the door rotates the bolt 10 in a counterclockwise direction and, consequently, rotates the bolt arm 15 in the same direction, whereupon the detent 20 moves the follower to a position such that the arm 35 cannot support the lever in the tilted position. The spring 27 moves the lever to the horizontal position and maintains it there while the follower remains in the position shown in FIG. 1. With the latch of this invention, there

5

is no way of starting the electrical mechanism with the door open. However, by means of the bolt arm 15, the door may be latched and unlatched as many times as may be desired without starting the electrical mechanism. A separate operation is required to close the switch, and yet the switch will be opened as soon as the strike is unlatched.

When the door is closed and latched as described, the operator must depress the right-hand end of the lever 25 in order to actuate the switch to the "on" position, as will now be clear. Once so actuated, the lever will be held in the position shown in FIG. 2 by the action of the prop arm 35 of the follower until such time as the bolt arm 15 is depressed. But immediately upon the depression of the left-hand end of the bolt arm 15, the follower will be rotated clockwise by the detent 20 and the lever 25 will snap back to the horizontal position, thus opening the switch.

It may be desired to provide a stop 41 struck up from the housing so as to limit the clockwise motion of the lever 25.

Separate means are provided for actuating the left-hand end of the bolt arm 15 and the right-hand end of the lever 25. The operating means may be push buttons, plungers or any other suitable devices. In FIG. 13 there is shown an escutcheon 42 near each end of which there is a plunger or button 43 or 44 slidably mounted for vertical motion with respect to the escutcheon. These are exemplary merely but are illustrated in detail in FIGS. 14 and 15. Each comprises a body 45 and, in the particular embodiment, a finger ledge 46 available from the front of the escutcheon. The button elements are slidably mounted in recesses in the front face of the escutcheon with provision against forward movement. This provision may be extensions 47 lying beyond an inner wall 48 forming part of the escutcheon; and the buttons or plungers may be so designed that they can be inserted into the escutcheon from the bottom. Each plunger or button has on its rear side abutment means 49 which is positioned to engage either the ledge 17 of the bolt arm or the ledge 25c of the lever. It will be understood that the bolt arm and the lever, being both spring biased, will tend to keep the buttons in their uppermost positions until they are actuated by the user of the apparatus.

While the device of FIG. 13 has been illustrated as a separate escutcheon which might be placed on the face of a wall of the appliance, the skilled worker in the art will understand that the escutcheon or a corresponding assembly of parts may be recessed into the front wall of the apparatus to whatever extent is desired. Also, various other configurations of an escutcheon or door element could be provided having other appearance factors. But the provision of protruding rotative handles has been eliminated, and the appearance factors of the appliance greatly improved.

The left-hand button of the device of FIG. 13 actuates the bolt arm 15 and may advantageously be marked "Off-Open." The right-hand button operates the lever 25 and may advantageously be marked "Start."

In the preferred form of the invention, as illustrated in the drawings, the amount of "play" provided by the notch 19 is such that the switch will be opened before the latch is released. This allows the machine to be turned off prior to or without the opening of the lid. In the case of dishwashers, it is advisable to pause a moment after shutting off the machine during a wash period, to permit the water action to subside sufficiently before opening the lid or door.

The effect set forth in the preceding paragraph is attained essentially by providing a bolt and a bolt arm as separate entities and arranging a lost motion connection between them, as previously described. Depending upon the extent of lost motion, it can be arranged so that a partial depression of the left-hand button 42 will open

6

the switch without unlatching the door. However, where the time delay feature is not desired, it does not constitute a departure from the generic aspects of the invention to make the bolt and bolt arm integral or to fasten them together.

Modifications may be made in the invention without departing from the spirit of it. The invention having been described in a certain exemplary embodiment, what is claimed as new and desired to be secured by Letters Patent is:

1. In a latch and switch mechanism for a door, a strike for attachment to a door and movable therewith, a housing having an orifice for the passage of said strike, a bolt pivoted to said housing for engaging and latching the strike, a bolt arm pivoted to said housing and having a portion extending in one horizontal direction for moving the bolt, a switch mounted in said housing, means extending in the opposite direction for actuating said switch, the last mentioned means comprising a lever pivoted on said housing and a switch arm pivoted to said lever, said switch arm having a portion for contacting an operating element of said switch and a portion for contacting said strike, so that said switch arm will operate said switch only if said lever is rocked to an operating position, and said switch arm is in contact with said strike, movable releasable means mounted on said housing for holding said lever in the switch operating position, and a connection between said releasable means and said bolt arm such as to release said releasable means when said bolt arm is moved.

2. The structure claimed in claim 1 wherein said bolt and bolt arm are integral.

3. The structure claimed in claim 2 including an escutcheon supported so as to cover said housing and spaced operating means on said escutcheon for independently actuating said bolt arm and said lever.

4. The structure claimed in claim 1 wherein said bolt and bolt arm are separate entities with a lost motion connection therebetween.

5. The structure claimed in claim 4 wherein the releasable means for holding the lever in said operating position is a rotative element having a portion for engaging the said bolt arm and holding it in the said position the said connection between the said holding means and the said bolt arm comprising a detent on the bolt arm engaging another portion of the said releasable holding means.

6. The structure claimed in claim 5 including an escutcheon and spaced operating means on said escutcheon for independently actuating said bolt arm and said lever.

7. The structure claimed in claim 4 wherein the said lost motion connection between the bolt and the bolt arm comprises a tine formed on the bolt, the said bolt arm having an opening with spaced edges positioned to engage the said tine, the said edges being sufficiently spaced to permit a degree of independent movement of the said bolt arm.

8. The structure claimed in claim 4 wherein said bolt arm is resiliently biased toward bolt-closing position, wherein said lever is resiliently biased toward a position for non-operation of said switch, and wherein said holding means is resiliently biased toward its holding position by resilient means of less strength than the biasing force on said lever.

9. In a door latch and switch device for an enclosure, a movable bolt pivoted with respect to said enclosure for engaging and latching a strike supported and moved by a door, biased means for moving said bolt to a release position, a switch, means supported with respect to said enclosure actuating said switch from an "off" to an "on" position, said actuating means comprising a pivoted movable element and a switch arm mounted thereon and capable of closing said switch only if said movable element is in an actuated position and if said arm simultaneously contacts said strike, and movable means for

7

latching said movable element in actuating position, there being an operating connection between the said means for moving said bolt and the said means for latching the movable element of said switch actuating means, an "Off-Open" button for moving said bolt actuating means and a "Start" button for moving the movable element of said switch actuating means, so that the switch cannot be closed unless the strike is latched and the "Start" button actuated, while actuation of the "Off-Open" button will release the strike and open the switch if the switch be closed.

10. The structure claimed in claim 9 including a lost

8

motion connection between the means for moving the bolt and the bolt itself whereby the opening of the switch will occur prior to the unlatching of the strike when the "Off-Open" button is actuated.

References Cited by the Examiner

UNITED STATES PATENTS

Re. 14,942 8/20 Horton et al. ----- 200—50

10 KATHLEEN H. CLAFFY, *Primary Examiner*.

BERNARD A. GILHEANY, *Examiner*.