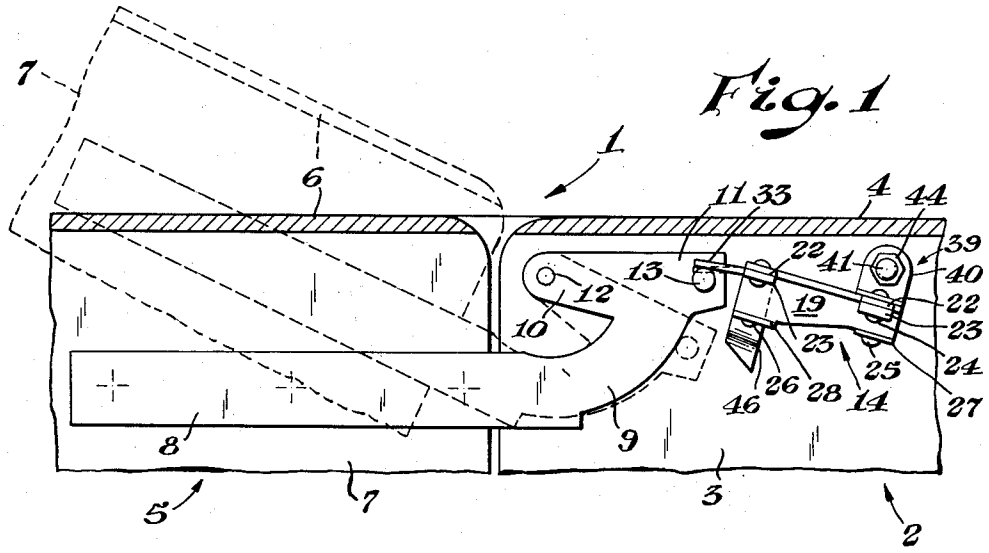
Aug. 18, 1964 W. L. BROWN ETAL 3,145,276

SELF-POSITIONING DOOR SWITCH CONSTRUCTION

Filed Feb. 23, 1962

Fig. 1



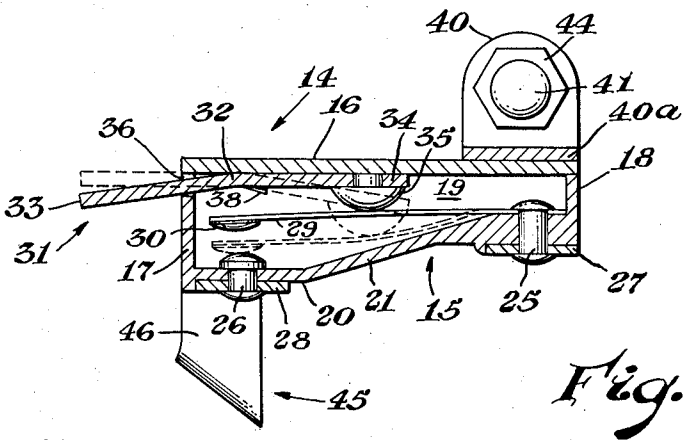


Fig. 3

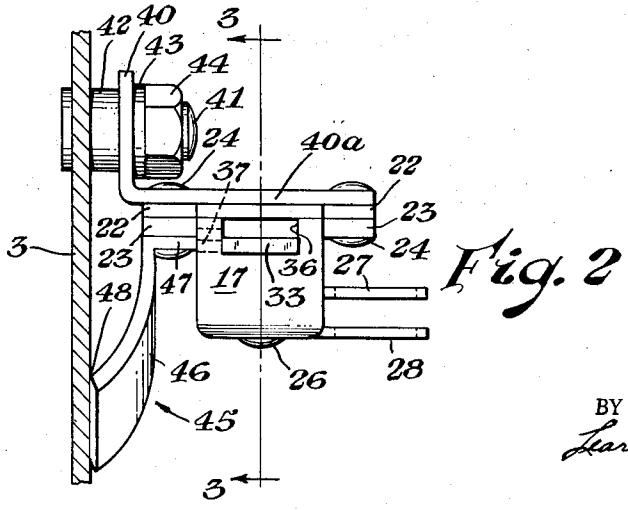


Fig. 2

INVENTOR.
William L. Brown
Robert Thomson
BY
Learman, Learman & McCulloch
ATTORNEYS

United States Patent Office 3,145,276 Patented Aug. 18, 1964

3,145,276

SELF-POSITIONING DOOR SWITCH CONSTRUCTION

William L. Brown, Garden City, and Robert Thomsen, Dearborn, Mich., assignors to Boyne Products, Inc., Detroit, Mich., a corporation of Michigan

Filed Feb. 23, 1962, Ser. No. 175,244
9 Claims. (Cl. 200—61.62)

This invention relates to a switch construction of the kind adapted to be actuated in response to the opening and closing of a movable member such as the door of a dish washer, washing machine or the like, and more particularly the invention pertains to a switch that is capable of being self-positioned in operative relationship with a movable door or the like in response to movement of the door.

There are many electrical devices that are adapted to be operable or inoperable according to the position of a movable member such as a door. For example, it is common practice to provide a switch adjacent the door of a dish washer, clothes washer, clothes dryer or the like, and which is so mounted with relation to the door as to permit the appliance to operate only when the door is fully closed. In order for such a switch to function properly, it must be precisely located with respect to the door so as to assure operation by the door. The necessity of precisely locating a switch is time consuming and consequently adds to the cost of producing the appliance. Moreover, because of the physical contact which must exist between the switch and some part of the appliance door, it is not unusual for either the switch or the door part to become misaligned, resulting in malfunctioning of the switch. This problem is particularly prevalent in those instances where the switch is not properly positioned relatively to the door initially.

Door actuated switches of the kind heretofore in use have been rigidly mounted on some part of the appliance structure. The rigidity of the mounting makes it difficult for the appliance owner to adjust a misaligned switch, even if he were inclined to do so, thereby necessitating a service call by an appliance repairman, with its resultant expense. Adjusting the known switches is not always an easy task, particularly if the switch is located in some remote portion of the appliance. For this reason, many appliance manufacturers locate the switch in a fairly accessible position, but this usually requires the provision of extended wiring and wire holding means, thereby adding to the cost of the appliance.

An object of this invention is to provide a switch that is operable in response to opening and closing of a movable member such as a door and wherein the switch is capable of being self-positioned by movement of the movable member.

Another object of the invention is to provide a switch of the kind indicated provided with means for yieldably holding it in adjusted position.

A further object of the invention is to provide an adjustable switch construction which is of such simplified construction as to permit it to be adjusted by the most unskilled person.

Another object of the invention is to provide a switch assembly which is capable of being mounted in a readily accessible position and yet which does not necessarily require the use of extended wiring.

Another object of the invention is to provide a switch of the character described which is simplified in construction and rugged and durable in use.

Other objects and advantages of the invention will be pointed out specifically or will become apparent from the following description when it is considered in conjunction with the appended claims and the accompanying drawing, in which:

FIGURE 1 is a view partly in section and partly in side elevation and illustrating the switch in operative association with a pivoted door;

FIGURE 2 is a view partly in section and partly in front elevation of the apparatus shown in FIGURE 1 and on an enlarged scale; and

FIGURE 3 is a longitudinal, sectional view taken on the line 3—3 of FIGURE 2.

Apparatus constructed in accordance with the invention is illustratively disclosed as adapted for use in an appliance **1** such as a dish washer, clothes washer, clothes dryer or the like, having a main cabinet portion **2** including a side wall **3** and a top wall **4**, the top wall having an opening therein that is adapted to be closed by a swingable door or lid **5** having a top wall **6** and side flange **7**. The door **5** may be swingably mounted on the main cabinet **2** by means of a hinge bar **8** that may be spot welded or otherwise suitably fixxed to the side flange **7** of the door, the hinge arm terminating at one end in an arcuate portion **9** that is provided with a forwardly projecting extension **10** and a rearwardly projecting portion **11**. The hinge may be pivoted to the cabinet side wall **3** by means of a pivot pin **12** that passes through the projection **10**. The hinge projection **11** includes a laterally extending operating stud or post **13** which will be referred to in more detail hereinafter.

The switch assembly is indicated in its entirety by the reference character **14** and comprises a casing **15** having a cover plate **16** and a hollow body formed by a front wall **17**, a rear wall **18**, side walls **19**, and a bottom wall **20** which includes an upwardly and rearwardly inclined portion **21**. The cover and all of the casing walls are formed of a suitable insulating material such as nylon or the like which is capable of being molded. The side, end and bottom walls of the casing preferably are molded as an integral unit and the cover **16** is formed separately. In order to maintain the casing parts assembled, the cover and body portions of the casing may be provided with laterally projecting ears **22** and **23**, respectively, through which rivets **24** or the like may extend so as to maintain the casing parts assembled.

Supported in the casing **15** is a pair of electrically conductive contact posts **25** and **26**, each of which extends through the bottom wall **20** of the casing, and each of the contacts being headed at both ends so as to be stable and to permit the contacts to serve as anchor members for electrically conductive terminals **27** and **28** to which wires (not shown) may be connected.

Within the casing **15** is movably supported a flexible bridging arm **29** formed of electrically conductive material and having one of its ends anchored to the bottom wall **20** by means of the headed contact **25**. The length of the arm **29** is such as to enable it to bridge the distance between the contacts **25** and **26**, and the free end of the arm **29** is provided with a contact **30** that is adapted to engage the contact **26**. When the arm **29** is in its normal or unstressed condition it is substantially planar and supports the contact **30** in a position out of engagement with the contact **26**. The flexibility of the arm **29**, however, enables the arm to be deflected so as to effect engagement between the contacts **30** and **26**.

Means is provided for effecting movement of the bridging arm **29** into engagement with the contact **26** and comprises a preferably metal, relatively inflexible actuating member **31** that is bent intermediate its ends as at **32** to form a lip portion **33** and a carrier portion **34** at the end of which is fixed a button **35** formed of nylon or other insulating material. The front wall **17** of the casing is provided with an opening **36** adjacent the cover **16** and through which the lip portion **33** of the actuator extends. The width of the opening **36** corresponds substantially to the width of the lip **33**, but the height of

the opening is substantially greater than the thickness of the actuator lip so as to enable the actuator **31** to rock about the fulcrum **32**. Rocking of the actuator in a counterclockwise direction, as viewed in FIGURE 3, is limited by the base of the opening **36** and by engagement of the carrier portion **34** with the cover **16**, and clockwise rocking of the actuator **31** is limited by engagement of the lip portion **33** with the cover **16**. Accordingly, the cover **16** constitutes stop means for limiting rocking movement of the actuator **31**.

The actuator **31** is mounted in the casing **15** in such manner that the button **35** is located at a position that is substantially midway between the contacts **25** and **26**, and the actuator is rockably maintained in that position by a tang **37** that extends laterally from the actuator and projects into a slot **38** that is formed in one side wall **19** of the casing.

Means is provided for rockably mounting the switch casing **15** on the cabinet **2** and comprises a bracket **39** having a flange **40***a* which is secured to the casing by means of the rivets **28** and another, right-angular flange **40** through which extends a pivot post **41**, the pivot post also passing through the cabinet wall **3**. The bracket **39** is rockably mounted on the pivot post **41** in spaced relation from the wall **3** by means of a spacer **42**, a washer **43**, and a nut **44**. The arrangement is such that the casing **15** is rockable as a unit about the axis of the pivot post **41**.

Although the switch casing is intended to be rockable about the axis of the pivot **41**, it is not intended that the casing be freely rotatable. Instead, the casing is mounted on the cabinet wall in such manner that the casing will be stable in any adjusted position until a force of predetermined magnitude is exerted on the casing to adjust its position relative to the cabinet.

Apparatus constructed in accordance with the invention includes a stabilizer **45** comprising a blade of spring steel or the like **46** that terminates at one end in a mounting flange **47** that may be secured to the casing by one of the rivets **24**. The other end of the blade **46** is curved toward the side wall **3** and terminates in a squared edge **48**. The curvature of the blade **46** is such that, when the switch casing is mounted, the squared edge **48** of the blade forcibly but yieldably bears against the side wall **3** and tends to bite into the side wall, thereby frictionally holding the casing in any selected position of adjustment relative to the side wall **3**.

To condition the apparatus for operation, the casing is pivoted on the cabinet wall **3** in such position that the lip **33** of the actuating member **31** lies in the path of movement of the post **13** which is carried by the hinge **8**. The initial positioning of the casing **15** should be such that rocking movement of the door **5** toward its closed position will effect engagement between the actuator lip **33** and the post **13** well in advance of the door's reaching its fully closed position. Upon engagement of the parts **33** and **13**, further closing movement of the door will cause the actuator to be rocked about its fulcrum **32**, thereby causing the button **35** to deflect the bridging arm **29** in such direction as to move the contact **30** toward the contact **26**.

The spacing between the contacts **30** and **26** and the height of the opening **36** in the front wall of the casing should be such that engagement of the contacts **26** and **30** is effected prior to the time the actuator **31** reaches its limit of clockwise rotation. Thus, upon initial engagement of the contacts **26** and **30** the actuator still will be capable of additional clockwise rotation.

Continued closing movement of the door after initial engagement of the contacts **26** and **30** will cause the actuator **33** to be rocked to its limit of clockwise rotation, thereby effecting bowing of the bridging arm **29** as is indicated in dash lines in FIGURE 3 and effecting engagement of the lip portion **33** with the cover **16**. Bowing of the bridging arm is permitted by reason of the inclination

of the wall portion **21**. Further closing movement of the door will cause the post **13** to exert sufficient force on the switch casing **15** that the latter bodily is rocked about the axis of the pivot pin **41** against the drag of the stabilizer blade **46**. When the door is fully closed, the actuator **31** will be in the position shown in dash lines in FIGURE 3 and the bridging arm **29** will be bowed.

Upon opening movement of the door **5**, the post **13** will be moved in a direction away from the actuator, thereby relaxing the force exerted by the actuator on the bridging arm **29**. Initial relaxation of the force exerted on the bridging arm will not cause disengagement of the contacts **26** and **30**, but will cause the arm **29** to assume a somewhat less bowed position. However, when the post **13** moves out of engagement with the actuator lip **33** the resilience of the arm **29** will cause the latter to become completely unstressed, thereby effecting disengagement of the contacts and restoration of the actuator to the position shown in full lines in FIGURE 3.

The reaction between the stabilizer blade **46** and the wall **3** will maintain the switch casing in the position to which it is adjusted and the tendency of the blade edge **48** to bite into the cabinet wall will deter inadvertent rocking of the casing. In the event the switch should rock accidentally in a counterclockwise direction, as viewed in FIGURE 1, closing of the door will restore it to its operative position. In the event the switch should be rocked in a clockwise direction from the position shown in FIGURE 1, it is a simple matter to rock the casing counterclockwise a distance sufficient to enable closing of the door to restore the switch to its operative position.

The previously described two stage action of the bridging arm **29** when being moved to its contact bridging position is an important characteristic of the invention in that the second or bowing stage of the arm **29** assures sufficient force being applied to the bridging arm to compensate for any wear of the contacts **26** and **30** and to insure good electrical engagement therebetween.

The disclosed embodiment is representative of a presently preferred form of the invention, but is intended to be illustrative rather than definitive thereof. The invention is defined in the claims.

We claim:

1. A self-positioning switch construction for use with a member movable in a path, said construction comprising a casing; contact means supported by said casing; bridging means movable into and out of bridging engagement with said contact means; actuating means operable to effect movement of said bridging means; support means; means movably mounting said casing on said support means with said actuating means in the path of movement of said member for operation thereby and for adjustment of said casing relative to said support means by said member; and frictional means reacting between said casing and said support means for frictionally but yieldably holding said casing in an adjusted position relative to said support means.

2. A self-positioning switch construction for use with a member movable in a path, said construction comprising a casing; contact means supported by said casing; a bridging arm movable into and out of bridging engagement with said contact means; movable actuating means operable to effect movement of said bridging arm; support means; means adjustably mounting said casing on said support means in such position that said actuating means lies in the path of movement in one direction of said member for movement thereby; and stop means reacting with said actuating means for limiting movement of the latter, said actuating means being operable to transmit movement to said casing relative to said support means in response to continued movement of said member in said one direction after engagement of said actuating means and said stop means.

3. The construction set forth in claim 2 including means reacting between said casing and said support

means for yieldably holding said casing in an adjusted position relative to said support means.

4. The construction set forth in claim 3 wherein said reacting means comprises spring means.

5. The construction set forth in claim 2 wherein said bridging arm is flexible and wherein said stop means is spaced from said actuating means a distance such that said bridging arm is in said bridging relation and is flexed by said actuating means prior to engagement between the latter and said stop means.

6. A self-positioning switch construction for use with a member movable in a path, said construction comprising a casing; spaced apart contact means supported by said casing; bridging means movable into and out of bridging engagement with said contact means; actuating means movably supported by said casing for moving said bridging means, said actuating means extending beyond said casing for engagement with said member; mounting means on said casing for mounting the latter on a support for movement relative thereto; and resilient stabilizing means supported by said casing and extending beyond the confines of the latter for reaction with said support to yieldably maintain said casing in any selected position of adjustment relative to said support.

7. The construction set forth in claim 6 wherein said stabilizing means comprises a spring arm having a free end that extends in a direction to bear against said support.

8. A switch construction comprising a casing; means

on said casing for adjustably mounting the latter on a support; a pair of contacts supported by said casing; a relatively flexible bridging member movably received in said casing and adapted to bridge said pair of contacts; relatively inflexible actuating means movably mounted on said casing and operable in one direction of movement to move said bridging member into bridging relation with said pair of contacts, said actuating means being movable in said one direction an amount greater than is necessary to effect said bridging relation of said pair of contacts by said bridging member so as to flex the latter; stop means reacting with said actuating means for limiting movement of the latter in said one direction; and stabilizing means supported by said casing and extending beyond the confines of the latter for reaction with said support to yieldably maintain said casing in a selected position of adjustment relative to said support.

9. The construction set forth in claim 8 wherein said actuating means is mounted for rocking movement.

References Cited in the file of this patent

UNITED STATES PATENTS

2,206,102	Meuer	July 2, 1940
2,627,567	Bell	Feb. 3, 1953
2,759,057	Whildin et al.	Aug. 14, 1956
2,785,257	Smith	Mar. 12, 1957
2,849,547	Taylor	Aug. 26, 1958
2,986,616	Hanserd	May 30, 1961
3,040,141	Whilden et al.	June 19, 1962