Aug. 20, 1957 J. G. McDONALD 2,803,719

SWITCH

Filed March 1, 1954

FIG. 1

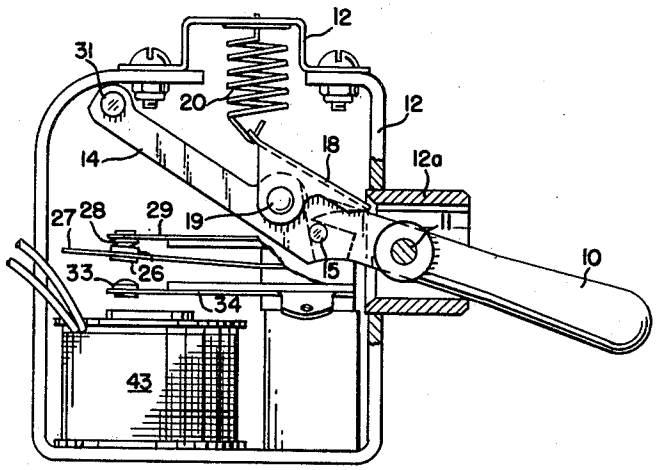


FIG. 2

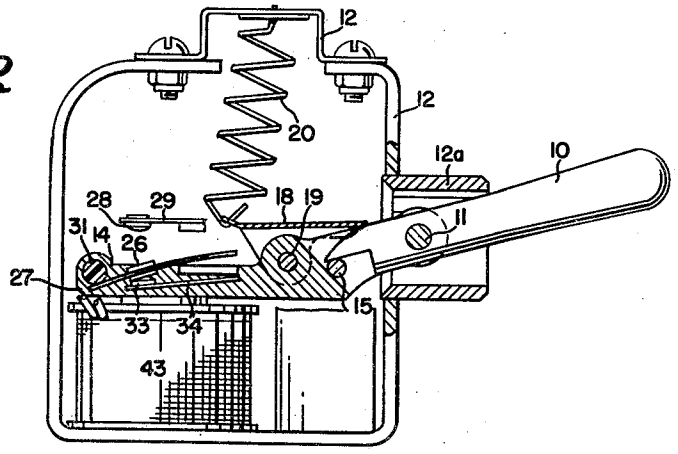
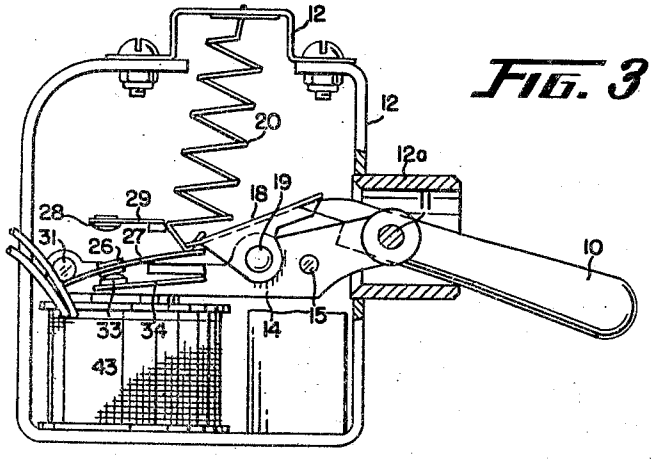


FIG. 3



INVENTOR.
JOSEPH G. McDONALD
BY
George H. Fisher
ATTORNEY

United States Patent Office

2,803,719

Patented Aug. 20, 1957

2,803,719

SWITCH

Joseph G. McDonald, Arden Hills, Minn., assignor to Minneapolis-Honeywell Regulator Company, Minneapolis, Minn., a corporation of Delaware

Application March 1, 1954, Serial No. 412,997

7 Claims. (Cl. 200—87)

This invention relates to switches and more particularly to switches that when closed become locked against manual opening.

One embodiment of my invention has two levers pivoted in a frame with abutments on the levers in such a way so as to provide a one-way connection. A third lever is centrally pivoted on the second lever and bears at one end on the first lever. A spring is attached to the opposite end of the third lever and the frame. This lever arrangement with the one-way connection and spring bias is used to perform the switching function. The spring bias normally holds the lever in what may be termed the "off" position. Manual rotation of the first lever from the "off" to "on" position rotates the second lever so that contacts are closed. An electromagnet then holds the second lever in this position. While the second lever is held by the electromagnet manual movement of the first lever from the "on" position to the "off" position is possible because of the one-way connection of the first and second levers. Release of the first lever after manual movement will cause it to return to the "on" position because of the bias applied by the spring through the third lever. Upon deenergization of the electromagnet through a separate controlling circuit or system the bias of the spring will return the whole lever assembly to the "off" position.

My invention provides a switch which may be closed manually when a given circuit is in operation but cannot be opened manually until this given circuit has become deenergized.

The position of the manually operable lever gives visual indication of the switch position but the lever cannot be used to move the switch to "off" position. There is no temptation on operator to try to force the switch to "off" position as might be with a switch that is merely locked in "on" position.

My invention can be utilized in many other places where similar characteristics are desirable on a switch or mechanical movement.

Therefore, an object of my invention is to provide a switch of the type described that is simple in construction, light in weight, and reliable in operation.

Other objects and advantages of my invention will in part be obvious and in part be described when the following specification is read in conjunction with the drawing in which:

Figure 1 is a side view of the switch in the normal "off" position,

Figure 2 is a side view of the switch in the normal "on" position, and

Figure 3 shows the switch in the "on" position with the manually operative lever in the "off" position.

Referring now in Figure 1, a manually operable lever **10** is pivoted on pin **11** in a cylindrical extension **12***a* of a frame **12**. A second lever **14**, also pivoted in frame extension **12***a* on the pin **11**, is bifurcated at its right end to accommodate the left or inner end of lever **10**. A pin **15** extending through both bifurcated portions

of lever **14** limits counterclockwise rotation of the lever **10** relative to the lever **14** and forms a one-way driving connection therebetween. If the lever **10** is moved in a counterclockwise direction from the position shown in Figure 1 the lever **14** may be moved to the position shown in Figure 2, but if lever **14** is held in the Figure 2 position, as will be described hereinafter, the lever **10** can be moved in a clockwise direction without corresponding movement of lever **14**.

A third lever **18** is pivoted in the second lever **14** on a pin **19**. The lever **18** is channel shaped and its two side portions lie on either side of the second lever **14**. A tension spring **20** connecting the upper portion of the frame **12** and the left hand end of the lever **18** biases this lever in a clockwise direction so that its right hand end, which bears on the left hand end of lever **10**, biases lever **10** into engagement with the pin **15**. The spring **20** also biases the assembly of the three levers in a clockwise direction to the position shown in Figure 1.

A movable contact **26** is carried by a blade **27** formed normally to hold the contact in engagement with a stationary contact **28** on a blade **29**. A pin **31** of insulating material on the left hand end of the lever **14** cooperates with the blade **27** when moved to the Figure 2 position to move the contact **26** to engage a stationary contact **33** on a blade **34**. The blades **27**, **29** and **34** are carried by the frame **12** and are suitably insulated therefrom.

The second lever **14** is made of magnetic material and its left hand end acts as an armature which cooperates with an electromagnet **43** mounted on the lower portion of frame **12**. When the lever **14** is moved to the position of Figure 2 it will be maintained in that position as long as the electromagnet is energized and cannot be returned manually.

Referring now to Figure 3, with the electromagnet **43** energized, a movement of lever **10** clockwise about pivot **11** will not move lever **14** against the holding of the electromagnet **43**. Such a movement of lever **10** will cause lever **18** to rotate counterclockwise about pivot **19** on lever **14** causing a further stretching of spring **20**. A release of the manually applied force on lever **10** will allow spring **20** to return the levers **10** and **18** to the positions as shown in Figure 2 with contacts **26** and **33** still in contact. Deenergization of electromagnet **43** will, of course, result in return of the lever **14** to the position shown in Figure 1.

Broadly, the invention contemplates any arrangement by which a single spring both biases the first and second levers to one position and also biases the two levers with respect to each other. It will be readily apparent that in accordance with my invention many changes may be made in details of the construction and arrangement of the parts. For example, my invention may be readily adapted to a different spring bias arrangement eliminating the third lever, or a different pivot arrangement of the first and second lever. My invention could also be readily adapted to utilizing a holding arrangement other than an electromagnet. The scope of my invention is accordingly defined by the appended claims.

I claim as my invention:

1. A switch consisting of a frame, a first and a second lever coaxially pivoted to said frame, cooperating abutments on said first and second levers providing a one-way connection, a third lever pivoted on said second lever, one end of said third lever bearing on said first lever, a spring attaching the opposite end of said third lever to said frame, said spring through said third lever normally biasing said first and second levers to a first position, said one-way connection of said first and second levers permitting manual rotation of said first lever to a second position to cause said second lever to rotate

to said second position, switch contacts operated by said rotation of said second lever from said first position to said second position, and electromagnetic means for holding said second lever in said second position, said second lever when held in said second position by said electromagnetic holding means normally holding said first lever in said second position through said third lever and said spring, said one-way connection of said first and second levers allowing manual movement of said first lever from said second position to said first position while said second lever is held in said second position by said electromagnetic holding means.

2. A switch consisting of a frame, a first lever pivoted to said frame, a second lever pivoted to said frame, cooperating abutments on said first and second levers providing a one-way connection, spring means for biasing said first and second levers to a first position, said one-way connection of said first and second levers causing a movement of said second lever to a second position upon movement of said first lever to a second position against the bias of said spring means, and means for holding said second lever in said second position against the bias of said spring means, means cooperating with said first lever and with said second lever when in said second position to normally hold said first lever in said second position, said one-way connection of said first and second levers allowing a manual movement of said first lever to said first position while said second lever is held in said second position by said holding means.

3. A switch consisting of a frame, a first lever pivoted to said frame, a second lever pivoted to said frame, cooperating abutments on said first and second levers providing a one-way coonnection, a third lever pivoted on said second lever with the first end bearing on said first lever, spring means attached to said frame and to the second end of said third lever biasing said first and second levers to a first position, a movement of said first lever to a second position causing a movement of said second lever to said second position through said one-way connection, an armature on said second lever, and electromagnetic holding means that said armature contacts when said second lever is in said second position, said holding means when operated holding said second lever in said second position against the bias of said spring means, said one-way connection allowing movement of said first lever to said first position while said second lever is held in said second position by said holding means thereof, said spring means through said third lever returning said first lever upon release to said second position by said holding means.

4. A switch consisting of a frame, a first and second lever coaxially pivoted to said frame, cooperating abutments on said first and second levers providing a one-way connection, a third lever pivoted on said second lever, one end of said third lever bearing on said first lever, spring means attaching the opposite end of said third lever to said frame, said spring means through said third lever normally biasing said first and second levers to a first position, said one-way connection of said first and second levers permitting a manual rotation of said first lever to a second position to cause said second lever to rotate to said second position, and means for holding said second lever in said second position, said holding means operative to hold said second lever in said second position against the bias of said spring means with said spring means through said third lever normally holding said first lever in said second position, said second lever and said holding remaining in said second position upon manual movement of said first lever from said second position to said first position due to said one-way connection.

5. A switch consisting of a frame, a first lever pivoted to said frame, a second lever pivoted to said frame, cooperating abutments on said first and second levers providing a one-way connection, a third lever pivoted on said second lever with the first end bearing on said first lever, spring means attached to said frame and to the second end of said third lever biasing said first and second levers to a first position, a movement of said first lever to a second position causing a movement of said second lever to said second position through said one-way connection, switch contacts operated by said movement of said second lever to said second position, and an electromagnet holding said second lever in said second position against the bias of said spring means, said second lever when in said second position normally holding said first lever in said second position through the bias of said spring means, said one-way connection of said first and second levers allowing a manual movement of said first lever to said first position while said second lever is held in said second position by said holding means.

6. A switch consisting of a frame, a first lever pivoted to said frame, a second lever pivoted to said frame, cooperating abutments on said first and second levers providing a one-way connection, a member attached to said second lever operatively cooperating with said first and second levers, spring means biasing said first and second levers through said member, said spring means normally biasing said levers to a first position, said one-way connection of said levers causing a movement of said second lever to a second position upon movement of said first lever to a second position against the bias of said spring means, and means for holding said second lever in said second position against the bias of said spring means, said member normally holding said first lever in said second position when said second lever is in said second position, said one-way connection of said first and second levers allowing a manual movement of said first lever to said first position while said second lever is held in said second position by said holding means.

7. A switch consisting of a frame, a first lever pivoted to said frame, a second lever pivoted to said frame, cooperating abutments on said first and second levers providing a one-way connection, spring means, a connection between said spring means and said first and second levers such that said spring means normally biases said levers into engagement, said spring means normally biasing said levers to a first position, said one-way connection of said levers causing a movement of said second lever to a second position upon movement of said first lever to a second position against the bias of said spring means, and means for holding said second lever in said second position against the bias of said spring means, said one-way connection of said levers allowing a manual movement of said first lever to said first position while said second lever is held in said second position by said holding means.

References Cited in the file of this patent

UNITED STATES PATENTS

1,379,691	James	May 31, 1921
1,658,380	Keilholtz	Feb. 7, 1928
1,676,340	Lindner	July 10, 1928
1,767,892	Lindquist	June 24, 1930
2,229,981	Mann	Jan. 28, 1941

FOREIGN PATENTS

399,369	Italy	Oct. 24, 1942
571,500	Germany	Mar. 1, 1933