March 30, 1965 D. M. HALLERBERG 3,176,105

SHOCK PROOF SWITCH ASSEMBLY USING INTERRUPTOR MEANS TO DISABLE ACTUATING MEANS

Filed Nov. 13, 1962

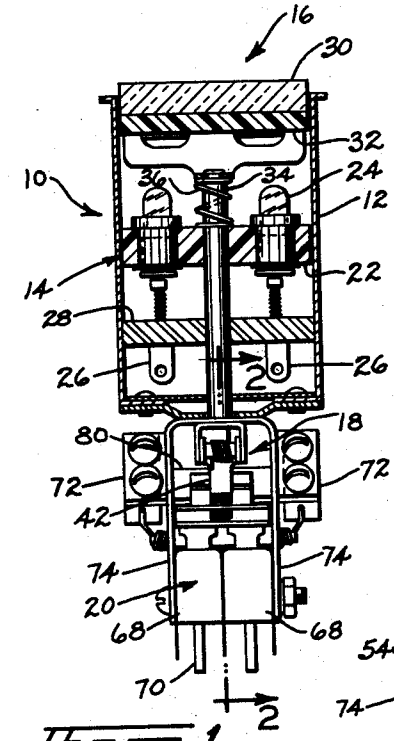


FIG. 1.

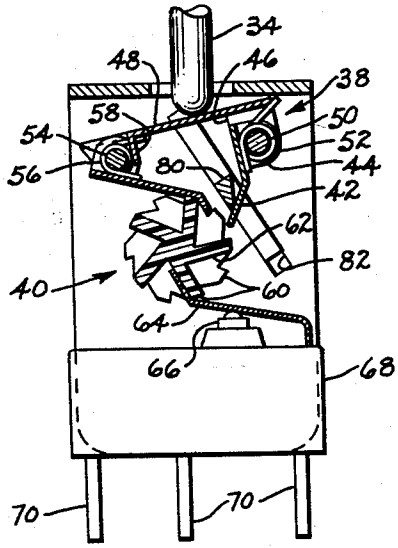


FIG. 2.

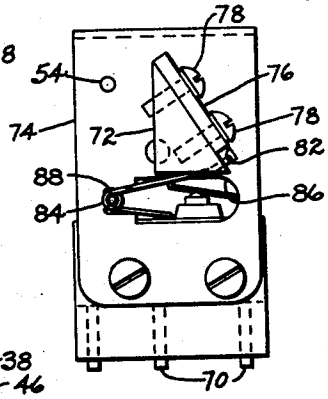


FIG. 4.

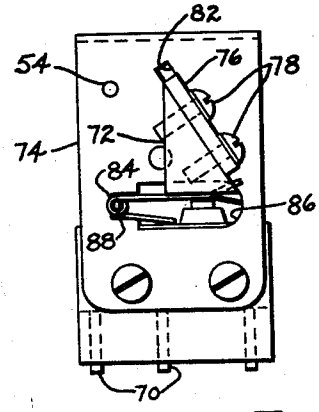


FIG. 5.

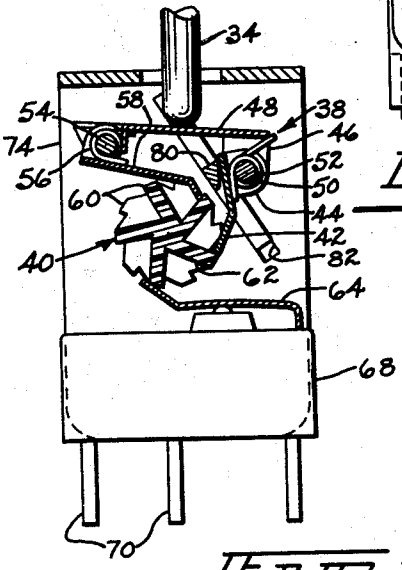


FIG. 3.

INVENTOR.

DON M. HALLERBERG

BY

ATTORNEYS

United States Patent Office

3,176,105

Patented Mar. 30, 1965

3,176,105

SHOCK PROOF SWITCH ASSEMBLY USING INTERRUPTOR MEANS TO DISABLE ACTUATING MEANS

Don M. Hallerberg, San Pedro, Calif.

Filed Nov. 13, 1962, Ser. No. 237,004

4 Claims. (Cl. 200—153)

This invention relates to a switch assembly and more particularly to a switch assembly having means to prevent accidental actuation as a result of a sudden change in movement.

Switch assemblies of the general type with which the present invention is concerned are often used in conjunction with indicator lights to monitor a changeable condition. If a change in the condition is desired, or if the condition has changed and the original condition is desired, an operator can manually actuate the switch of the assembly to achieve these results. Indicator light-switch assemblies of this general nature are disclosed more fully in a co-pending application of Don M. Hallerberg, Serial No. 111,806, now patent No. 3,090,949.

If these indicator light-switch assemblies are mounted in a movable body, such as a missile or a submarine, the body may undergo a change in movement sufficiently rapid to accidentally actuate the switch, because of the inertia of the movable light and switch components. This unintentional actuation may even occur to a switch in a stationary building if subjected to a blast or an earthquake, for example.

The present invention relates to a switch assembly of the type generally discussed above which has means to prevent accidental actuation of the switch because of a sudden movement change. This is accomplished by a weight, which preferably has a mass equal to or greater than the mass of the movable switch operating components, and interruptor means movable by the weight. The interruptor means and weight are guided in such a manner that, if a sudden movement occurs, the interruptor means interferes with an actuator for the switch components to prevent operative contact between the actuator and the switch itself.

It is, therefore, a principal object of the invention to provide an indicator light-switch assembly with means to prevent actuation of the switch as a result of a sudden movement of the assembly.

Other objects and advantages will be apparent from the following detailed description of a preferred embodiment thereof, reference being made to the accompanying drawings, in which:

FIG. 1 is a plan view, with parts broken away and with parts in cross section, of an indicator light-switch assembly embodying the invention;

FIG. 2 is a view in cross section and on an enlarged scale taken along the line 2—2 of FIG. 1;

FIG. 3 is a view in cross section similar to FIG. 2 but with the switch actuator shown in a different position;

FIG. 4 is a side view in elevation on a smaller scale, of the switch components shown in FIGS. 2 and 3; and

FIG. 5 is a view similar to FIG. 4, but with parts broken away and with parts in section, of the components in still a different position.

Referring to the drawings, an indicator light-switch assembly embodying the invention is indicated at **10** and includes a housing **12**, a lamp unit **14**, a manually-operable actuator unit **16**, a switch-actuating assembly **18**, and a switch unit **20**.

The lamp unit **14** includes a lamp panel **22** carrying lamps **24** which are electrically connected to terminals **26** in a terminal plate **28**. The terminals **26** serve to connect the lamps **24** into a suitable circuit so that the lamps are either lighted or extinguished upon the existence or occurrence of a predetermined event or condition. For example, the lamps **24** can be lighted when fuel in a tank drops below a predetermined quantity or upon a predetermined change in temperature of a monitored body or passage. Usually four of the lamps **24** are employed in the switch unit **10** with the lamps connected to four individual circuits, to two circuits, or to a single circuit. In the latter two instances, the extra lamps serve as spares and continue to operate even if the associated ones in the same circuit burn out to provide a margin of safety. Further details on the purpose and operation of the lamp unit **14** are set forth in the aforementioned patent application. Since the lamp unit does not constitute part of the instant invention, it will not be discussed in detail.

The manually-operated actuator **16** includes a translucent lens **30** supported by a bracket **32** which is affixed to an actuator rod **34**. The lens **30** can carry any desired indicia so that the specific condition being monitored will be apparent to the operator. Usually, a large number of the units **10** are mounted in a control panel so that the operator can quickly check the status of a large number of conditions. The shaft **34** slidably extends through the lamp panel **22** and the terminal plate **28** and can be pushed inwardly by the operator simply by pressing on the lens **30**. When released, the actuator unit **16** returns to its original position by means of a spring **36**. The actuator **16** can also be completely removed from the housing **12** along with the lamp panel **22** to facilitate changing of the lamps **24** as fully described in my previously mentioned application.

The switch-actuating assembly **18** is in the path of the actuator rod **34** and is moved thereby. The assembly **18** includes a pawl member **38** and a ratchet cylinder **40** which is rotated by the pawl member to actuate the switch unit **20**. The pawl member **38** includes a pawl or switch-actuating member **42** having ears **44** which are pivotally connected to ears **46** of a lever **48** by a pin **50**. A coil spring **52** urges the pawl **42** toward and against the ratchet cylinder **40**. The lever **48** is pivotally supported through a pivot pin **54** and is urged upwardly against the end of the actuator rod **34** by a coil spring **56** located around the pin **54** between the lever **48** and a retainer strip **58**. The strip **58** is urged by the spring **56** in the opposite direction against the ratchet cylinder **40** to prevent rotation of the cylinder in a counterclockwise direction, as shown in FIGS. 2 and 3.

The ratchet cylinder **40** includes a plurality of ratchet teeth **60** which rotate the cylinder **40** when engaged by the pawl **42**. The cylinder **40** further has longitudinal projections or ridges **62** extending over its length with those portions on each side of the teeth **60** engaging and depressing resilient strips **64** which, in turn, depress buttons **66** of switches **68** (FIG. 1) of the switch unit **20**. The switches **68** can be wired through terminals **70** to any suitable circuitry and can be of many different types so that their poles or contacts are either opened or closed when the buttons **66** are depressed, or some of the contacts can be closed and some opened.

If the switch unit **10** is suddenly moved in a direction opposite to that in which the manually-operated actuator **16** is moved to operate the switches **68**, the mass of the actuator unit **16** will tend to move it into the housing **12** and, if the acceleration is sufficient, will actually operate the switches **68**. This will also occur if the unit **10** is moving in the direction in which the actuator unit **16** is moved and suddenly stops. The mass of the lens **30**, the bracket **32**, and the rod **34** then will overcome the force of the spring **36** and cause the actuator rod **34** to move toward the switch unit **20** just as if it were depressed by the operator. The rod **34** then overcomes the force of the spring **56** and urges the lever **48** downwardly to move the

pawl 42 into engagement with one of the teeth 60 and rotate the cylinder 40 in a clockwise direction. This motion brings one of the ridges 62 into contact with the strips 64 and depresses the buttons 66 to actuate the switches 68, or vice versa, if one of the ridges 62 was previously in contact with the strip 64. When the actuator unit 16 again reaches its normal outer position, the pawl 42 moves upwardly, sliding over another one of the teeth 60 and is ready for another downward movement. The retainer 58 engages one of the teeth 60 as the pawl 42 moves upwardly to prevent rearward or counterclockwise rotation of the cylinder 40.

To prevent such an accidental actuation of the switch unit 20, the present invention includes an interruptor member having a mass equal to or slightly greater than the mass of the parts which tend to cause the accidental or unintended movement of the switches. To this end a pair of weights 72 are located adjacent side walls 74 of the lower portion of the assembly 10. The weights 72 are attached to guide plates 76, by screws 78 in this instance, with the plate 76 being connected by a cross bar or interruptor member 80. The plates 76 extend through guide slots 82 in the side walls 74 to direct movement of the weights 72 and the cross bar 80 in a direction which intersects the normal path of the pawl or switch-actuating member 42 and which also has a component parallel to the direction in which the switch actuator unit 16 is depressed to actuate the switch unit 20. The weights 72 are normally maintained at the upper ends of the slots 82 by coil springs 84, the upper ends of which engage the lower surfaces of the weights 72 and the lower ends of which are retained in suitable openings 86 of the side walls 74. The intermediate coil portions of the springs 84 are retained on projections 88 bent out from the side walls 74.

The weights 72 are normally in the upper position, at the upper ends of the slots 82, because of the force of the springs 84, and the cross bar 80 is then at the rear of the pawl 42 and has no effect upon it. If the assembly 10 should suddenly move in a direction opposite to the direction to which the actuator 16 is normally depressed or movement in the same direction suddenly ceases, and the change in the movement is sufficient to cause the actuator unit 16 to be depressed and actuate the unit 20, the weights 72 will similarly be moved relative to the side wall 74, because the mass of the weights 72 is substantially equal to or greater than the mass of the actuator 16. The weights thus move downwardly in the slot 82 and move the cross bar 80 into the path of the pawl 42, pushing it outwardly (FIG. 5), so that the pawl will move over, and will not engage the teeth 60 of the ratchet cylinder 40. With the cross bar 80 in this position, the pawl 42 can be depressed as much as desired without having any effect on the switch unit 20. When the sudden movement or acceleration has ceased, the springs 84 will return the weights 72 to the upper ends of the slots 82 and thereby remove the cross bar 80 from the path of the pawl 42, so that it can again operate in the usual manner.

Various modifications of the above described embodiment of the invention will be obvious to those skilled in the art, and it is to be understood that such modifications can be made without departing from the scope of the invention, if they are within the spirit and tenor of the accompanying claims.

I claim:

1. In a switch assembly comprising pawl means movable between a first position and a second position, manually-operable means for moving said pawl means from said first position to said second position, ratchet means movable by said pawl means when in its second position, and switch means actuated by said ratchet means when engaged by said pawl means, the improvement comprising a weight, interruptor means associated with said weight and movable therewith, guide means for directing said interruptor means between a first position spaced from the path of said pawl means and a second position intercepting the path of said pawl means between the first and second positions of said pawl means, with said interruptor means preventing said pawl means from reaching the second position of said pawl means when said interruptor means is in its second position, and resilient means holding said interruptor means in its first position except during sudden movement of said switch assembly sufficient to cause said manually-operable means to move said pawl means from its first position to its second position.

2. A switch assembly comprising switch-actuating means movable in a given path between a first position and a second position, manually-operable means for moving said switch-actuating means from said first position to said second position, switch means actuated by said switch actuating means when in its second position, said switch actuating means being yieldably movable in a direction transversely of its path, a weight, interruptor means associated with said weight and movable therewith, and guide means for directing said interruptor means in a path intersecting the path of said switch-actuating means between the first and the second positions of said switch-actuating means, said interruptor means moving said switch-actuating means to one side of its path when said interruptor means intersects said path and engages said switch-actuating means, said interruptor means moving into the path of said switch-actuating means during sudden movement of said switch assembly sufficient to cause said manually-operable means to move said switch-actuating means from its first position toward its second position.

3. A switch assembly comprising switch-actuating means movable in a predetermined path between a first position and a second position, means for moving said switch-actuating means from its first position to its second position, switch means actuated by said actuating means when in its second position, a weight interruptor means connected to said weight and movable therewith, means for directing said interruptor means in a lineal path intersecting the path of said actuating means between said first position and said second position to prevent said actuating means from reaching its second position as a result of a sudden change in movement of said switch assembly sufficient to cause movement of said switch-actuating means and to cause said weight to move said interruptor means into the path of said switch-actuating means, and means for resiliently urging said weight and said interruptor means back toward their original positions.

4. A switch assembly comprising switch-actuating means movable in a predetermined path between a first position and a second position, means for moving said switch-actuating means from its first position to its second position, switch means actuated by said actuating means when in the second position, a pair of weights on opposite sides of said switch-actuating means, interruptor means connected between said weights and movable therewith, means for directing said interruptor means and said weights in a lineal path angularly disposed to and intersecting the path of said actuating means between said first position and said second position to prevent said actuating means from reaching its second position by forcing it to one side of its intended path, and yieldable means for moving said switch-actuating means back into its path when out of engagement with said interruptor means.

References Cited by the Examiner

UNITED STATES PATENTS

2,399,920	5/46	Glover	200—153
2,506,187	5/50	Yarrick	200—153
2,523,774	9/50	Moran	200—153

BERNARD A. GILHEANY, *Primary Examiner.*