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Burns

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[54] **BELL CRANK TYPE OPERATING MEANS FOR SIMULTANEOUSLY ACTUATING INTERLOCKED PAIR OF ELECTRICAL SWITCHES**

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[52] **U.S. Cl.** ..... **200/50 C**, 200/17 R, 200/18

[51] **Int. Cl.** **H01h 9/26**, H01h 3/46

[58] **Field of Search** ..... 200/4, 16 B, 16 C, 200/16 D, 17 R, 18, 50 C, 172 R, 172 A

[56] **References Cited**

UNITED STATES PATENTS

3,604,863	9/1971	Schink	200/16 C
3,199,017	8/1965	Graves et al.	200/4 X
3,329,778	7/1967	Bedocs	200/16 C
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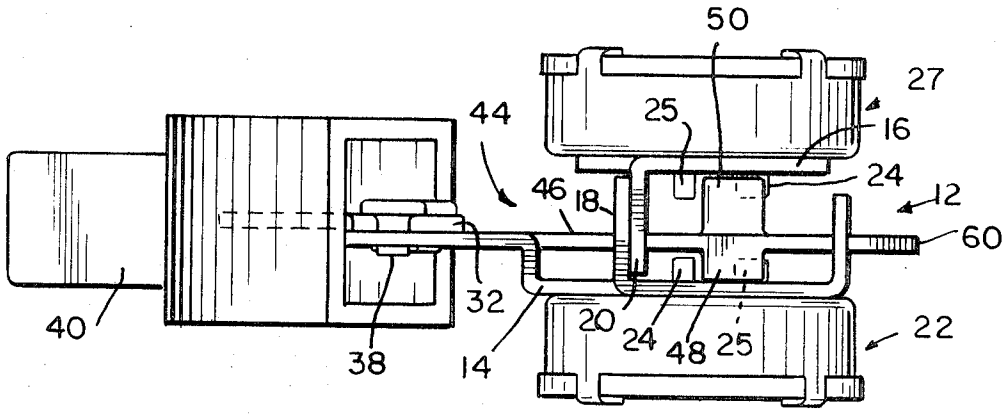
[57] **ABSTRACT**

A bell crank moves a switch actuator blade between a pair of opposed rotary switches to actuate same.

7 Claims, 4 Drawing Figures



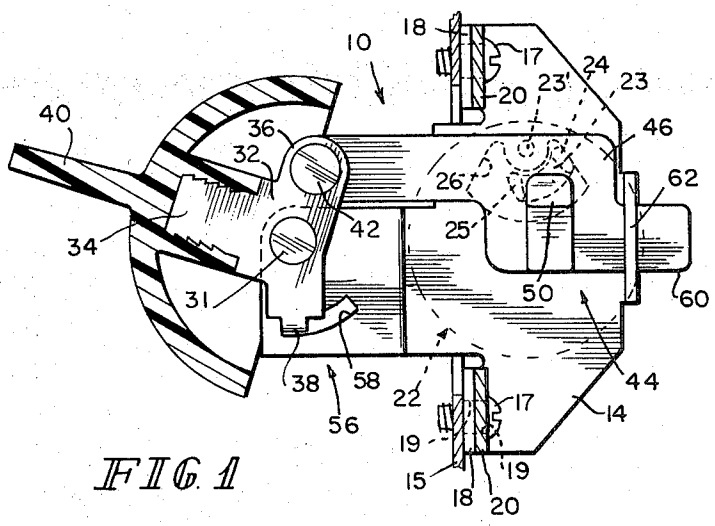


FIG. 1

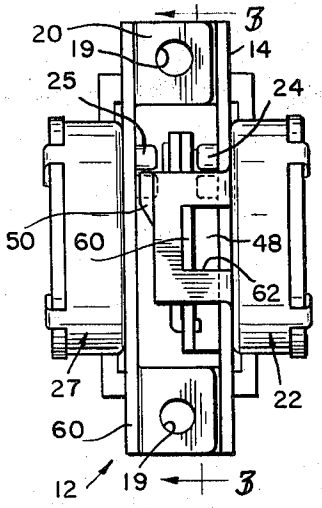


FIG. 2

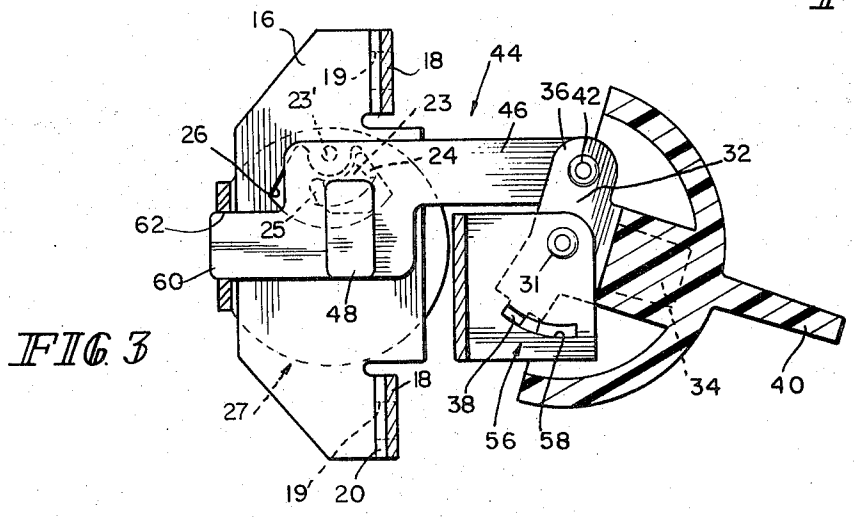


FIG. 3

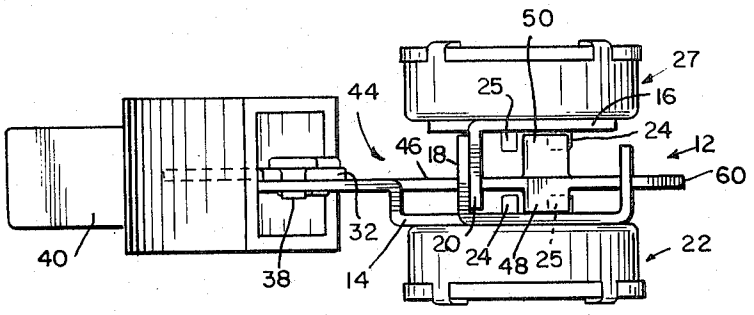


FIG. 4

BELL CRANK TYPE OPERATING MEANS FOR SIMULTANEOUSLY ACTUATING INTERLOCKED PAIR OF ELECTRICAL SWITCHES

The present invention is directed to a device for controlling switches and more specifically to the type of switches which are actuated by rotary actuators employed by the switches.

The audio-video industry widely accepts rotationally actuated, on-off, over center snap action switches, such as disclosed by U.S. Pat. No. 2,820,864, W. A Newman, et al. In the past, rotationally actuated switches were normally coupled with and controlled by a volume control of the variable resistor type. These types of switches are normally found in radios and televisions. Switches of this nature are designed to be actuated by an actuator moving in a concentric path across the switch actuator.

Adapting the rotary actuator switch to control mechanism other than the concentric type presents a great deal of problems such as force factors, lost motion within the actuator device, space limitation, and provisions for the device to be controlled by various types of external hardware.

It is, therefore, an object of the present invention to provide a control device having a frame for supporting a plurality of electrical switches, supporting and positioning means for the linkage required to actuate the switches, and means on the frame for mounting the frame to a control panel.

Another object is to provide a mechanism for actuating the switches that can be easily assembled with a minimum amount of parts and a limited amount of frictional generating surfaces to provide smooth operating conditions.

A further object is to provide a fabricated frame for the control which can be assembled during manufacturing or may be assembled when attaching the frame to a chassis.

It is another object of the invention to provide a travel limiting feature to assure proper amount of movement of the control device.

Another object is to provide a control for electrical switches that is neat, compact and having a substantially uncluttered exterior.

The foregoing and other objects of the present invention may be more fully appreciated from the following description and the accompanying drawings wherein:

FIG. 1 is a side view in section of the control device in one position of operation;

FIG. 2 is an end elevation of FIG. 1;

FIG. 3 is a section taken along line 3—3 of FIG. 2, in another position of operation; and

FIG. 4 is a bottom view of FIG. 1.

Accordingly, the invention provides a frame means, comprising a first frame coupled to and co-planer with a second frame, each having a cooperating electrical switch attached thereto. Linearly moveable between the frames and positioned to travel in an interference path to operate the electrical switches is a switch actuating blade. The switch actuating blade is coupled to and moveable by a bell-crank, pivotally carried on the first frame. A slot in the first frame, in cooperation with a protrusion on the bell-crank, conveniently provides a limit travel control. The bell-crank is formed so as to retainably receive a control lever for manual actuation of the bell-crank, which in turn linearly moves the switch actuating blade. Linear movement of the switch actuating blade will position the switches to an on or off condition.

Referring now to the drawings, the switch control **10** includes a frame means **12** having a first frame **14** and a second frame **16**. The first frame member **14** serves as the primary support member, and has formed thereon a pair of outwardly projecting mounting wings **18** for mounting the first frame **14** to a chassis **15**, by fastener **17**. Another function of the first frame **14** is to provide a mounting for a first rotary actuated electrical switch **22**. Switch **22** could be mounted to the frame **14** by some suitable means, such as by welding, for example. Second frame **16** is designed to cooperate with the first frame **14** to provide a support for second rotary actuated switch **27** and to properly align it so as to be controlled by the same actuator as the switch **22**. Rotary actuated switches **22** and **27** are of the type described in the aforementioned U.S. Pat. No. 2,820,864, W. A. Newman, et al., and are controlled by an actuator **23**. Actuator **23** includes a pivot post **23'**, upstanding legs **24** and **25**, and an opening **26** in the housing for limiting the travel of the actuator **23**. The actuator **23** is coupled to an overcenter spring (not shown) to move the electrical contacts in the switch to an on or off condition.

Rigidly coupled to the first frame **14** is a pivot post **31** for pivotly carrying a bell crank **32**. The bell crank **32** includes a first leg **34**, a second leg **36**, and a tongue **38**. First leg **34** is designed to receive a variety of different types of external hardware for transmitting motion from outside a chassis to the bell crank. As shown in the present embodiment, one of the forms of hardware used is a control lever **40**. Control lever **40** provides a mechanical advantage to the control switch as a result of its length.

The second leg **36** of the bell crank is hinged to switch blade **46** by a hinge pin **42** for imparting motion from the bell crank to switch actuator means **44**. The path of travel of switch blade **46** is transverse to the axis of pivot post **31**. A travel limit control **56** is provided to limit the travel of the switch blade. Travel limit control **56** includes a travel limiting tongue **38** which is located on the bell crank and positioned to travel in a slot **58** in first frame **14**. It can be seen that as the bell crank is moved to a first position, the distance of travel is controlled by the tongue **38** moving in slot **58** and is stopped at the ends of slot **58**.

Switch actuating means **44** includes switch blade **46**, and bosses **48** and **50**, and a retaining tab **60**. The retaining tab **60** is provided to retain the distal end of the switch blade **46** opposite that of the hinged end. The tab **60** is retained in a window **62** projecting from the first frame **14**. As switch blade **46** is moved to the two extreme positions, furthermost right and furthermost left, as shown in FIGS. **1** and **3** respectively, it can be seen that the bosses **48** and **50** engage the rotary switch actuators **23** on switches **22** and **27** respectively. This is achieved by the boss **48** engaging one of the upstanding legs **24** or **25** of the rotary switch actuator **23** on switch **22** and the boss **50** engaging the upstanding legs **24** and **25** of the rotary switch actuator **23** of switch **27**. It should be noted that the bosses **48** and **50** actuate their respective rotary switch actuators to an over center condition and allow the rotary switch actuator to then travel at its own speed until the switch actuator is stopped by the windows **26** in the switches **22** and **27**.

A feature of the present device is that first frame **14** and second frame **16** are so designed that they may be assembled together by their wings **18** and **20** and rigidly attached by welding or other means well known in the art. Optionally, the frames **14** and **16** may be assembled together at the time they are being attached to a chassis **15** by alligning the mounting wings **18** of the first frame **14**, with the mounting wings **20** of second frame **16** and then rigidly coupling the frames to each other with the same fastener such as mounting screw **17** which mounts the frame means **12** to the control panel through mounting apertures **19**.

OPERATIONS

To actuate the switches, the operator moves the control lever **40** from the position as shown in FIG. **1** downwardly to come to rest in a position as indicated in FIG. **3**. As the lever **40** is moved downward, the bell crank **32** pivots about its pivot post **31** moving the end of leg **36** to the counterclockwise as viewed in FIG. **1**. The amount of travel of the bell crank is controlled by a travel limiting means **56**, wherein tongue **38** of the bell crank travels in slot **58** in the first frame **14**. Leg **36** of the bell crank **32** is coupled to switch blade **46** by hinge pin **42** to thereby also move the switch blade **46** to the left in FIG. **1**. As switch blade **46** is moved, the switches **22** and **27** are simultaneously actuated by way of the bosses **48** and **50** on the blade being in an interference path with the rotary switch actuators **23** on the respective switches. To return the switches to the condition as shown in FIG. **1** from the condition as shown in FIG. **3**, the control lever **40** is moved upwardly to pivot the bell crank about its pivot **31** and therefore impart motion to the switch blade **46** through the hinge pin **42** to thereby move the rotary switch actuators **23** to the condition as in FIG. **1**. It should be noted that if the second frame **16** has been deleted, only the switch **22** will be actuated and depending upon the geometry of the switches **22** and **27**, the switches will be switched to an "on or off" condition.

The present invention therefore provides a means for controlling one or more opposed switches by a single control lever to at least two conditions of the switches.

What is claimed is:

1. A control for electrical switches comprising:

a. frame means

b. at least two separate and distinct electrical switch bodies carried in a face to face relationship by said frame means, said electrical switches including rotary switch actuators,

c. a bell crank having first and second legs and mounted for pivotal movement on said frame,

d. a control lever carried on said first leg to impart movement thereto,

e. a switch actuating blade carried by said frame means and hinged to said second leg to move said actuating blade in a linear direction between said electrical switch bodies, and

f. means carried on said switch actuating blade engaging said rotary switch actuators.

2. A control according to claim **1** further including a travel limiting means limiting said pivotal movement of said bell crank.

3. A control according to claim **2** wherein said travel limiting means includes a tongue on said bell crank extending into a slot in said frame means.

4. A control according to claim **1** wherein said frame means includes a pair of switch supporting frames each carrying one of said electrical switch bodies.

5. A control according to claim **5** wherein said switch supporting frames are connected by welding.

6. A control according to claim **4** wherein said switch supporting frames are connected to each other by the same fastener which attaches said frame means to a control panel.

7. A control according to claim **1** wherein said engaging means comprises a pair of bosses carried on opposed sides of said switch actuating blade.

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