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POSITIVE INTERLOCK SWITCH

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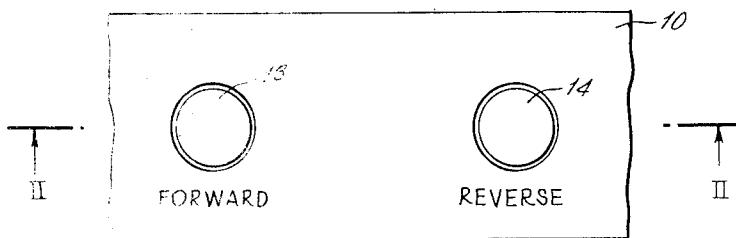


Fig. 1.

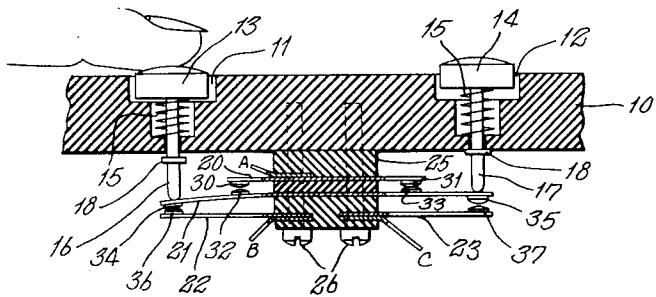


Fig. 2.

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## UNITED STATES PATENT OFFICE

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## POSITIVE INTERLOCK SWITCH

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4 Claims. (Cl. 260—5)

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My invention relates to improvements in switches, and more particularly to a new and novel type of positive interlock switch. This application is a division of my now abandoned co-pending application, Serial No. 21,191, filed April 15, 1948, for Sound Synchronizing Apparatus.

One object of my invention is to provide a switch supplying power to two circuits wherein both circuits cannot be supplied with power simultaneously, thus preventing possible damage when the circuits are related, as they may be, for example, in the forward and reverse operation of a reversible drive electric motor.

Another object of my invention is to provide such a switch which is positive in operation and yet which can be constructed simply and at low cost of relatively few parts.

In accordance with my invention, I provide a switch with two circuits selectively connectable to a common source of potential and in which, in the event of simultaneous operation of the switch to connect both circuits to the common source of potential, the latter will be automatically disconnected from both.

My invention will be more fully understood from the following description when taken with the accompanying drawing, in which:

Fig. 1 is a plan view from above of a switch in accordance with my invention; and

Fig. 2 is a cross-sectional view along plane II—II of Fig. 1.

In the embodiment disclosed, plate or panel 10 is provided with two apertures 11 and 12 spaced as shown. Push-button 13 is recessed in and extends through aperture 11 and push-button 14 is recessed in and extends through aperture 12. The finger-engaging head of each push-button 13 and 14 is urged upward out of its respective aperture 11 or 12 in panel 10 by means of a compression spring 15 surrounding the respective actuating rods 16 and 17 of push-buttons 13 and 14, respectively, each of apertures 11 and 12 being shaped as shown in cross section in Fig. 2 to receive a portion of the finger-engaging head of the push-button 13 or 14, spring 15, and the respective actuating rod 16 or 17. A collar 18 is provided around each of actuating rods 16 and 17 adjacent the lower surface of panel 10 to limit the movement of each of push-buttons 13 and 14 as biased by its spring 15. These collars 18 may, for example, be split washers engaging a cooperating groove in each of actuating rods 16 and 17.

Between push-buttons 13 and 14 and beneath panel 10 is disposed an assembly comprising contact strips 20—23 as shown, each of conducting

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material and insulated from one another and held in position by means of insulation body or block 25. Contacts strips 20—23 are aligned in the same vertical plane with actuating rods 16 and 17, and contact strips 22 and 23 are additionally aligned to lie in the same horizontal plane relative to the drawing. Machine screws 26 secure insulation block 25 to the lower surface of panel 10 in addition to aiding in maintaining contact strips 20—23 in their predetermined relative positions.

Middle contact strip 21 is made of flexible semi-rigid material whereas contact strips 20, 22 and 23 need not be flexible, although they may be, and electrical terminals or connections A, B and C are provided, each connecting with respective contact strips 20, 22 and 23.

Lower contacts 30 and 31 are provided on the lower surface of uppermost contact strip 20 at the respective ends thereof and cooperating respectively opposed contacts 32 and 33 are provided on the upper surface of the middle contact strip 21. Additional contacts 34 and 35 are provided on the lower surface of contact strip 21 at the respective ends thereof and beyond the upper surface contacts 32 and 33. A contact 36 opposing and cooperating with contact 34 is provided on the upper surface of contact strip 22 and a similar contact 37 opposing and cooperating with contact 35 is provided on the upper surface of contact strip 23.

Contact strips 20—23 are disposed such that normally contacts 30 and 32 are engaged, as are contacts 31 and 33, while the remainder of the contacts are disengaged. In this normal position actuating rods 16 and 17 just touch opposite ends of middle contact strip 21 while their respective collars 18 engage the lower surface of panel 10. Note that actuating rod 16 of push-button 13 is aligned with contacts 34 and 36 rather than bearing against flexible middle contact strip 21 intermediate contacts 32 and 34. This insures a positive contact between contacts 34 and 36 when push-button 13 is depressed. Actuating rod 17 of push-button 14 is similarly aligned with contacts 35 and 37 for the same reason.

When push-button 13 is depressed as shown in Fig. 2, contacts 30 and 32 are disengaged and contacts 34 and 36 engaged. A circuit is then completed between electrical connections A and B through contacts 31, 33, 34 and 36, in the order named. If push-button 13 is now released and push-button 14 depressed, contacts 31 and 33 will be disengaged and contacts 35 and 37 en-

gaged so that an electrical connection is established between connections A and C through contacts 30, 32, 35 and 37, in the order named.

It will thus be seen that contact strip 21 acts as a flexible transfer connection between upper contact strip 20 and either one of lower contact strips 22 and 23, depending upon whether push-button 13 or 14, respectively, is depressed. However, if both push-buttons 13 and 14 are depressed simultaneously, contact 30 is disengaged from contact 32 simultaneously with contact 31 being disengaged from contact 33 and hence no circuit from electrical connection A is completed to electrical connection B or C. This provides a positive interlocking feature.

Thus, when electrical connection A is connected to a power source, electrical connection B connected to a forward rotation connection for a motor, and electrical contact C connected to the reverse rotation connection for the same motor, accidental misoperation of both circuits simultaneously is prevented, removing the danger of damage to the motor or any other similar device or circuit in which a switch in accordance with my invention is utilized.

It is also to be noted that while both connections B and C are disconnected from connection A when push-buttons 13 and 14 are depressed simultaneously, these connections B and C are then electrically connected through contacts 36, 34, 35, and 37 in the order named. This operation of my switch may be utilized to advantage in some uses.

What is claimed is:

1. A positive interlock switch comprising first, second, and third terminals, first and second contacts connected together and to said first terminal, a third contact disposed adjacent said first contact and connected to said second terminal, a fourth contact disposed adjacent said second contact and connected to said third terminal, and a flexible conducting transfer member disposed between said first and third, and second and fourth contacts and fixedly mounted intermediate its ends so as to normally engage said first and second contacts, whereby urging the end of said transfer member adjacent said third contact toward said third contact to contact the latter disengages said member from said first contact and completes a circuit between said first and second terminals through said second and third contacts, urging the end of said transfer member adjacent said fourth contact toward said fourth contact to contact the latter disengages said member from said second contact and completes a circuit between said first and third terminals through said first and fourth contacts, and simultaneous urging of both ends of said transfer member toward said third and fourth contacts respectively to contact both completes a circuit between said second and third terminals through said third and fourth contacts while disconnecting both said second and third terminals from said first terminal.

2. A positive interlock switch comprising an insulating body, a conducting strip extending through and carried by said body, an electrical contact disposed at each end of said strip beyond said block and on the same side of said strip,

a flexible conducting strip bearing two contacts, one opposing each of said first-mentioned contacts, and extending through and carried by said block, said flexible conducting strip being positioned in said block to normally engage each pair of opposed contacts and having end portions extending at either end beyond said opposed contacts and bearing an additional contact at either end thereof on the opposite side thereof from that bearing its contacts opposing said first-mentioned contacts, third and fourth conducting strips carried by and extending from opposite sides of said insulating body and spaced apart therein so as to be insulated from one another, each of said last-mentioned conducting strips bearing a contact opposed to the respective end contact of said flexible conducting strip but normally spaced and disengaged from its respective opposed contact, and a push-button for and bearing against each end portion of said flexible conducting strip on the side first-mentioned for disengaging the normally engaged contacts and engaging the normally disengaged contacts adjacent its respective end portion.

3. A switch for selectively closing one of two circuits but preventing simultaneous closure of both, comprising a first pair of spaced conductively interconnected contacts adapted to serve as a common connection to one side of both circuits, a flexible conductive strip fixed intermediate its ends so as to present two flexible cantilever arms, each arm having its obverse face normally bearing against one of the first pair of contacts, and a second pair of contacts each adapted to serve as a connection to the other side of one of the two circuits and each adapted to be engaged by the reverse face of one of the arms when that one of the arms is flexed to break engagement between its obverse face and one of the first pair of contacts.

4. A switch for selectively closing one of two circuits but preventing simultaneous closure of both, comprising a first pair of spaced conductively interconnected contacts adapted to serve as a common connection to one side of both circuits, a flexible conductive strip fixed intermediate its ends so as to present two flexible cantilever arms, each arm having its obverse face normally bearing against one of the first pair of contacts, a second pair of contacts each adapted to serve as a connection to the other side of one of the two circuits and each adapted to be engaged by the reverse face of one of the arms when that one of the arms is flexed to break engagement between its obverse face and one of the first pair of contacts, and circuit opening and closing means for selectively flexing each of said arms to disengage it from the one of the first pair and engage it with the one of the second pair of contacts.

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#### REFERENCES CITED

The following references are of record in the file of this patent:

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