July 21, 1942. L. L. YOUNG ET AL 2,290,521

DOOR INTERLOCK

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Fig. 1

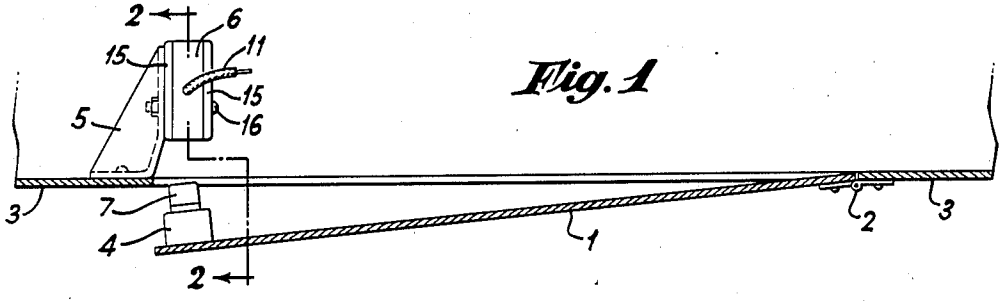


Fig. 2

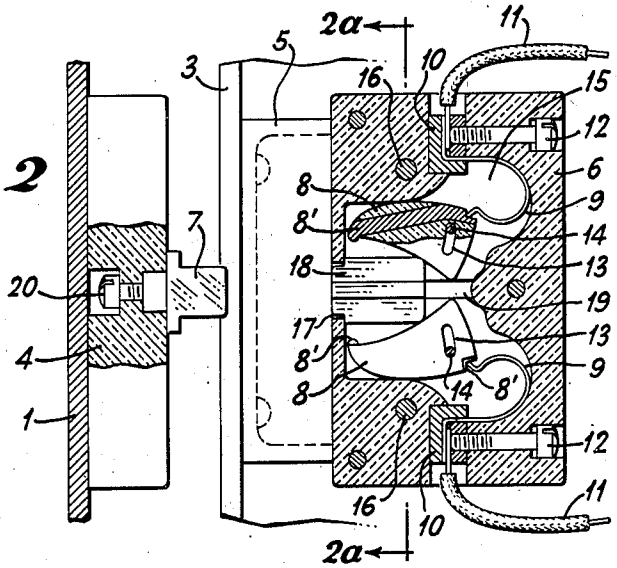


Fig. 2a

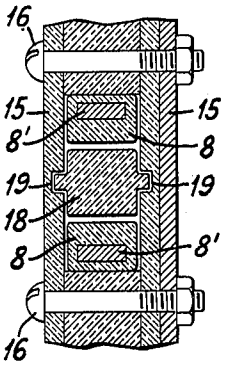
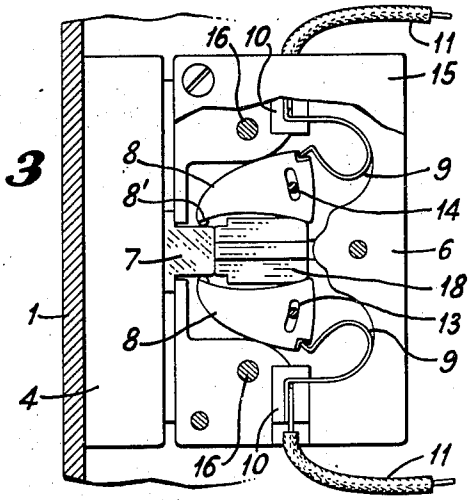


Fig. 3



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Fig. 4

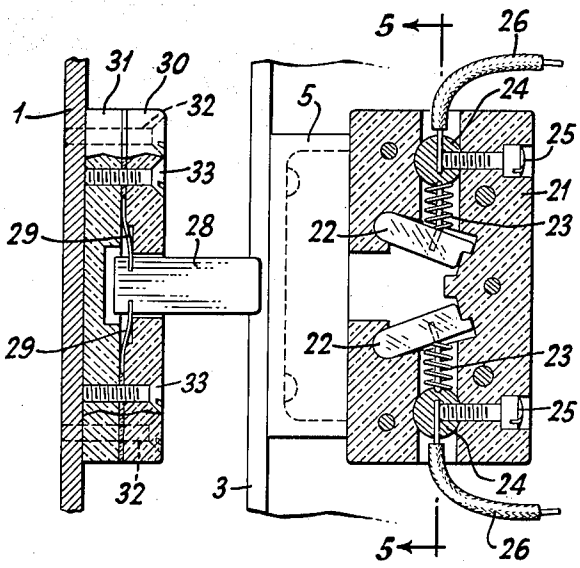


Fig. 5

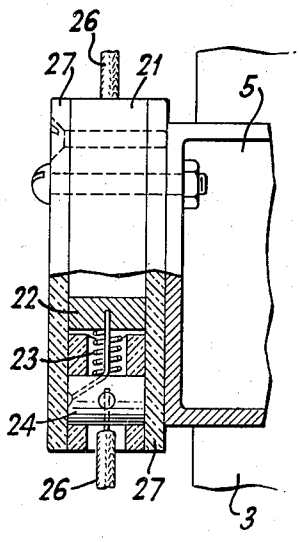
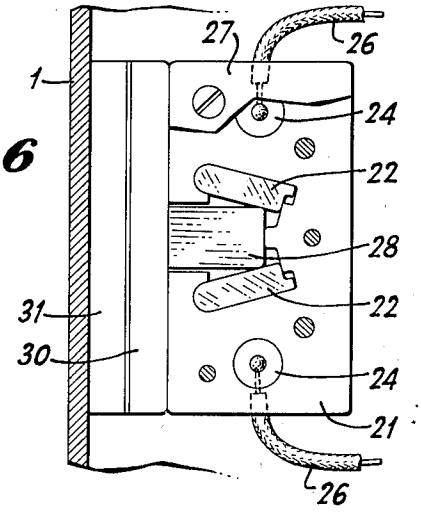


Fig. 6



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DOOR INTERLOCK

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Application August 16, 1940, Serial No. 352,842

9 Claims. (Cl. 200—54)

This invention relates to a new and novel door interlock which is particularly adapted to a radio transmitter or other high voltage apparatus.

An object of this invention is to provide a device which will protect the operator from coming into contact with dangerous voltages.

Another object of this invention is to prevent a circuit from being completed by the insertion of an unauthorized metallic member which is not part of the interlock.

A feature of this invention is the novel arrangement in which the interlock ejects any metallic member from being inserted to temporarily short-circuit the device. Also, the contacts are arranged with a wiping action to prevent poor contact due to dirt and corrosion.

Door interlock switches are well known in the prior art to act as a protective circuit to remove dangerous voltages from apparatus inside an enclosure of high voltage apparatus when the door of the enclosure is opened. In the prior art devices, various means have been used, ranging from a simple plug switch to complicated devices operated by keys. However, no simple device heretofore, insofar as I am aware, has accorded both dependability and still safeguarded against a careless operator who frequently will insert a conducting plug into a safety device, thus preventing its functioning as a safety device thereafter. The device of this invention cannot be short-circuited and forgotten because any metallic member which is thrust into it will be expelled because of its particular construction. Also, positive electrical contact is assured by a definite wiping action and a strong spring tension maintains secure electrical contact. Briefly, the device of this invention comprises a casing member which encloses a pair of pivoted contact members and a metallic plunger which moves the pivoted contact members and thus completes the electrical circuit.

This invention will best be understood by referring to the accompanying drawings, in which:

Fig. 1 is a sectional view through an enclosure of a radio transmitter or other high frequency apparatus showing the general location of the interlock of this invention;

Fig. 2 is a longitudinal cross-section of the interlock of this invention when the door is in an open position the section being taken on lines 2—2 indicated in Fig. 1;

Fig. 2a is a partial cross section of Fig. 2, the section being taken on lines 2a—2a;

Fig. 3 is a side elevation with the cover cut away to show the operating members when the door is in the closed position;

Fig. 4 is a longitudinal cross-section of a modification of this invention shown with the contact arrangement when the door is in the open position;

Fig. 5 is a rear view partly in section of Fig. 4; and

Fig. 6 is a side elevation with the cover cut away to show the operating members when the door is in the closed position.

Referring now to Fig. 1 of the drawings, a typical arrangement of the interlock switch of this invention is shown wherein member 1 represents the door of a radio transmitter which is hinged by hinge 2 to an enclosure member 3 of a radio transmitter. At the free end of the door, there is secured a movable non-metallic member 4. A bracket 5 is secured to an enclosure member 3 to support the casing 6 of the interlock of this invention, which is suitably arranged in such relation that upon closing the door 2, a metallic plug member 7 will actuate the switch parts within casing 6 to complete the electrical circuit.

Referring now in detail to Figs. 2 and 3, located within casing 6, which is preferably made of some rugged insulation material, such as "Bakelite," is a pair of toggle contact members 8 of insulating material having embedded within its central portion metal conductor pieces 8' which protrude beyond the insulation material at the upper and lower portions. An actuating spring 9 is provided for maintaining the toggle contact members 8 in the inoperative position, as shown by Fig. 2. Springs 9 also act to form the electrical conductor between metallic members 8' and a pair of terminal blocks 10 into which external wires 11 are secured by means of a set screw 12. Toggle members 8 have an arcuate slot 13 and a pin 14 passes therethrough and is embedded at each end in cover plates 15 which are located on each side of block 6 to completely enclose the interlock device. Pin 14 is arranged on cover plates 15 so that the motion of the toggle contact parts 8 is a combination of sliding and rotation about pin 14. Casing member 6 is secured to bracket 5 by means of a plurality of screws 16. In order that no metallic substance may be placed within casing 1, the actuating aperture 17 is filled with an insulating member 18 which slides in slots 19 cut in covers 15. The switch is actuated as shown in the position indicated by Fig. 3, by means of a metallic plunger 7 which is secured to an insulating block 4 by a screw 20 and when the door

is closed, plunger 7 enters a portion within casing 6, and displaces member 18 downward to such a position that plunger 7 can contact metallic inserts 8'. It will be noted that when the door is in the open position, springs 9 cause the toggle contact members 8 to be held with strong pressure against pins 14 with the upper ends of the toggle contact parts 8' drawn well back within their nesting position, the lower parts of toggle 8 holding the guard member 18 in a position to obstruct any effort to insert a short-circuiting device into the interlock. When the door is closed as indicated by Fig. 3, plug 7 acts upon guard block 18, causing it to be pushed inward, as mentioned above. This inward motion pushes the lower ends of toggle contact parts 8 away from each other, altering the relative position of the pins 14 with the point of contact of the actuating springs 9, so as to introduce a toggle action which causes the upper ends of the toggle contact parts 8 to approach each other and make firm contact at the opposite sides of plug 7 which now reaches inside the device a sufficient distance to contact inserts 8' and to complete the circuit closing. With this construction, a definite wiping action takes place near the end of the travel of plug 7, giving good electrical contact and freedom from corrosion at the contact surfaces. It should be noted that the circuit closing plug 7 is physically removed when the door is opened and ingress into the inside of the contact device is barred from the outside of casing 6. The toggle contact parts 8 exert a strong ejecting force against guard block 18 at all times so that it cannot stick in the depressed position. This same ejecting force holds the upper end of toggle contact parts 8 firmly back in their protecting position out of reach from any short-circuiting means. In this device, should an inexperienced or careless operator secure some metal plug similar to the male plug 7 so as to short-circuit the device, the door cannot be closed so that such an unauthorized short-circuiting device cannot be forgotten or left in a place to endanger the life of another operator, who might be unaware that such a short-circuiting device was used.

The modification shown in Figs. 4, 5 and 6 is somewhat similar to that shown in Figs. 1 to 3, inclusive, and likewise comprises an insulating casing 21, which is shaped as shown to hold two metallic contact pieces 22, two springs 23 which bear against member 22, and a metallic insert 24. Member 24 is held in place by means of screws 25 which are threaded into the lower end thereof. Electrical connection to the switch is made by means of leads 26 being soldered to inserts 24. Casing 21 is enclosed by means of covers 27. A metallic plunger member 28 is secured by two pieces of flat spring members 29 which are interposed between two insulating strips 30 and 31. The entire assemblage of members 28 to 31, inclusive, is secured to door 1 by means of a plurality of screws 32. The two insulating members 30 and 31 are secured by screws 33. In the operation of this device and in the closed position shown by Fig. 6, the conducting plug 28 freely contacts the surfaces of members 22, thus completing the electrical circuit. It should be noted that there will be a force exerted by plug 28, causing contact pieces 22 to be moved apart against the action of springs 23, thus completing an electrical circuit through the device. It will also be noted that should any attempt be made to replace a loose metallic member to substitute for plug 28, which is secured to door 1, that it will be immediately ejected by action of springs 23.

A modification of the device shown in Figs. 2 and 3 would be to omit the insulating guard block 18 and use a longer male metallic plug 7. In this case, however, there will be greater ease in inserting an unauthorized short-circuiting device. Also, another modification would be to use a spring wire loop of suitable size and shape to replace the flat bronze springs 9 if a spring of small cross-section is to be used. However, in such a construction, there should be added flexible conducting leads between parts 8' and terminal members 10 so as to remove the possibility of electrical currents drawing the temper of the springs due to heating, and while only two embodiments of this invention are shown, it is to be distinctly understood that it should not be limited precisely thereto.

What is claimed is:

1. An interlock switch comprising a casing member having a central aperture therein, a pair of movable contact members pivotally located within said casing member, a spring contact member normally urging said movable contacts together, an insulating barrier preventing said movable contacts from touching each other, a metallic plunger member arranged to pass through the aperture in said casing and complete an electrical circuit between said movable contacts.

2. An interlock switch comprising a casing member having a central aperture therein, a pair of movable contact members pivotally located within said casing member, a spring member normally urging said movable contacts in a position toward one another, an insulating member located in the aperture of said casing and in a position to normally separate said contacts, a movable metallic plunger arranged to pass through the aperture in said casing to displace said insulating member and thus complete an electrical circuit between said movable contact members.

3. An interlock switch for protecting the electrical circuit of a radio transmitter comprising a casing member having a central aperture therein, a pair of movable contact members each having a slot, a pin for each contact member secured to said casing and arranged to slide in said slot to guide each movable contact member, a metallic plunger member arranged to pass through the aperture in said casing and complete an electrical circuit between said movable contact members.

4. An interlock switch for protecting the electrical circuit of a radio transmitter comprising a casing member having a central aperture therein, a pair of movable contact members having one of their faces arranged at an angle with respect to the aperture in said casing, an insulating barrier arranged to slide in said casing for preventing said movable contacts from touching each other, a metallic plunger member arranged to pass through the aperture in said casing to displace said barrier and complete an electrical circuit between said movable contact members.

5. An interlock switch for protecting the electrical circuit of a radio transmitter comprising a casing member having a central aperture therein, a pair of movable contact members each having a slot, a pin for each contact member secured to said casing and arranged to slide in said slot to guide each movable contact member, means to normally urge said movable contacts in a position toward one another, a metallic plunger ar-

ranged to pass through the aperture in said casing and in a position between said movable contacts to displace and contact them, and thus complete an electrical circuit therebetween.

6. An interlock switch comprising an insulating casing member having a central aperture therein, a pair of movable members of insulation material having embedded therein a conductive member which protrudes beyond the insulation material at the upper and lower portions thereof and serve as contacts for said switch, said movable members pivotally located within said casing member, a metallic plunger arranged to pass through the aperture in said casing and in a position between said movable members to complete the electrical circuit between the conductive member which protrudes beyond the insulation at the upper portion thereof, and spring tension means for urging the movable members toward one another and for contacting said conductive material which protrudes beyond the lower portion of said movable contact members and arranged to make external circuit connections.

7. An interlock switch comprising an insulating casing member having slots and a central aperture therein, a pair of movable contact members pivotally located within said casing and arranged to move in a zone restricted by said slots in the casing, a plunger member arranged to pass through the aperture in said casing, said plunger member secured to an insulating strip which is fastened to an external movable member and arranged to complete an electrical circuit between said contacts when said external member is moved to a position which displaces said contacts in the slots within said casing.

8. An interlock switch comprising a casing member having a central aperture therein, two movable contact members located within said casing, an insulation member interposed between said contact members and located to normally close the aperture in said casing, a metallic plunger member arranged to pass through the aperture in said casing to displace said insulation member and to complete an electrical circuit between said movable contact members.

9. An interlock switch comprising a casing member having a central aperture therein, a pair of movable contact members pivotally located within said casing member, a spring contact member normally urging said movable contacts together, an insulating barrier arranged to slide in said casing for preventing said movable contacts from touching each other, a metallic plunger member arranged to pass through the aperture in said casing to displace said insulating barrier and to complete an electrical circuit between said movable contacts.

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