

May 24, 1949.

W. E. PARISH
INTERLOCK MECHANISM FOR SWITCH
AND RECEPTACLE UNITS

2,470,944

Filed Aug. 14, 1946

3 Sheets-Sheet 1

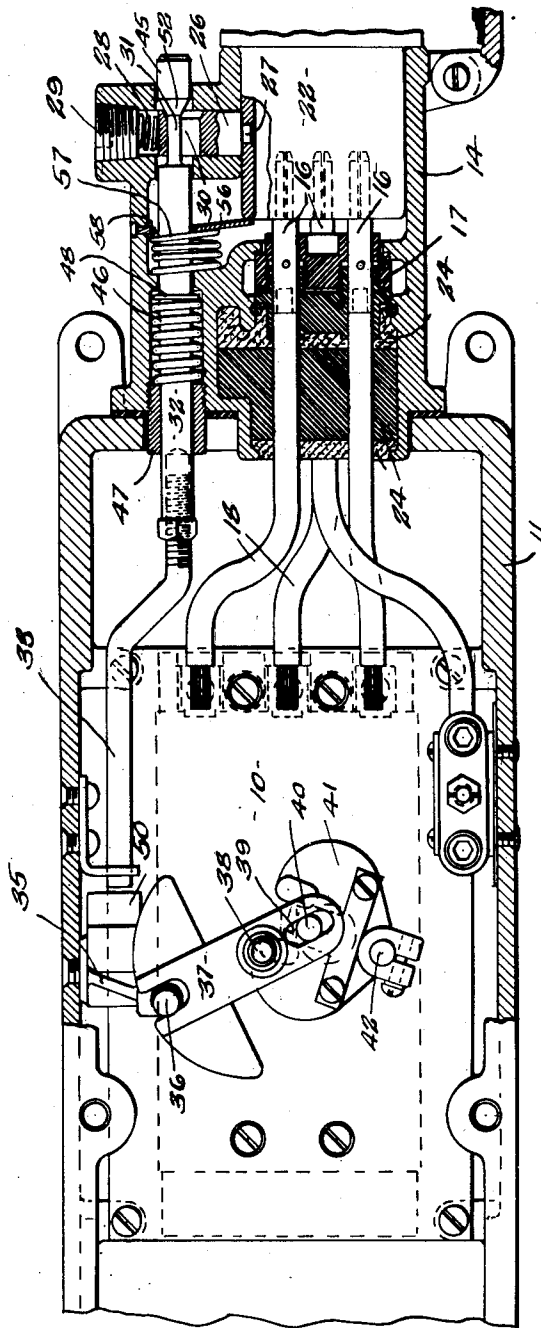


Fig. 1

INVENTOR
William E. Parish
BY
Badell & Thompson
ATTORNEYS

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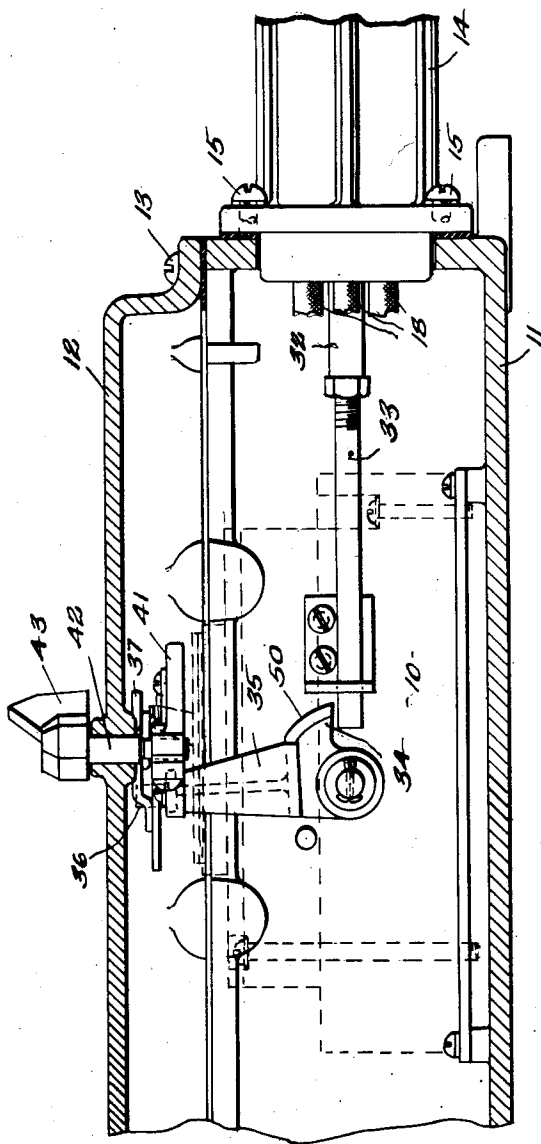


Fig. 2-

INVENTOR.
Willard E. Parish
BY
Bozell & Thompson
ATTORNEYS.

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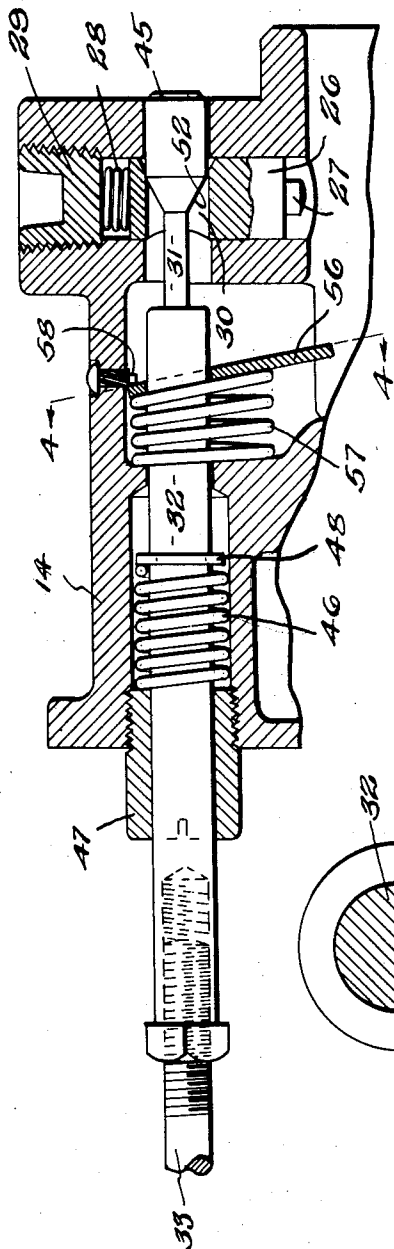


Fig. 3-

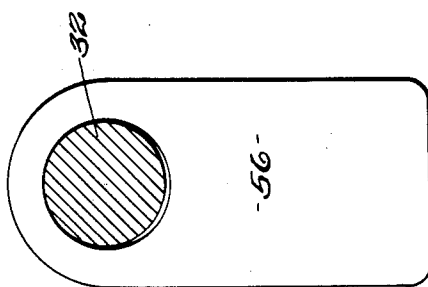


Fig. 4-

INVENTOR.
Willard E. Parish
BY
Bodell & Thompson
ATTORNEYS.

UNITED STATES PATENT OFFICE

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INTERLOCK MECHANISM FOR SWITCH AND RECEPTACLE UNITS

Willard E. Parish, Syracuse, N. Y., assignor to
Crouse-Hinds Company, Syracuse, N. Y., a corporation of New York

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6 Claims. (Cl. 200—50)

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This invention relates to interlock mechanisms for use on electrical units comprising a switch and a plug receptacle. In units of this type, the switch is employed to connect and disconnect the contacts of the terminal with a power supply, and these mechanisms function to prevent insertion of the plug into the receptacle, or withdrawal of the plug therefrom, while the contacts of the switch are closed. In other words, the mechanism compels the switch to be used to open and close the circuit rather than the contacts of the plug and receptacle.

The invention has as an object a mechanism of the type referred to embodying a particularly economical and efficient structure incorporated in the switch and receptacle housing, and which functions to prevent insertion of the plug into the receptacle, or its removal therefrom, while the contacts of the switch are closed, and to prevent actuation of the switch to the on position while the plug is out of the receptacle, the mechanism coacting with the cylindrical portion of the plug without it embodying any special structure or arrangement other than the provision of a small hole in the cylindrical surface of the plug, whereby all plugs now in use on portable apparatus, and the like, can be used with housings embodying this mechanism by simply providing a small aperture in the side wall of the cylindrical portion of the plug.

The invention has as a further object a structure functioning in the manner described and which requires a separate manual operation to move the plug locking member out of plug locking position before the plug can be inserted, or withdrawn, from the receptacle.

The invention consists in the novel features and in the combinations and constructions hereinafter set forth and claimed.

In describing this invention, reference is had to the accompanying drawings in which like characters designate corresponding parts in all the views.

Figure 1 is a top plan view of an electrical unit embodying my invention, with parts shown in section.

Figure 2 is a side elevational view of the structure shown in Figure 1, and with parts of the housing shown in section.

Figure 3 is an enlarged fragmentary view of the interlock mechanism shown in the right hand portion of Figure 1.

Figure 4 is an end elevational view of the lock bar retaining member, being taken substantially on line 4—4, Figure 3.

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The switch 10, illustrated in dotted outline Figures 1 and 2, is mounted in a housing or enclosure in the form of a metal box 11 provided with a cover 12 detachably secured thereto as by screws 13. The receptacle 14 is mounted in or on one end wall of the housing 11, as by screws 15.

The receptacle includes a plurality of contacts 16 carried by an insulating disk 17 and connected to conductors 18 which, in turn, are connected to one side of the switch 10. The receptacle, at its outer end, is provided with a cylindrical bore to receive a plug 22, the plug having a set of contacts complementary to and engageable with the contacts 16 of the receptacle, and the plug and the receptacle having coacting means, not shown, for guiding the plug in a predetermined relation during its insertion into the receptacle, whereby the proper contacts of the plug will engage those of the receptacle, as will be well understood.

It will also be understood that the contacts of the plug are connected to conductors which extend to some apparatus requiring power, and that the switch functions to connect and disconnect the terminal 16 of the receptacle to a source of power entering in the opposite end of the housing 11.

The unit herein described is intended particularly for use in hazardous locations and accordingly, the object in view is to prevent the engagement and disengagement of the plug and receptacle contacts while the switch is in the on position. The housing 11 is of explosion resisting structure and is effectively sealed from the outer atmosphere, the conductors 18 extending from the receptacle to the interior of the housing through seals 24, all whereby any explosion that might take place within the housing 11, by the opening or closing of the switch contacts, will not be communicated to the outer atmosphere, as will be well understood.

The interlock mechanism consists of a plug locking member 26 mounted in the receptacle and being moved radially inwardly and outwardly from the axis of the plug receiving bore.

The side wall of the plug is provided with an aperture to receive a reduced end portion 27 of the locking member when the plug is completely inserted in the receptacle. The plug locking member 26 is urged inwardly, and normally maintained in plug engaging position by a helical compression spring 28 acting against the outer end thereof and against a plug 29. A control member is provided for moving the plug lock out of plug engaging position, this member being manu-

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ally operable exteriorly of the housing. The locking member is formed with a slot, or enlarged aperture, 30 intermediate its ends, to receive a reduced portion 31 of a control bar 32 slidably mounted in the housing in a direction parallel to the axis of the plug. This bar is provided with an extension member 33, the inner end of which terminates in juxtaposition to a projection 34 formed on an arm 35 which constitutes part of the switch actuating mechanism. The upper end 36 of the arm 35 is positioned in a slot formed in one end of a horizontally arranged arm 37 journaled on the pivot 38 carried by the cover 12. The opposite end of the arm 37 is formed with an elongated slot 39 receiving a pin 40 carried by a member 41 secured to the lower end of a shaft 42, also journaled in the cover. The upper end of the shaft is provided with an operating handle 43.

In Figures 1 and 2, the switch is shown in the off position. When the handle 43 is turned, the arm 35 moves in a clockwise direction, or to the right, Figure 1, to move the switch to closed position. The opposite end of the bar 32 extends through the end of the receptacle 14, and the end portion 45 normally extends outwardly therefrom, as shown in Figure 1. The bar is yieldingly urged outwardly by helical compression spring 46 acting at one end against a guide bushing 47 threaded into the housing, and at its opposite end against a pin 48 carried by the bar.

In Figure 1, the plug 22 is properly inserted in the receptacle. The inner portion 33 of the control bar 32 is positioned out of the path of movement of the projection 34. The outer end 45 of the bar protrudes from the receptacle 14, and the intermediate reduced portion 22 is in register with the slot 23 in the plug lock 26, whereby it is urged inwardly by the spring 28, with the projection 27 positioned in the aperture of the plug wall. Accordingly, the switch may be turned to on and off positions, but the plug cannot be withdrawn from the receptacle.

To withdraw the plug, it is necessary to manually push the bar 32 inwardly. This, however, cannot be done unless the switch is in the off position, as shown in Figure 2, due to the fact that the arcuate surface 50 of the projection 24 moves in juxtaposition to the end of the extension 33 when the switch is turned to the on position. When the switch is in the off position and the bar 32 is pushed inwardly, it coacts with the plug lock member 26 to move it radially outwardly. The outer end of the slot or aperture 30 in the plug lock member is chamfered, and the reduced portion 31 of bar 32 merges with the outer end portion 45 with a conical surface 52, the angle of which is complementary to the chamfer of the slot 30, whereby when the bar is moved inwardly, the member 26 is moved radially out, moving the projection 27 out of engagement with the plug and permitting its withdrawal from the receptacle. When the bar 32 is thus moved inwardly, it moves under the projection 34, as illustrated in Figure 2, and thereafter the switch cannot be moved to the on position.

Means is provided for maintaining the bar 32 from outward movement by the action of spring 46 after the plug 22 has been withdrawn from the receptacle. This mechanism is in the nature of a cramp plate 56 formed, adjacent one end, with an aperture slightly larger than the diameter of the bar 32. When the plate 56 is positioned substantially perpendicular to the axis of the bar 32, the bar readily slides through the aperture in the

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plate. The plate is normally maintained at an angle out of such perpendicular relation by a helical compression spring 57 arranged on the bar 32 and of considerably greater diameter. This spring functions to press one end of the plate against a pin 58 extending into the aperture in which the bar 32 is slidably mounted and thus, that end of the plate is held against axial movement relative to the bar and the receptacle. The opposite end of the plate is positioned to be engaged by the inner edge of the plug 22 when the same is inserted in the receptacle, and inward movement of the plug thus moves the plate from the inclined position, shown in Figure 3, to a position substantially perpendicular to the bar 32, as illustrated in Figure 1.

When the plug is withdrawn from the receptacle and the plate 56 assumes the position shown in Figure 3, the plate is clamped on the bar, and outward movement of the plate and the bar is restrained by the pin 58.

As previously explained, it is necessary, prior to the withdrawal of the plug from the receptacle, to first press the bar 32 inwardly to the position shown in Figure 3, in order to retract the plug locking member 26. The first part of the outward or withdrawal movement of the plug permits the plate 56 to assume the bar cramping position by action of spring 57 and thereafter, the bar is restrained against outward movement until the plug has been again reinserted in the receptacle and, as previously explained, while the bar is in this position, the switch cannot be actuated to closed position.

What I claim is:

1. An interlock mechanism for a switch and plug comprising a switch and plug receptacle housing, a switch and receptacle mounted in said housing, switch actuating mechanism operable to move said switch into on and off positions, a plug lock member mounted in the receptacle and movable into and out of plug engaging position and operable when in plug engaging position to prevent insertion of a plug in the receptacle, and to lock a plug positioned in the receptacle against withdrawal therefrom, a plug lock control member movable manually exteriorly of the casing independently of said switch actuating mechanism to move said plug lock member out of plug locking engagement, a retaining member operable to hold said control member in such position to maintain the plug lock member out of engagement and being operable upon insertion of a plug in the receptacle to release said control member and permit the plug lock member to move into plug locking engagement, and said switch actuating mechanism being cooperable with said control member to prevent such manual movement thereof when the switch is in the on position.

2. An interlock mechanism for a switch and plug comprising a switch and plug receptacle housing, a switch and receptacle mounted in said housing, switch actuating mechanism operable to move said switch into on and off positions, a plug lock member mounted in the receptacle and movable into and out of plug engaging position and operable when in plug engaging position to prevent insertion of a plug in the receptacle and to lock a plug positioned in the receptacle against withdrawal therefrom, means yieldingly urging said plug lock member into plug engaging position, a plug lock control member movable manually exteriorly of the casing to move said plug lock member out of plug engaging position, a re-

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taining member operable to hold said control member in such position to maintain the plug lock member out of engagement and being operable upon insertion of a plug in the receptacle to release said control member and permit the plug lock member to move into plug engaging position, and said switch actuating mechanism being cooperable with said control member to prevent such manual movement thereof when the switch is in the on position.

3. An interlock mechanism for a switch and plug comprising a switch and plug receptacle housing, a switch and receptacle mounted in said housing, switch actuating mechanism operable to move said switch into on and off positions, a plug lock member mounted in the receptacle and movable into and out of plug engaging position and operable when in plug engaging position to prevent insertion of a plug in the receptacle, and to lock a plug positioned in the receptacle against withdrawal therefrom, a plug lock control member movable manually exteriorly of the casing to move said plug lock member out of plug locking engagement, means operable to yieldingly move said control member to permit said plug lock member to move into plug engaging position, a retaining member operable to hold said control member in position to maintain the plug lock member out of engagement and being operable upon insertion of a plug in the receptacle to release said control member and permit the plug lock member to move into plug locking engagement, and said switch actuating mechanism being cooperable with said control member to prevent such manual movement thereof when the switch is in the on position.

4. An interlock mechanism for a switch and plug comprising a housing, a switch mounted in the housing, switch actuating mechanism operable to move the switch into on and off positions, a receptacle mounted in the housing and having a plug receiving bore, a plug lock member mounted in the receptacle and movable radially of the plug receiving bore in the receptacle, means yieldingly urging said plug lock member inwardly into plug locking engagement to prevent withdrawal of a plug from the receptacle, a control bar slidably mounted in the receptacle and being manually operable exteriorly thereof independently of said switch actuating mechanism to move said plug lock member out of engagement with the plug when the switch is in the off position, and said switch actuating mechanism being cooperable to prevent such movement when the switch is in the on position.

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5. An interlock mechanism for a switch and plug comprising a housing, a switch mounted in the housing, switch actuating mechanism operable to move the switch into on and off positions, a plug lock member mounted in the receptacle and movable radially of the plug receiving bore into and out of plug engaging position, means yieldingly urging said plug lock into plug engaging position, a control bar slidably mounted in the receptacle, means yieldingly urging said bar outwardly and said bar being cooperable, when moved outwardly by said means, to permit the plug lock member to move into plug locking engagement, and said bar being manually movable inwardly to move said plug lock member out of engagement, and said switch actuating mechanism being cooperable to prevent such movement of the bar when the switch is in the on position.

6. An interlock mechanism for a switch and plug comprising a housing, a switch mounted in the housing, switch actuating mechanism operable to move the switch into on and off positions, a receptacle mounted in the housing and having a plug receiving bore, a plug lock member mounted in the receptacle and movable radially of the plug receiving bore into and out of plug engaging position, means yieldingly urging said plug lock member into plug engaging position, a control bar slidably mounted in the receptacle, means yieldingly urging said bar outwardly, and said bar being cooperable when moved outwardly to permit the plug lock member to move into plug locking engagement, said bar being manually movable exteriorly of the housing and being provided with a cam surface cooperable with said plug lock member upon inward movement of said bar to move said plug lock out of plug locking position, and said switch actuating mechanism being cooperable to prevent such inward movement of the bar when the switch is in the on position.

WILLARD E. PARISH.

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