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Marzec

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[54] INTERLOCK DEVICES

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[51] **Int. Cl.**.....**H01r 13/44**

[58] **Field of Search** .....339/36, 34, 37, 39, 43, 44 R, 339/44 M, 75 R, 75 P, 82, 14 R, 14 P, 91, 176 R, 176 L; 292/182, DIG. 65; 219/209; 192/129, 135; 774/66, 67

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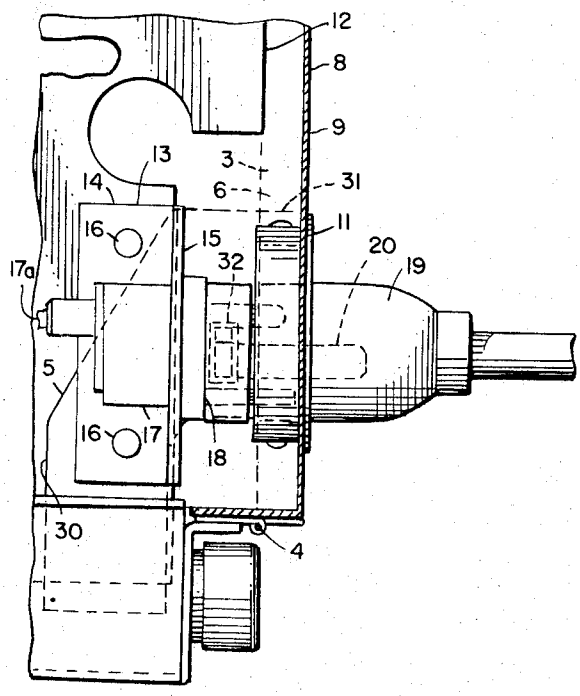
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Assistant Examiner—Terrell P. Lewis
Attorney—Johnston, Root, O'Keeffe, Keil, Thompson & Shurtleff

[57] **ABSTRACT**

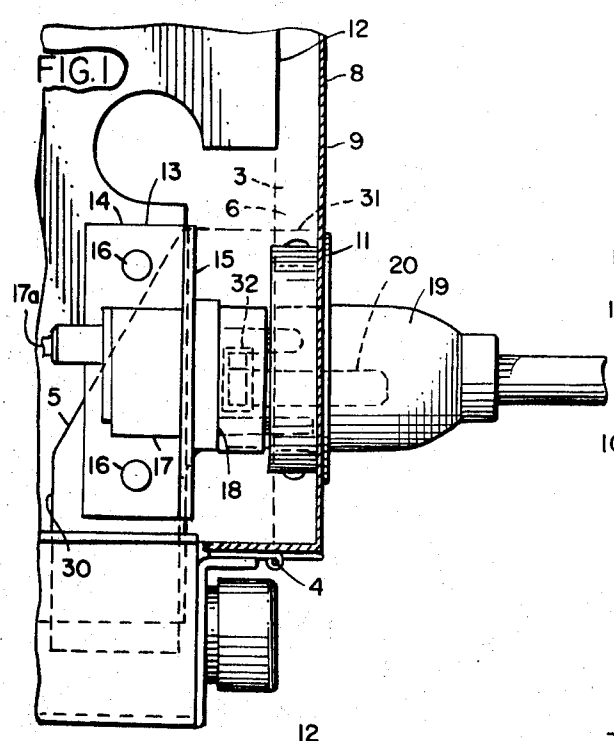
A mechanical interlock device having a member movable between one position effective to prevent the insertion of an electric plug into a socket and another position wherein it is ineffective to prevent such insertion, and wherein the member affords a door latch when it is disposed in the aforementioned other position.

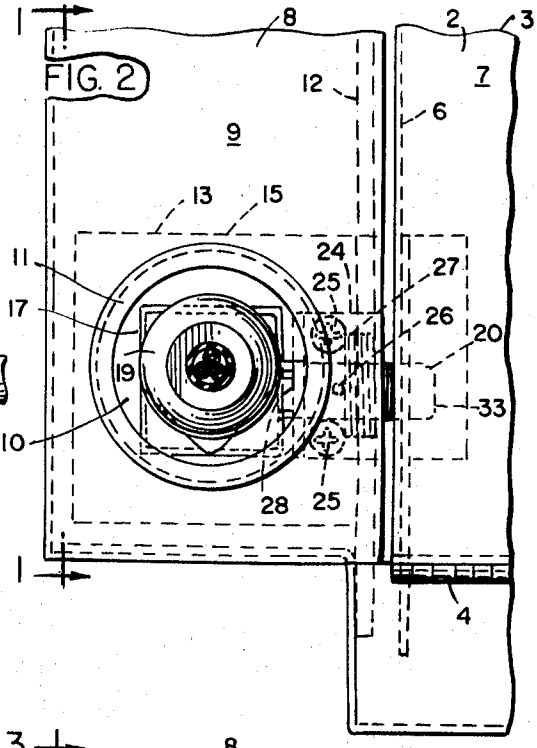
10 Claims, 4 Drawing Figures

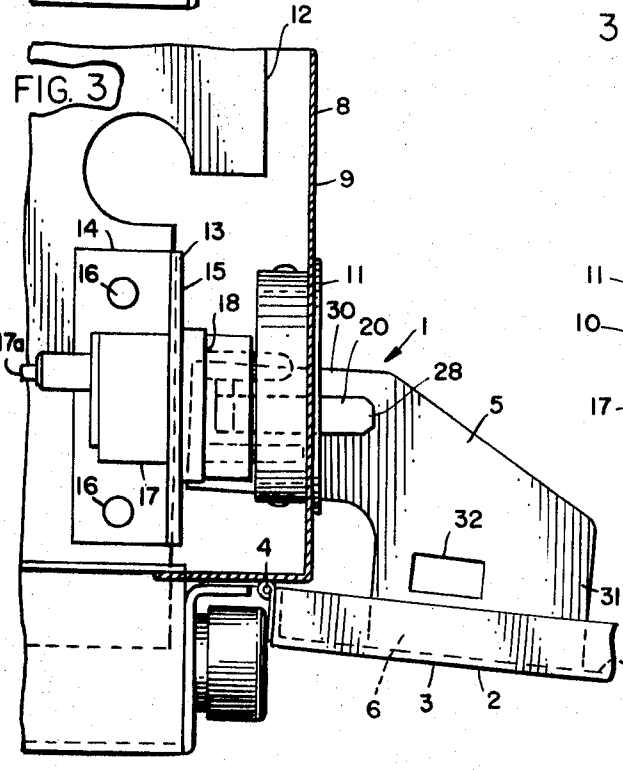


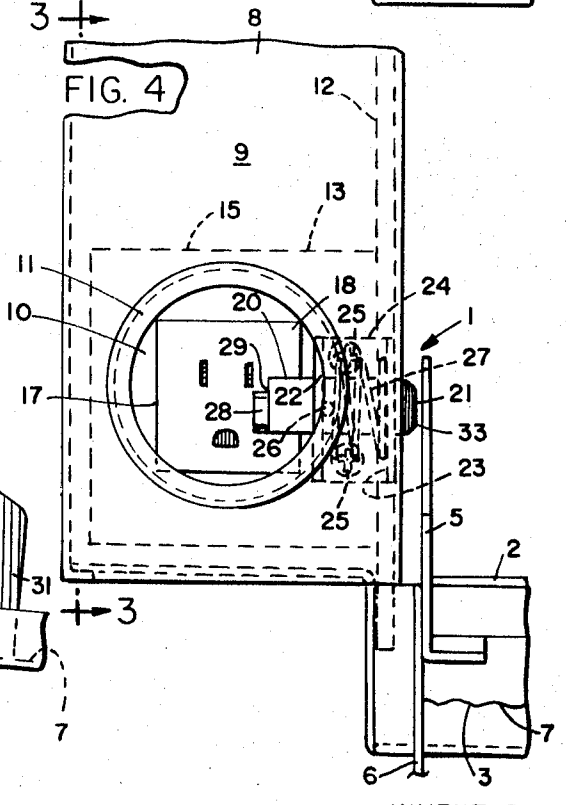
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3,660,798









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ATT'YS

INTERLOCK DEVICES

BACKGROUND OF THE INVENTION

This invention relates to interlock devices, and, more particularly, to mechanical interlock devices which are particularly well adapted for use on housings having electrically powered units therein.

It is a primary object of the present invention to afford a novel interlock device for housings having electrically powered units therein.

Another object of the present invention is to afford a novel device for selectively preventing and permitting the interconnection of two electrical connectors.

Another object of the present invention is to afford a novel device for selectively preventing the opening of a door in a housing where units within the housing are connected to an electrical power source.

A further object of the present invention is to afford a novel interlock device for use on a housing for electrically powered units and having a door therein, the device having parts constituted and arranged in a novel and expeditious manner effective to automatically prevent the connecting of the units to a source of power when the door is open and to automatically prevent the opening of the door when the units are connected to a source of electric power, while permitting such connection when the door is closed and permitting opening of the door when the units are not connected to a source of electric power.

Another object of the present invention is to afford a novel mechanical interlock device of the aforementioned type, which may be mounted on the outside of such a housing in a novel manner effective to afford ready access thereto.

Yet another object of the present invention is to afford a novel interlock device of the aforementioned type which is practical and efficient in operation and which may be readily and economically produced commercially.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawing which, by way of illustration, show a preferred embodiment of the present invention and the principles thereof and what I now consider to be the best mode in which I have contemplated applying these principles. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a fragmentary, detail sectional view of a housing having a mechanical interlock device embodying the principles of the present invention;

FIG. 2 is a fragmentary, rear elevational view of the housing shown in FIG. 1;

FIG. 3 is a fragmentary, detail sectional view similar to FIG. 1 but showing certain parts disposed in different operative positions; and

FIG. 4 is a fragmentary, rear elevational view similar to FIG. 2, but showing the parts disposed in the position shown in FIG. 3.

DESCRIPTION OF THE EMBODIMENT SHOWN HEREIN

A mechanical interlock device 1, embodying the principles of the present invention, is shown in the drawings mounted on a housing 2 to illustrate the presently preferred embodiment of the present invention. The housing 2 may be of any suitable type such as, for example, the type commonly used on photocopy machines, and the like, and embodies a rear door 3 hingedly mounted by means of a hinge 4 for substantially vertical swinging movement between a substantially upright, closed position, as shown in FIGS. 1 and 2, and a rearwardly and outwardly projecting open position, as shown in FIGS. 3 and 4.

The mechanical interlock device 1 includes a latch in the form of a substantially L-shaped bracket 5, FIGS. 1, 3 and 4, mounted on the inner face of a side wall 6 of the door 3, the side wall 6 projecting forwardly from the rear wall 7 of the door 3 when the door 3 is disposed in the aforementioned closed position.

An auxiliary housing 8 is mounted on the housing 2 in outwardly projecting relation thereto adjacent to the side wall 6 of the door 3. The housing 8 includes a rear wall 9 which preferably is disposed in uniplaner relation to the rear wall 7 of the door 3 when the latter is disposed in closed position. An opening 10 extends through the rear wall 9, and a ring 11 is mounted in the opening 10 to cover the exposed edges of the latter which, normally, in the manufacture thereof may be relatively sharp.

An upright interior wall or partition wall 12 is mounted in the housing 8 in substantially perpendicular relation to the rear wall thereof and terminates at its rear edge in forwardly spaced relation to the rear wall 9. A substantially L-shaped, mounting bracket 13, having two legs 14 and 15 disposed substantially perpendicular to each other, is mounted on the face of the wall 12 remote from the housing 2 by suitable means such as rivets 16 extending through the leg 14, with the leg 15 projecting from the wall 12 in substantially parallel, forwardly spaced relation to the rear wall 9 of the housing 8.

An electric socket or plug 17, having one end or face 18, FIGS. 3 and 4, adapted to operatively receive a complementary socket or plug, such as the plug 19, FIGS. 1 and 2, is mounted in, and extends through the leg 15 of the mounting bracket 13 with the face 18 disposed between the leg 15 of the mounting bracket 13 and the rear wall 9 of the housing 8 in axial alignment with the opening 10 in the rear wall 9. Suitable electric wires, such as the wire 17*a*, FIGS. 1 and 3, extend from the socket 17 and may extend into the housing 2 for connection to electrical units, not shown, mounted therein.

The mechanical interlock device 1 also includes an abutment member in the form of a substantially L-shaped slide 20 having one leg 21 extending perpendicularly through, and slidably mounted in the side flanges 22 and 23 of a substantially channel-shaped mounting bracket 24 secured to the rear face of the leg 15 of the mounting bracket 13 by suitable means such as screws 25. The mounting bracket 24 is disposed between the socket 17 and the housing 2 and the leg 21 of the slide is disposed therein for substantially horizontal reciprocation into and out of the housing 2 forwardly of the front edge portion of the side wall 6 of the rear door 3 thereof, and rearwardly of the plug-receiving face 18 of the socket 17.

A pin 26 is mounted in the leg 21 of the slide 20 between the webs 22 and 23 of the mounting bracket 24, and a compression coil spring 27 is mounted around the leg 21 between the pin 26 and the side web 23 of the mounting bracket 24 to thereby continuously, yieldingly urge the slide 20 to the left, as viewed in FIGS. 2 and 4, in the mounting bracket 24, the engagement of the pin 26 with the side web 22 of the mounting bracket 24 limiting the movement of the slide 20 in this direction.

The slide 20 also includes another leg 28, which projects substantially perpendicularly rearwardly from the end portion 29 of the leg 21 disposed on the side of the mounting bracket 24 remote from the housing 2. The leg 28 is disposed in such position and, preferably, is of such length that it projects outwardly through the opening 10 in the rear wall 9 of the auxiliary housing 8. The slide 20 is of such size, and is so disposed in the housing 8, that when it is disposed in its extreme inward position, as shown in FIG. 4, relative to the housing 8, the leg 28 thereof projects outwardly from the rear face 18 of the plug 17 at or adjacent to the center portions of the opening 10 and the rear face 18, and the end portion 29 of the leg 21 to which the leg 28 is attached projects across the face 18 of the socket 17 in position to prevent the insertion of a plug, such as the plug 19, into operative connection with the socket 17; and when the slide 20 is disposed in its extreme outward position relative to the housing 8, as shown in FIG. 2, the leg 28 and the end portion 29 are disposed a sufficient distance to the right,

as viewed in FIG. 2, that the leg 28 is disposed in the outer peripheral edge portion of the opening 10, and the leg 28 and the end portion 29 are disposed a sufficient distance to the right of the center portion of the face 18 that a connector plug, such as the plug 19, may be inserted through the opening 10 into operative connection with the socket 17. It will be observed that with the slide 20 disposed in the last mentioned position, and with a plug, such as the plug 19 thus operatively connected to the socket 17, removal of the plug 19 from the housing 8 is effective to free the slide 20 to the urging of the spring 27 and thereby permit the slide 20 to be automatically returned to effective plug-blocking position, as shown in FIG. 4.

The substantially L-shaped bracket 5, which, it will be remembered, comprises a portion of the mechanical interlock device 1, has two legs 30 and 31, FIGS. 1 and 3, disposed substantially perpendicular to each other. The free edge portion of the leg 31 is connected to the side wall 6 of the rear wall 3 of the housing 2 and the leg 31 projects rearwardly therefrom in such position that the leg 30 projects substantially vertically downwardly therefrom when the rear door 3 of the housing 2 is disposed in closed position, FIG. 1. The leg 31 of the bracket 5 has an opening 32 therethrough, FIG. 3. The opening 32 is so disposed in the leg 31 in such position that when the door 3 of the housing 2 is disposed in closed position, the opening 32 is disposed in forwardly spaced relation to the front edge of the side wall 6 of the door 3 in axial alignment with the leg 21 of the slide 20. The opening 32 is complementary in size and shape to the cross-sectional size and shape of the leg 21, and the leg 21 is of such length that when it is disposed in its farthest inward position relative to the housing 8, as shown in FIG. 4, the free end 33 thereof is disposed outwardly of the bracket 5, and when it is disposed in its outermost position relative to the housing 8, with the door 3 of the housing 2 disposed in closed position, as shown in FIG. 2, it extends through the opening 32. The opening 32 is preferably of such size that it will receive the leg 21 of the slide 20 therein with a relative snug, but freely slidable fit so that when the leg 21 is disposed in the opening 32, the door 3 of the housing 2 is effectively latched against movement from its closed position, and cannot be moved from its closed position until the slide 20 is moved to the left, as viewed in FIGS. 2 and 4, into position to again move the end portion 33 out of the opening 32 and move the end portion 29 and the leg 28 into overlying relation to the face 18 of the socket 17.

The bracket 5 is so mounted on the door 3 of the housing 2 that when the door 3 is in any position other than the aforementioned closed position, either a solid portion of the leg 31 or a solid portion of the leg 30 is disposed in alignment with the leg 21 of the slide 20 to thereby block the slide 20 from moving out of plug-blocking relation to the plug 18; and the only time that the slide 20 can be moved out of such plug-blocking position is when the door 3 is closed with the opening 32 aligned with the leg 21.

It will be seen that with this construction, the mechanical interlock device 1 is effective to prevent opening of the door 3 of the housing 2 when a plug, such as the plug 19 is disposed in operative position in the socket 17 so as to insure against access to the interior of the housing 2 when the electrical units therein are connected to a source of electric power; and, further, is effective to insure that a plug, such as the plug 19, may not be inserted into operative connection relative to the socket 17 when the door 3 of the housing 2 is disposed in any position other than the closed position shown in FIGS. 1 and 2.

In the operation of the mechanical interlock device 1, when the door 3 of the housing 2 is disposed in closed position, without the slide 20 being held to the right by an external force, such as manually or by the plug 19, the slide 20 is automatically held by the coil spring 27 in the plug-blocking position shown in FIG. 4. In this position of the slide 20, the door 3 may be opened and closed. When it is desired to insert a plug, such as the plug 19, into operative position in the socket 17, this requires the slide 20 to first be moved outwardly to the right, into the position shown in FIG. 2 which requires that the door 3 be in fully closed position. Such movement of the slide 20 may be accomplished by pushing the leg 28 of the slide 20 to the right, as viewed in FIGS. 2 and 4, the leg 28 projecting outwardly through the opening 10 to afford ready access thereto for this purpose. This movement of the slide 20 is effective to move the outer end portion 33 of the leg 21 thereof into the opening 32 in the bracket 5 to thereby latch the door 3 in closed position. Also, this movement of the slide 20 is effective to move it out of the aforementioned plug-blocking position, and the plug 19 may then be inserted into the socket 17. In this position of the plug 19, it is effective to hold the slide 20 in latching position, so that the door 3 may not be opened, and access may not be had to the interior of the housing 2. Thereafter, if the plug 19 is removed from the socket 17 to thereby free the slide 20 for movement to the left, as viewed in FIGS. 2 and 4, the spring 27 is automatically effective to so move the slide 20 to the left, and thus unlatch the door 3 for movement into open position and, simultaneously, block the socket 17 against insertion of the plug 19 thereinto.

From the foregoing, it will be seen that the present invention affords a novel mechanical interlock device which is effective to prevent the connection of units within the housing 2 to a source of electric power when the door 3 is open.

Also, it will be seen that the present invention affords a novel mechanical interlock device which is effective to prevent the door 3 of the housing 2 from being opened when such units within the housing 2 are connected to a source of electric power through the socket 17.

In addition, it will be seen that the present invention affords a novel mechanical interlock device which is practical and efficient in operation and which may be readily and economically produced commercially.

Thus, while I have illustrated and described the preferred embodiment of my invention, it is to be understood that this is capable of variation and modification, and I therefore do not wish to be limited to the precise details set forth, but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. In a unit including a housing having a door mounted thereon for movement between open and closed position, and a socket, for receiving an electrical connector plug, mounted on said housing, a mechanical interlock device comprising
   a. abutment means mounted on said housing for movement between
      1. one position wherein it is effective to block insertion of such a plug into said socket, and
      2. another position wherein said socket is free to receive such a plug, and
   b. means on said door in position to block movement of said abutment means from said one position to said other position when said door is disposed in said open position.

2. The combination defined in claim 1, and in which
   a. said means on said door is
      1. ineffective to block movement of said abutment means from said one position to said other position when said door is in said closed position, and
      2. operatively engaged with said abutment means in position to prevent movement of said door from said closed position to said open position when said door is disposed in said closed position and said abutment means is disposed in said other position.

3. The combination defined in claim 2, and
   a. in which
      1. said abutment means is normally disposed in said one position, and
   b. which includes
      1. means operatively connected to said abutment means and yieldingly urging the latter toward said one position at all times.

4. The combination defined in claim 2, and in which

a. said means on said door comprises a bracket mounted on said door and movable therewith,
b. said bracket has
1. an opening therethrough in position to receive said abutment means upon movement of said abutment means from said one position to said other position, and
2. a solid portion effective to block movement of said abutment means from said one position to said other position when said door is disposed out of said closed position.

5. In a unit including a housing having a door hingedly mounted thereon for substantially vertical swinging movement between a closed position and an open position, an electrical connector socket, for receiving an electrical connector plug in operative position therein, mounted on said housing,
a. abutment means,
b. supporting means on said housing and operatively engaged with said abutment means for supporting said abutment means for movement between one position and another position relative to said supporting means,
c. said supporting means being mounted on said housing in such position that
1. when said abutment means is disposed in said one position it is effective to block the insertion of such a plug into said operative position in said socket, and
2. when said abutment means is disposed in said other position it is ineffective to block the insertion of such a plug into said operative position in said socket, and
d. a latch mounted on said door and movable therewith,
e. said latch having
1. means positioned thereon for operatively engaging said abutment means, when the latter is disposed in said other position and said door is disposed in said closed position, for holding said door in said closed position, and
2. means positioned thereon for operatively engaging said abutment means, when said abutment means is in said one position and said door is in said open position, for holding said abutment means in said one position.

6. The combination defined in claim **5**, and in which
a. said latch has an opening therethrough,
b. said means for holding said door closed comprises the edge portions of said latch defining said opening,
c. said latch has a portion extending from said opening, and
d. said means for holding said abutment means in said one position comprises said last mentioned portion of said latch.

7. The combination defined in claim **6**, and in which
a. said latch is a substantially L-shaped member,
b. said opening is disposed in one end portion of said member, and
c. said portion extending from said opening comprises the other end portion of said member.

8. The combination defined in claim **5**, and in which
a. said abutment means comprises a substantially L-shaped member having
1. one leg slidably mounted in said supporting means, and
2. another leg projecting outwardly away from said socket.

9. The combination defined in claim **5**, and in which
a. said socket
1. is mounted outside said housing, and
2. has a plug-receiving face disposed in substantially parallel relation to said door,
b. said supporting means comprises a bracket disposed between said socket and said housing, and
c. said abutment means is slidably mounted in said bracket for movement into and out of said housing between
1. said one position wherein it is disposed in overlying relation to said face, and
2. said other position wherein it is disposed out of said overlying relation to said face.

10. The combination defined in claim **9**, and which includes another housing mounted on said first mentioned housing in outwardly projecting relation thereto, and in which
a. said other housing has an outer wall disposed in substantially parallel relation to said face,
b. said outer wall has an opening extending therethrough in substantially axial alignment with said face,
c. said bracket is mounted in said other housing,
d. said abutment means comprises a substantially L-shaped member having
1. one leg slidably mounted in said bracket for longitudinal reciprocation therein in substantially parallel relation to said outer wall between said socket and said outer wall during movement of said abutment means between said one and other positions, and
2. another leg projecting outwardly from said one leg into said opening, and
e. said other leg is
1. disposed in a peripheral edge portion of said opening when said abutment means is disposed in said other position, and
2. disposed closer to the center of said opening than said peripheral edge portion when said abutment means is disposed in said one position.

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