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ELECTRIC PLUG AND RECEPTACLE

Filed Sept. 22, 1954

3 Sheets-Sheet 1

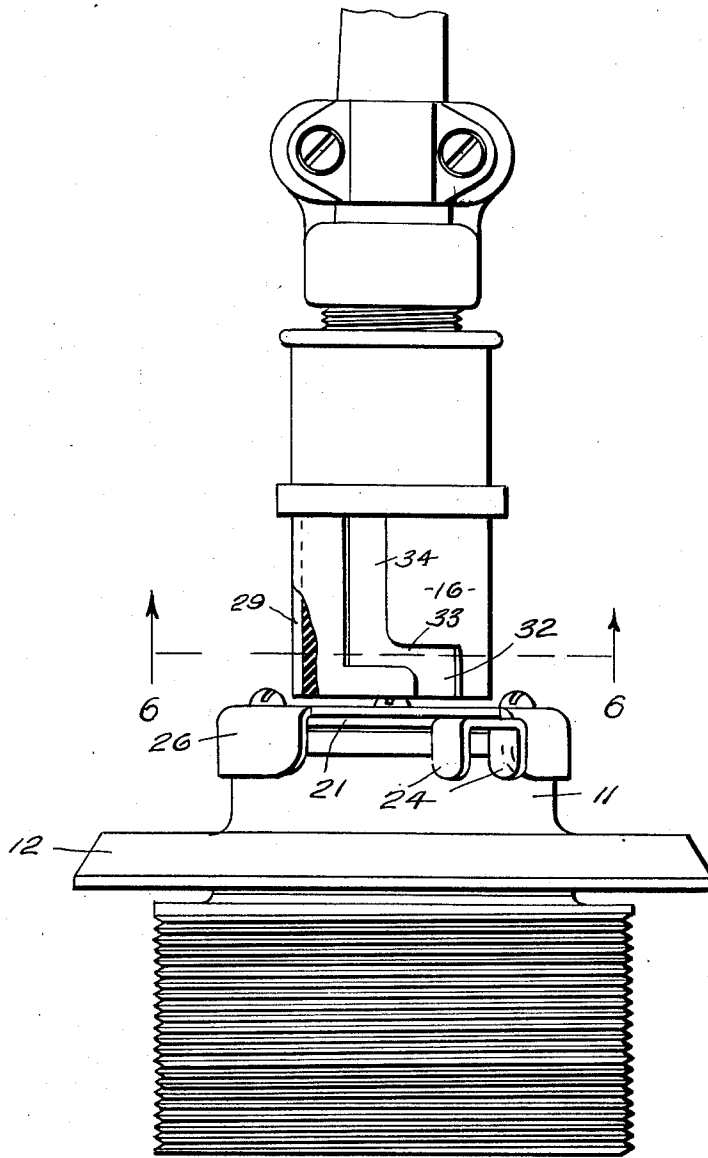


Fig. 1 -

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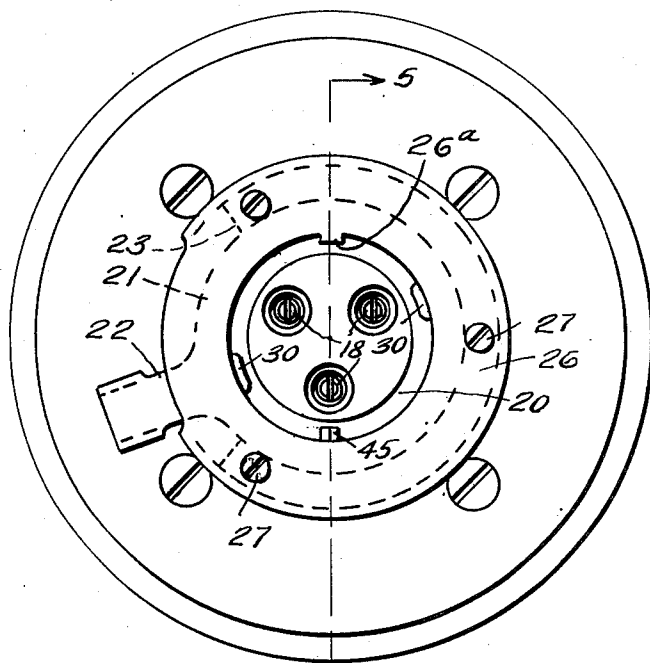


Fig. 2

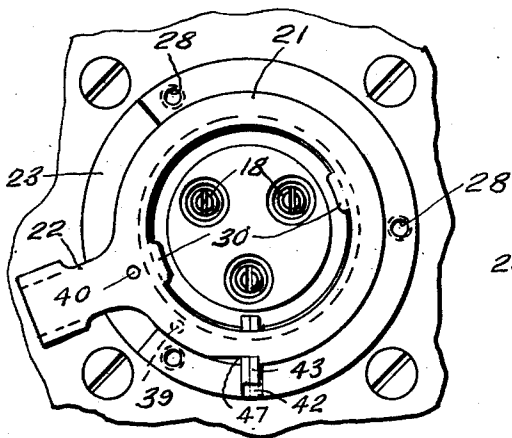


Fig. 3

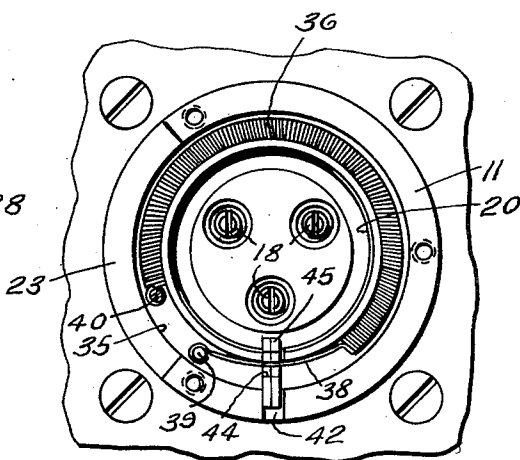


Fig. 4

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ELECTRIC PLUG AND RECEPTACLE

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5 Claims. (Cl. 339—111)

This invention relates to an electric plug and receptacle of the type embodying an arrangement operable to prevent complete coaxing movement between the plug and receptacle without a delay in such movement. Plug and receptacle structures of this type are commonly known as delayed action units. This delayed action in the movement of the plug relative to the receptacle is particularly advantageous when the plug is withdrawn from the receptacle to break the circuit between the plug and the receptacle. In this operation, the separation of the plug and receptacle contacts produces considerable arcing. The delayed action mechanism is employed in plug and receptacle units which are installed in hazardous locations. The arrangement is such that in withdrawing the plug, the mating terminals of the unit are separated, but are still enclosed in an arc quenching structure, when the delayed action elements of the unit function to delay further separation of the plug from the receptacle to afford time for the arc to be completely quenched.

A plug and receptacle unit of this type is disclosed in Patent No. 2,047,126, to H. P. Hastings, July 7, 1936. The structural arrangements disclosed in that patent necessitate manual manipulation of the delayed action structure both upon insertion and removal of the plug from the receptacle. These plug and receptacle units are extensively used in hospital operating rooms and it has been found disadvantageous for personnel in the operating room to require the use of both hands in order to insert the plug in the receptacle.

This invention has as an object a delayed action plug and receptacle structure embodying a delayed action mechanism, including a plug interfering or locking member latched into locking position during the initial movement of the plug in the receptacle, and which is automatically unlatched, and moved out of locking position, upon such initial insertion of the plug to permit complete insertion of the plug in the receptacle. The locking member coacts with the completely inserted plug, in such manner, as to prevent complete withdrawal of the plug until the locking member has been manually shifted, the locking member and its actuating and latching mechanism embodying an arrangement adapted to be mounted in receptacle holders of conventional design and being co-operable with standard plugs, the numbers of which, now in use, run into several hundred thousand.

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.

In the drawings—

Figure 1 is a side elevational view of a plug and receptacle unit embodying my invention.

Figure 2 is an end view, in plan, of the receptacle with the plug locking member positioned for initial insertion of the plug in the receptacle.

Figure 3 is a view, similar to Figure 2, with the retain-

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ing member removed, showing the locking member in top plan.

Figure 4 is a view, similar to Figure 3, with the locking member removed from the receptacle holder.

Figure 5 is a vertical sectional view of the receptacle unit and holder, the view being taken on a line corresponding to line 5—5, Figure 2.

Figure 6 is a view taken on line 6—6, Figure 1.

The receptacle 10 is of cylindrical form and is fixedly mounted in a holder 11 provided with a radially extending flange 12. The receptacle is held against axial movement by snap rings 13 and against rotary motion by a screw 14. The plug member is also of cylindrical form. The forward end portion 16 of the plug is in the form of a sleeve encircling contacts 17 which, upon insertion of the plug in the receptacle, coacts with complementary contacts 18 carried by the receptacle.

The outer end of the holder 11 is formed with a circular aperture, having a diameter greater than the body of the receptacle 10, to provide an annular passage 20 through which the shell portion 16 of the plug moves upon insertion and withdrawal of the plug. The outer end of the holder 11 is also formed with an annular recess in which there is rotatably mounted a plug locking member 21 and which is formed with an arm portion 22 extending radially through an arcuate slot 23, formed in the outer wall of the recess, see Figure 3. This arm has bent-over ear portions 24 to provide a handle by which the locking member 21 may be rotated in the recess. The locking member is retained in the recess by a circular cover plate 26 fixed to the holder 11, as by screws 27 threaded into apertures 28 formed in the end face of the holder. The cover member 26 has a central aperture complementary to the aperture in the holder 11 to provide a continuation of the passage 20 through the face of the receptacle unit. The cover 26 is formed with an inwardly extending lug 26^a. The shell 16 of the plug is formed with a lengthwise extending slot 29 in its periphery. This slot and the lug 26^a provide means for restraining rotation of the plug relative to the receptacle during the insertion and withdrawal of the plug from the receptacle.

The locking member 21 is formed with a pair of inwardly extending lugs 30 positioned in diametrically opposed relation, and the shell 16 of the plug is formed on its periphery with lengthwise extending slots 32. These slots extend inwardly a short distance from the end of the plug confronting the receptacle, and communicate with circumferentially extending slots 33 which, in turn, connect with a second pair of lengthwise extending slots 34. The slots 32 are positioned relative to the slot 29 so that in order to insert the plug in the receptacle, the locking member has to be rotated to the position shown in Figure 2. That is, the lugs 30 of the locking member are then positioned in registration with the slots 32 and with the slot 29 in registration with the fixed lug 26^a. Accordingly, the plug may be inserted until the inner wall of the slots 33 engage the lugs 30, whereupon the locking member 21 has to be rotated clockwise, Figure 2, to move the lugs 30 through the slots 33 and in registration with the slots 34, whereupon the plug may be moved the rest of the way into the receptacle.

The arrangement above described is substantially shown in the Hastings Patent No. 2,047,126, above referred to. While this arrangement is effective to delay movement of the plug both inwardly and outwardly of the receptacle, it necessitates manual manipulation of the locking member 21 to effect insertion of the plug in the receptacle. In the structure of my invention, the recess in which the locking member 21 is positioned is formed in its bottom wall with an annular groove 35 in which there is positioned a coil tension spring 36. One end of this spring is formed with a straight portion 38, the free end of which

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is formed with an eye for securement to a pin 39 mounted in the recess 35. The opposite end of the spring is formed with an eye attached to a pin 40 depending from the locking member 21. With this arrangement, the spring 36 yieldingly urges the locking member in a clockwise direction, Figures 2 and 3.

The holder 11 is formed with a radially extending slot 42 in which there is slidably mounted a latch member 43, formed with a notch 44 through which the straightened end portion 38 of the spring extends, whereby the spring also yieldingly urges the latch member toward the axis of the receptacle, and the inner end of the latch member is formed with a nose portion 45 extending into the passage 20 when the latch is moved inwardly by the spring 36. The outer portion of the latch engages the peripheral edge of the locking member 21, which is formed with a notch 47, to receive this outer portion of the latch when the locking member is in position for initial insertion of the plug, as shown in Figures 2 and 3, and in this position, the spring 36 is under tension.

When the plug is inserted in the receptacle, the shell portion 16 passes in the passage 20 engaging the nose portion 45 of the latch, see Figure 5, and thus moves the latch radially outwardly so that the outer portion thereof is moved out of the notch 47 of the locking member, whereupon this member is free to rotate in a clockwise direction, Figures 2 and 3. The latch is positioned inwardly from the cover member 26 in relation to the spacing of the circumferentially extending slots 33, so that the lugs 30 of the locking member are in registration with these slots when the latch is moved out of latching position, whereupon the spring 36 effects clockwise rotation of the locking member to bring the lugs 30 thereof in registration with the slots 34, whereupon the plug may be moved completely into the receptacle.

This arrangement avoids the necessity of manually manipulating the locking member, and permits an operator to completely insert the plug in the receptacle with one hand. When the plug is withdrawn from the receptacle, the outer walls of the slots 33 engage the lugs 30, necessitating rotation of the locking member manually to move the lugs through the slots 33 in registration with the slots 32. This manual manipulation assures delayed action of sufficient time to make certain that any arc effected by the separation of the contacts 17, 18, is quenched prior to complete separation of the plug and receptacle bodies.

What I claim is:

1. In an electric plug and receptacle, the combination of a receptacle having contacts therein, a plug member movable into and out of the receptacle and having contacts for coacting with the contacts of the receptacle, a holder for the receptacle having an annular entrance passage around the receptacle, said receptacle and plug being non-rotatable relative to each other during movement of the plug into and out of coaction with the receptacle, an annular locking member rotatably mounted on the body in concentric spaced relation to the outer end of the receptacle and having a radial arm extending outwardly from the body, said plug being formed on its periphery with an entrance slot extending lengthwise of the plug from the end thereof confronting the receptacle and communicating with a circumferentially extending slot connecting with a second lengthwise extending slot, said locking member having an inwardly extending lug projecting into said passage, a latch member operable to latch said locking member with the lug thereof in registration with the entrance slot of the plug, said latch being movable by the plug upon initial insertion thereof in the receptacle out of latching position, and spring means operable to effect rotation of said locking member to move the lug thereof through said circumferential slot into registration with said second lengthwise extending plug slot to permit complete insertion of the plug in the receptacle.

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2. In an electric plug and receptacle, the combination of a receptacle having contacts therein, a plug member movable into and out of the receptacle and having contacts for coacting with the contacts of the receptacle, a holder for the receptacle having an annular entrance passage around the receptacle, said receptacle and plug being non-rotatable relative to each other during movement of the plug into and out of coaction with the receptacle, said holder being formed with an annular recess at the entrance of said passage, the recess opening into said passage at the outer end thereof and toward the periphery of the plug member when the plug is in the receptacle, the peripheral wall of said recess being formed with a slot, an annular locking member rotatably mounted in said recess and having a radial arm extending outwardly through said slot, said plug being formed on its periphery with an entrance slot extending lengthwise of the plug from the end thereof confronting the receptacle, and communicating with a circumferentially extending slot connecting with a second lengthwise extending slot, said locking member having an inwardly extending lug projecting into said passage, a latch member operable to latch said locking member with the lug thereof in registration with the entrance slot of the plug, said latch being movable by the plug, upon initial insertion thereof in the receptacle, out of latching position, and spring means operable to effect rotation of said locking member to move the lug thereof through said circumferential slot into registration with said second lengthwise extending plug slot to permit complete insertion of the plug in the receptacle.

3. In an electric plug and receptacle, the combination of a receptacle having contacts therein, a plug member movable into and out of the receptacle and having contacts for coacting with the contacts of the receptacle, a holder for the receptacle having an annular entrance passage around the receptacle, said receptacle and plug being non-rotatable relative to each other during movement of the plug into and out of coaction with the receptacle, an annular locking member rotatably mounted on the body in concentric spaced relation to the outer end of the receptacle and having a radial arm extending outwardly from the body, said plug being formed on its periphery with an entrance slot extending lengthwise of the plug from the end thereof confronting the receptacle and communicating with a circumferentially extending slot connecting with a second lengthwise extending slot, said locking member having an inwardly extending lug projecting into said passage, a latch member mounted in the holder and having a plug engaging portion and a latching portion, spring means operable when said locking member is positioned with the lug thereof in registration with the entrance slot in the plug to urge said plug engaging portion of the latch in position for engagement by the plug upon initial insertion of the plug in the receptacle, and urging said latch portion in latching relation with said locking member, said spring means also operable to effect rotation of said locking member to move the lug thereof through said circumferential slot into registration with said second plug slot to permit complete insertion of the plug in the receptacle.

4. The combination defined in claim 3 including a single spring means common to both of said latch and locking members.

5. In an electric plug and receptacle, the combination of a receptacle having contacts therein, a plug member movable into and out of the receptacle and having contacts for coacting with the contacts of the receptacle, a holder for the receptacle having an annular entrance passage around the receptacle, said receptacle and plug being non-rotatable relative to each other during movement of the plug into and out of coaction with the receptacle, said holder being formed with an annular recess at the entrance of said passage, the recess opening into

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said passage at the outer end thereof and toward the periphery of the plug member when the plug is in the receptacle, the peripheral wall of said recess being formed with a slot, an annular locking member rotatably mounted in said recess and having a radial arm extending outwardly through said slot, said plug being formed on its periphery with an entrance slot extending lengthwise of the plug from the end thereof confronting the receptacle, and communicating with a circumferentially extending slot connecting with a second lengthwise extending slot, said locking member having an inwardly extending lug projecting into said passage, a latch member mounted in said holder for movement transversely of said recess and said passage, a spring mounted in said recess and being operable when said locking member is positioned with the lug thereof in registration with the entrance slot in the plug to urge said latch member inwardly in said

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passage for engagement by the plug upon initial insertion thereof in the receptacle and to also urge said latch in latching relation to said locking member, said latch being movable outwardly from the receptacle upon engagement by the plug, and said spring coacting with said locking member to effect rotation thereof to move the lug carried thereby through said circumferential slot into registration with said second lengthwise extending slot in the plug.

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