July 7, 1936. H. P. HASTINGS 2,047,126

ELECTRIC PLUG AND SOCKET

Filed April 10, 1933 3 Sheets-Sheet 1

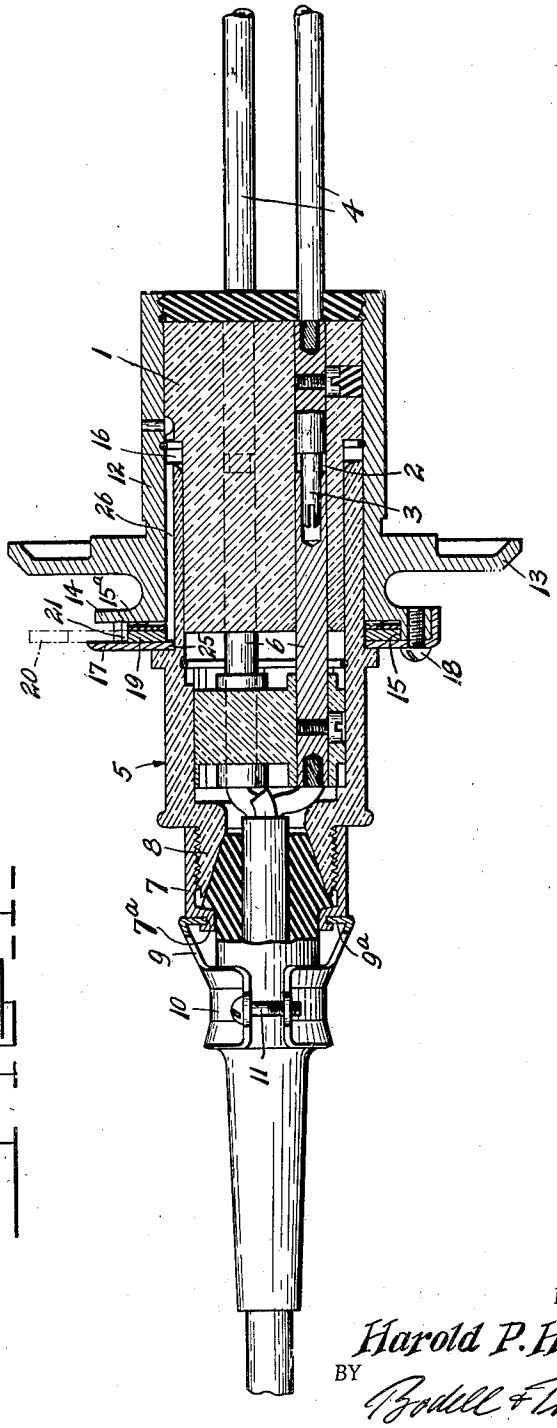

Fig. 1.

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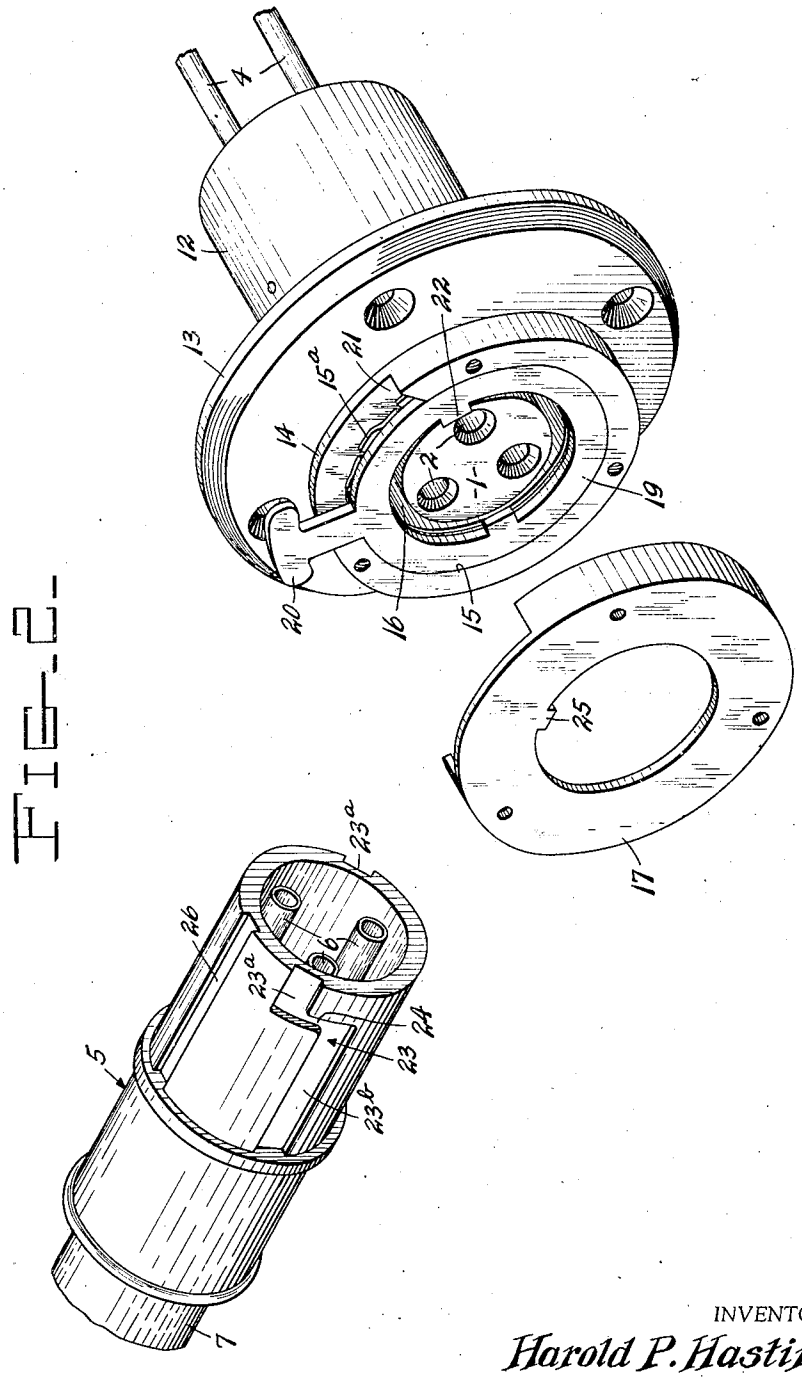

FIG. 2.

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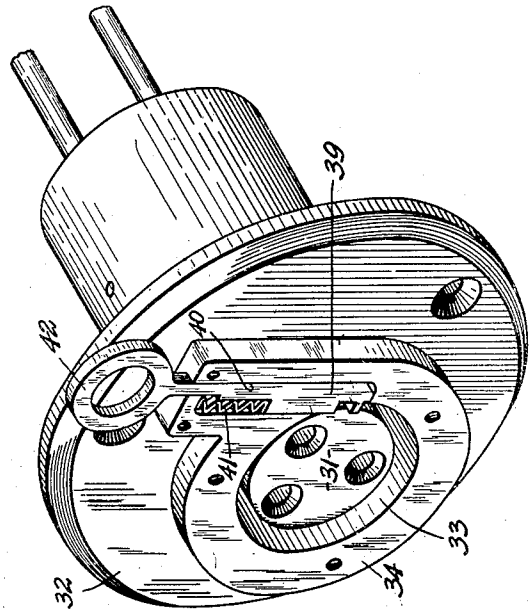
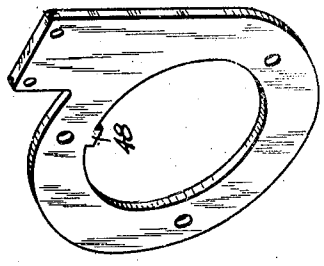


FIG. 3.



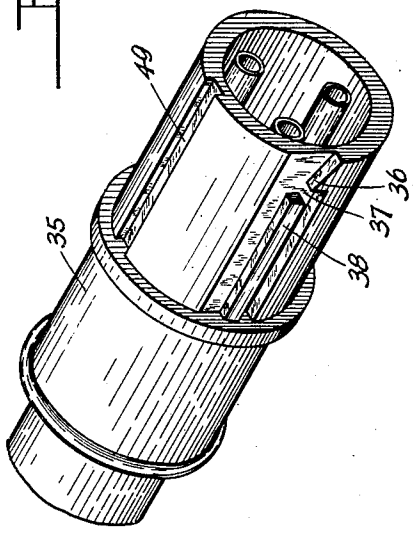
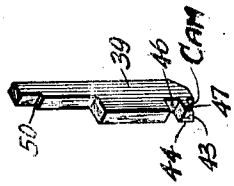


FIG. 4.



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UNITED STATES PATENT OFFICE

2,047,126

ELECTRIC PLUG AND SOCKET

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Application April 10, 1933, Serial No. 665,326

15 Claims. (Cl. 173—328)

This invention relates to electric plugs and sockets installed where there are explosive gases and vapors in the surrounding atmosphere, and has for its object a particularly simple and compact means for requiring that the plug be withdrawn with a two step operation, one step being sufficient to separate the plug terminals from the socket terminals, and the other step to completely withdraw the plug from the socket with a time interval between the two steps to permit arcs that may form between the terminals to be extinguished before the complete separation of the plug from the socket.

It further has for its object, a socket assembly wherein the locking member takes up a minimum space in the direction of the axis of the socket.

It further has for its object a socket member of the so-called flush type with a compact locking member that projects but a small distance in front of the wall in which the socket is permanently placed, and presents an ornamental rather than an unsightly appearance when installed in such places as hospitals.

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 longitudinal, sectional view of a socket and plug embodying this invention.

Figure 2 is an exploded, isometric view of the same, a portion of the plug being broken away.

Figure 3 is a view, similar to Figure 2, of a modified form of this plug and socket.

Figure 4 is a detail view of the latch, or lock, shown in Figure 3.

1 designates the socket, that here shown being a block, or plug, of insulation having passages 2 therein, in which socket terminals 3 are located, the passages being arc tight passages. There are usually three terminals, one of which is a grounding terminal. The terminals are connected to suitable wires 4.

5 designates the plug, this including a body of insulation in the form of a sleeve having a plug therein in which are mounted plug terminals 6 complemental to the socket terminals 3. The terminals 6 are usually tubular, and the terminals 3 are plugs for entering the tubular terminals. However, the specific construction of the terminals and the manner in which they are mounted, form no part of this invention.

One of the terminals 6 is a grounding terminal which coacts with a grounded terminal of the socket. Also, the plug is provided with suitable means for attachment to a cable for the service wires, this means being shown as a collar 7 threading on a nipple 8 at the rear end of the plug, and formed with resilient yoke arms 9 having clamping jaws 10 for embracing the cable, or the armor thereof, these jaws being clamped together by suitable means as screws 11. The yoke arms 9 project from a base ring 9^a which seats in a groove 7^a at the outer end of the collar, the outer wall of the groove being spread or swaged over on the ring.

The socket 1 is mounted in a holder 12, usually of metal, which in turn is mounted in an electric outlet box, not shown, embedded in the wall of a building, or in any other support.

This holder, as here shown, includes a tubular body having an annular face plate 13 provided with screw holes, by means of which the face plate is attached to a wall in which the holder is mounted. The body is also formed with a flattened flange like head 14 at its front end, this head being preferably annular and provided with an internal recess 15 opening toward the plug passage 16 which is an annular passage around the socket, and which receives the sleeve, or tubular portion of the plug 5, so that the recess opens toward the periphery of the plug when the plug is in the socket. The outer wall 17 of the recess 15 is removable, and is here shown as a plate fitting over the body of the head and having a passage for the plug. It is held in position in any suitable manner, as by screws 18. In Figures 1 and 2, the recess 15 is arcuate and preferably annular.

19 is a locking member movable, or shiftable, in the recess, this locking member and the plug having means coacting to require that the plug be withdrawn by a two step operation. The locking member, as here shown, is in the form of a flat ring rotatably mounted in the annular recess 15, or in the form of a plate arranged edgewise in the recess, and having an outwardly extending handle portion 20 extending through a slot 21 in the peripheral wall of the recess. As shown in Figure 2, the locking member 19 is formed with an inwardly extending lug 22, and preferably with two of such lugs located diametrically opposite each other, and the plug 5 is formed with angular peripheral slots 23 extending lengthwise thereof. Said slots include two lengthwise portions 23^a and 23^b, one of which opens through the outer end of the plug, and a transfer portion 24 connecting the two lengthwise portions. The locking member 19 is held from undue play or looseness in the recess 15 by a spring washer 15^a.

In operation, when inserting the plug in the socket, the locking member must be in position so that the lug or lugs 22 are in line with the entrance end of the angular slot or slots 23, and the plug inserted until the lugs 22 come in line

with the transfer passage 24, whereupon the locking member must be shifted to carry the lug through the transfer passage 24 into alinement with the slot portion 23b, so that the plug can be completely inserted. In withdrawing the plug from the socket, the plug is pulled outwardly until it brings the transfer passage 24 in line with the lugs 22 and then, the locking member is shifted to carry the lugs through the transfer passage 24 into alinement with the portions 23a of the slot, so that the plug can be completely withdrawn.

Upon the withdrawing movement of the plug, the plug terminals are completely separated from the socket terminals when the transfer passage 24 comes in line with the lugs 22 and stops further withdrawal of the plug, and the terminals are separated far enough so that all arcs that may have formed are extinguished by the separation of the plug and socket terminals. Preferably the holder and the plug are provided with means for alining the plug with the socket so that terminals of like polarity will be brought into engagement, and as here shown, the outer removable wall 17 of the recess 15 is provided with an inwardly extending lug 25, and the plug with a complemental straight longitudinal groove 26.

The locking mechanism requiring the two-step withdrawing operation of the plug is particularly simple, consists of few parts, and is extremely compact, or flat, in a direction lengthwise of the axis of the socket member, so that it can be located close to the wall or to the face plate, when the face plate is used, and hence, not project to any extent from the wall in which the socket is mounted.

In Figure 3 is shown a modified form of this invention in which a locking member, or latch, is located in a small space at the entrance end of the guide passage for the plug.

In the form shown in Figure 3, it is unnecessary to shift the locking member by hand during the insertion of the plug into the socket, and the shifting of the locking member out of locking position takes place automatically by the movement of the plug into the socket, and the locking member moves back into locking position automatically when the plug is partly inserted in the socket but the plug and socket terminals are separated, so that the latch is in position to obstruct complete withdrawal of the plug in one operation, and is stopped by the latch when the terminals, after being engaged, are separated sufficiently to permit any arcs to extinguish, and the latch must be shifted out of latched position manually to complete the withdrawal of the plug.

In the form shown in Figure 3, means are also provided for preventing the premature withdrawal of the latch out of locking position. That is, for locking it in latched position until the plug has been withdrawn far enough to separate the terminals and permit any arcs to extinguish.

31 designates the socket. 32 designates the holder forming an entrance passage 33 around the socket.

34 designates a flattened flange-like head at the entrance of the passage 33.

35 designates the plug member having a horn or shoulder 36 at its advance end, and a latch receiving recess 37 in the rear of the shoulder 36, and also having a lengthwise key rib 38 extending rearwardly from the recess.

39 designates a lock, or latch member, located in a recess 40 formed in the flange 34, and movable therein, the recess being straight and tangential to the passage 33 and the latch or lock 39 being movable in a tangential direction relatively to the plug. The latch is pressed into its latching position by a spring 41, and moved out of its latched position manually by a handle 42 suitably connected to the latch. The latch 39 is provided with an inclined, or cam, surface 43 for coacting with the advance end of the shoulder or horn 36, and with an abrupt face 44 for coacting with the rear side of the shoulder when the latch is in the recess 37 to obstruct the complete withdrawal of the plug 35. The latch is also formed with a key slot 46 for receiving the key rib 38 and with a face 47 arranged in the path of the front end of the key rib 38 so that the plug can be pushed back into the socket, when the latch is withdrawn out of the latch recess 37.

The holder is also provided with a lug 48 for coacting with a groove 49 on the plug, thus serving to initially aline the plug and the socket. The latch 39 is limited in its outward movement in order to prevent the face 47 from being withdrawn out of position to coact with the front end of the key rib 38. As shown, the latch 39 is formed with a shoulder 50 coacting with the upper end wall of the recess 40 when the latch is withdrawn far enough for its head to clear the horn 36. When so limited, the surface 47 is in the path of the end of the key rib 38 and prevents further movement of the plug into the socket while the latch is withdrawn. Hence, the operator can not insert the plug completely into the socket if he should take hold of the latch and hold it in its withdrawn position.

In operation, the plug is inserted in the socket, and the horn or shoulder 36 engaging the latch, cams it out of its normal position against the action of the spring 41. When the plug has been partly inserted in the socket, or far enough for the shoulder 36 to clear the latch 39, the latch is moved by its spring into the latching recess 37 and thus obstructs the withdrawal of the plug, and further endwise movement of the plug moves the key rib 38 through the key slot 46 of the latch, locking the latch in position to engage the shoulder 36 upon withdrawal of the plug and hence, preventing complete withdrawal of the plug in one movement, and requiring that the withdrawing movement of the plug be limited long enough to withdraw the latch 39 manually out of the recess 37 thus giving time for any arcs to be extinguished in the arc tight passages.

In either exemplification of my invention, the latch, or lock member is located in a compact space at the entrance end of the socket, and does not extend any appreciable distance in front of the wall in which the socket is located. Hence, the latch being compact and occupying but a small space in a direction lengthwise of the socket, permits the socket to be used in places, such as hospitals, without unduly projecting into the room, and without presenting an unsightly appearance.

What I claim is:

1. In an electric plug and socket, the combination of a socket having terminals therein, a plug movable into and out of the socket and having terminals for coacting with the socket terminals, a holder for the socket formed with a guide passage for the plug around the socket, said socket and plug being non-rotatable relatively to each other during the movement of the plug and into and out of coaction with the socket; said holder being formed with an internal recess at the en-

trance end of the guide passage, said recess opening toward the periphery of the plug member when said plug is in the guide passage, and a locking member located in said recess, the locking member and the plug having coacting means for preventing complete withdrawal of the plug in one operation, the locking member being shiftable in the recess and relatively to the plug into position to permit the completion of the withdrawal of the plug member, the locking member having a handle located outside of the socket.

2. In an electric plug and socket, the combination of a socket having terminals therein, a plug movable into and out of the socket and having terminals for coacting with the socket terminals, a holder for the socket formed with a guide passage for the plug member around the socket member, said socket and plug being non-rotatable relatively to each other during the movement of the plug into and out of coaction with the socket; said holder being formed with an internal recess at the entrance end of the guide passage, said recess opening toward the periphery of the plug when said plug is in the guide passage, and a locking member slidable in said recess in a direction at an angle to the movement of the plug, the locking member and the plug having coacting means for requiring that the plug member be withdrawn with a two step operation, the locking member having a handle located outside of the socket.

3. In an electric plug and socket, the combination with a socket having terminals therein, a plug movable into and out of the socket member and having terminals for coacting with the socket terminals, a holder for the socket having an annular plug entrance around the socket member, said socket and plug being non-rotatable relatively to each other during the movement of the plug into and out of coaction with the socket, said holder being formed with an internal 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 socket member, said recess being arcuate, a locking member having an arcuate part movable in the arcuate recess, the locking member being manually operable and having a handle for moving it, the plug and the locking member having coacting means for obstructing the complete withdrawal of the plug from the socket when the plug reaches a predetermined position and for holding the lock from movement until the plug reaches that position.

4. In an electric plug and socket, the combination with a socket having terminals therein, a plug movable into and out of the socket member and having terminals for coacting with the socket terminals, a holder for the socket having an annular plug entrance around the socket member, said socket and plug being non-rotatable relatively to each other during the movement of the plug into and out of coaction with the socket, said holder being formed with an internal 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 socket member, said recess being arcuate, a locking member having an arcuate part movable in the arcuate recess, the locking member being manually operable and having a handle for moving it, the locking member having an inwardly extending lug projecting into said passage, and the plug member being formed with an angular peripheral groove extending lengthwise thereof for receiving the locking member lug, said groove having two lengthwise portions and a transverse portion connecting them.

5. In an electric plug and socket, the combination of a socket having terminals therein, a plug movable into and out of the socket and having terminals for coacting with the socket terminals, a holder for the socket having an annular plug passage around the socket, said holder including a body portion having a flattened flange-like head at its outer end, the head being formed with a recess opening into the passage and toward the periphery of the plug when said plug is in the passage, and a locking member located in the recess and having a handle extending outside of the same, the locking member and the plug having coacting means for requiring a two step withdrawing operation of the plug.

6. In an electric plug and socket, the combination with a socket having terminals therein, a plug member movable into and out of the socket member and having terminals for coacting with the socket terminals, a holder for the socket having an entrance passage around the socket, said socket and plug being non-rotatable relatively to each other during the movement of the plug into and out of coaction with the socket, said holder being formed at its outer end with an annular head formed with an annular recess opening into said passage and toward the periphery of the plug when the plug is in the socket, a manually operable locking member including an annular body in the recess and rotatably mounted therein, and an outwardly extending arm extending through the peripheral wall of the recess, said arm having a handle at its outer end, the peripheral wall being formed with a slot for said arm, the annular portion of the locking member being provided with a lug extending into said passage, and the plug being formed with an angular slot extending lengthwise thereof for receiving the lug.

7. In an electric plug and socket, the combination with a socket having terminals therein, a plug member movable into and out of the socket member and having terminals for coacting with the socket terminals, a holder for the socket having an entrance passage around the socket, said socket and plug being non-rotatable relatively to each other during the movement of the plug into and out of coaction with the socket, said holder being formed at its outer end with an annular head formed with an annular recess opening into said passage and toward the periphery of the plug when the plug is in the socket, a manually operable locking member including an annular body in the recess and rotatably mounted therein and an outwardly extending arm extending through the peripheral wall of the recess, said arm having a handle at its outer end, the peripheral wall being formed with a slot for said arm, the annular portion of the locking member being provided with a lug extending into said passage, and the plug being formed with an an angular slot extending lengthwise thereof for receiving the lug, the holder and the plug being also formed with means for aligning the socket and plug so that terminals of like polarity of the socket and plug are aligned.

8. In an electric plug and socket, the combination with a socket having terminals therein,

a plug movable into and out of the socket, and having terminals for coacting with the socket terminals, said socket and plug being non-rotatable relatively to each other during the movement of the plug into and out of coaction with the socket, and a holder for the socket formed with a guide passage for the plug; of a manually operable latch carried by the holder at the entrance of said passage, the latch and the plug having coacting means for locking the plug from complete withdrawal after the terminals are separated, and means extending to the outside of the socket for operating the latch.

9. In an electric plug and socket, the combination with a socket having terminals therein, a plug movable into and out of the socket, and having terminals for coacting with the socket terminals, said socket and plug being non-rotatable relatively to each other during the movement of the plug into and out of coaction with the socket, and a holder for the socket formed with a guide passage for the plug; said holder formed with a recess opening edgewise into said passage at the entrance end thereof, and a manually operable latch located in the recess, the latch and the plug having coacting means for obstructing complete withdrawal of the plug after the terminals of the plug and socket are separated, and means extending to the outside of the socket for operating the latch out of its obstructing position.

10. In an electric plug and socket, the combination of a socket having terminals therein, a plug movable into and out of the socket and having terminals for coacting with the socket terminals, a holder for the socket having an annular plug passage around the socket, said holder including a body portion and an annular flattened flange like head at its outer end, the head being formed with a recess opening into the passage and toward the periphery of the plug when said plug is in the passage, and a locking member movable in the recess and having a handle extending outside of the head, the locking member and the plug having coacting means for requiring a two step withdrawing operation of the plug, the front side of said recess being a removable plate and the locking member being flat and arranged edgewise in the recess with one edge toward said passage.

11. In an electric plug and socket, the combination of a socket having terminals therein, a plug movable into and out of the socket and having terminals for coacting with the socket terminals, a holder for the socket having an annular plug passage around the socket, said holder including a body portion having a face plate, the holder being formed with a slot like recess at its outer end opening into the passage and toward the periphery of the plug when said plug is in the passage, and a locking member located in the recess and having a handle extending outside of the same, the locking member and the plug having coacting means for requiring a two step withdrawing operation of the plug, the front side of said recess being a removable plate and the locking member being flat and arranged edgewise in the recess with one edge toward said passage.

12. In an electric plug and socket, the combination with a socket having terminals therein, a plug movable into and out of the socket, and having terminals for coacting with the socket terminals, and a holder for the socket formed with a guide passage for the plug; of a spring pressed latch carried by the holder at the entrance end of said passage, the latch and the plug having coacting means whereby the latch is moved out of locking position by initial part way inward movement of the plug, and also having coacting means whereby upon the completion of the initial inward movement of the plug, and before engagement of the plug and socket terminals, the latch moves into latching position under the influence of its spring and locks the plug from withdrawal, and means for withdrawing the latch manually when in the latter position.

13. In an electric plug and socket, the combination with a socket having terminals therein, a plug movable into and out of the socket, and having terminals for coacting with the socket terminals, and a holder for the socket formed with a guide passage for the plug; of a spring pressed latch carried by the holder at the entrance end of said passage, the latch and the plug having coacting means whereby the latch is moved out of locking position by the initial part way inward movement of the plug, and also having coacting means whereby upon the completion of the initial inward movement of the plug, the latch moves into latching position under the influence of its spring and locks the plug from withdrawal, the latch and the plug also having coacting means for preventing withdrawal of the latch until the plug has been withdrawn a predetermined distance.

14. In an electric plug and socket, the combination with a socket having terminals therein, a plug movable into and out of the socket, and having terminals for coacting with the socket terminals, and a holder for the socket formed with a guide passage for the plug; a spring pressed latch carried by the holder at the entrance end of said passage, the latch and the plug having coacting means whereby the latch is moved out of locking position by the initial part way inward movement of the plug, and also having coacting means whereby upon the completion of the initial inward movement of the plug, the latch moves into latching position under the influence of its spring and locks the plug from withdrawal, the latch and the plug also having coacting means for preventing withdrawal of the latch until the plug has been withdrawn a predetermined distance, and also means for preventing complete insertion of the plug when the latch is held in its unlatched position, and the plug is in an intermediate position in the socket.

15. In an electric plug and socket, the combination with a socket having terminals therein, a plug movable into and out of the socket, and having terminals for coacting with the socket terminals, a holder for the socket formed with a guide passage for the plug around the socket; said holder formed with a spring pressed latch at the entrance end of the passage and movable in a direction at an angle to the movement of the plug, the plug being provided with a shoulder at its advance end for coacting with the latch to unlatch the same upon initial movement of the plug into the socket, and with a latching recess in the rear of said shoulder, the latch being also formed with a key passage, and the plug with a lengthwise key rib in the rear of the latching recess and alined with the key passage when the latch is in the latching recess.

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