This invention relates to electrical plugs and sockets, and has for its object, a particularly simple and efficient means for primarily preventing complete withdrawal of the plug from the socket after the plug terminals and socket members are separated, but before the plug is entirely withdrawn from the socket, so as to prevent the ignition of explosive gases in the locality of the plug and socket member by arcing between the plug and socket terminals while they are being separated.

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sectional view, partly in elevation of a plug and socket embodying my invention, the plug being shown as partly withdrawn from the socket member a sufficient distance to separate the terminals of the plug and socket member, and as limited in this position.

Figure 2 is a fragmentary view, the casings of the plug and socket member being shown in section, and the insulation which supports the terminals being shown in elevation, the guide members being shifted into its position occupied for permitting a complete withdrawal of the plug.

Figure 3 is an elevation, partly broken away, showing the plug member as completely withdrawn from the socket member.

Figure 4 is an end view of the plug member.

Figure 5 is an end view of the socket member.

Figure 6 is an end view of the plug member looking to the left, Figure 1, showing the guide member in its position assumed after the plug has been withdrawn far enough to separate the plug and socket terminals, but before the plug terminals have left the arc tight passages of the socket member.

Figure 7 is a view similar to Figure 6 showing the guide member as shifted about its axis.

Figure 8 is a developed view of the interior of the guide member.

The preferred embodiment of my invention comprises generally a socket member having terminals therein, and a plug member movable into and out of the socket member and having terminals for cooperating with the former terminals, a third member usually carried by the socket member and formed with a zigzag guide, or a guide having substantially straight portions extending lengthwise thereof arranged out of alinement or staggered, and an angular or transverse portion or passage connecting the straight portions, the plug member having guide means as shoulders movable along the guide of the third member, the third member having a rotary movement for bringing the straight portions of the guide into alinement with the shoulder on the plug, the straight portions and the angular portions being so located that the plug is stopped, when being withdrawn after the plug terminals are separated, but before the plug is completely separated from the socket so that any arcs formed between the terminals are broken and the resulting flame cooled and extinguished before the outer air, which may contain ignitable gases, enters the socket. Any means to delay the complete separation of plug and socket will accomplish this purpose. In the embodiment of the invention herein described, this means consists of a bayonet joint interlock between the plug and a rotating sleeve on the socket.

An important feature of this invention is to provide a circuit breaking plug and receptacle whereby there must be a momentary delay before the plug can be completely withdrawn from the socket after the terminals have been separated, and the resultant arc broken in order to permit the arc flame to cool below the ignition temperature of any flammable mixture of air and dust or gases that may be in the vicinity of the plug and the socket.

The socket member comprises a suitable tubular casing 1, and an internal block 2 of insulation in which are mounted terminals 3, these being located in arc tight passages 4 formed in the block of insulation 2. The casing is mounted on a suitable support 5 through which the service wires 6 enter, these being secured in any suitable manner to the terminals 3.

The plug member likewise comprises a tubular casing 7 having a support of insulation 8 in which are mounted terminals 9 for coating with the terminals 3, the advance ends of the terminals 9 entering the passages 4.

In the illustrated embodiment of the invention, the terminals 9 are formed with sockets 10 at their ends which receive the ends of the terminals 3. The plug member 7 is provided with a suitable end or stem 11 through which the wires 12 enter, these being connected to the terminals 9 in any suitable manner.

The construction thus far described, per se, forms no part of this invention.

The means for preventing complete separation
of the plug and socket members after they have been drawn away from each other far enough only to separate the terminals while in the arc tight passage, comprises a member having a guide for the plug, this guide having straight end portions extending in a direction lengthwise of the plug and socket members, and an intermediate angular or transverse portion, the plug member having shoulders movable along the guide, the guide member capable of rotative movement to bring one or the other of the lengthwise portions into alignment with the shoulders when the plug member is part way in, or part way out of the socket in order that the plug member may be operated to complete its movement.

13 designates the guide member which is rotatably mounted on the casing 1 of the socket member, it being shown as screw threaded thereon, and when once placed in position, held from unrotative movement by a stop pin 14 extending into the casing of the socket member 1 and having its outer end located in a slot or notch 15 formed in the rear end of the guide member 13, the pin limiting the rotative movement of the guide member.

In the illustrated embodiment of my invention, the guide member is formed with internal lengthwise projections or guides 16 extending from near its end and terminating short of the outer end in a stop shoulder 16* and with end projections 17 at its outer end out of alignment or staggered with respect to the projections 16 and formed with a transverse passage 18 at the outer end of the projections 16; and the plug is formed with diametrically extending shoulders 19 with spaces 20 between their ends complementary to the projections 17. There are a plurality, preferably two projections 17 located diametrically opposite each other and two projections 17 similarly located. The inner faces 17* of the projections 17 and the outer ends 18* of the projection 16 constitute shoulders located in planes spaced apart and forming the transverse passage 18.

In order that the plug can be inserted in the socket only in one position so that proper pairs of terminals 3 and 10 will coat, the socket is provided with an internal shoulder 21 and the plug with a lengthwise groove 22. The shoulder 21, the lengthwise groove also prevent relative turning or tendency to turn of the plug and socket during withdrawal of the plug and during turning of the guide member 13.

In operation, the guide member 13 must be in the position shown in Figure 7 in which the projections 17 permit the plug shoulders 19 to be inserted into the guide member 13 between the outer projection 17 and against the end faces 16* of the projection 16 and in line with the transverse passage 18.

After the plug has been partially inserted in the socket with the shoulders 19 against the ends of the projections 16, the guide member 13 is given a partial turn to move the projections 16 out of alignment with the shoulders 19, Figure 6, and the spaces 20 in alignment with said projections 16 so that the plug can be completely inserted to bring the pairs of terminals 3, 10 into contact, this turning of the guide member 13 bringing the projections 17 into interlocking engagement with the shoulders 19 to prevent uninterrupted withdrawal of the plug from the socket. To withdraw the plug from the socket, the plug is first pulled outwardly until the shoulders 19 come against the faces 17* of the projections 17 and into alignment with the transverse passages 18, and then to complete the withdrawal of the plug, the guide member 13 is turned to move the projections 17 into alignment with the spaces 20. If an attempt is made to insert the plug into the socket by first turning the guide member, the shoulder 18 will encounter the outer sides of the projections 17 and hence, the guide member must be turned to proper position to permit the plug to be inserted until the shoulders 19 come against the ends of the projections 18. In order that the plug and socket may be arc tight when the plug is but partially withdrawn, the passages 4 of the insulation 2 of the socket and the terminals 10 are long enough so that 25 the ends of the terminals 10 are in the arc tight passages when the plug is partly withdrawn with the shoulders 19 obstructed by the end projections 17. Hence, it is necessary to have the guide member 13 rotatable instead of the plug member 21 or the socket member 1, a stop pin member 14 prevents the insertion of the plug member into the socket member with one uninterrupted movement, nevertheless, the primary object is to prevent the withdrawal of the plug member 25 from the socket member with one uninterrupted movement, or to prevent the complete separation of the plug and socket member and to stop the separating movement momentarily while the plug terminals 10 are separated from the socket terminals 2 but both are located in the arc tight passages 4.

What I claim is:

1. In an electric plug and socket, the combination of a socket member having terminals therein, and a plug member movable into and out of the socket and having terminals for conducting with the former terminals, a stop member for preventing the withdrawal of the plug member from the socket member when the terminals are separated, and before the plug and socket members are separated, the stop member being movable about its axis for releasing the plug member from the stop member to permit complete withdrawal of the plug member, and means for preventing turning of the plug member relative to the socket member during the insertion and withdrawal of the plug member and during the turning 22 of the stop member.

2. In an electric plug and socket, the combination of a socket member having terminals therein, and arc tight passages around the terminals, a plug member movable into and out of the socket and having terminals for entering said passages and cooperating with the former terminals, a third member carried by the socket member and formed with a guide for the plug member, said guide having an intermediate angular portion, and the plug member being movable along the guide, the angular portion of the guide forming a stop for stopping the withdrawing movement of the plug member after the terminals thereof are separated from the terminals of the socket member, and before the plug terminals have left the arc tight passages and the plug and socket members are completely separated, the third member having a partial rotative movement for moving the angular portion of the guide out of engagement with the means on the plug member whereby the plug can be completely withdrawn.

3. In an electric plug and socket, the combination of a socket member having terminals therein, and arc tight passages around the terminals, a plug member movable into and out of the socket
and having terminals for entering said passages and cooperating with the former terminals, a third member carried by the socket member and formed with a guide for the plug member and cooperating with the former terminals, a third member carried by the socket member and formed with a guide for the plug member, said guide having an intermediate angular portion, and the plug member being provided with means movable along the guide, the angular portion of the guide forming a stop for stopping the withdrawing movement of the plug member after the terminals thereof are separated from the terminals of the socket member and before the plug terminals have left the arc tight passages and the plug and socket members are completely separated, the third member having a partial rotative movement for moving the angular portion of the guide out of alinement with the means on the plug member, whereby the plug can be completely withdrawn, the plug and socket members having coacting key and groove means for preventing the entrance of the plug into the socket except in a predetermined position.

4. In an electric plug and socket comprising a socket member having terminals therein and arc tight passages around the terminals, the plug member being movable into and out of the socket, and having terminals for entering the passages and cooperating with the former terminals, a third member carried by the socket member and being formed with internal projections arranged out of lengthwise alinement and with a space between the planes of their opposing ends, and the opposing ends of the projections forming stops for preventing endwise movement of the plug, the third member having a projection movable along the lengthwise projections and transverse-ly through said space out of alinement with one projection into alinement with the other, the third member having a rotative movement for moving the projections of the third member relative to the projection of the plug member when the plug member is aligned with said space to bring one of the projections of the third member out of alinement with the projection of the plug and the other projection of the third member to alinement with the projection of the plug member.

5. In an electric plug and socket comprising a socket member having terminals therein and arc tight passages around the terminals, the plug member being movable into and out of the socket, and having terminals for entering the passages and cooperating with the former terminals, a third member carried by the socket member and being formed with internal projections arranged out of lengthwise alinement and with a space between the planes of their opposing ends, and the opposing ends of the projections forming stops for preventing endwise movement of the plug, and the plug member having a projection movable along the guide, the third member having a rotative movement for moving the projections of the third member relatively to the projection of the plug member when the plug member is aligned with said space to bring one of the projections of the third member out of alinement with the projection of the plug and the other projection of the third member to alinement with the projection of the plug member.

6. In an electric plug and socket, the combination of a socket member having terminals therein and arc tight passages around the terminals, a plug member movable into and out of the socket and having terminals for entering and cooperating with the former terminals, a third member carried by the socket member and formed with a guide for the plug member, said guide having an intermediate angular portion, and the plug member being provided with means movable along the guide, the angular portion of the guide forming a stop for stopping the withdrawing movement of the plug member after the terminals thereof are separated from the terminals of the socket member, and before the plug terminals have left the arc tight passages the plug and socket member is completely separated from the socket member, the third member being rotatably mounted on the socket member for bringing the angular portion of the guide out of alinement with the guide means on the plug member.

7. An electric plug and socket comprising a socket member having terminals therein and arc tight passages around the terminals, and the plug member movable into and out of the socket, and having terminals for entering the passages and cooperating with the former terminals, a third member mounted on the plug member having a projection movable along the guide, the third member having a rotative movement for moving the projection of the plug member out of the transverse portion of the guide into alinement with one of the lengthwise portions, the transverse portion being located to engage the projection on the plug member before the plug terminals have left the arc tight passages when the plug member is being withdrawn out of the socket member.

8. In an electric plug and socket, the combination of a socket member having terminals therein and a plug member movable axially rectilinearly out of the socket member, and means for stopping the axial withdrawing movement of the plug member after the terminals are separated and before the plug and socket members are separated, said means being movable about the axis of the plug and socket members to permit complete withdrawal of the plug member, and means connecting the plug and socket members to aline the terminals thereof and relieve them of strains tending to misalign them during the turning of said means.

9. In an electric plug and socket, the combination of a socket member having terminals therein, a plug member having terminals for cooperating with the former terminals, the plug member being movable rectilinearly into and out of the socket, a stop member carried by the socket member substantially concentric therewith and cooperating with the plug member to stop the withdrawing movement of the plug member after the terminals are completely separated and before the plug and socket members are completely separated, the stop member being movable about its axis for releasing the plug member from the stopping member to permit complete withdrawal of the plug member, and means for holding the plug member from turning relative to the socket member during the turning of the stop member.

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