

UNITED STATES PATENT OFFICE.

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ELECTRICAL CONNECTER.

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My invention relates to improvements in electrical connectors. One of its objects is to provide an improved electrical connector adapted to connect X-ray tubes in high potential circuits, and for similar purposes. Another object is to provide an electrical connector adapted to be readily connected and disconnected, and which is positively locked against being accidentally disconnected while a high potential current is flowing. Another object is to provide an improved electrical connector one terminal of which is provided with a lamp socket arranged to carry two electrical currents and which is adapted to be positively locked in its connected position, and requires to be first unlocked before it can be disconnected. Another object is to provide an improved combination lamp socket and positive electrical connector to serve as a cathode connector for X-ray tubes. My invention also comprises certain details of form and combination and arrangement of components, all of which will be fully set forth in the description of the accompanying drawings in which:

Fig. 1 is a side elevation of an X-ray tube with my improved connector applied to the cathode terminal thereof.

Fig. 2, is a side elevation of my improved connector with the several elements thereof separated one from another.

Fig. 3, is a central vertical section through my improved connector showing the several elements assembled in operative relation.

Fig. 4, is an end view of the intermediate connector member.

Fig. 5, is an end view of the opposite end of the intermediate connector member.

Fig. 6, is a perspective view of one of the latch members detached.

Fig. 7, is a central vertical section illustrating a modification.

The accompanying drawings illustrate the preferred embodiment of my invention in which 15 represents an X-ray tube provided with an anode or positive terminal 16 and a cathode or negative terminal 17. The cathode terminal takes the form of an incandescent lamp film 18 which is sealed into one end of the tube with two lamp or filament terminals 19 and 20 of the type usually employed in incandescent electric lamps projecting externally of the tube 15. The terminals 19 and 20 are concentrically arranged and insulated one from the other in the man-

ner usual in the threaded terminals of incandescent lamp bulbs.

These X-ray tubes are fragile and delicate, and require to be handled with care to prevent injury thereto. They are also usually mounted in lead-glass shields to protect the operator from X-rays, with only their terminals projecting from the shields, which further renders them more liable to injury and less accessible to reliably and conveniently connect and disconnect the circuit terminals thereto and avoid injury to the bulb or to the operator.

In order to make connection with the terminals 19 and 20, I provide a socket member having a sheet metal casing 22, a tubular terminal 24 separated by insulating material 25 from the casing 22 and threaded to engage the threaded exterior of the terminal 20. The terminal 24 is attached to a block of porcelain or other insulating material 26 inclosed and held in place by the casing 22.

A resilient terminal 27 is mounted in position to be engaged by the end of terminal 19 when the terminals 20 and 24 are screwed together. The terminal 27 is attached to an angle plate 28 by means of a screw 29. The angle plate 28 is in turn attached rigidly to the porcelain 26 by means of a stem or bolt 30 extending axially through the porcelain 26 and a clamping nut 31. The terminal 24 is electrically connected to the casing by means of a thin strip of metal 32 which extends over one edge of the insulating tube 25 into contact with the inner face of said casing 22. The stem 30 extends through the rear end of the casing 22 where it is insulated from the casing 22 by means of a sleeve 33 of insulating material held in place by means of a set screw 320. The end of the stem 30 extending from the casing 22 has a blunt point 34 and an annular recess 35 between the casing 22 and said point 34.

An intermediate connecting member 36 of insulating material is internally recessed at one end to fit the rear of the casing 22 and is bored concentrically to receive the portion of the stem 30 extending from the casing 22. A resilient contact member or terminal 37 is seated in a recess in the connecting member 36 and is held in place relative to member 36 by means of a bolt 38 which also attaches an angle plate 39 to the rear end of member 36. The free end of the

contact member 37 yieldingly engages the rear end of casing 22 when said member 36 is forced over the rear end of casing 22. A latch member 44 is mounted in a transverse recess 440 at the rear end of member 36 as shown in Figs. 2 and 4 by means of two screws 390 and 40 passing through slotted openings 41 and 42. A coiled spring 43 is slipped over the end of the latch member 44 and seats against shoulders 72 to energize the latch member 44 tending to hold said latch member at one extremity of its range of movement. A head or push-button 45 at one end of the latch member 44 and extending beyond the side wall of member 36 enables the operator to force the latch 44 backwardly against the pressure of the spring 43.

When the contact member 36 is forced into engagement with the end of the casing 22, the pointed nose 34 of the stem 30 enters the central perforation 46 in the latch member 44 and serves to retract the latch against the energy of the spring 43 until the latch member 44 finally enters the annular recess 35 and thereby serves to positively latch or lock the contact member 36 in position relative to the casing 22 and members carried thereby until such time as the push-button 45 is energized to release the member 36 from the casing 22. A resilient terminal member 48 is attached by a screw 49 to the member 36 and projects into position to be engaged by the nose 34 of the stem 30. The screw 49 also serves to clamp an angle plate 50 to the member 48. The socket member and intermediate member 36 are relatively rotatable without interrupting the circuit.

A binding screw 51 serves to connect one wire or circuit terminal 52 to the angle plate 39. A binding screw 53 serves to connect the opposite wire or circuit terminal 54 to the angle plate 50. A terminal member or cap 55 of insulating material is attached by screw threads 56 to the member 36. The cap member 55 is provided with a perforation 57 through which the wires 52 and 54 enter the recess in the cap member 55. Said cap member 55 serves to protect the operator from the contact with the bare terminals housed within said cap. The latch member 44 is insulated by the member 36 from the casing 22.

In practice a low tension direct or alternating current flows say from the terminal 39 through the bolt 38 and member 37 to the casing 22 and hence through the terminals 24 and 20 to one end of the filament 18, thence from the opposite end of the filament 18 through terminals 19 and 27 to the stem 30, thence by terminal 48, to terminal plate 50. The filament also serves as the cathode terminal of a high tension current which may enter the tube 15 by the electrode 16 and leave tube 15 by electrode 18 and branch

conductor 62. If desired the anode terminal connection may be of the same positively locked character heretofore described for the cathode terminal of the X-ray tube.

In Fig. 7 I have illustrated a modification of the socket member which is adapted to be employed in connection with members 36 and 55 substantially as shown in Figs. 2 and 3, but for the purpose of creating an extension of the high tension and filament circuits leading to the X-ray tube, in place of being employed to make connection directly to the end of the tube as shown in Fig. 1. One or more of the sockets shown in Fig. 7, are to be employed in addition to the cathode connection shown in Figs. 1 and 3 to provide an extended circuit, as for instance where it is desired to locate the X-ray tube beneath a table or bed or in another similar locality at a distance from the X-ray cabinet.

The socket member Fig. 7 comprises a terminal 300 corresponding to the terminal 30 of Figs. 2 and 3, provided with an annular recess 350 and a point 340. The terminal 300 is insulated from a metal shell or casing 220, corresponding to the shell 22 of Figs. 2 and 3, by means of a collar 330 of insulating material, corresponding to the member 33 of Figs. 2 and 3. A socket member 77 of insulating material is seated over one end of a tube 78 of mica or other insulating material through which the extension portions 79 and 80 of the circuit members 52 and 54 are conducted from the X-ray cabinet to the X-ray tube. The socket member 77 has attached thereto by means of a screw 81 a metal angle plate 82 let into a recess in the face of member 77. The shell 220 is attached to the socket member 77 by means of screws 83 and 84, one of which 83 is threaded into the insulating material of member 77 while the other 84 is threaded into the angle plate 82 to establish electrical contact between the shell 220 and the angle plate 82 and section 79 of the circuit, which is attached by the screw 81 to the angle plate 82. The opposite circuit member 80 is attached at one end to the inner end of the member 300 by means of a clamping nut 85. In practice where the extension is employed a pair of members 36 and 55 located close to the X-ray cabinet are electrically connected to circuit terminals 52, 54, and 62 and mechanically connected and locked as heretofore described to the members 220 and 300 shown in Fig. 7, located for instance at one end of a long extension tube 78 of insulating material. At the opposite end of the extension tube 78, another pair of members 36 and 55 are employed and electrically connected to opposite ends of the circuit extension members 79 and 80, and said last mentioned members 36 and 55 are in turn to be connected mechanically to a socket member such as shown in Figs. 2, and 3, and

which socket member is connected to the cathode terminals 19 and 20 of the X-ray tube. As illustrated the socket member 77 is held in place upon the end of the extension tube 78 by means of set screws 87 and 88. The socket member 77 may however be threaded upon the end of the tube 78 in substantially the manner shown in Figs. 1 and 3 if desired.

The apparatus herein shown and described is capable of considerable modification within the scope of the claims without departing from the spirit of my invention.

What I claim is:

1. An electrical connector comprising a socket member having an annular terminal and a concentrically and centrally arranged terminal insulated therefrom and extending beyond said annular terminal, a connecting member of insulating material provided with a terminal to resiliently engage said annular terminal and a terminal insulated therefrom to resiliently engage the central terminal of said socket member, and a resiliently actuated latch member carried by said connecting member and serving to detachably lock said connecting member relative to said socket member against displacement endwise while allowing said socket member and connecting member to move relatively rotatively.

2. An electrical connector comprising a socket member having an annular terminal and a concentrically and centrally arranged terminal insulated therefrom and extending beyond said annular terminal, a connecting member provided with a terminal to resiliently engage said annular terminal and a terminal insulated therefrom to resiliently engage the central terminal of said socket member, said socket member and connecting member being relatively movable rotatively without disconnecting their terminals, and a resiliently actuated latch member carried by said connecting member and engaging said central terminal of the socket member to lock said socket member and connecting member against relative displacement endwise thereof.

3. An electrical connector comprising a socket member having an annular terminal and a concentrically and centrally arranged terminal insulated therefrom and extending beyond said annular terminal, said central terminal being provided with an annular locking recess and terminating conically to engage and automatically throw a resiliently actuated latch member, a connecting member provided with a terminal to engage said annular terminal of the socket member and a terminal insulated therefrom to engage the central terminal of said socket member, and a resiliently actuated latch member carried by said connecting member and adapted to be automatically engaged

and shifted by the introduction of said central terminal into said connecting member and to engage the locking recess of said central terminal to lock said socket member and connecting member against relative displacement endwise thereof while permitting relative movement of said socket member and connecting member rotatively thereof.

4. An electrical connector comprising a socket member having an annular terminal and a concentrically and centrally arranged terminal insulated therefrom and extending beyond said annular terminal, said central terminal being provided with an annular locking recess and terminating conically to engage and automatically throw a resiliently actuated latch member, a connecting member provided with a terminal to engage said annular terminal of the socket member and a terminal insulated therefrom to engage the central terminal of said socket member, and a resiliently actuated latch member carried by and movable transversely of said connecting member and adapted to be automatically engaged and shifted by the introduction of said central terminal into said connecting member and to engage the locking recess of said central terminal to lock said socket member and connecting member against displacement endwise thereof while permitting relative movement of said socket member and connecting member rotatively thereof.

5. An electrical connector comprising a socket member having an annular terminal and a concentrically and centrally arranged terminal insulated therefrom and extending beyond said annular terminal, said central terminal being provided with an annular locking recess and terminating conically to engage and automatically throw a resiliently actuated latch member, a connecting member of insulating material provided with a terminal to engage said annular terminal of the socket member and a terminal insulated therefrom to engage the central terminal of said socket member, and a resiliently actuated latch member carried by and transversely adjustable relative to said connecting member and adapted to be automatically engaged and shifted by the introduction of said central terminal into said connecting member and to engage the locking recess of said central terminal to lock said socket member and connecting member against displacement endwise thereof while permitting relative movement of said socket member and connecting member rotatively thereof.

6. An electrical connector comprising a first member which is provided with an annular terminal and a concentrically and centrally arranged terminal insulated therefrom and extending beyond said annular terminal, a second member provided with a terminal

to engage and move rotatively relative to said annular terminal of the first member and a terminal insulated therefrom to engage the central terminal of said first member and to move rotatively relative to said central terminal, and a resiliently actuated latch member carried by and movable transversely relative to one of said members and to latch said members against disengagement endwise thereof while permitting said members to move freely rotatively relative to one another.

7. An electrical connector comprising a socket member and a connecting member, one of said members being provided with a centrally projecting electrical terminal and an annular electrical terminal substantially

concentrically arranged about said central terminal, and the other of said members being provided with an electrical terminal to engage and rotate relative to said central terminal and an independent electrical terminal to engage and rotate relative to said annular electrical terminal, and a latch member carried by one of said members and operable to positively lock said socket member and connecting member against displacement endwise thereof while permitting relative movement of said socket member and connecting member rotatively thereof.

In testimony whereof, I have hereunto affixed my signature.

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