C. H. THORDARSON.

CIRCUIT CLOSING PLUG FOR ELECTRICAL CIRCUITS.

APPLICATION FILED APR. 9, 1910.

966,139.

Patented Aug. 2, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

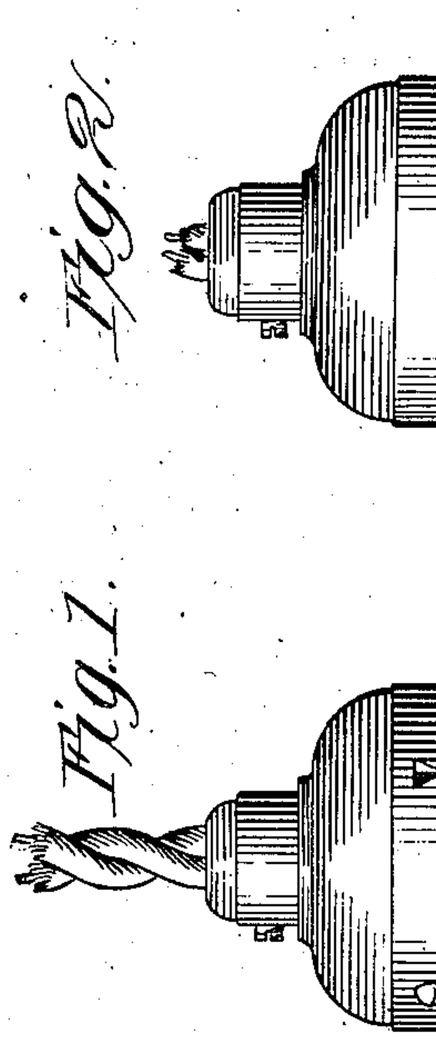


Fig. 2.

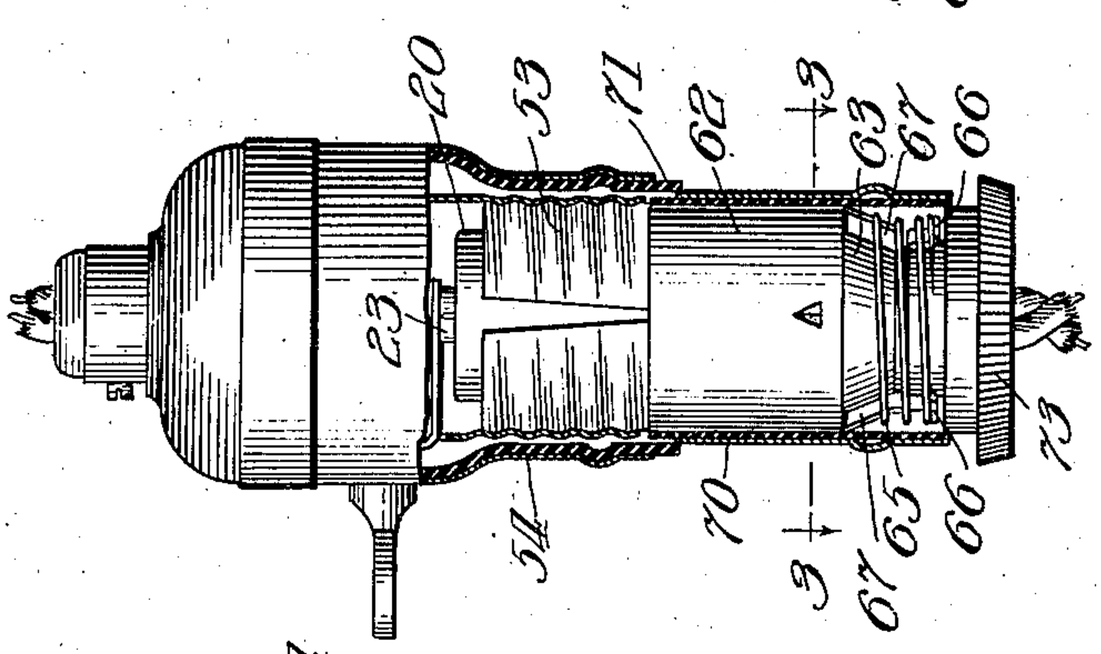


Fig. 3.

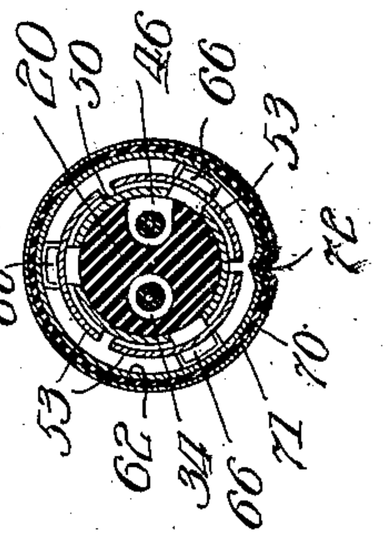


Fig. 4.

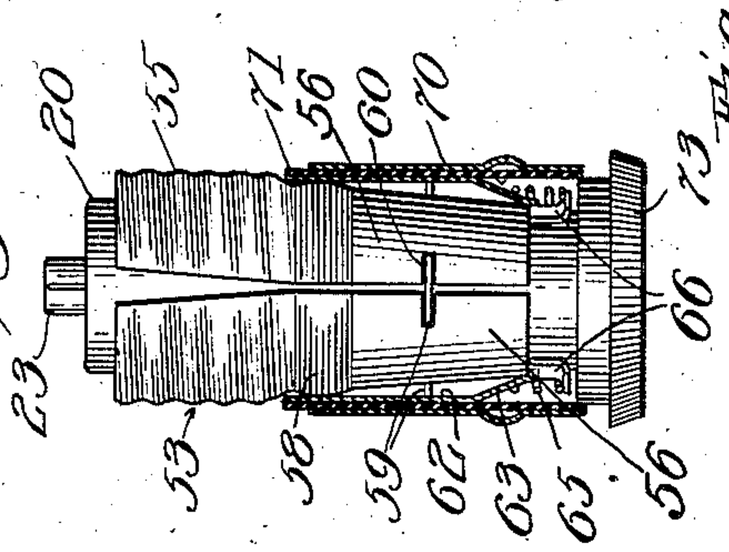


Fig. 5.

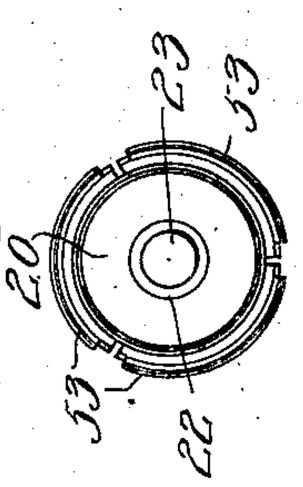


Fig. 6.

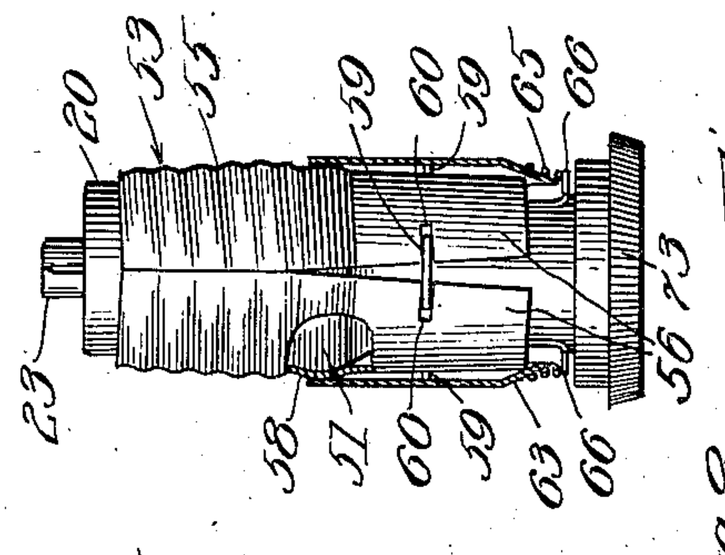


Fig. 7.

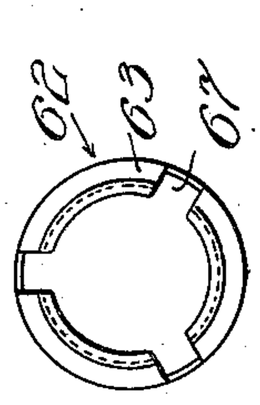


Fig. 8.

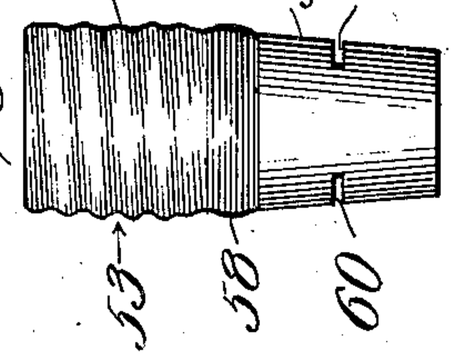
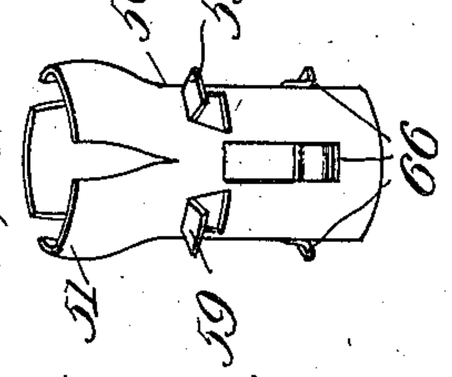


Fig. 9.



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2 SHEETS—SHEET 2.

Fig. 13.

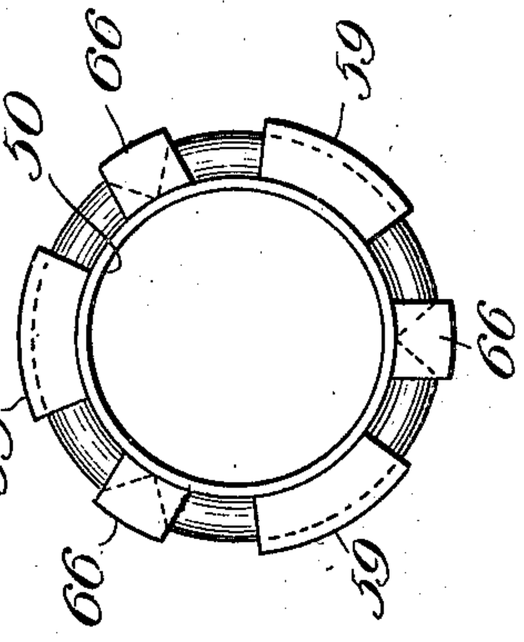


Fig. 15.

Fig. 14.

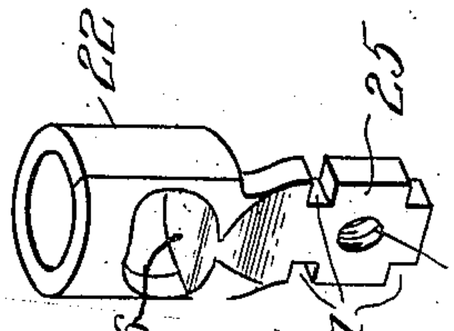


Fig. 16.

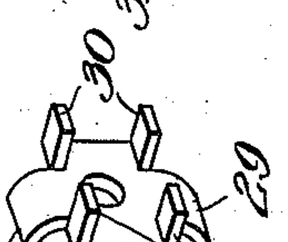


Fig. 17.

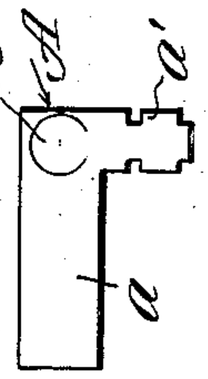


Fig. 18.

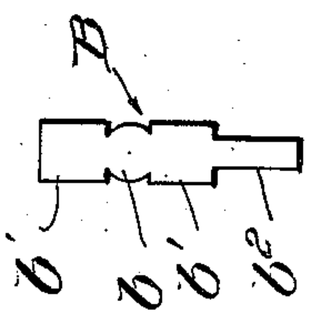


Fig. 11.

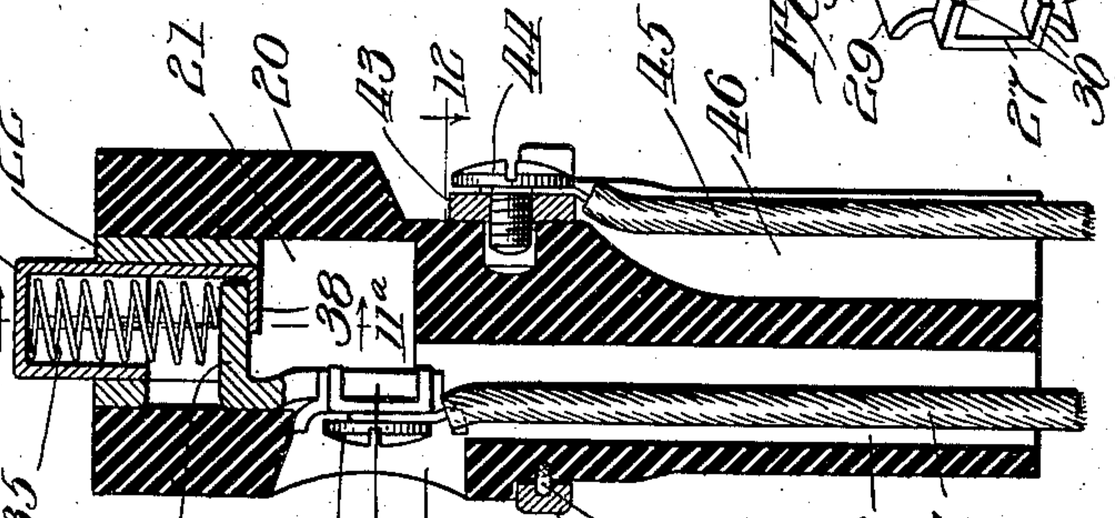


Fig. 12.

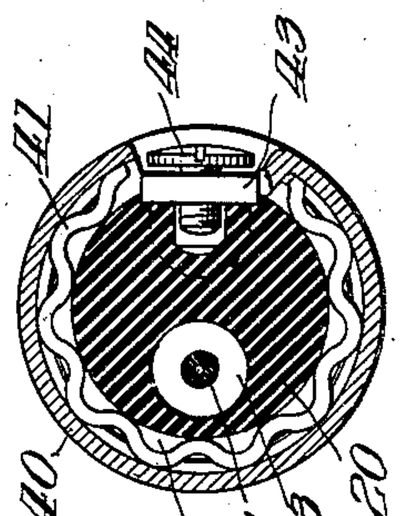


Fig. 10.

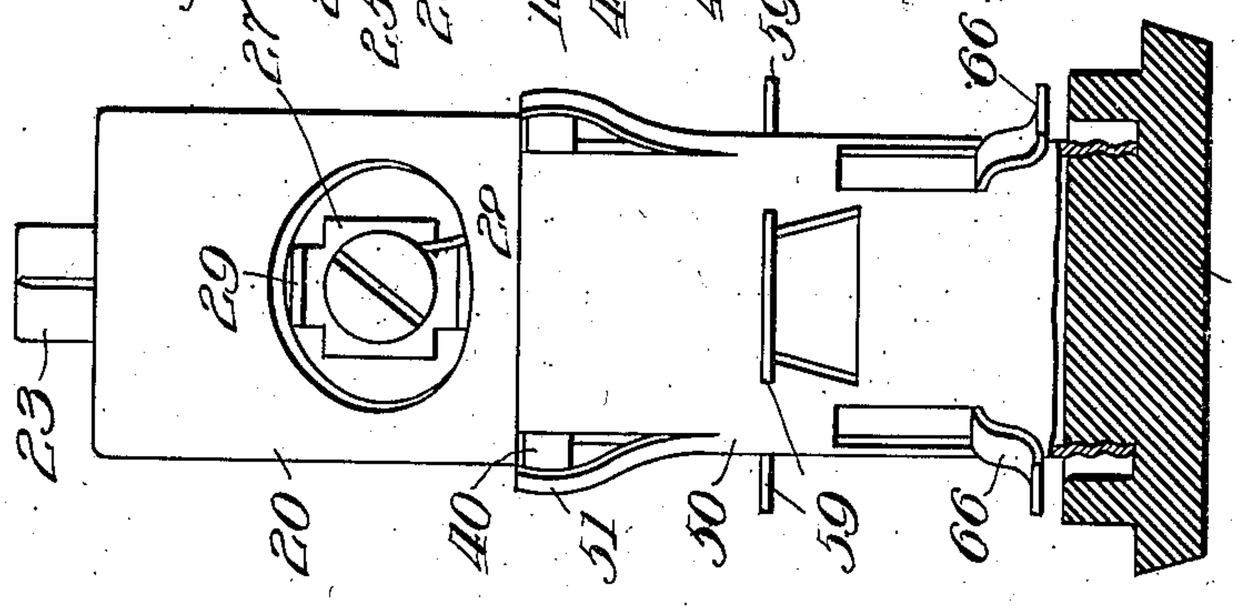
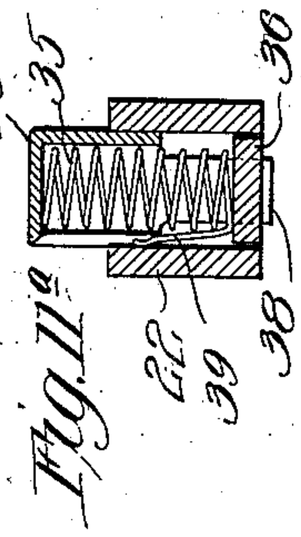


Fig. 11ª.



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UNITED STATES PATENT OFFICE.

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CIRCUIT-CLOSING PLUG FOR ELECTRICAL CIRCUITS.

966,139. Specification of Letters Patent. Patented Aug. 2, 1910.

Application filed April 9, 1910. Serial No. 554,317.

To all whom it may concern:

Be it known that I, CHESTER H. THORDARSON, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Circuit-Closing Plugs for Electrical Circuits; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in quick breaking circuit closing plugs for electric circuits, and the invention consists in the matters hereinafter set forth and more particularly pointed out in the appended claims.

Among the objects of the invention is to provide a circuit closing plug for use with standard screw-threaded sockets, so arranged as to permit a quick connection and disconnection of the plug, and thereby enable a plug and socket connection of this general character to be used in circuits carrying higher amperage than is practical with the usual screw-threaded plug and socket connection.

A further object of the invention is to provide a novel collapsible and expansible plug for this purpose, with novel means for actuating the same and for locking the expansible elements in expanded position.

Further objects of the invention are to simplify the construction of the various metal parts of the plug so that the same may be made by simple stamping operations, to provide means for assembling the parts, arranged to avoid the use of solder and rivet connections, and to otherwise improve the construction of the plug.

As shown in the drawings, Figure 1 is a side elevation of a plug and socket, the latter made in accordance with my invention. Fig. 2 is a partial section and partial elevation thereof. Fig. 3 is a transverse section on line 3—3 of Fig. 2. Fig. 4 is a partial section and partial elevation of the plug, showing the collapsible sleeve in expanded position to engage the screw-threaded socket. Fig. 5 is an end view thereof. Fig. 6 is a view similar to Fig. 4, showing the plug collapsed. Fig. 7 is an end view of the tapered actuating and locking ring for the expansible elements of the plug. Fig. 8 is a detail of one of the segments of the expansible plug sleeve. Fig. 9 is a perspective view of the metal supporting frame for the expansible elements of the plug. Fig. 10 is a partial section and partial elevation of said supporting frame and the insulating core on which it is mounted. Fig. 11 is an axial section of the core and the terminals mounted thereon. Fig. 11ª is a section on the line 11ª—11ª of Fig. 11. Fig. 12 is a transverse section on the line 12—12 of Fig. 11. Fig. 13 is an inner end view of the supporting frame. Figs. 14, 15 and 16 are perspective views of the parts constituting the center terminal of the plug. Fig. 17 is a plan view of the sheet metal blank from which the part shown in Fig. 14 is made. Fig. 18 is a plan view of the sheet metal blank from which the part shown in Fig. 15 is made.

The central insulating core 20, which will be made of porcelain or other suitable insulating material, is provided at its outer end with an axial opening 21 in which is fitted a metal bushing 22 that contains the tubular central terminal 23 of the plug. Said terminal has a sliding fit in the bushing and is spring held therein, in a manner hereinafter to be described, so as to yield backwardly in the bushing when engaged with the central terminal of the socket when the plug is assembled with the socket. The bushing 22 has an extension or attaching arm 25 by which the bushing is fixed in the plug, as by means of the binding screw 26 extending through a washer 27 that is pressed into a recessed portion 28 in the core located at one side of and intersecting the axial recess 21. As herein shown, said washer is held in the recess 28 by means of the lugs 29 thereon pressed against the walls of the recess. The washer is also shown as provided with the prongs 30 which interlock with notches 31 in the attaching arm or extension 25. The screw 26 extends loosely through the washer into a screw-threaded opening 32 of the arm 25 and the spurs 30 of said washer serve to hold the bushing from endwise movement in the core, thus relieving the screw 26 of this duty. One of the circuit wires 34 is extended through a longitudinal passage 33 in the core in line with the recess 28 and the end of said wire is clamped between the washer 27 and the head of the binding screw.

The tubular central terminal 23 is pressed outwardly by means of a spring 35 within said terminal and interposed between the end wall thereof and a lug 36 bent inwardly from the bushing 22; and said terminal is provided with an inwardly extending arm 37 having at its inner end a lug 38 which is bent inwardly over the inner side of the lug 36 to limit the outward movement of the terminal under the action of its spring. The said bushing 22 may be made from a flat sheet metal strip or blank A shown in Fig. 17, the member a of which is rolled in cylindric form to constitute the bushing proper, and the member a' of which constitutes the attaching arm 25. The lug 36 is cut from the blank at the intersection of the members a and a' and is folded inwardly during the forming process. The central tubular terminal 23 may likewise be made up from the sheet metal blank B shown in Fig. 18, the central portion b constituting the end wall of the terminal, and the portion b', b' being formed up to constitute the cylindric wall thereof, while the portion b^2 constitutes the extension or arm 37 and lug 38. The parts 22 and 23 are assembled with the spring 35 between them before the lug 38 of the arm 37 is bent up, and when said lug is bent up at right angles to said arm 37, it constitutes a stop to limit endwise movement of the parts. The terminal 39 of said spring is elongated to lie at one side of the spring and extends through the slotted side of the tubular terminal, as shown in Fig. 11^a, into bearing contact with the bushing, so as to press the terminal laterally into close contact with the bushing. Thus a good path for the current is afforded without passing the current through the spring 35.

40 designates an open combined terminal and locking ring which surrounds the core 20 and is held in place thereon by an open, wavy, resilient retaining ring 41 that is contained partially in a groove 42 of the core and in a corresponding groove on the inner side of said ring. The said ring is formed at one end with a flattened portion 43 that has a screw-threaded opening to receive the binding screw 44, between the head of which and the portion 43 the other circuit wire 45 is attached. The core is provided with an exterior groove 46 to receive the circuit wire 45. The said ring 40 is not fitted tightly on the core, as indicated in Fig. 12, and the ring is preferably made of resilient material, and coöperates with the resiliency of the retaining ring 41 to permit the locking ring to spring toward the core for a purpose hereinafter to be described.

Surrounding the inner end of the core is a tubular, metal supporting frame 50 which fits at its inner end closely over the core and formed to provide a bell shaped outer end to fit over the terminal ring 40 and to snugly embrace the same in a manner to detachably lock the supporting frame on the core. The outer bell shaped end of the tubular supporting frame is slitted to provide a plurality of spring arms 51, the resiliency of which, combined with the resiliency of the terminal ring and its retaining ring, permits the parts to be readily assembled or separated, while holding them in fixed position when assembled.

The core and tubular supporting frame thereon constitutes the body of the socket, the parts of which are detachably locked together and remain permanently locked during the ordinary use of the plug. Said body supports a sleeve which constitutes the plug terminal of one side of the circuit and also the interlocking member of the plug by which the plug is locked to the socket. The said terminal and interlocking member is a collapsible, metal, screw-threaded sleeve which is composed of the segments 53, 53, 53, three of said segments being employed, as shown. The shape of the segments is best shown in Fig. 8. Each segment consists of a screw-threaded end 55 and a plain end 56. The plain ends 56 of the segments lie over and surround the supporting frame 50 and the screw-threaded ends thereof project inwardly beyond the supporting frame over the inner end of the core and are angularly spaced, as shown in Figs. 4 and 5. The said segments are provided between their ends with transversely curved concave seats 58 which fit over the convex outer ends of the arms 51 of the supporting frame, whereby said segments are pivotally mounted on the frame so that the screw-threaded ends thereof may swing toward and from the core to contract and expand the sleeve formed by said segment. The plain ends of the segments extend between angularly spaced lugs 59, 59 bent outwardly from the frame, which lugs engage marginal oppositely opening notches 60 of the segments to hold the segments loosely in position on the frame. Surrounding the plain ends of said segments 53 is an actuating and locking ring 62 which is provided with a conical or tapered inner end 63, as best shown in Figs. 4 and 6 and 7. Said ring is mounted to slide endwise on the plain ends of the segments, and when slid upwardly into the position shown in Fig. 4, the smaller part of the taper engages the outer ends of the segments to swing the inner screw-threaded ends thereof outwardly, or expand the sleeve formed by the segments. In this position of the segments the sleeve formed thereby is expanded to fit closely with an interlocking effect in the socket 54. When said ring is slid inwardly to the position shown in Fig. 6, the inner ends of the segments are allowed to swing outwardly to permit the

outer screw-threaded ends thereof to swing inwardly to collapse the sleeve formed thereby, in which position of the parts the plug may be freely withdrawn from the socket and inserted thereinto.

A spring 65 is interposed between the tapered end of the actuated and locking ring and lugs 66 bent outwardly from the outer end of the supporting frame 50, and said spring serves to normally hold the said ring in position to lock the segments in their outermost or expanded positions, but yields to permit the ring to slide outwardly to collapse the segmental sleeve. The said tapered end of the locking ring 62 is provided with angularly spaced notches 67, (Fig. 7) arranged to permit the lug 66 of the supporting frame to pass therethrough when said ring is assembled on and moved from the frame. A sleeve 70 surrounds said actuating and locking ring, with an insulating bushing 71 interposed between the same and said ring, said sleeve and bushing being locked to the ring to slide therewith in the manner shown at 72 in Figs. 1 and 3. Said sleeve constitutes the manually engageable member which is grasped to actuate the collapsible sleeve actuating and locking ring. The insulating bushing 72 extends inwardly beyond said sleeve 70 and slightly into the mouth of the socket 54 so as to insulate the socket sleeve from the metallic portion of the plug which is engaged by the hand in removing the socket from and inserting it into the socket.

73 designates a cap made of insulating material which is screw-threaded to the outer end of the tubular body 50 to hold the slidable parts on the said body and to provide a finished end on the body for an engagement by the hand in manipulating the plug.

To insert the plug into the socket, the body of the socket is grasped between the first and second fingers of the hand and the thumb placed against the cap 73 and pressed inwardly. By this movement the body and the segmental sleeve are moved inwardly in the actuating and locking ring 62 to carry the outer ends of the sleeve segments away from the tapered end 63 of the actuating and locking ring and to permit said segments to collapse or swing inwardly so that the plug may be inserted directly into the screw-threaded socket 54. When the plug is inserted into the socket and the parts released, the spring 65 forces the tapered end of the locking ring into engagement with the ends of the segments in a manner to swing or expand the screw-threaded ends thereof outwardly and thereby hold the same in interlocking engagement with the threads or other interlocking parts of the socket. It will be noted that when the collapsible segmental sleeve is locked in its expanded position it is held just as tightly in the socket as though the screw-thread or interlocking member was formed on a solid part of the plug and that the plug cannot be separated from the socket by a pull exerted on the cord or circuit wires. When the plug is to be withdrawn from the socket the sleeve 70 is grasped and pulled outwardly, thereby withdrawing the tapered end of the locking ring away from the plain outer ends of the segments to permit the latter to collapse so as to release the same from the screw thread or other interlocking part of the socket. When the locking ring is thus slid outwardly to remove the plug from the socket, the spring 65 is placed under compression, and this compressive force of the spring acts, when the interlocking parts of the plug and socket are released one from the other, to quickly force the plug away from the socket, thereby effecting a quick separation or break of the center terminals of the plug and socket which prevents arcing between said terminals. This quick break is also assisted by reason of the spring action of the central terminal of the plug. It will thus be evident that the plug may be used with a higher tension current, without arcing, than is possible by the use of a screw-threaded plug wherein the breaking of the circuit is effected by unscrewing the plug from the socket. The spring or resilient central terminal also has the effect to press the interlocking threads of the plug and socket into close interfitting engagement, and also follows the central terminal of the socket so as to maintain a good connection between said central terminals.

It will be observed that the metal parts of the socket may be made almost wholly from sheet metal by a stamping or swaging operation. The segments 60 are thus made and the supporting body 50, the locking ring 62 and the terminal ring 40, as well as the parts 22 and 23 before described, may also be readily made in this manner.

While I have described the various structural details of the socket shown with considerable particularity, it will be understood that such details may be varied without departure from the essential principles of the invention, and the invention is not limited to such details except as hereinafter made the subject of specific claims.

I claim as my invention:

1. A circuit closing plug for a standard screw-threaded socket, embracing an expansible and collapsible screw-threaded member adapted for engagement with the screw-threaded member of the socket and means for locking the collapsible member expanded.

2. A circuit closing plug for a standard screw-threaded socket, embracing a segmental, collapsible and expansible sleeve adapted

to interlock with the screw-threaded socket and means for actuating the sleeve segments and for locking them expanded.

3. A circuit closing plug embracing a supporting body, segments loosely and pivotally mounted thereon to constitute an expansible and collapsible sleeve formed for interlocking engagement with a socket and a ring movable on said segments for locking them expanded.

4. A circuit closing plug embracing a supporting body, pivotal segments arranged about the body to form a sleeve having means for interlocking with a socket and a locking ring provided with a conical portion for engagement with said segments to lock them expanded.

5. A circuit closing plug comprising a body and an expansible and collapsible sleeve thereon for interlocking engagement with a socket, combined with a locking ring for locking the sleeve expanded and a spring to hold the latter in its locking position.

6. A circuit closing plug embracing a supporting body, segments mounted on and carried by the body and arranged to form a sleeve for interlocking engagement with a socket and pivoted between their ends, a locking ring slidable endwise of said segments and provided with a conical or wedge portion for engagement with the segments to lock the latter in their expanded positions and a spring interposed between the body and said ring for holding the conical portion of the sleeve normally and yieldably engaged with said segments.

7. A circuit closing plug comprising a body and an expansible and collapsible sleeve thereon for interlocking engagement with a socket, combined with yielding locking means to normally lock the sleeve expanded, said yielding means being adapted to exert pressure on the body in a direction to effect a quick break between the socket and plug terminals when the elements of the sleeve are released.

8. A circuit closing plug provided with an endwise, movable, spring-pressed central terminal and comprising a body and an expansible and collapsible sleeve thereon for interlocking engagement with a socket, combined with yielding locking means to normally lock the sleeve expanded, said yielding means being adapted to act on the body in the direction of movement of said terminal, whereby said yielding means and said spring-pressed terminal act together to effect a quick break between the socket and plug terminals when the elements of the sleeve are released.

9. A circuit closing plug comprising an insulating core, a tubular metal supporting frame thereon and detachably locked thereto, a collapsible and expansible metal terminal sleeve surrounding said frame for interlocking connection with a socket and actuating and locking means for said sleeve.

10. A circuit closing plug comprising an insulating core, a tubular metal supporting frame thereon and detachably locked thereto, a metal terminal sleeve surrounding said frame for interlocking connection with a socket, composed of segments pivoted between their ends on said frame, a locking ring surrounding and slidable on said segments and provided with means for releasably locking the segments expanded.

11. A circuit closing plug comprising an insulating core, a tubular metal supporting frame thereon and detachably locked thereto, a metal terminal sleeve surrounding said frame for interlocking connection with a socket, composed of segments formed at their inner ends with screw threads and having plain outer ends and pivoted between their ends to the frame to swing at their screw-threaded ends toward and away from the core and a locking ring slidable on the plain ends of the segments and formed with a taper to engage the plain ends of the segments in a manner to lock the screw-threaded ends thereof expanded.

12. A circuit closing plug comprising an insulating core, a tubular metal supporting frame thereon and detachably locked thereto, a metal terminal sleeve surrounding said frame for interlocking connection with a socket composed of segments pivoted between their ends on said frame, angularly spaced lugs on said frame between which the outer ends of the segments extend and engaged with marginal notches in said segments, a locking ring surrounding and slidable on said segments and provided with means for releasably locking the segments expanded.

13. A circuit closing plug comprising an insulating core carrying a central plug terminal, a tubular metal supporting frame thereon and detachably locked thereto, a metal terminal sleeve for interlocking connection with a socket, composed of segments pivoted between their ends on the frame, said frame being provided with lugs which interlock with the segments to hold the latter in position on the frame, a locking ring slidable on the segments and formed with a taper to engage the segments to lock the latter expanded, and a spring interposed between the said ring and other lugs on the frame for yieldingly holding the ring in its locking position.

14. A circuit closing plug comprising an insulating core carrying a central plug terminal, a tubular metal supporting frame thereon and detachably locked thereto, a metal terminal sleeve for interlocking connection with a socket, composed of segments pivoted between their ends on the frame, said frame being provided with lugs which

interlock with the segments to hold the latter in position on the frame, a locking ring slidable on the segments and formed with a taper to engage the segments to lock the latter expanded, and a spring interposed between the said ring and lugs on the frame for yieldingly holding the ring in its locking position, the conical portion of the locking ring being provided with notches to pass over the spring abutment lugs in assembling the device.

15. A circuit closing plug comprising a core of insulating material, a central terminal carried thereby, a metal terminal ring fitted over the core, a tubular metal frame fitted also over the core and detachably interlocked to said ring and a metal terminal sleeve supported on said frame and constructed for interlocking connection with a socket.

16. A circuit closing plug comprising, in combination, a core of insulating material provided with a central terminal, a metal terminal ring surrounding the same, a tubular metal frame surrounding the core and having spring arms adapted to fit over and detachably interlock with said ring, and a metal terminal sleeve carried by the said frame and adapted for interlocking connection with a socket.

17. A circuit closing plug comprising, in combination, a core of insulating material provided with a central terminal, a metal terminal ring surrounding the same and grooved on its inner side and the core being provided with an annular groove, a retaining ring contained partly in the groove of the core and partly in the groove of said ring to lock the ring to the core, a tubular metal frame surrounding the core and having spring arms adapted to fit over and detachably interlock with said ring, and a metal terminal sleeve carried by the said frame and adapted for interlocking connection with a socket.

18. A circuit closing plug comprising a core of insulating material, a central terminal carried thereby, a resilient metal terminal ring fitted over and yieldable toward the core, a tubular metal frame fitted also over the core and detachably interlocked to said ring and a metal terminal sleeve supported on said frame and constructed for interlocking connection with a socket.

19. A circuit closing plug comprising, in combination, a core of insulating material provided with a central terminal, a metal terminal ring surrounding the same and grooved on its inner side and the core provided with an annular groove and an open spring ring of wave like formation contained partly in the groove of the terminal ring and partly in the groove of the core for locking said ring to the core, a tubular metal frame surrounding the core and having spring arms adapted to fit over and detachably interlock with said ring, and a metal terminal sleeve carried by the said frame and adapted for interlocking connection with a socket.

20. A circuit closing plug comprising a core of insulating material, a central terminal carried thereby, an open metal terminal ring fitted over the core and provided with an enlarged end to receive a binding screw for a circuit wire, a tubular metal frame surrounding the core and releasably interlocked to said terminal ring, and a metal terminal sleeve carried by said frame and adapted for interlocking connection with a socket.

21. A circuit closing plug comprising a core of insulating material, a central terminal carried thereby, a metal terminal ring fitted over the core, a tubular metal frame surrounding the core and having means for detachably locking it to said terminal ring, a metal terminal sleeve surrounding said frame and adapted for interlocking connection to a socket and composed of angularly separated segments pivoted between their ends on the frame, and a locking ring slidable on said segments and formed with a taper to engage the segments to lock the sleeve expanded.

22. In a circuit closing plug, a tubular metal body provided at one end with spring arms adapted to engage over a part carried by the core of the plug and provided between its ends with angularly spaced lugs, said frame being made of sheet metal and said lugs being bent outwardly from the sheet metal body of the frame.

23. In a circuit closing plug, a tubular metal body provided at one end with spring arms adapted to engage over a part carried by the core of the plug to lock the body to the core and provided at its other end with angularly spaced lugs formed up from the body of the frame to constitute spring abutments and between its ends with other angularly spaced lugs formed up from the sheet metal body of the frame, the latter lugs being arranged out of line with the former lugs.

24. In a circuit closing plug, a central terminal comprising a metal bushing, a tubular terminal piece slidable in the bushing and a spring acting to normally hold the terminal piece projected from the sleeve and to press the terminal piece laterally against the sleeve.

25. In a circuit closing plug, a central terminal comprising a metal bushing, a tubular terminal piece slidable in the bushing, a spring acting to normally hold the terminal piece projected from the sleeve, and a stop for limiting the outward movement of the terminal piece, said spring being provided with a terminal which engages the bushing

in a manner to hold the terminal piece laterally pressed against the bushing.

26. In a circuit closing plug, a central terminal comprising a sheet metal bushing provided with an endwise extending attaching arm and near one end with an internal lug, a hollow sheet metal terminal piece slidable in the bushing and a spring interposed between said lug and the end wall of the terminal piece, said terminal piece being provided with an inwardly turned lug adapted to engage the bushing lug to limit the outward movement of the terminal piece under the action of its spring.

27. In a circuit closing plug, the combination with a core made of insulating material and provided at one end with an axial recess and at its side with a lateral notch opening into the recess, a metal bushing within said recess, a yieldably mounted terminal piece carried by said bushing, the bushing being provided with an arm which extends at its end in line with said notch, a washer in said notch having interlocking engagement with said arm to hold the bushing from withdrawal from the core and a binding screw extending through said washer into said arm.

28. A circuit closing plug for a standard screw-threaded socket provided with a central spring terminal and embracing a segmental, collapsible and expansible sleeve adapted to interlock with the screw-threaded socket and means for actuating the sleeve segments and for locking them expanded.

In testimony, that I claim the foregoing as my invention I affix my signature in the presence of two witnesses, this sixth day of April A. D. 1910.

CHESTER H. THORDARSON.

Witnesses:
WILIAM L. HALL,
WILLIAM GOLDBERGER.