

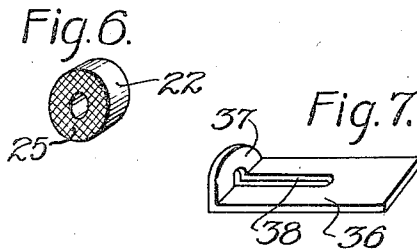
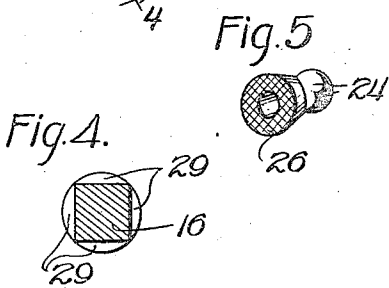
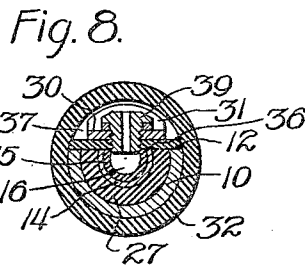
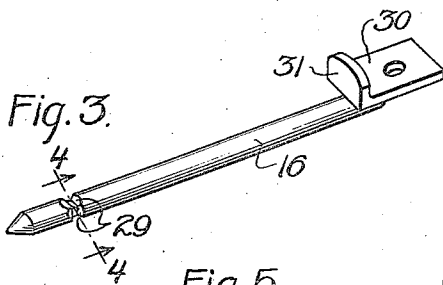
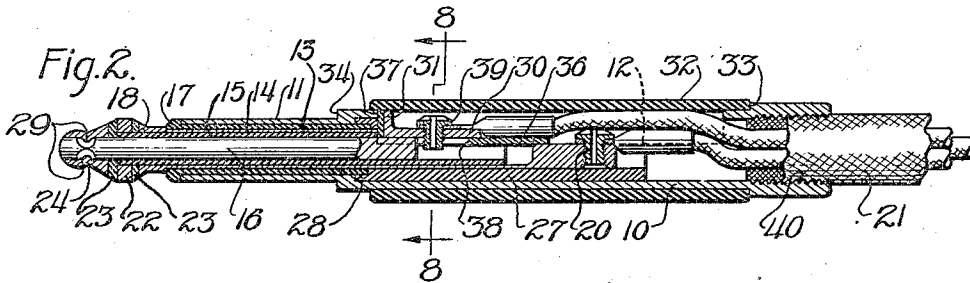
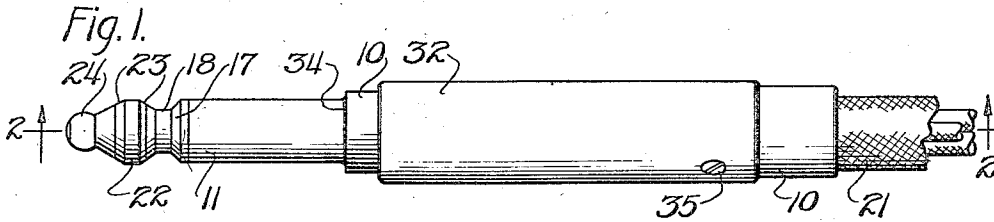
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B. K. FORD

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CONNECTING PLUG

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UNITED STATES PATENT OFFICE

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CONNECTING PLUG

Original application filed July 27, 1927. Serial No. 208,692. Divided and this application filed June 20, 1928. Serial No. 286,858.

This invention relates to connecting plugs, and more particularly to a connecting plug which is adapted to be used as the terminal of a telephone cord and to cooperate with a telephone jack.

Electrical conductors such as are used for interconnecting electrical circuits are frequently provided at their free ends with connecting plugs which are designed to engage jack contacts attached to other conductors and which jack contacts may be fixedly positioned. A plurality of individually insulated conductors of this type assembled under a common sheath to constitute a flexible strand termed a "cord" is frequently used in telephone exchanges for interconnecting electrical circuits of telephone switchboards. In such cases the connecting plug attached to the cord is usually provided with contacting portions which are insulated from each other, individually connected with the conductors of the cord and designed to engage cooperating contacting portions or springs of a jack terminal secured in the telephone switchboard. Due to the continual insertion and withdrawal by a switchboard operator of the plug in and from the jacks of the switchboard the plug is subjected to considerable wear, stress and strain and their replacement may therefore be quite frequent.

The object of this invention is a rigid and durable connecting plug for electrical conductors of few and simple parts which may be quickly but securely assembled in an expeditious, efficient and economical manner and is a division of my copending application, Serial No. 208,692, filed July 27, 1927.

In accordance with the aforementioned objects the present invention contemplates a connecting plug, consisting of a plurality of contacting elements which are insulated from each other and which are provided with conducting portions positioned in the body portion of the plug to receive the ends of the electrical conductors and enclosed by an insulating sleeve. Integral with the body portion is a hollow projecting portion through which, and insulated therefrom, the conducting portions of the contacting elements extend. The conducting portion of one of the

contacting elements which specifically constitutes the tip of the connecting plug assembly, consists of a steel wire, such as music wire, provided at one end with a series of circularly arranged depressions in which the metal of the tip contacting element is compressed, resulting in its being securely and firmly attached to its associated part. The opposite end of the steel wire conducting portion is provided with an angular extension which is insulated from and clamped during the assemblage of the plug against a surface of the body disposed at an angle to the longitudinal axis thereof, the attaching of the tip contact being contemporaneous with the clamping of the angular extension.

Other objects and advantages of this invention will more fully appear from the accompanying detailed description taken in connection with the accompanying drawings which illustrate one embodiment thereof, in which

Fig. 1 is an elevation of an electrical connecting plug embodying the features of this invention and manufactured in accordance with the improved method shown attached to a cord;

Fig. 2 is a section on the line 2—2 thereof looking in the direction indicated by the arrows;

Fig. 3 is a perspective view of the center pin;

Fig. 4 is an enlarged section on the line 4—4 of Fig. 3 looking in the direction indicated by the arrows;

Figs. 5 and 6 are enlarged perspective views of the tip contact and "dead" collar;

Fig. 7 is a perspective view of an insulating member, and

Fig. 8 is an enlarged section on the line 8—8 of Fig. 2 looking in the direction indicated by the arrows.

This invention is particularly applicable to a connecting plug structure for telephone cords and in the embodiment illustrated in the drawings is of the three conductor type, that is, it provides for the extension of suitable contacts of the jack (not shown) of three conductors. The plug consists of a tubular body portion 10 and a projecting sleeve por-

tion 11, of less diameter than the portion 10, which is adapted to be inserted in a jack terminal to make electrical contact with certain contact springs thereof. The body portion 10 is cut away intermediate its ends as shown at 12 to form a web portion for the purpose of affording access to its interior at points where conductors of the cord are to be connected to certain terminals to be referred to hereinafter. Carried within the bore of the sleeve portion 11 is an insulating sleeve 13, a conducting sleeve 14, an insulating sleeve 15 and a center pin 16 mounted one within the other in the sequence named. The insulating sleeve 13 has formed on the outer end thereof (Fig. 2) a flanged portion 17, while the inner end thereof extends along the bore of the sleeve portion 11 and terminates adjacent the inner shoulder of the bore of the body portion 10. The outer end of the conducting sleeve 14 is formed with an enlarged ring portion 18 which is insulated from the outer end of the sleeve portion 11 by the flanged portion 17 of the insulating sleeve 13, while the inner end of the sleeve 14 is closed for the purpose of providing a supporting portion for a screw 20 for securing one of the three conductors constituting a cord 21 to the sleeve 14. The insulating sleeve 15 extends for a suitable distance from the outer end of the enlarged portion 18 of the sleeve 14 for a purpose which will become apparent as this description progresses, the inner end of the sleeve 15 extending within the bore of the sleeve 14 to a point adjacent the inner closed portion thereof.

Mounted upon the insulating sleeve 15 is a dead collar 22 of conducting material, which is insulated on its inner end from the adjacent end surface of the portion 18 of the sleeve 14 by an insulating washer 23 and on its outer end by a similar washer 23 from the inner end surface of a tip member 24, the member is fitted tight on the center pin 16 so that it must be slightly forced when assembled thereon. The flat end faces of the dead collar 22 are knurled as shown at 25 (Fig. 6); also the inner flat end face of the tip member 24 is knurled as shown at 26 (Fig. 5). The purpose of the knurling of these faces of the collar 22 and tip member 24 is to prevent the rotation of the washers 23 and the collar 22 relative to each other or to other parts of the plug during a subsequent profiling or finishing operation to be referred to hereinafter. It will be apparent in the completed plug, as well as during the operation just referred to wherein the various parts axially disposed upon the center pin 16 are maintained under compression one against the other, that the knurled metal end faces of the collar 22 and tip member 24 will be pressed into the adjacent end faces of the comparatively soft material composing the

washers 23, thus securely locking the washers and collar 22 from rotation.

Referring to Figs. 2, 3 and 4, particularly Fig. 4, it will be observed that the outer end (Figs. 2 and 3) of the center pin 16, which is made of a material similar to music wire for the purpose of providing a maximum stiffness or rigidity to the plug, is provided with four equally spaced shallow notches 29, two of the notches appearing in Figs. 2 and 3. In assembling the plug, the tip member 24 is staked on the center pin 16 in such a manner that the peripheral surface of the bore thereof is lodged or forced down into the notches 29 to completely fill them with the metal composing the tip and thereby firmly securing the latter member from relative movement in all directions on the pin 16. Between the peripheral surface of the bore of the body portion 10 and the peripheral surface of that portion of the sleeve 14 extending thereinto is an insulating sleeve 27 which is an extension of the insulating sleeve 13, the two sleeves overlapping as shown at 28.

Electrically welded to the right end of the center pin 16, before the assemblage of the plug, is a terminal plate 30 (Fig. 2) provided with a right angle shoulder 31, which is rounded at its upper end surface as viewed in Figs. 2, 3 and 8 to conform to the curvature of the body portion 10 of the plug and is preferably disposed below or within the diameter of the portion 10 to prevent the plate 30 from contacting with the peripheral surface of the bore of an outer insulating shell or hand grip 32 mounted on the body portion 10. Although the hand grip 32 is composed of insulating material it is desirable to space the shoulder 31 therefrom in case moisture gathered on the hand grip should afford a ready electrical path between the body portion 10 and the shoulder 31. One end of the shell 32 engages a shoulder 33 formed on the body portion 10 adjacent its inner end, the opposite end extending to a point adjacent a shoulder 34 provided on the body portion 10 in forming the sleeve portion 11 thereof, and is fixed to the body portion 10 by a screw 35 (Fig. 1).

The outer vertical face of the shoulder 31 of the plate 30, as well as the lower face of the latter is spaced from the surfaces of the body portion 10 produced in the forming of the web portion 12 thereof by an insulating member 36 (Fig. 7) provided with a right angle arm 37, the arm serving to insulate the inner end surface of the conducting sleeve 14 from the plate 30, the sleeve 14 being cut away to conform to the web portion 12 of the body 10, as will readily be understood. The member 36 is provided with a suitable slot 38 for that portion of the center pin 16 which is welded to the plate 30. A screw 39 similar to the screw 20 threaded into the closed end of the conducting sleeve 14 is threaded into

the plate 30 for securing another one of the three conductors to the center pin 16.

Another of the three conductors constituting the cord 21 is maintained in electrical contact with the peripheral wall of a threaded portion 40 of the bore of the body portion 10 at its inner end by turning back the bared conductor which is firmly held in electrical contact with the threaded portion by the cord which is threaded thereinto. The screws 39 and 20 each secure one of the conductors to the center pin 16 to which is staked the tip member 24 and the conducting sleeve 14 having integrally formed thereon the ring portion 18, while to the body portion 10 of the plug having the sleeve portion 11 is secured another cord in the manner hereinbefore referred to. The tip contact, the ring portion and the sleeve portion of the body, respectively, being included in what are generally termed the "tip", "ring" and "sleeve" circuits in telephone exchange circuits.

During the final assemblage of the connecting plug herein described the tip member 24, dead collar 22, insulating washers 23 at either end of the latter, conducting sleeve 14 and insulating sleeve 13 are maintained under pressure against the left end of the sleeve portion 11 of the plug body 10 and simultaneously therewith the shoulder 31 of the plate 30, which is welded to the center pin 16 is pressed against the arm 37 of the insulating member 36 in turn backed by a vertical surface (Fig. 2) of the body portion 10 formed at one end of the cut away or web portion 12 thereof. This pressure brings the various parts close together and serves to press the knurled metal end faces of the collar 22 and tip member 24 into the adjacent faces of the washers 23, as hereinbefore described, thus securely locking these parts together. While the aforementioned parts are under compression suitable means is employed to stake the tip member 24 onto the center pin 16, as hereinbefore described, thus forcing the metal of the tip member into the notches 29 and securely locking the parts while under compression to the body portion 10. After completion of the assemblage the sleeve portion 11 of the body portion 10, together with the portion of the plug extending from the left end thereof (Fig. 2), is polished or profiled to provide a desired contour for insertion in the jacks of the switchboard. The center pin 16 with the terminal plate 30 secured thereto is mounted within the body 10 by inserting it through the opening formed in the body in producing the web portion 12 thereof.

It will be obvious that a connecting plug of the hereinbefore described type, due to the rigidity afforded by the music wire center pin 16 and the right angled integral shoulder 31 provided on the terminal plate 30, that a connecting plug structure results which is

adequate to stand the wear, stress and strain to which plugs of this type are subjected, thus holding their replacement down to a minimum.

What is claimed is:

1. An electrical connecting plug comprising an apertured body portion, a threadless conducting element extending through the aperture of the body portion and having a peripheral depression, a contact secured to said conducting element solely by metal of the contact cooperating with the peripheral depression in said conducting element, and insulating means for insulating the respective elements of the plug assembly.
2. An electrical connecting plug comprising an apertured body portion, a threadless conducting element extending through the aperture of the body portion and provided with closely adjacent depressions, a contact secured to said conducting element by metal of the contact engaging the depressions in said conducting element, and insulating means for insulating the respective elements of the plug assembly.
3. An electrical connecting plug comprising an apertured body having a web portion formed thereon, conducting means extending through the aperture of the body and provided with an angular extension disposed adjacent a surface of the body at one end of the web portion thereof, a contact secured to the conducting means, and insulating members for separating the contact and means including the angular extension of the latter from the body, the contact secured to the means by lodging material of the contact in the surface of the conducting means.
4. An electrical connecting plug comprising an apertured body having a web portion formed thereon, conducting means extending along the aperture of the body and provided with an angular extension disposed adjacent a surface of the body at one end of the web portion thereof, a contact surrounding a peripheral portion of the conducting means, and insulating members for separating the contact and the means including the angular extension of the latter from the body, the contact secured to the conducting means by lodging material of the contact at a plurality of points in the peripheral surface of the conducting means.
5. An electrical connecting plug comprising an apertured body having a web portion formed thereon, a conducting pin extending into the aperture of the body and provided with an angular extension disposed adjacent a surface of the body formed at a similar angle at one end of the web portion thereof, apertured tip and ring contacts mounted upon the pin, and insulating members for separating the contacts from each other and the body and the pin including the angular extension thereof also from the body, the tip

contact secured to the pin by lodging material of the contact in a plurality of depressions formed in the peripheral surface of the pin while the parts are under compression in a direction parallel to the longitudinal axis of the body.

6. An electrical connecting plug comprising a longitudinally apertured body having a web portion formed thereon, conducting means extending along the aperture of the body and provided with an angular extension disposed adjacent a surface of the body at one end of the web portion thereof, apertured tip and ring contacts mounted upon the means, a collar mounted upon the conducting means between the tip and ring contacts, and insulating means for separating the contacts and collar from each other and the body and the means including the angular extension thereof also from the body, the opposite ends of the collar and the adjacent end of the tip contact provided with knurled faces, the tip contact secured to the means by lodging material of the contact in the peripheral surface of the means while the parts are under compression in a direction parallel to the longitudinal axis of the body, thus pressing the knurled faces of the collar and tip contact in the adjacent faces of the insulating members.

7. An electrical connecting plug comprising an apertured body having a web portion formed thereon, conducting means extending along the aperture of the body provided with an angular extension disposed adjacent a surface of the body at one end of the web portion thereon and having a peripheral depression, a contact fixed to the conducting means and swaged into the peripheral depression thereof, and insulating members for separating the contact and conducting means from the body.

8. An electrical connecting plug comprising an apertured body having a web portion formed thereon, a threadless conducting means extending along the aperture of the body provided with an angular extension disposed adjacent a surface of the body at one end of the web portion thereon and having a peripheral depression, a contact fixed to the threadless conducting means and swaged into the peripheral depression thereof, and insulating members for separating the contact and conducting means from the body.

9. An electrical conducting plug comprising an element having an indentation, and a plurality of contacting members held in their respective positions relative to the element by one positioned over the indentation and being swaged thereinto to secure its rigid mounting on the element.

10. An electrical conducting plug including an indented element, a contact member positioned over and swaged into the indentation and having a knurled surface, and means having a knurled surface and cooperating

with the contacting member to prevent a relative movement therebetween.

11. An electrical connecting plug including an apertured body having a web portion formed thereon, an indented element extending along the aperture of the body, a contacting member and a plurality of cooperating insulating members mounted thereon for forming a triple contact, the contacting member having a knurled surface and positioned over and swaged into the indentation of the element, and means having a knurled surface for cooperating with the knurled surface of the contacting member to prevent relative movement between the portions of the plug.

12. An electrical connecting plug comprising an apertured body portion, a conducting element extending through the aperture of the body portion and provided with arcuate depressions intersecting each other to form an irregular groove completely around the peripheral surface thereof, a contact secured to said conducting element solely by material of the contact cooperating with the peripheral depressions in said conducting element, and insulating means for insulating the respective elements of the plug assembly.

13. An electrical connecting plug comprising an apertured body portion, a threadless conducting element extending through the aperture of the body portion and provided with closely adjacent depressions, a contact secured to said conducting element by metal of the contact engaging the depressions in said conducting element, and insulating means secured in position with said contact as its inner surface is forced into said depressions.

14. An electrical connecting plug comprising an apertured body having a web portion formed thereon, conducting means extending along the aperture of the body, an angular extension welded to the conducting means disposed adjacent a surface of the body at one end of the web portion thereof, a contact fixed to the angular extension and insulating members for separating the contact and means including the angular extension of the latter from the body.

15. An electrical connecting plug comprising an apertured body, a conducting member extending along the aperture of the body, an angular extension welded to the conducting member and disposed adjacent a surface of the body, a contact fixed to the angular extension, and an insulating member conforming to the angular extension for insulating the latter from the body.

In witness whereof, I hereunto subscribe name this 1st day of June, A. D., 1928.

BEN KING FORD.