Aug. 23, 1938. L. T. FREDERICK 2,128,132

SOCKET

Filed Oct. 12, 1932 2 Sheets-Sheet 1

Fig. 1.

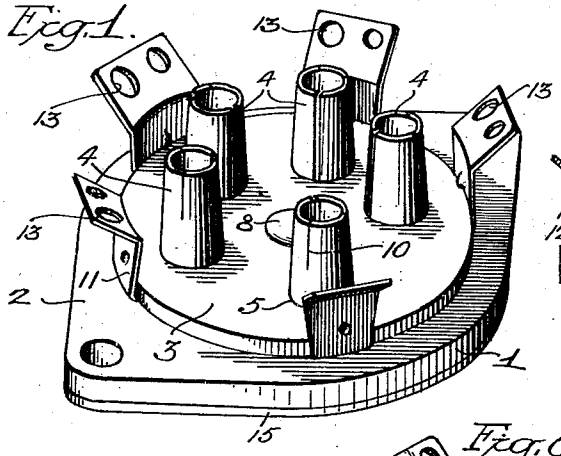


Fig. 2.

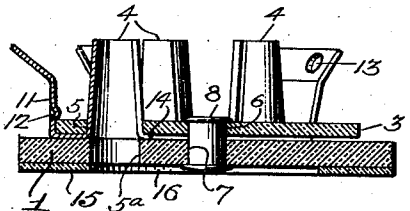


Fig. 5

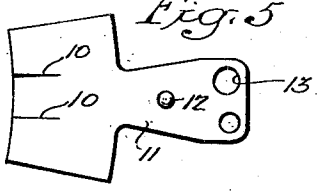


Fig. 6

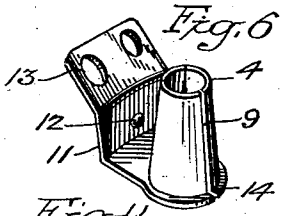


Fig. 9

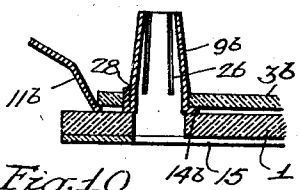


Fig. 11

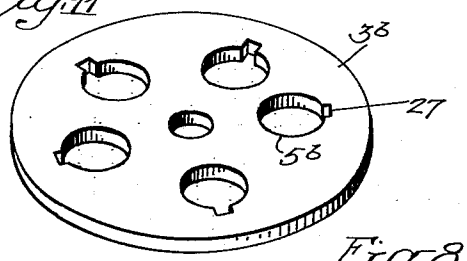


Fig. 10.

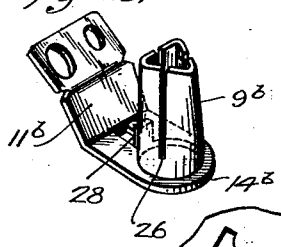


Fig. 8.

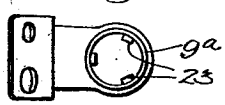


Fig. 3.

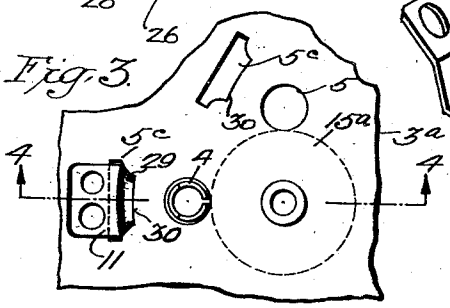


Fig. 7

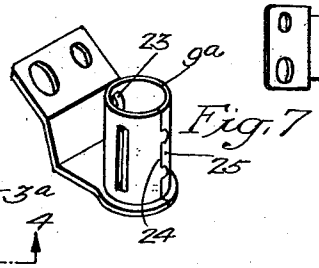
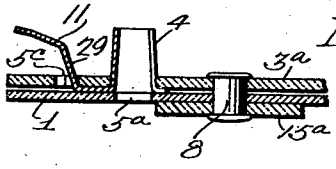


Fig. 4.

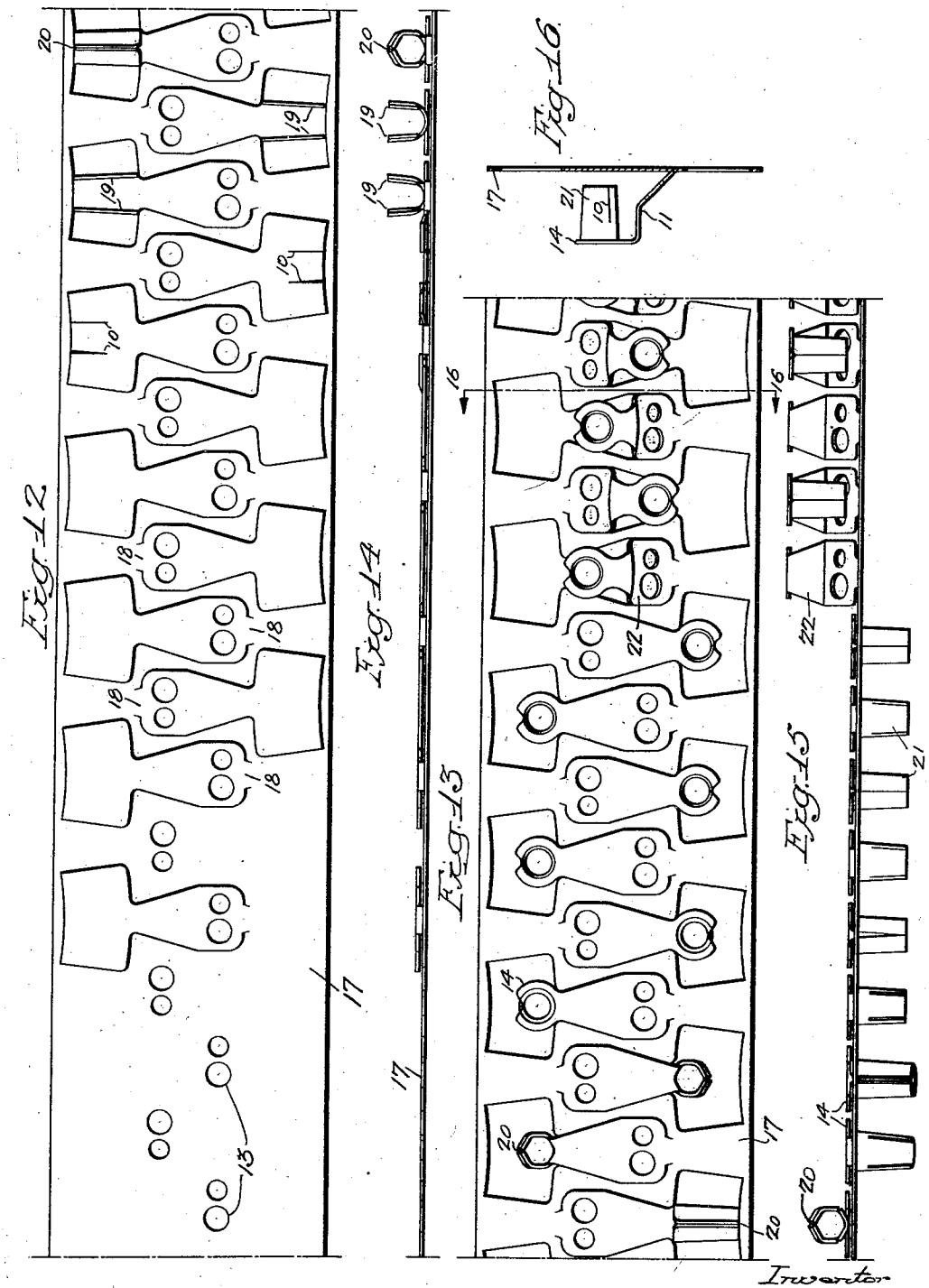


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Aug. 23, 1938. L. T. FREDERICK 2,128,132

SOCKET

Filed Oct. 12, 1932 2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,128,132

SOCKET

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Application October 12, 1932, Serial No. 637,504

6 Claims. (Cl. 173—328)

This invention relates to socket devices, and particularly to sockets for vacuum tubes which are adapted to receive the cylindrical contact prongs of vacuum tubes.

The principal object of the invention is to provide an improved socket of simple construction which may be manufactured at low cost and which embodies novel structural features that greatly enhance the performance of its intended function.

Broadly, the invention contemplates the provision in a socket of a contact element comprising a tubular barrel or eyelet portion and a terminal lug extending therefrom, the barrel portion being adapted to receive, engage and wipe an inserted contact prong and the terminal lug affording a means of electrical connection to the socket element. A plurality of such socket elements are threaded into a mounting plate which is secured to the underside of the base plate.

These generally stated features, as well as others, will be more fully described hereinafter, reference being now had to the accompanying drawings, in which

Fig. 1 is a perspective view of an inverted assembled socket utilizing a preferred form of contact element;

Fig. 2 is a sectional view of the socket taken along a diametric line passing through the center of one of the contact elements;

Fig. 3 is a detail plan view of an alternative construction;

Fig. 4 is a detail sectional view along line 4—4 of Fig. 3;

Fig. 5 is a face view of the stamped sheet metal blank from which a socket element is formed;

Fig. 6 is a perspective view of the formed socket element;

Fig. 7 is a perspective view of a modified form of socket element;

Fig. 8 is a plan view of the socket element of Fig. 7;

Fig. 9 is a partial sectional view of an inverted assembled socket using a still further modification of the socket element, the view being taken along the line passing through the center of the contact element;

Fig. 10 is a perspective view of this form of contact element;

Fig. 11 is a perspective view of a modified form of the mounting plate which is used in the embodiment of Figs. 9 and 10;

Figs. 12 and 13 are face views of portions of a metal strip or sheet during the formation of contact elements of the preferred form;

Figs. 14 and 15 are side views of the portions; and

Fig. 16 is a sectional view along line 16—16 of Fig. 13.

Referring particularly to Figs 1 and 2 of the drawings, there is shown a socket comprising a base plate 1 having mounting ears 2, a mounting plate 3, and contact elements 4, this device being adapted for use with a five-prong vacuum tube, although, it will be understood that the invention is applicable to any device regardless of the number of contact elements used. Mounting plate 3 is provided with a plurality of circularly arranged apertures 5 through which the contact elements 4 are threaded. Base plate 1 is provided with similar apertures 5a aligned with apertures 5 and adapted to receive the prongs of a tube. The mounting plate is also provided with a central aperture 6 which aligns with a central aperture 7 in the base plate 1, these aligning apertures being adapted to receive an attaching rivet 8 or the like.

The contact elements 4 are of similar construction and each is formed from a sheet metal stamping or blank, such as is shown clearly in Fig. 5. After the formation of the blank, the contact element is formed by bending or pressing the blank to form the finished article illustrated clearly in Fig. 6. When thus formed, the contact element comprises a frusto-conical barrel portion which preferably, though not necessarily, has longitudinal slits 10 therein. It will be noted that the blank of Fig. 5, from which the element is formed, is substantially T-shaped and the head of this blank is rounded or circularly bent to form the frusto-conical barrel portion.

The contact element also comprises a terminal lug 11 which extends laterally from one end of the barrel portion and is bent as clearly illustrated in Figs. 1, 2 and 6. The terminal lug may have formed thereon a knob-like projection 12, the purpose of which will appear more clearly hereinafter. The angularly extending end of the terminal lug is provided with suitable apertures 13 for the attachment of an electrical conductor. It will be noted from Fig. 6 that the large end or base of the frusto-conical barrel portion is flanged as at 14. This large end of the barrel portion is of such diameter that it will freely receive a contact prong of a vacuum tube, while the small end of the barrel portion is of such diameter that it will not freely receive the prong. When the prong is inserted into the barrel portion through the large end thereof, it engages and is wiped by the wall of the barrel portion at the

small end thereof. This results in a spreading of the small end of the barrel and gives very good electrical contact between the prong and the contact element, especially since the element is formed of spring metal.

After the contact elements have been formed in the manner above described, they are threaded through the respective openings in the mounting plate 3, as illustrated clearly in Fig. 2. The transversely extending portion of the terminal lug lies flat against the face of the mounting plate and the lug passes around the edge of the mounting plate, as clearly illustrated. The projecting knob 12 is located so that the mounting plate seats snugly between the transverse portion of the terminal lug and the projecting knob, as illustrated clearly in Fig. 2. When the contact elements are threaded through the mounting plate, the spring-like terminal lug allows the projecting knob 12 to snap over the mounting plate so as to securely hold each contact element in place. The flange 14 of each contact element seats against and engages the mounting plate about the aperture thereof so as to also hold the contact element in place. I have found that the projecting knob 12 is not necessary because the spring-like terminal lug frictionally engages the edge of the mounting plate to securely lock the contact element in place. The projecting knob is, therefore, an optional feature.

After the contact elements have been assembled on the mounting plate, the plate is attached to the base plate 1 by means of rivet 8 above mentioned. A finder ring or plate 15 may be provided to facilitate insertion of the tube prongs in the socket. This ring has apertured mounting ears which align with the ears 2 of the base plate and permit its attachment to the base plate. The centrally located aperture 16 of the finder ring is of such diameter that it circumscribes the openings in the base plate through which the tube prongs are inserted.

An alternative construction is shown in Figs. 3 and 4, wherein the mounting plate 3a is of the same shape as the base plate 1 and is provided with slit-like apertures 5c. The socket elements are threaded through openings 5 and 5c, as clearly illustrated. The lug 11 of each socket element is tapered at 29 and the tapered portion thereof seats snugly in the recess 30 of aperture 5c. The lug is tensioned toward the center of the socket element. When the element is threaded into the mounting plate apertures, the lug 11 passes freely through the wide portion of aperture 5c and the tapered portion of the lug enters the recess 30, as above noted, to immobilize the element. Projections 12 are omitted. Instead of the finder ring 15 there is provided a plate or button 15a which is circumscribed by the openings 5a in plate 1. This button serves the same purpose as the finder ring, viz. to guide the tube prongs into the socket. The central rivet holds the plates together.

The sockets illustrated in Figs. 1 to 6 are of simple construction and may be manufactured commercially at low cost. The socket elements may be formed in a few simple operations and, by virtue of their integral formation, are strong and durable. The specific construction of these elements and the manner in which they are assembled and attached to the base plate are important features which mutually contribute toward an inexpensive but highly satisfactory article.

The preferred form of the socket element illustrated in Figs. 1 to 6 and described in detail above lends itself to economic commercial manufacture and may be made in the manner illustrated in Figs. 12 to 16. Referring specifically to Figs. 12 and 13, there is shown a strip or sheet 17 of spring metal which is intended to be a continuous strip from which successive socket elements are formed in successive steps. Figs. 12 and 13, when considered together, illustrate a length of strip 17 showing the various stages of formation of the socket elements. It is intended then that Fig. 13 be considered as placed at the right hand side of Fig. 12 and that the strip portions illustrated be integral. Figs. 14 and 15 are similar side views of the strip portions and are likewise to be considered as constituting a continuous strip.

Beginning at the left side of the illustration of Fig. 12, it will be noted that the first step in the formation of a socket element is to punch the holes 13 in strip 17. The next step is the stamping out of the blank which has already been described in connection with Fig. 5. It will be noted that the blanks are substantially completely stamped from strip 17, there being only a small portion 18 left integral with the strip. Slits 10 are now cut in the blanks. The side wing-like portions 19 of the blank are now bent away from strip 17, as indicated more clearly in Fig. 14. The extending edges of the wing-like portions are now brought together as indicated clearly at 20 and the preformed barrel portion is bent at right angles to the strip. The flange 14 is now spread from the eyelet portion of the contact and a true frusto-conical shape is imparted to the eyelet portion as illustrated at 21. The terminal lug is now bent to the desired shape, the socket element being raised out of the plane of strip 17, as illustrated clearly at 22 (see Fig. 16). The completely formed socket element is now severed or broken away from strip 17 and is ready for use.

It is important to note that the substantially T-shaped blank, which is used to form the socket element, may be formed with very little waste from a continuous strip, as illustrated. By stamping the successive blanks from the strip in dovetailed or interdentate fashion, as clearly illustrated, substantially all of the material of the strip is utilized, there being only a small amount of scrap. This is a very important feature of the device which greatly enhances its commercial value in practice. While the successive operations, which are performed upon the continuous strip as illustrated and above described, may be carried out by hand-operated devices, in actual practice, it is preferable to provide a single machine having automatically operable parts that are adapted to successively perform the necessary operations. By having the parts of the machine arranged to operate in succession at predetermined time intervals, and feeding the strip into the machine at a proper rate or speed, a large number of socket elements may be formed per unit time at little cost. Such machines as that mentioned are old in various arts and are commonly used in mass production. For the purpose of the present invention, it is unnecessary to mention further the particular machine which would be used. It might be well to state, however, that the illustrations of Figs. 12 to 16 have been taken from an actual sample produced by a machine of the type mentioned which has been put into operation.

Referring now to Figs. 7 and 8, there is disclosed a modified form of contact element which

is generally similar to the form above described and is adapted for use in the same general manner. In this instance, however, the tubular barrel portion **9a** is substantially cylindrical in shape and is provided with inwardly pressed portions **23** which are adapted to firmly engage and wipe the tube prong as it passes through the barrel portion. The prong-engaging portions **23** are preferably formed by striking-out spaced longitudinal strips and pressing these strips inward. In this modification, the barrel portion is provided with interlocking, interdentate edges **24** and **25**. While a dovetail construction of these edges is illustrated, any other suitable construction giving the desired interlocking coaction may be utilized. Aside from these differences, the contact element is identical with that above described. In constructing this form of contact element, a metallic stamping or blank is formed and the element is formed by bending or pressing the blank to the form clearly illustrated in Fig. 7. This form of element may be made in the same manner as is the preferred form.

In Figs. 9 to 11, there is illustrated a further modification, in which the contact element takes the same general form, having a barrel portion **9b** and a terminal lug **11b**. The barrel portion is drawn from a blank so as to provide the body thereof and the flanged end **14b**. The body is pressed into polygonal cross section over a portion of its length, it being formed triangularly in the illustration of Figs. 10 and 11. It will be understood, however, that any polygonal shape may be imparted to the barrel portion. In the formation of the barrel portion, longitudinal slits **26** are provided and arranged so that they are located in the sides of the polygonal structure. The purpose of this construction is also to obtain good electrical contact between the tube prong and the contact element.

It is preferred that this form of socket device be used with a mounting plate such as is illustrated in Fig. 11. This plate **3b** is provided with a plurality of circularly arranged apertures **5b** having radially disposed recess portions **27**. The purpose of these recesses is to cooperate with a detent **28** struck-out and turned up from the horizontal portion of terminal lug **11b**. When the socket element is completely formed, as illustrated and above described, it will be threaded through one of openings **5b** with the terminal lug extending radially outward and with detent **28** extending into recess **27** as illustrated in Fig. 9. Although this construction is preferred, it will be understood that the socket element may be used with any other desired locking means such, for example, as provided in the preferred embodiment.

It will be noted that the eyelet portion of this form of socket device is seamless and, as stated above, the element is formed by drawing the barrel portion from the blank. Obviously, this form of device may be made in large quantities commercially in the same general manner as illustrated and described above in connection with the preferred form.

Although the invention has been disclosed herein with reference to certain specific embodiments and a preferred method of making the various devices, it will be apparent that changes and modifications may be made without departing from the spirit of the invention.

I claim:

1. In a socket, a mounting plate having a pair of openings therein, one of said openings being slit-like and having a recess, and a contact element comprising a tubular prong-receiving barrel portion and a tapered terminal lug extending therefrom, said barrel portion extending through the other of said openings, said lug extending through said slit-like opening and being adapted to pass freely therethrough but tensioned so that its tapered portion seats snugly in said recess to immobilize said element.

2. In a socket, a mounting plate having a pair of openings therein, one of said openings being slit-like and having a recess, and a contact element comprising a prong-engaging portion and a tapered terminal lug extending therefrom, said prong-engaging portion extending through the other of said openings, said lug extending through said one opening with its tapered portion seated in said recess.

3. An electrical socket receptacle for a vacuum tube having a terminal prong, comprising a pair of thin superposed apertured insulating plates with an aperture of one plate in alignment with an aperture of the other plate to receive said prong, a metallic contact member composed of a single piece of thin resilient metal and comprising a flat anchoring part disposed between said plates and an angularly divergent contact part extending from said anchoring part through one of the apertures and aligned with the said apertures to receive said prong, said contact part comprising a portion formed as an angularly divergent prolongation of said anchoring part and a pair of wings or arms extending from said portion in a direction parallel to said plates and directed toward each other about an axis perpendicular to said plates, the said wings forming with said portion a channel generally conformable to the contour of said prong and aligned axially with said apertures to receive and resiliently grip said prong when it is inserted through said apertures, said prong-receiving channel having inherent expansibility and contractibility by virtue of the resilience of said wings and adapted to engage the inserted prong along a plurality of longitudinal lines of contact extending substantially the length of said channel, whereby good electrical contact with said prong and secure holding of the prong are maintained.

4. An electrical socket receptacle for a vacuum tube having a terminal prong, comprising a pair of thin superposed apertured insulating plates with an aperture of one plate in alignment with an aperture of the other plate to receive said prong, a metallic contact member composed of a single piece of thin resilient metal and comprising a flat anchoring part gripped between said plates and an angularly divergent contact part extending from said anchoring part through one of the apertures and aligned with the said apertures to receive said prong, said plates being separated only by the trickness of said flat anchoring part and engaging the opposed flat surfaces of said anchoring part throughout the areas of said surfaces, said contact part comprising a portion formed as an angularly divergent prolongation of said anchoring part and a pair of wings or arms extending from said portion in a direction parallel to said plates and directed toward each other about an axis perpendicular to said plates, the said wings forming with said portion a channel generally conformable to the contour of said prong and aligned axially with said apertures to receive and resiliently grip said prong when it is inserted through

said apertures, said prong-receiving channel having inherent expansibility and contractibility by virtue of the resilience of said wings and having a smooth projectionless inner surface adapted to engage and wipe the inserted prong throughout the length of said channel, whereby good electrical contact with said prong and secure holding of the prong are maintained, and flat supporting means extending from said wings between said plates at the supported end of said channel for supporting said contact part at points spaced from said gripping part.

5. An electrical socket receptacle for a vacuum tube having a terminal prong, comprising a pair of thin superposed apertured insulating plates with an aperture of one plate in alignment with an aperture of the other plate to receive said prong, a metallic contact member composed of a single piece of thin resilient metal and comprising a flat anchoring part gripped between said plates and an angularly divergent contact part extending from said anchoring part through one of the apertures and aligned with the said apertures to receive said prong, said plates being separated only by the thickness of said flat anchoring part and engaging the opposed flat surfaces of said anchoring part throughout the areas of said surfaces, said contact part comprising a portion formed as an angularly divergent prolongation of said anchoring part and a pair of wings or arms extending from said portion in a direction parallel to said plates and directed toward each other about an axis perpendicular to said plates, the said wings forming with said portion a channel generally conformable to the contour of said prong and aligned axially with said apertures to receive and resiliently grip said prong when it is inserted through said apertures, said prong-receiving channel having inherent expansibility and contractibility by virtue of the resilience of said wings and having a smooth projectionless inner surface adapted to engage and wipe the inserted prong throughout the length of said channel, said contact part having longitudinal slits therein to supplement its resilient gripping of the prong, whereby good electrical contact with said prong and secure holding of the prong are maintained.

6. An electrical socket receptacle for a vacuum tube having a terminal prong, comprising a pair of thin superposed apertured insulating plates with an aperture of one plate in alignment with an aperture of the other plate to receive said prong, a metallic contact member composed of a single piece of thin resilient metal and comprising a contact part, a terminal part, and a flat anchoring part connecting the contact part and the terminal part, said anchoring part being gripped between said plates, said plates being separated only by the thickness of said flat anchoring part and engaging the opposed flat surfaces of said anchoring part throughout the areas of said surfaces, said contact part extending angularly from said anchoring part through one of the apertures and aligned with the apertures to receive said prong, said contact part comprising a portion formed as an angularly divergent prolongation of said anchoring part and a pair of wings or arms extending from said portion in a direction parallel to said plates and directed toward each other about an axis perpendicular to said plates, the said wings forming with said portion a channel generally conformable to the contour of said prong and aligned axially with said apertures to receive and resiliently grip said prong when it is inserted through said apertures, said prong-receiving channel having inherent expansibility and contractibility by virtue of the resilience of said wings and having a smooth projectionless inner surface adapted to engage and wipe the inserted prong throughout the length of said channel, whereby good electrical contact with said prong and secure holding of the prong are maintained, and flat supporting means extending from said wings between said plates at the supported end of said channel for supporting said contact part at points spaced from said gripping part.

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