Dec. 12, 1950 F. G. BAC 2,533,343

ELECTRIC CONNECTING DEVICE

Filed Jan. 24, 1947 2 Sheets-Sheet 1

Fig. 1

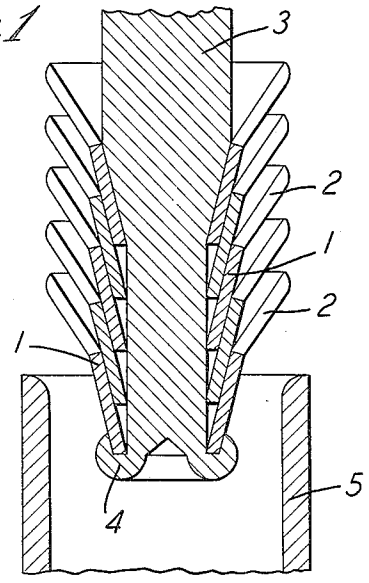


Fig. 2

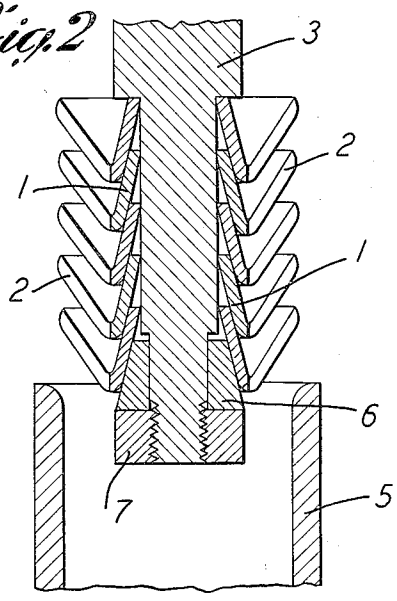


Fig. 3

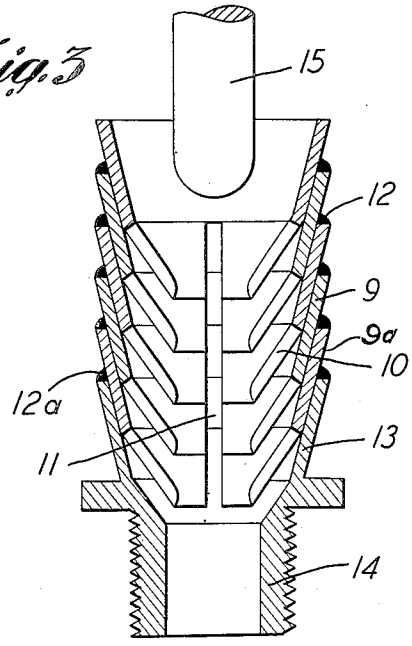
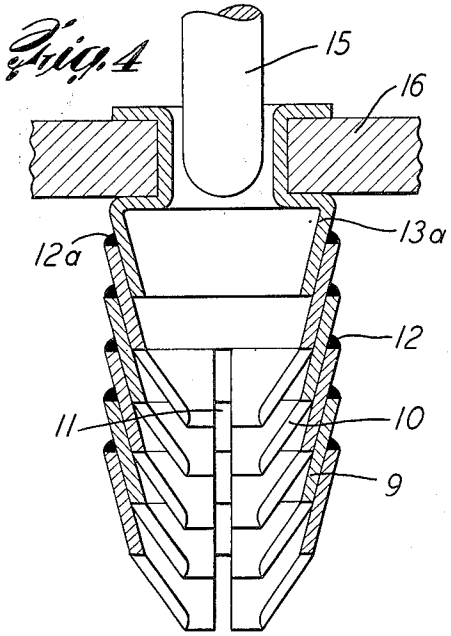


Fig. 4



INVENTOR.
FERNAND GEORGES BAC
BY
Hammond & Littell
ATTORNEYS

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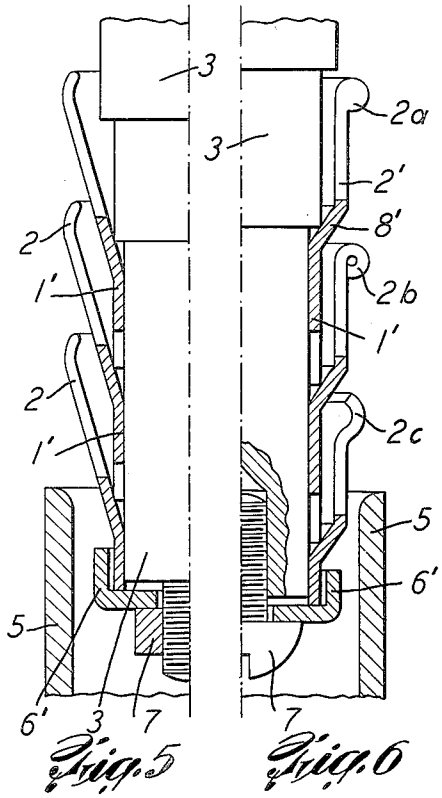


Fig. 5

Fig. 6

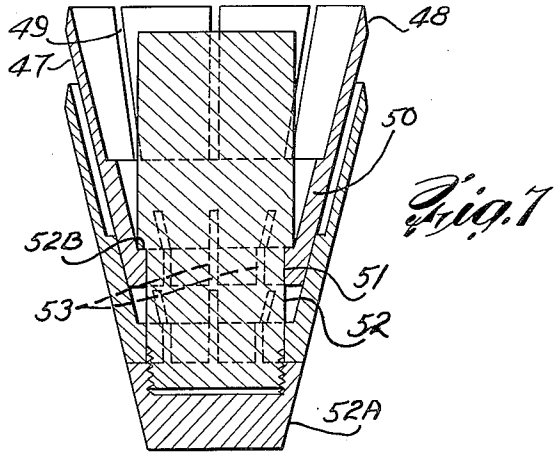


Fig. 7

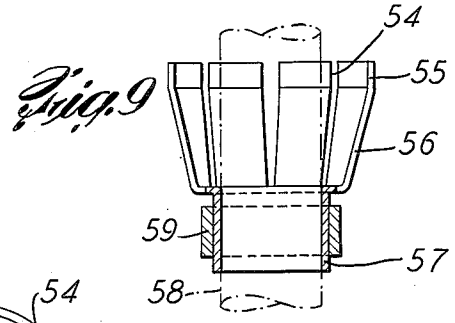


Fig. 9

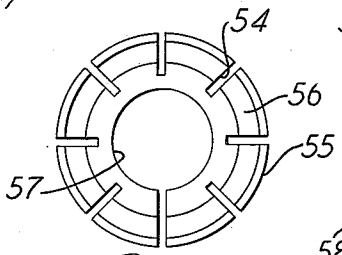
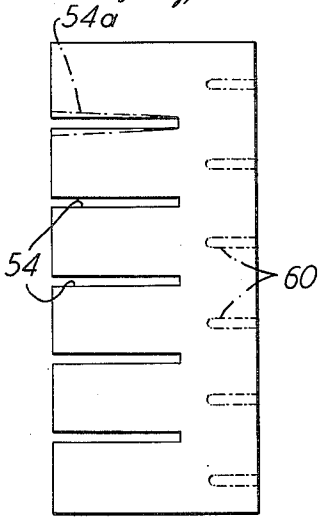


Fig. 10

Fig. 8



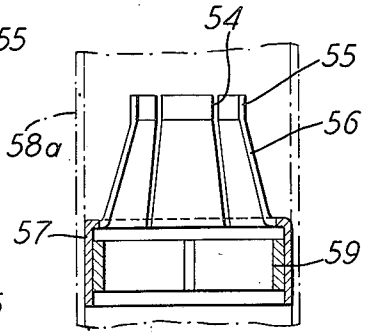


Fig. 11

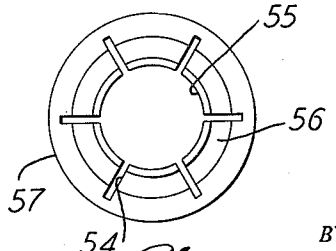


Fig. 12

INVENTOR.
FERNAND GEORGES BAC
BY
Hammond & Littell
ATTORNEYS

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ELECTRIC CONNECTING DEVICE

Fernand Georges Bac, Paris, France

Application January 24, 1947, Serial No. 724,094
In France November 3, 1944

12 Claims. (Cl. 173—363)

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The present invention relates to electric connecting devices comprising resilient plugs or sockets.

Known devices of such a type usually have the drawback of either insuring too small a connecting area or number of contact points, or being too complicated or cumbersome.

According to the present invention, such drawbacks are avoided by building the resilient contact member—plug or socket—out of a series of resilient slit rings, preferably conically shaped, piled up or nested coaxially and kept in place by a clamping device or by welding.

The connection members according to the invention are fully described hereafter, with reference to the appended drawings in which:

Fig. 1 is a fragmentary sectional view of a plug and socket type connector.

Fig. 2 is a fragmentary sectional view generally similar to Fig. 1.

Fig. 3 is a fragmentary sectional view of another form of the plug and socket type connector.

Fig. 4 is generally similar to Fig. 3.

Fig. 5 is a fragmentary, sectional view of a plug and socket connector of a modified form.

Fig. 6 is a sectional view of a plug and socket type connector generally similar to Fig. 5.

Fig. 7 is a sectional view of one form of connector.

Fig. 8 is a rectangular cut-out of a sheet from which a connector element can be formed.

Fig. 9 is a sectional view of an assembled male type connector.

Fig. 10 is an end view looking from the top of Fig. 9.

Fig. 11 is a sectional view of a socket type contactor.

Fig. 12 is an end view looking from the bottom of Fig. 11.

The plug shown at Fig. 1 consists of a series of frusto-conical rings comprising one continuous part 1 and a section 2 open according to a wider angle than the former and carrying a number of slots, for instance four, diametrically opposite one another and following the generatrix of the cone. Said rings are piled up on one another onto a rod 3, sections 1 being clamped onto one another by spreading the end 4 of rod 3. The thus built plug cooperates with a rigid socket 5 the inner diameter of which is slightly smaller than that of the larger base of the frusto-conical sections 2.

When the plug is pressed into the socket, the frusto-conical sections are resiliently squeezed

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and insure a perfect connection, the connecting surfaces between plug and socket 5 being thus multiplied without the overall dimension of the plug being greater than those of any usual plug.

In the plug shown at Fig. 2, sections 1 and 2 of the frusto-conical rings effect inverted conicities, said rings thus forming a kind of trough, which makes it possible to decrease the length of the plug without however modifying the connecting surface. The clamping of the rings is insured by a conical washer 6 and a nut 7 screwed onto the threaded end of rod 3.

The socket shown at Fig. 3 was built by piling up or nesting frusto-conical rings with two conicities, comprising a section 9 which has the smaller angle and forms a continuous ring, and a section 10, with a larger conical angle, and comprising, like the section 2 of the rings forming the plugs shown at Figs. 1 and 2, slots 11 directed along the generatrix of the cone. Sections 9 are piled into one another and connected by a welded bead 12. The thus formed unit is supported by a member comprising a conical part 13 into which the last ring 9a is engaged (said ring being connected with part 13 by a welded bead 12a) and a threaded cylindrical part 14 which makes it possible to fasten it on a corresponding support. The thus built socket cooperates with a plug 15, the diameter of which is slightly larger than the inner diameter of the smaller base of the frusto-conical rings 10. The operation is similar to that of the above described plugs, the introduction of plug 15 into the socket entailing a slight opening of rings 10, which brings about a perfect connection between the plug and the socket.

In the example shown at Fig. 4, one finds the same elements as in Fig. 3, but the rings are now suspended from the supporting member which comprises a conical part 13a penetrating inside the first ring 9 and is connected with the latter by means of a welded bead 12a, said supporting member being in its turn clamped upon an insulating or metallic support 16.

The plug shown at Fig. 5 consists of a series of resilient rings, preferably stamped, comprising a cylindrical section 1' and a conical section 2, both said parts being provided with slots, for instance four diametrically opposite slots, extending on part of the length of the generatrix of said sections. Said rings are piled up or nested on one another onto a rod 3 and pressed by means of a washer 6' and a nut 7. The free and slit edge of each cylindrical section 1' is thus clamped between rod 3 and the conical part

2 of the next ring, which ensures a perfect electrical connection between the various elements of the unit.

In the example shown at Fig. 6, the resilient rings are formed of two cylindrical sections 1' and 2' connected by a frusto-conical section 8' and provided, like sections 1' and 2 in the preceding example, with longitudinal slots. In order to further increase the connection between section 2' of the rings and corresponding socket 5, the free edge of said section forms a bead which may be full, as at 2*a*, in the case of turned or forged rings, or rolled up, as at 2*b* and 2*c*, in the case of stamped rings.

In all the above mentioned devices, it is possible to limit the possible flexion of the resilient parts to such a value that the yield stress shall never be reached, in order to avoid any risk of permanently deforming the elements when said parts are completely squeezed. For this purpose, the annular space comprised between parts 1 and 2 or 2' or between parts 9 and 10 or 10' of two neighbouring elements should be chosen as small as possible. In the case of plugs, it is also possible to limit the flexion through limiting the width of the slots provided in the contact rings.

The operating safety achieved by the great number of contact points makes it possible to build resilient plugs or sockets out of light alloys (aluminium alloys), which offer the advantage of lightness, or out of steel, which is more economical and wears out less, as well as out of copper alloys.

The plug shown at Fig. 7 consists of turned conical elements which comprise a relatively thin section 47 chamfered at 48, in which slots 49 are machined, said section being followed up by another thicker section 50 which comprises a cylindrical bore 51 with the same diameter as rod 52 on which the elements are assembled. The latter are piled up on said rod and pressed against each other by any of the above mentioned means such as by nut 52A forcing the elements into squeezing relationship against shoulder 52B, slots 53 being provided in the base of section 50 of each element in order to ensure a resilient pressure on the rod.

Such a manner of manufacture entails complicated machining processes which necessitate an important loss of metal; such drawbacks are avoided in the building of elements described hereafter.

Said elements are manufactured starting from a roll-milled metal sheet out of which a rectangle (Fig. 8) is cut out, at least one of the larger sides of which bears slots 54 made parallel with the direction of rolling. Said rectangle is then rolled up in the shape of a cylinder, then pressed back or stamped in order to obtain either a male element such as that shown at Figs. 9 and 10, or a female element such as shown at Figs. 11 and 12. Said elements comprise a cylindrical part 55, followed up with a conical section 56, the total length of said two sections substantially corresponding to that of slots 54, then a second cylindrical section 57, the inner diameter (for the male element) or the outer diameter (for the female element) respectively correspond to the outer and inner diameter of the rod or tube for assembling the elements, said members being shown in dot-dash lines at 58 and 58*a*.

The resilient elements according to the invention are pressed on the rod or inside the tube by means of an annular spring 59 placed either (Figs. 9 and 10), around the cylindrical section

57 in order to press the latter on the assembling rod, either (Figs. 11 and 12) inside the same section 57, in order to expand the latter and press it inside the assembling tube.

When manufacturing female elements, the slots 54 provided in the rolled flange are preferably widened as shown in dot-dash lines at 54*a* in Fig. 8, in order to avoid excessive tightening of said slots when the conical section of the elements is shaped.

Shorter slots may be provided on the side opposite to slots 54, as shown in dot-dash lines at 60 in Fig. 8, in order to impart a certain resiliency to the cylindrical section 57 of the male or female elements and to improve thus the tightening on the assembling rod or inside the assembling tube.

What I claim is:

1. In an electric coupling having a plug and socket, a contactor for connecting said plug and socket comprising a plurality of rings, each of said rings having a frusto-conical portion, said rings being nested one within the other with a frusto-conical portion of one ring making direct contact with the next ring, surfaces of the rings remote from the aforementioned direct contacting portion providing a series of peripheral contacts between a plug and socket, and means connecting said rings together in squeezing relationship to each other.

2. In an electric coupling having a plug and socket, a contactor for connecting said plug and socket comprising a plurality of rings, each of said rings having a frusto-conical portion, said rings being nested one within the other with a frusto-conical portion of one ring making direct contact with the next ring, surfaces of the rings remote from the aforementioned direct contacting portion having a plurality of slots therein and providing a series of peripheral contacts between a plug and socket, and means connecting said rings in squeezing relationship to each other.

3. In an electric coupling having a plug and socket, a contactor for connecting said plug and socket comprising a plurality of rings with frusto-conical contractile portions, said rings being nested one within the other with a frusto-conical portion of one ring making direct contact with a frusto-conical portion of another ring, the surfaces of said rings remote from said portions in direct contact providing a series of peripheral contacts between a plug and socket, and means connecting said rings in squeezing relationship to each other.

4. In an electric coupling having a plug and socket, a contactor for connecting said plug and socket comprising a plurality of rings with frusto-conical contractile portions, and means holding said rings in series with a part of said frusto-conical portions in direct contact, said rings being nested one within the other so as to exert a squeezing action on one another, surfaces of said rings remote from said portions in direct contact providing a series of peripheral contacts between a plug and socket.

5. In an electric coupling having a plug and socket, a contactor for connecting said plug and socket comprising a plurality of interfitting rings mounted on a plug, said rings having a relatively thin frusto-conical section with slots therein and a relatively thicker section substantially continuing the same frustum of the said frusto-conical section, said thicker section having a cylindrical central bore therein for mounting on said plug.

6. In an electric coupling having a plug and socket, a contactor for connecting said plug and

socket comprising a plurality of rings with frusto-conical contractile portions, said frusto-conical portions being nested one within the other so as to make direct contact with each other, said rings having a relatively thin portion with slots cut therein, and a relatively thick portion with a cylindrical bore therethrough, said relatively thin portions providing a series of peripheral contacts between a plug and socket.

7. In an electric coupling having a plug and socket, a contactor carried by a plug comprising a plurality of rings with a cylindrical bore therethrough, said cylindrical bores being engageable with said plug, said rings being frusto-conically shaped and nested one within the other so as to make direct contact with each other, the surfaces of said rings remote from said nested portions providing a series of peripheral contacts between a plug and socket, and means connecting said rings in squeezing relationship.

8. In an electric coupling having a plug and socket, a contactor for connecting said plug and socket comprising a plurality of rings with frusto-conical contactor portions in which the rings are nested one within the other so as to make direct contact with each other, said rings having a second frusto-conical portion with an apex angle different from the first mentioned frusto-conical section, the frusto-conical portions of said rings with the smaller apex angle serving to make direct contact with each other and the frusto-conical portions of said rings with the greater apex angle providing a series of peripheral contacts between a plug and socket.

9. In an electric coupling having a plug and socket, a contactor for connecting said plug and socket comprising a plurality of rings with frusto-conical contactor portions in which the rings are nesting one within the other so as to make direct contact with each other, said rings having a second frusto-conical portion with an apex angle different from the first mentioned frusto-conical section, the frusto-conical portions of said rings with the smaller apex angle serving to make direct contact with each other and the frusto-conical portions of said rings with the greater apex angle providing a series of peripheral contacts between the plug and socket, the frusto-conical portions being inverted relative to each other.

10. In an electric coupling having a plug and socket, a plug comprising a rod, a plurality of

rings, each of said rings having a frusto-conical portion, said rings being mounted on said rod and nested one within the other with a frusto-conical portion of one ring making direct contact with the next ring and with said rod, surfaces of said rings remote from said direct contacting portion providing a series of peripheral contacts between the plug and the socket, said rings being connected together in squeezing relationship to each other.

11. In an electric coupling having a plug and a socket, a contactor for connecting said plug and socket comprising a plurality of rings, each of said rings having a frusto-conical portion, said rings being nested one within the other with a frusto-conical portion of one ring making direct contact with the next ring, the contacting portion of said rings being slotted and surfaces of said rings remote from said direct contacting portion providing a series of peripheral contacts between a plug and socket, said rings being connected together in squeezing relationship to each other.

12. In an electric coupling having a plug and socket, a plug comprising a rod, a plurality of rings, each of said rings having a frusto-conical portion, said rings being mounted on said rod and nested one within the other with a frusto-conical portion of one ring making direct contact with the next ring, the contacting portion of said rings being slotted and surfaces of the rings remote from said direct contacting portion providing a series of peripheral contacts between the plug and socket, said rings being connected together in squeezing relationship to each other.

FERNAND GEORGES BAC.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
969,676	Tomlinson	Sept. 6, 1910
2,426,429	Bels	Aug. 26, 1947

FOREIGN PATENTS

Number	Country	Date
844,859	France	of 1939
855,711	France	Feb. 19, 1940
888,044	France	Feb. 19, 1942