Nov. 13, 1956 E. HOFMANN 2,770,794

ELECTRICAL CONNECTING DEVICE

Filed Dec. 1, 1949

Fig. 1

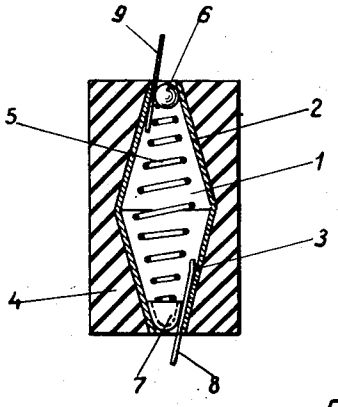


Fig. 2

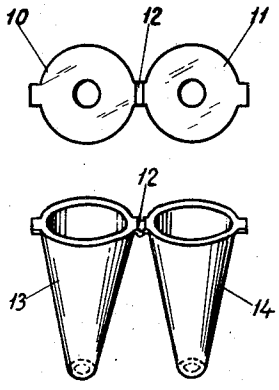


Fig. 2a

Fig. 3

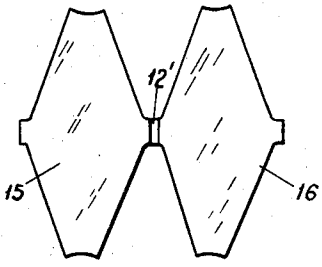


Fig. 5

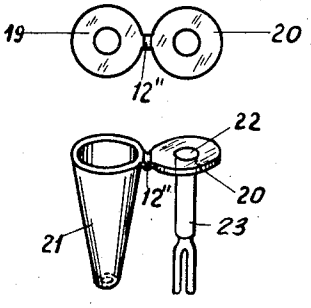
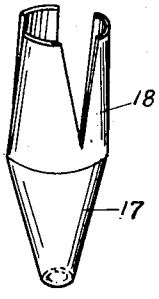


Fig. 5a

Fig. 4



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ELECTRICAL CONNECTING DEVICE

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5 Claims. (Cl. 339—273)

It is known to use as an electrical connecting appliance a clamping device which is constituted by an outer casing enclosing a metal socket comprising two frusto-conical halves. Two clamping elements such as balls are arranged in said socket, so as to be slidable longitudinally with respect thereto and so urged towards the terminal smaller cross-sections of said socket by a compression spring interposed between them, that the conducting wires introduced on either side between each ball and the corresponding wall of the metal socket is firmly squeezed. Such a clamping device thus permits to establish a simple electrical connection between two conducting wire ends, said connection being very easily established, while being nevertheless very safe.

Since the manufacture in one piece of such a biconic clamping device has given rise heretofore to great difficulties, the two truncated cones of the metal socket are usually assembled by their large bases in contact with each other by screwing or the like. However, even with most carefully assembled metal sockets, it has been difficult to avoid drawbacks resulting from the fact that the conductor resistance at the assembling place does not correspond to that of the other parts of the socket and from the fact that the assembling connection itself tends to yield and to become faulty. It results from said drawbacks not only undesired heatings and current losses, but also current breaks, when, due to any permanent or intermittent vibrations, the assembling connection between the two parts is released and becomes unsafe (loose contact).

This invention has for its object a biconic metal socket of this type constituting the inner part of a clamping device made, e. g. of a molded material so constructed that its two halves offer an uninterrupted metallic and hence electric connection. The socket thus obtained is then coated in a manner known per se, with an outer casing made of a suitable insulating material, such as synthetic resin molded material.

The invention will be better understood with reference to the accompanying drawings in which illustrative embodiments are shown.

In these drawings:

Fig. 1 is a cross-sectional view of a clamping device according to the invention,

Figs. 2 to 4 are diagrammatical views of four constructive embodiments of the inner biconic socket offering an uninterrupted metallic and hence electric connection.

Figs. 5 and 5*a* are, respectively, a plan view and perspective view of a single socket and plug combination, at an intermediate stage of manufacture.

The clamping device according to the invention is constituted by a metal socket **1**, the frusto-conical halves of which are in contact with each other by their larger base and offer an uninterrupted metallic and electric connection. The socket is outwardly coated, e. g. with an insulating molded material **4**. The two ends of a spiral coil spring **5** urge two clamping elements **6** and **7** towards the small conical cross-sections of the inner socket thus squeezing the two wire ends **8** and **9** safely and firmly.

According to the main feature of the invention, the two cones **2** and **3** of the metal socket **1** should be interconnected through an uninterrupted metallic and hence electric connection, i. e. a connection which is not obtained by means of screws, soldering or the like but, on the contrary, through the metal proper. This may be provided by means of several embodiments:

In the example shown in Figs. 2 and 2*a*, two metal plates **10**, **11** having the same size and shape which are integrally interconnected through a lug **12** are drawn into two conic horns **13** and **14** which remain interconnected through said lug **12**. It is then only necessary to bring said metal horns into contact by their larger base by bending them about the mid-axis of lug **12** which is grooved for this purpose to obtain directly the metal inner socket **1** around which the molded material is then compressed. It is clear that the two truncated cones **13**, **14** may also be assembled by spot welding, soldering or the like effected between their larger bases, after the same have been brought into contact with each other. In any case, the uninterrupted metallic connection **12** between the truncated cones remains and ensures a perfect electric flow.

Fig. 3 shows how the metal socket **1** may be also obtained from two longitudinally cut plates forming two corresponding compressed halves **15**, **16** which are as previously interconnected through a grooved lug **12'**, by bending said halves about the longitudinal axis of said lug into the desired socket. In this case also, the insulating material is deposited around said socket subsequently, after having assembled the halves **15**, **16**.

Another mode of construction is shown in Fig. 4. In this case, the socket **1** is constituted by a lower frusto-conical part **17** and an upper part **18** provided with slots. Said slots are so disposed that said upper part **18** of the socket also assumes a frusto-conical shape after the tongues have been brought together.

The clamping device shown in Fig. 1 is used for connecting electrically two wire ends. It is however also possible to manufacture by the same principle usual plug connecting devices. In this case, it is only necessary to use one of the frusto-conical halves e. g. **2**, a plug being substituted for the other frusto-conical half **3**. But, in this case also, it is required that the metal truncated cone is connected to the plug through an uninterrupted connection which is perfectly safe and constant.

Figs. 5 and 5*a* show how such a connection may be effected according to the invention. The frusto-conical metal socket **21** is drawn from one of two metal plates **19**, **20** interconnected as previously through a lug **12''**, while the plug **23** is secured in the opening **22** of the unchanged plate **20**, e. g. by welding, soldering or the like.

The above described method permits to manufacture in any case biconic metal sockets, the truncated cones of which offer an uninterrupted metallic connection. This is an essential condition for obtaining known clamping devices having good properties. In order to obtain also a contact as safe as possible between the wires to be interconnected and the metal socket, it is possible to provide in the inner wall of the metal socket, one or more longitudinal grooves.

It will be understood that the invention is in no way limited to the above described embodiments in which many modifications may be made within the scope of the invention.

What I claim is:

1. A clamping connection device adapted to be interposed between the ends of two electric conductors to be interconnected, comprising a metal socket formed of a shell having the shape of a truncated cone provided with an outer insulating material casing, an integral clamping element having a peripheral surface of revolution having a diameter larger than the smallest internal diameter of

said cone at the apex of said cone and smaller than the largest internal diameter thereof, of said cone, said clamping element being disposed within said socket adjacent the smaller end thereof of said socket and adapted to directly contact and squeeze one of said conductor ends against the inner conical wall of said socket, so as to establish direct electric contact therebetween, elastic resilient means located within the socket and adapted to urge said clamping element toward the smaller end of said cone into its squeezing position to provide firm direct contact between the conductor and the conical wall surface irrespective of the smallness of the conductor diameter, and conductive means formed integrally with said socket and adapted for contact with a second electric conductor, so that there is provided between said electric contacts an integral uninterrupted metallic electric path.

2. A device according to claim 1 in which said conductive means is in the shape of a second truncated cone complementary to said first named cone and enclosed within the same insulating casing with its larger end abutting the larger end of said first named cone, and which includes a second spherical clamping element having a diameter larger than the smallest internal diameter of said second cone and smaller than the largest internal diameter thereof, disposed within said second cone adjacent the smaller end thereof, and in which said elastic means extends into both said cones and urges both said clamping elements into conductor-holding position.

3. A device according to claim 2 in which said cones are seamless and are integrally connected by a lug extending between their abutting larger ends.

4. A device according to claim 2 in which at least one of said cones is split lengthwise along at least two lines.

5. A device according to claim 1 in which said conductive means is in the form of a plate adapted for attachment to a plug.

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