Feb. 14, 1933. N. H. WATTS 1,897,829

ELECTRICAL TERMINAL

Filed Dec. 3, 1929

FIG. 1.

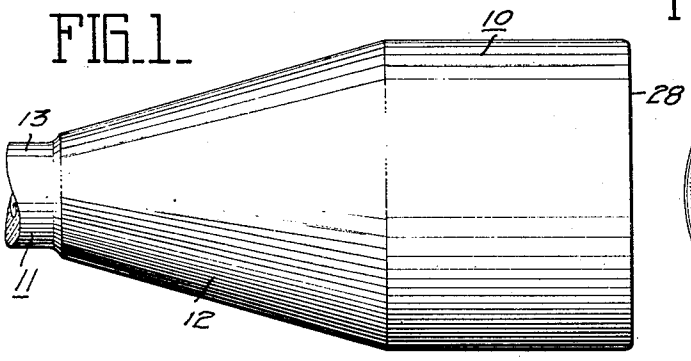


FIG. 2.

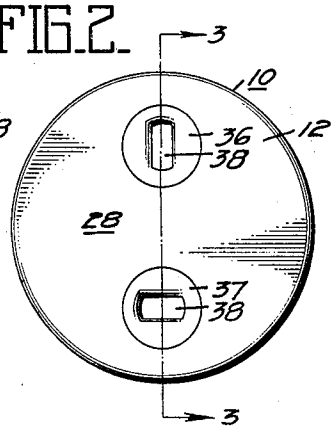
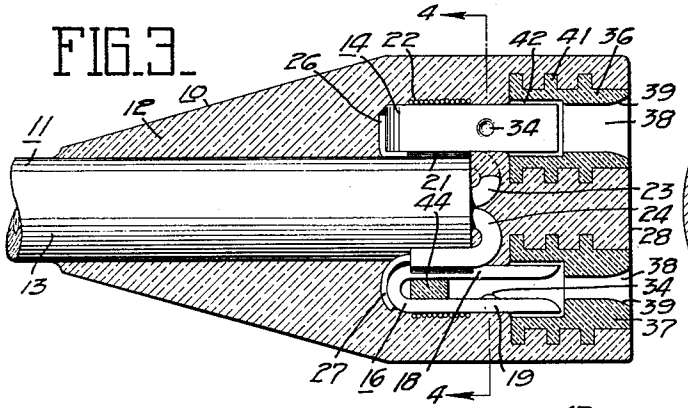


FIG. 3.



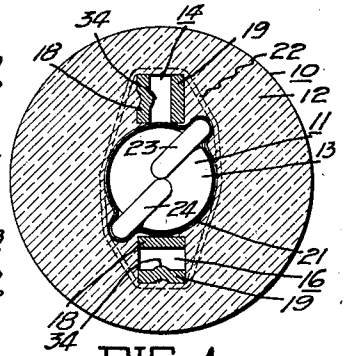
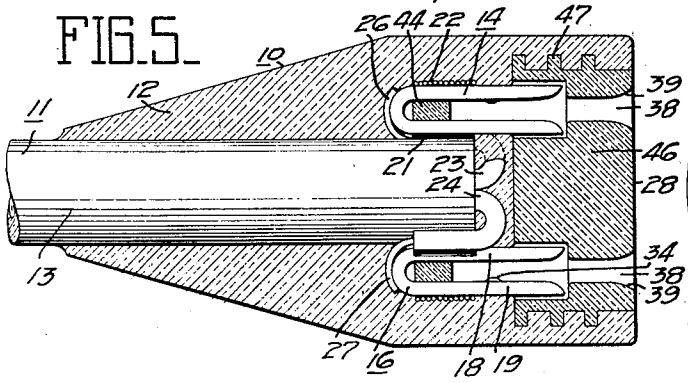


FIG. 4.

FIG. 5.



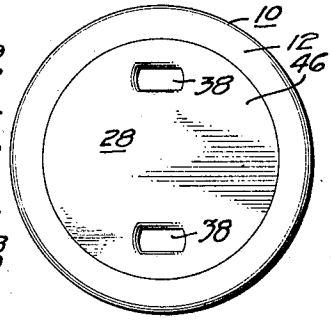
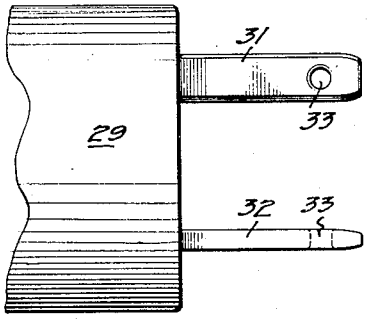


FIG. 6.

FIG. 7.



INVENTOR.
Noble H. Watts
BY White, Frost, Fleche & Lothrop
ATTORNEYS.

Patented Feb. 14, 1933 1,897,829

UNITED STATES PATENT OFFICE

NOBLE H. WATTS, OF ALAMEDA, CALIFORNIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO GENERAL ELECTRIC COMPANY, OF SCHENECTADY, NEW YORK, A CORPORATION OF NEW YORK

ELECTRICAL TERMINAL

Application filed December 3, 1929. Serial No. 411,272.

This invention relates generally to terminal devices such as are employed for making detachable electrical connection with complementary connector devices. It has particular application to terminal devices incorporating in their construction resilient insulating material, such as vulcanized rubber.

It is a general object of the present invention to devise a terminal of the above character having provision for preventing deterioration of surfaces exposed to arcing.

It is a further object of the invention to devise a novel and practical form of female terminal incorporating resilient material such as vulcanized rubber.

It is a further object of the invention to devise a novel form of terminal device characterized by the novel incorporation of means forming a non-deteriorating arc chute.

Further objects of the present invention will appear from the following description in which the preferred embodiment of the present invention has been set forth in detail in conjunction with the accompanying drawing. It is to be understood that the appended claims are to be accorded a range of equivalents consistent with the state of the prior art.

Referring to the drawing:

Figure 1 is a side elevational view illustrating a terminal constructed in accordance with the present invention.

Fig. 2 is an end view of the terminal shown in Fig. 1.

Fig. 3 is a cross sectional view of the terminal shown in Fig. 1, taken along the line 3—3 of Fig. 2.

Fig. 4 is a cross sectional view taken along the line 4—4 of Fig. 3.

Fig. 5 is a view similar to Fig. 3, but illustrating a modified construction for the terminal.

Fig. 6 is an end view of the terminal illustrated in Fig. 5.

Fig. 7 is a side elevational view illustrating a complementary male connector device capable of cooperating with the female terminals illustrated in Figs. 1 to 6 inclusive.

In the construction of terminal devices, such as are frequently employed upon the ends of flexible electrical cables, it has previously been proposed to utilize resilient insulating material, such as a soft vulcanized rubber, for forming a substantial portion of the terminal body. The use of resilient material in this manner has many advantages. For example a terminal of this kind when properly designed is practically indestructible, and when the contact members are embedded in the resilient material, a certain amount of relative movement is permitted. Furthermore the connections between the conductors of the associated electrical cable and the contact members can be made in such a manner that they will not become loosened or broken over a long operating period. In the present instance I have devised a practical form of female terminal in which the body incorporates such resilient insulating material.

Referring to the drawing, in Figs. 1 and 2 a terminal has been designated generally at 10, which incorporates the present invention, and which is formed permanently upon the end of a flexible electrical cable 11. Referring to the cross section of Figs. 3 and 4, the terminal includes a body member 12, formed of suitable resilient insulating material, such as resilient vulcanized rubber. The electrical cable 11 preferably has a sheath 13 also made of resilient insulating material, such as vulcanized rubber, to which the body portion 12 is directly bonded or vulcanized. Positioned within the body portion 12, are the female contact members 14 and 16. The form of these contact members may vary within the scope of the present invention, although for simplicity I prefer to employ members made of a single spring strip double U-shaped as shown to form the two opposed parallel branches 18 and 19. The material from which these contact members are constructed should of course have relatively good electrical conductivity, as for example brass, bronze, or hard copper.

Rather than to provide special mountings for contact members 14 and 16, it is pr-fer-

able to have these members embedded in the resilient material of body portion 12. For certain reasons which will be presently explained, it is also preferable to provide means in addition to the resilient material of body portion 12, for anchoring or securing these members to the inner end of the flexible electrical cable 11. Thus in the construction shown in Figs. 3 and 4, a suitable filler material 21 is wrapped about the inner end of cable 11, a suitable material being a cotton or fiber tape. Contact members 14 and 16 are then bound upon opposite sides of the filler 21, as by means of a wrapping of cord 22. The conductors 23 and 24 extending from the inner end of cable 11, are turned or doubled back and their uninsulated ends electrically connected to the contact members by soldering or welding, as indicated at 26 and 27.

Contact members 14 and 16 are of course accessible for engagement with complementary male contact members, thru the front face 28 of the terminal. A conventional connector device capable of cooperating with the terminal of Figs. 1 to 4 inclusive, is shown in Fig. 7. In its simplest form it can consist of a body member or structure 29 from which the metallic prongs 31 and 32 project. These prongs frequently have apertures 33 in their outer ends. To cooperate with apertures 33, contact members 14 and 16 are provided with integral pressed out portions 34, which interfit with apertures 33, when the two devices are fitted together.

It is evident that when the two connector devices are being fitted together or being detached, under closed circuit conditions, an arc is apt to occur between the ends of the contact members 14 and 16 which are adjacent the face 28, and the outer ends of the male contact members 31 and 32. Since resilient vulcanized rubber is a non-refractory material, any arcing occurring along or near such a surface will cause carbonizing of the rubber, thus providing an alectrical conducting path. If such carbonizing were permitted to occur, it would in all probability augment the arcing between the contact members, and might ultimately form a leakage path directly between the female contact members 14 and 16, in the event that the female terminal forms the live end of the electrical circuit. In any event such carbonizing of resilient rubber surfaces near the contact members causes deterioration of the terminal, with the result that the usefulness of a terminal may be materially impaired and its life materially shortened.

To avoid such deterioration, in my invention surfaces of a substantially refractory material, that is a material which will not substantially deteriorate when subjected to the heat of an arc, are provided in such a manner as to interrupt the surface leakage path between the contact members 14 and 16. Preferably such refractory surfaces are presented in proximity to the points where arcing is apt to occur. Thus in Figs. 1 to 4 inclusive, I provide members 36 and 37 in conjunction with the contact members 14 and 16 respectively. For convenience these members are identical in construction, and they are made of material whose resistance is not broken down when subjected to the heat of an arc. A suitable material of this character is porcelain. These members 36 and 37 are preferably embedded in the resilient material of outer portion 12, and have their outer ends substantially flush with the terminal face 28. In this particular instance, each member is provided with slots or openings 38, to accommodate the male contact members of the device shown in Fig. 7. The outer edges of openings 38 are curved as indicated at 39, to permit ready access of the male contact members. Annular ribs 41 are provided upon each member 36 and 37, to provide a secure anchoring or interlocking engagement with the resilient material of body portion 12. The inner end of members 36 and 37 are provided with recesses or cavities 42, within which the outer ends of contact members 14 and 16 can loosely extend. Therefore when male contact members are inserted into the contact members 14 and 16, branches 18 and 19 are free to spread a certain amount and to properly align themselves.

It will be apparent from the above description, that when an arc occurs between the outer ends of contact members 14 and 16, and the prongs or contact members of the complementary device, such an arc or arcs will occur along the interior of refractory members 36 and 37, and therefore along or near nondeteriorating or refractory surfaces. Therefore in this respect members 36 and 37 may be said to form substantially non-deteriorating or refractory arc chutes, for the contact members 14 and 16. It is also characteristic of the particular construction described above, that the refractory members 36 and 37, which are generally of relatively fragile material compared to the durable and non-breakable material of the body portion 12, are surrounded and protected by the resilient material so that they cannot be readily broken. Furthermore greater durability and ease of assembly is afforded by having members 36 and 37 separate from and not directly mechanically connected with contact members 14 and 16.

In assembling and manufacturing the terminal of Figs. 1 to 4 inclusive, it may be explained that care should be taken to prevent inflow of rubber between the branches 18 and 19 of the contact members 14 and 16. Thus in practice I have found that it is desirable, before contact members 14 and 16

are bound to the inner end of cable 11 by cord 22, to insert filler blocks 44 between the inner ends of branches 18 and 19. A certain amount of suitable material such as paper, can also be wrapped about contact members 14 and 16, and the associated refractory members 36 and 37. The assembly is completed by applying a suitable amount of unvulcanized rubber stock, after which it is placed in a suitable vulcanizing mold. The mold preferably includes prongs which extend thru refractory members 36 and 37 and into the contact members 14 and 16, thus holding these parts in proper position. The vulcanizing of the rubber is preferably done under considerable pressure, to insure proper flowing of the rubber about contact members 14 and 16, and about and between the refractory members 36 and 37. When removed from the vulcanizing mold, the spaces between branches 18 and 19, and the cavity 42, will be substantially free of rubber.

It should be noted that the terminal of Figs. 1 to 4 inclusive is of the polarized type, in that contact member 14 occupies a position substantially at 90° with respect to contact member 16. It is evident however that these contact members may be set so as to receive the prongs of a standard male connector device.

It is evident that in place of utilizing two separate refractory members 36 and 37, that these parts can be combined into a single member. Such a construction is shown in Figs. 5 and 6. Thus in this case a single refractory member 46 is embedded in the resilient material of body portion 12, and extends between the contact members 14 and 16. This member 46 functions in substantially the same manner as members 36 and 37 of Figs. 1 to 4 inclusive, and is likewise provided with openings 38 for receiving the male contact members. Ribs 47 formed on its periphery, insure a good interlocking engagement with the resilient material of body portion 12. In Fig. 5 contact members 14 and 16 are shown arranged to cooperate with a standard male connector device.

I claim:

1. In a terminal, a body formed of resilient non-refractory insulating material, a contact member disposed within said body and accessible with respect to a complementary contact member thru one face of the body, and a member embedded in the resilient material of the body yieldably independent of said first-named contact member and presenting a substantially refractory surface adjacent the initial point of contact between said first named contact member and said complementary member.

2. In an electrical terminal, a body including resilient non-refractory insulating material, a female contact member disposed within said body and accessible to a complementary contact member thru one face of the body, and a member of refractory material surrounding a portion of said first named contact member and embedded in said resilient material, said first named contact member being movable relative to said refractory member.

3. In an electrical terminal, a body including resilient insulating material, a flexible electrical cable extending into said body, a plurality of female contact members embedded in the insulating material of said body, and means for anchoring said members to the inner end of said cord, the conductors of said cord being electrically connected to said contact members independently of said anchoring means.

In testimony whereof, I have hereunto set my hand.

NOBLE H. WATTS.