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E. G. WALSH

2,291,566

ELECTRICAL CONNECTING DEVICE

Filed March 15, 1941

FIG. 1

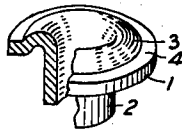


FIG. 3

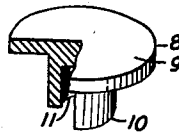


FIG. 2

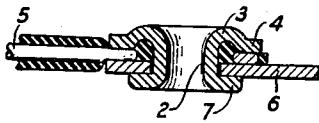


FIG. 4

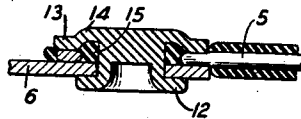


FIG. 5

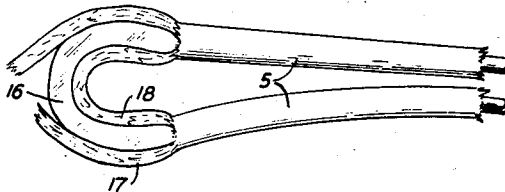
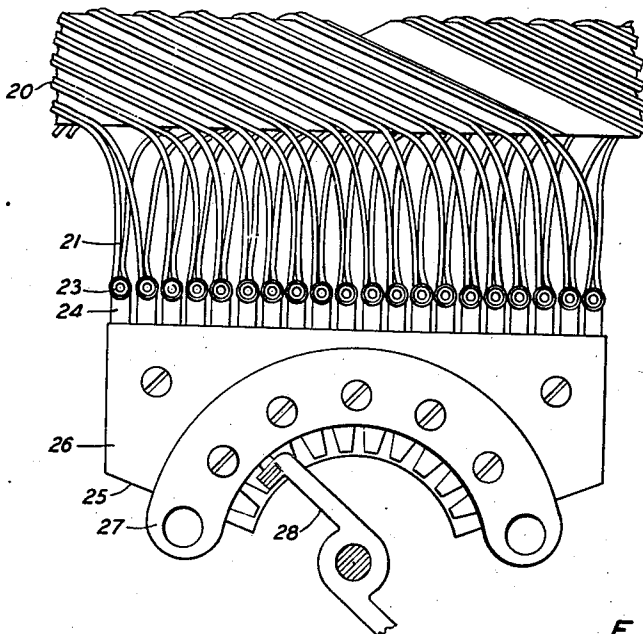


FIG. 6



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ELECTRICAL CONNECTING DEVICE

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Application March 15, 1941, Serial No. 383,507

5 Claims. (Cl. 173—324)

This invention relates to electrical connecting devices and particularly to connecting means for electrical conductors.

An object is to provide permanent and reliable electrical connections between conductors by simple and inexpensive means.

Heretofore connections have been made between the insulated conductors and terminals and one method was to bare the end of the conductor and fold it over the insulation portion, pierce a hole through the folded portion of the conductor and pass an eyelet through this hole and through a hole in the terminal and clamp the eyelet together over the conductor and terminal to establish an electrical connection between the bare end of the conductor and the terminal. Other connecting means have been provided in which an eyelet is inserted through the insulation of a conductor, comprising a plurality of individual strands, and between the strands of the conductor at this point and then clamp or fold the eyelet over the insulation so that the strands will make electrical connection with the eyelet.

In a copending application by R. F. Mallina and H. O. Siegmund, filed March 15, 1941, Serial No. 383,530, an arrangement is provided for establishing an electrical connection between an insulated conductor and a terminal through an eyelet in which the conductor is looped over the tubular portion of the eyelet and the eyelet is then clamped down to crush the insulation away from the loop by the flange of the eyelet to establish electrical connection between these elements.

It is a feature of the present invention to provide means for establishing an electrical connection between an insulated conductor and a terminal through an eyelet or other riveting means in which the eyelet is provided with a flange having an inner cup-shaped portion and an outer flat portion or rim so that when the conductor is looped over the tubular portion of the eyelet and the eyelet is then clamped down over the conductor and the terminal by a suitable tool that preserves the original shape of the flange, the insulation would be crushed away from the portion that comes in contact with the flat rim of the flange and thereby causes the conductor to establish electrical connections with the flat rim while the cup-shaped portion of the flange serves as a depository for the insulation removed from the exposed portion of the loop. This arrangement is to prevent the loop from being shifted, widened out or otherwise distorted by the insu-

lation removed from the exposed portion and to prevent the rim from injuring the conductor. Another advantage of this arrangement is that this joint will occupy a comparatively small space which is essential when a plurality of connections of this kind are placed close together as in wiring of telephone apparatus.

Another feature of the applicant's invention is an arrangement whereby the two portions of the flange of the eyelet may be formed by a special tool from an eyelet having originally a flat flange when the eyelet is clamped over the loop, the outer flat rim portion of the flange being maintained in a flat condition while the inner portion of the flange is formed into the cup-shaped formation.

It should be understood that the invention is not confined to any particular type of eyelet but that any suitable type may be used. For example, a so-called hollow rivet may be employed in which a hole or depression is provided in the part of the shank which is to be spread out and clamped over the terminal.

The invention has been illustrated in the accompanying drawing in which:

Fig. 1 shows an eyelet that has been preformed in accordance with this invention;

Fig. 2 shows an eyelet of the type shown in Fig. 1, formed to establish a connection between an insulated conductor and a terminal, in accordance with the applicant's invention;

Fig. 3 shows a hollow rivet that may be employed to carry out the invention;

Fig. 4 shows a rivet of the type shown in Fig. 3 formed to establish a connection between an electrical conductor and a terminal;

Fig. 5 shows a loop of insulated wire with the insulation separated from the conductor at the loop; and

Fig. 6 shows an application of this invention to a terminal bank and a multiple cable in which a plurality of insulated conductors are connected to the terminals of the bank in accordance with the applicant's invention.

Referring now to the drawing, in Fig. 1 an eyelet 1 has been shown having a hollow shank 2 and a flange comprising an inner cup-shaped portion 3 and an outer flat portion or rim 4. This eyelet, as shown in Fig. 1, may be employed for establishing a connection between the insulated conductor 5 and a terminal 6 as shown in Fig. 2. As shown in this figure, the conductor is looped around the shank 2 of the eyelet and the shank is inserted in a hole in the terminal 6 and then the eyelet is clamped down over the

conductor and terminal to form a holding rim 7 and to cause the rim 4 to engage the insulated conductor 5 to crush or separate the insulation from the conductor where this rim touches it. A portion of the insulation crushed from the conductor and the insulation inside the loop will gather in the cup-shaped portion 3 of the eyelet which thus serves as a depository for this part of the insulation to prevent the loop from shifting or losing its original outside dimension, and the flat rim 4 will not nick or otherwise injure the conductor. Any suitable tool may be employed for clamping the eyelet in place except that it must not alter the shape of the flange of the eyelet but preserve the cup-shaped portion 3 and the flat rim 4 in their original forms. The insulation material for the conductor 5 may be of such a nature that it will readily be crushed away from the conductor when clamped by the eyelet as described. Cellulose acetate is suitable for this purpose, although the invention is not limited to the use of this particular material but conductors having other suitable insulation materials may be employed.

In Fig. 3 a hollow rivet 8 has been shown having a flat flange 9 and a shank 10 which is partially hollowed out as shown at 11. If this type of rivet as shown in Fig. 3 is employed for establishing a connection between an insulated conductor 5 and a terminal 6, shank 10 is inserted in the loop of the conductor 5 and then into a hole in the terminal 6 whereupon the hollowed-out portion as at 11 of the shank 10 is clamped, swaged or spun out to form a ridge or flange 12 as shown in this figure. A tool should be provided for clamping the rivet in place which will bend down or form an outer flat rim 13 and an inner hollow portion 14 from the originally flat flange 9. Thus the space near the shank as shown at 15 on the rivet will serve as a depository for the insulation removed from the upper and lower sides of the loop and the insulation inside the loop in the same manner as when an eyelet as shown in Fig. 1 is employed for this purpose of connecting a terminal to an insulated conductor. It should be noted that the rims 4 and 13 will, by virtue of being flat, not crush or otherwise injure the bared conductor and by virtue of the cup-shaped portions the insulation gathered inside the loop of the conductor will not in any way widen out or otherwise displace the loop when being secured between the eyelet and the terminal.

In Fig. 5 a loop of the conductor 5 has been shown with the insulation removed from the end of the loop to bare the loop as at 16 to cause the insulation to be spread out on outer and inner sides of the loop as at 17 and 18. The insulation as shown at 18 is deposited in the cup-shaped portion of the eyelet or rivet as described.

Fig. 6 illustrates how connections may be made between insulated conductors and terminals by means of eyelets as described when these insulated conductors are employed for connecting terminals in a switchbank. The insulated conductors may be arranged in a ribbon cable as shown at 20 and provided with loops such as at 21 which are passed over eyelets such as at 23 and through a hole in the terminals such as at 24 to crush the insulation at the loop for establishing electrical connections between the conductors and terminals in the manner described. It is readily seen that by this invention the conductor loops are not spread out beyond the width of the terminals and thus preserve a suit-

able distance between adjacent connections. The terminals may be arranged in the bank 25 in which several layers of terminals may be provided and insulated by intermediate plates such as 26 and clamped together with clamping plates 27 and the terminals may extend in arcuate formation for selection by rotary brushes. One of said brushes has been illustrated at 28. It should be understood, of course, that the connecting means in accordance with the applicant's invention may be employed in any other arrangements wherein good electrical connection is required between an insulating conductor and a terminal or between a conductor or an eyelet without departing from the spirit of the invention.

What is claimed is:

1. In combination, an insulated conductor having a loop formed therein, a terminal having an aperture, an eyelet provided with a shank and a flange, said flange having an inner cup-shaped portion and an outer flat portion or rim, said eyelet having its shank inserted through the loop of said conductor and the aperture of the terminal with the shank clamped down over the terminal to crush the insulation away from the conductor between the flat rim and the terminal so that an electrical connection is established between the bared loop and the terminal while the cup-shaped portion of the flange forms a depository for insulation crushed away from the conductor.

2. In combination, an insulated conductor having a loop formed therein, a terminal having an aperture, a rivet having a shank and a flat flange, said rivet having its shank inserted through the loop and the aperture and swaged so that the flat flange is formed with an inner cup-shaped portion and an outer flat portion with the flat portion crushing the insulation away from the conductor and so that a part of the crushed insulation is deposited in the cup-shaped portion for the establishing of an electrical connection between the bared portion of the loop and the terminal and to prevent the spreading of the loops during the swaging operation.

3. In combination, an insulated conductor having a loop formed therein, a terminal having an aperture, a rivet having a shank and a flange in which the inner portion is cup-shaped and the outer rim of the flange is flat with the shank inserted through the loop and the aperture and riveted so that the insulation around the upper and lower surfaces of the loop is separated from the conductor and a part thereof is deposited in the cup-shaped portion of the flange for the establishing of an electrical connection between the bared portion of the loop, the outer rim of the flange, the rivet and the terminal.

4. In combination, a conductor having a cellulose acetate insulation and having a loop formed in the conductor and a rivet in which the flange is cup-shaped at the inner portion and flat at its rim and having a shank of the same diameter as the loop inserted through the loop and riveted so that the insulation is crushed away from the loop and part of it deposited inside the loop in the cup-shaped portion of the flange without changing the original diameter of the loop and to establish electrical connection between the bared conductor and the rivet.

5. In combination, a single wire insulated conductor having a loop therein and a rivet having a shank and a flange in which the inner portion of the flange is cup-shaped and the outer rim of the flange flat, said rivet having its shank in-

serted in said loop and the shank riveted down over the loop so that the outer flat rim of the flange crushes the insulation away from the loop on one side thereof and the riveted portion of the shank crushes away the insulation from the opposite side of the loop without opening up the loop by permitting a portion of the insulation

5 crushed away from the opposite sides of the loop to be deposited in the cup-shaped portion of the flange to form an electrical connection between one side of the loop and the rim and between the opposite of the loop and the riveted portion of the shank.

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