Dec. 8, 1936. A. A. BERNDT 2,063,718

CONNECTER

Filed Feb. 23, 1934

Fig. 1.

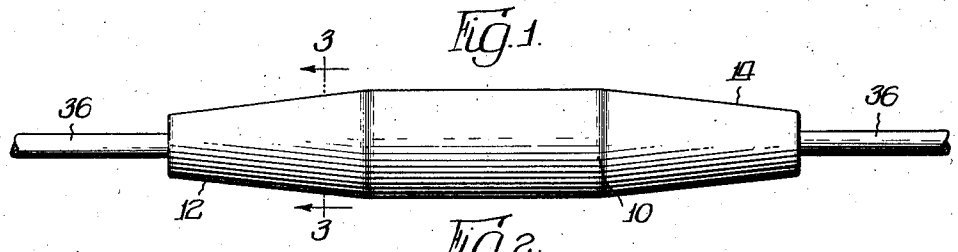


Fig. 2.

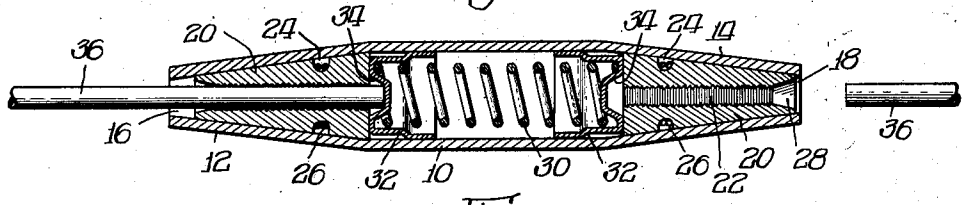
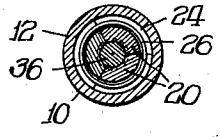


Fig. 3.



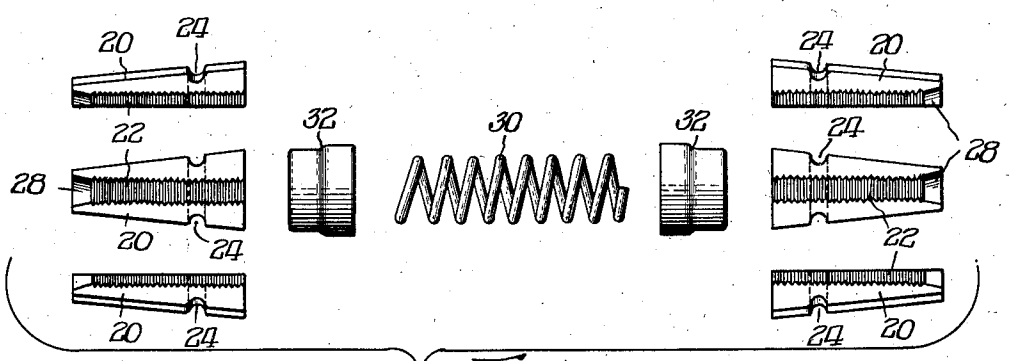


Fig. 4.

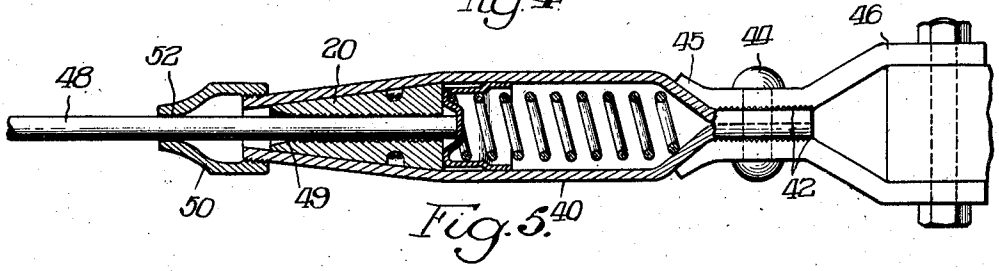


Fig. 5.

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CONNECTER

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Application February 23, 1934, Serial No. 712,597

10 Claims. (Cl. 173—303)

The invention relates to electrical connecters and has reference particularly to a device for connecting wires and electrical conductors without the use of solder or tools.

An object of the invention is to provide a connecter for the purposes stated which will be as strong as the members joined thereby; which will not cut or materially injure the conductors although providing a connection having a conductivity equal to or better than that of an equal length of conductor; which will make a joint comparing favorably with the present costs of joints constructed by other methods, and which will not require tools of any kind.

A further object of the invention is to provide a connecter having all the parts housed within a casing so that they can not become lost and which will be simple, light and compact.

A further object is to provide means for connecting wires and the like in the form of a coupling consisting of a casing forming the housing for gripping elements of novel construction, which grip the wire with increased force as the tension on the wire increases and which are held in spaced relation within the casing by means operative to control the extent of insertion of the wire within the gripping elements and which also functions to prevent injury thereto due to the insertion of the wire.

The coil springs used in connecters of the present type are made of non-ferrous, non-corrosive metal, and even though a good grade of such metal is used the same will easily take a permanent set if compressed to the point where the convolutions of the spring contact, or substantially contact, each other. Therefore, another object of the invention is to provide a connecter of improved construction having gripping members retained within tapering end portions of the casing by a coil spring of non-ferrous and non-corrosive metal and wherein means are provided for preventing compression of said coil spring to the extent where said spring will take a permanent set.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation, as will be more fully described and particularly pointed out in the specification, drawing and claims appended hereto.

In the drawing which illustrates an embodiment of the device and wherein like reference characters are used to designate like parts—

Figure 1 is an elevational view showing the completed connecter;

Figure 2 is a longitudinal sectional view taken substantially through the center of the connecter and showing one set of gripping elements in engagement with a conductor and the other set inoperative;

Figure 3 is a transverse sectional view taken substantially along the line 3—3 of Figure 1;

Figure 4 is a view showing the various elements housed within the casing in disassembled relation; and

Figure 5 is a longitudinal sectional view showing a modified construction of connecter provided with a cap member.

Referring particularly to Figures 1 and 2 the connecter is shown as comprising a casing 10 of any suitable metal, preferably copper or an alloy thereof, and having tapering end portions 12 and 14 which provide end openings 16 and 18, respectively, of reduced diameter compared to the size of the casing at the center. The walls of the casing in the vicinity of the end openings are somewhat greater in thickness than the casing wall at other points since the extreme outer ends of the casing are called upon to withstand severe strain due to the tension placed upon the conductor wires.

Located within the casing are a plurality of gripping members 20 associated in sets of three and located within the end portions of the casing for contact with the tapering walls. Each member is of wedge shaped formation, as more particularly shown in Figure 4, and is formed with a trough or groove extending lengthwise thereof and suitably roughened by means of teeth 22. Each member is also provided on its exterior surface with a groove or recess 24 running transversely of the member and which receives several strands 26 of suitable material for holding the members in associated relation to form a set as previously mentioned. The wire is held by the gripping members by imbedding the teeth 22 into the surface of the wire although not to the extent as would cause damage to the wire. It is desired that the sets of members be flexibly held together by the means 26 which will permit their separation by a reclaiming tool when it is desired to release the conductor. To render the members operative for the purpose of releasing the engaged conductor their ends adjacent the openings 16 and 18 are bevelled as at 28. Also the gripping members are flexibly held together to form a small opening which will restrict the passage of the inserted wire with the result that the members become associated with the end of the inserted wire. Further movement of the

wire does not alter this relation and the wire is finally gripped with the members engaging the wire close to its end. The gripping members in combination with other structure to be presently described make a practical and operative connecter.

For maintaining the sets of gripping members in spaced relation and in contact with the tapering walls of the casing a coil spring **30** is located between the sets, having convolutions of a diameter substantially less than that of the casing so as to have free movement within the casing, and of a length to exert sufficient tension for an operative connecter. The coil spring has its respective ends seating within cup-shaped members **32** provided with a base recessed at **34** for centering the conductor wires **36** and having a diameter which increases in steps from the base to the open end for purposes which will presently appear.

In accordance with the invention the height of each cup-shaped member, that is, the distance from the base to the rim, is designed to prevent full compression of the resilient coil spring **30**. It will be understood from Figure 2 that the insertion of a wire within the gripping members continues until its end contacts with the recessed base in the adjacent cup member **32**. The act of inserting the wire, however, forces the gripping member away from the tapering walls towards the center of the casing, causing compression of spring **30**. In most instances the act of inserting the wire will cause one cup member to contact with the other, whereupon further compression of the spring is of course impossible. The height of the cup-shaped members is an important factor therefore in the successful operation of joining the connecter to the wires since if their height is too great only a limited compression of the spring **30** is possible and the gripping members will not have sufficient play for their proper functioning. On the other hand, however, to allow complete compression of the spring, that is, where the convolutions are caused to contact each other, has been found to injure the spring by causing a permanent set, resulting in a reduction in the force exerted by the spring to maintain the members separated. The cup members are therefore of a height that when they contact sufficient play for proper operation of the gripping members is provided, although the spring is not fully compressed. More specifically, the coil spring can be compressed to the point just short of that where injury due to a permanent set would occur.

It is also noted that the diameter of the base portion of the cup-shaped member is considerably less than the interior diameter of the center portion of the casing, whereas, the diameter of the cup from the center to rim is somewhat larger to slidably fit the interior of the casing. The reduced diameter of the base portion of the cup member is necessary as this portion is located within a tapering end section of the casing when the gripping members are inoperative as shown in the right hand section of Figure 2. The enlarged diameter of the cup controls the slidable movement of the same during compression of the spring in the act of inserting a wire. The contour or shape of the members **32** allows them to fit within a tapered end portion so that they have maximum movement and also maintains them in proper position during movement to insure alignment of the spring.

To connect the wires **36** their respective ends are inserted within the end openings of the casing **10** and forced through the longitudinal bore provided by the gripping members. As the conductor is slightly less in diameter than the normal size of the bore, the gripping members are forced rearwardly out of contact with the tapering end wall of the casing, permitting insertion of the conductor. The gripping members are carried in with the inserted wire so that they become associated with the very end of said wire and after tension has been placed thereon to again locate the members in contact with the tapering end portion of the casing, it will be found that the wire has been inserted just far enough to project a small distance beyond the members. This action of the gripping members and the operation of the cup-shaped members in preventing complete compression of the coil spring are salient factors in the practicability of the present connecter. If it were possible to insert the wire **36** well within the casing where its inserted end would cause compression of the spring it would hamper and at times prevent insertion of the wire at the opposite end of the casing, thus making the connecter worthless. The members are flexibly held by the strands **26** so that they yieldingly separate to a certain extent and move as a unit which prevents one member from having action independent of the other members of the set. They are preferably made of metal having a medium hard surface and may be shaped to require two, three, four or even five to form a set of elements as disclosed.

The resulting joint with the present connecter is as strong as the conductors joined, since increasing the tension on the conductors functions to increase the intensity of the gripping relation. Also the joint is of high conductivity due to the excellent contact between the conductor wires, gripping members and casing, which is supplemented by the cup members which contact the respective ends of the conductors and the casing. The connecter comprises a unitary device having no threaded members to become separated and lost nor is it possible for the parts to get out of order. Also the connecter efficiently withstands corrosion since the contacts between conductor, gripping members and casing are within the casing and therefore it is impossible for corrosion to effect the connecter either electrically or mechanically.

The modified form of connecter shown in Figure 5 has one-half of the casing **40** provided with a tapering portion which houses elements of identical construction, and having operation similar to that described with respect to the connecter shown in Figure 2. The other end of the casing is flattened and provided with serrations **42** for securement as by rivets **44** to a support in the form of bifurcated arms **46** likewise provided with serrated surfaces for engagement with those in the flattened portions of the casing. The arms are extended at **45** for bracing the sides of the casing to reinforce the connection with the support against vibrations. The form of connecter disclosed provides an anchor for the conductor **48** which is fastened to the connecter in a manner as described. The vibrations of the conductor have been found to cause severing of the wire at **49**, the initial point of contact between the same and the gripping members. This will be understood when it is realized that the conductor is under compression at this point due to the action of the gripping elements and further the surface of the wire is cut by contact of

the teeth 22 with the wire. The vibrations accentuate the cutting action of the teeth and further cause the wire to crystallize with the result that the connection soon fails.

To make a practical and serviceable anchorage the invention provides a cap member 50 adapted to be threaded to the end of the casing 40 and having an opening 52 permitting passage of the conductor. The opening is a size substantially that of the conductor. As shown in Figure 5 the walls of the opening are smooth and slightly curved to minimize the danger of scratching or otherwise marring the surface of the conductor at this point. With the cap constructed as above described and secured to the end of the anchoring connecter the vibrations in the conductor 48 are dampened at 52, the point of contact of the opening in the cap with the conductor, and therefore the vibrations are considerably reduced if not entirely eliminated at the initial contact between the conductor and the gripping elements. The conductor does not crystallize at point 52 since this portion of the wire is not under compression nor is the surface cut as is the case with that portion of the wire held by the gripping elements. As a result the anchoring connecter of the invention is practicable and fulfills all requirements of service.

It is to be understood that I do not wish to be limited by the exact embodiment of the device shown which is merely by way of illustration and not limitation, as various and other forms of the device will of course be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

I claim:

1. A connecter for connecting electrical conductors, wires and the like, comprising a casing having its end portions reduced in diameter to form tapering end portions, gripping members housed within the casing and located in the tapering end portions respectively, said gripping members being adapted to grip and hold the wires inserted into the casing against outward movement, a coil spring located centrally of the casing for holding the gripping members in contact with the walls of the end portions, and a pair of cup-shaped members housed by the casing and providing seats for the respective ends of said coil spring, said cup-shaped members having their open ends directed toward each other and adapted to contact with each other to prevent full compression of the coil spring.

2. A connecter for connecting electrical conductors, wires and the like, comprising a casing having its end portions reduced in diameter to form tapering end portions, gripping members housed within the casing and located in the tapering end portions respectively, said gripping members being adapted to grip and hold the wires inserted into the casing against outward movement, a coil spring located centrally of the casing for holding the gripping members in contact with the walls of the end portions, and a pair of cup-shaped members housed by the casing and having their open ends directed inwardly to provide seats for the respective ends of said coil spring, said cup-shaped members having a recessed base for positioning the end of the wire held by the associated gripping members and being of a length to prevent complete compression of the spring, when their open ends are brought into contact.

3. A connecter for electrical wires comprising a casing formed of a metal tube having end portions of tapering formation, a plurality of gripping members located within each end portion for engagement with the tapering walls of the same, each set of gripping members being flexibly held together by means encircling the members, a coil spring located centrally of the casing for holding the gripping members in separated relation and in contact with the walls of the tapering portions, and a pair of cup members housed within the casing and located between the coil spring and the associated gripping members respectively, said cup members having their open ends directed toward the spring to provide seats for the respective ends of the coil spring and having an outside diameter to provide for free slidable movement within the central portion of the casing, said cup members being brought into contact with each other in the operation of inserting a wire within the gripping members to prevent compression of the coil spring to the extent where said spring will take a permanent set.

4. A connecter for connecting electrical conductors, wires and the like, comprising a tubular casing having at least one end portion reduced in diameter to form a tapering end portion, gripping members housed within the casing and located within said tapering end portion, said gripping members being adapted to grip and hold a wire inserted into the end of the casing against outward movement, flexible means tying said gripping members together so that the same have movement as a unit in the operation of connecting with a wire, a coil spring located within the casing for holding the gripping members in contact with the walls of the end portion, a cup-shaped member located between the gripping members and the adjacent end of the coil spring, said cup-shaped member having its open end directed inwardly to provide a seat for said spring, and another inwardly directed cup-shaped member providing a seat for the other end of the spring, the open end of said cup-shaped members contacting each other to prevent complete compression of the spring in the operation of inserting a wire to be held by the gripping members.

5. A connecter for connecting electrical conductors, wires and the like, comprising a casing having its end portions reduced in diameter to form tapering end portions, gripping members housed within the casing and located in the tapering end portions respectively, said gripping members being adapted to grip and hold the wires inserted into the casing against outward movement, a coil spring located centrally of the casing for holding the gripping members in contact with the walls of the end portions, and a pair of cup-shaped members housed by the casing and having their open ends directed inwardly to provide seats for the respective ends of the coil spring, the periphery of each of said cup-shaped members adjacent the base being reduced in diameter in order to fit within the tapered end portions of the casing so that said cup-shaped members may have maximum movement.

6. A connecter for connecting electrical conductors, wires and the like, comprising a casing having its end portions reduced in diameter to form tapering end portions, gripping members housed within the casing and located in the tapering end portions respectively, said gripping members being adapted to grip and hold the wires inserted into the casing against outward movement, flexible means tying each set of gripping members together whereby each set has

movment as a unit in the operation of connecting with a wire, a coil spring located centrally of the casing for holding the gripping members in contact with the walls of the end portions, and a pair of cup-shaped members located within the casing and having their open ends directed inwardly to provide seats for the respective ends of the coil spring, the periphery of said cup-shaped members adjacent their base being reduced in diameter with respect to the periphery adjacent their open ends, whereby said cup-shaped members fit within the tapered end portions of the casing and also have a close sliding fit with the inside wall centrally of the casing.

7. A connecter for connecting electrical wires, comprising a casing having its end portions reduced in diameter to form tapering end portions, gripping means housed within the casing and located in the tapering end portions respectively, said gripping means being adapted to grip and hold the wires inserted into the casing against outward movement, a coil spring located centrally of the casing for holding the gripping means in contact with the walls of the end portions, and a member located between each end of said coil spring and associated gripping means, each member having a base for seating the coil spring, and a portion extending inwardly towards the center of the casing, said inwardly extending portions contacting each other to prevent compression of the coil spring during the act of inserting a wire within the gripping means to the extent where said coil spring will take a permanent set.

8. A connecter for connecting electrical wires, comprising a casing having its end portions reduced in diameter to form tapering end portions, gripping members housed within the casing and located in the tapering end portions respectively, said gripping members being adapted to grip and hold the wires inserted into the casing against outward movement, a coil spring located centrally of the casing for holding the gripping members in contact with the walls of the end portion, and a pair of cup-shaped members housed by the casing, said members each having their open end directed toward the spring to provide a seat for the respective ends of the coil spring and having a recessed base for receiving the end of the wire held by the gripping members, and each cup-shaped member having its greatest diameter adjacent the open end.

9. A connecter for electrical wires, comprising a casing having its end portions reduced in diameter to form tapering end portions, gripping members housed within the casing and located in the tapering end portions respectively, said gripping members being adapted to grip and hold the wires inserted into the casing against outward movement, a coil spring located centrally of the casing for holding the gripping members in contact with the walls of the end portions, and a pair of cup-shaped members housed by the casing and providing seats for the respective ends of said coil spring, said cup-shaped members adjacent their open end having a periphery of larger diameter than that of their base to form a close slidable fit with the central portion of the casing.

10. A connecter for electrical wires, comprising a tubular casing having at least one tapered end portion, gripping members housed by said tapering end portion and having contact with the walls thereof, a coil spring located within the casing for holding the gripping members in contact with the walls of the end portion, a tubular member having a base and an open end and being located between the gripping members and the adjacent end of the coil spring, said tubular member having its open end directed toward the coil spring, to provide a seat for said spring the periphery of said member adjacent the open end being of a diameter to slidably fit the inside wall centrally of the casing to guide the member during movement in the operation of inserting the wire and the periphery of said tubular member adjacent the base being reduced in diameter so that said member may fit within the tapered end portion of the casing.

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