

[54] **ELECTRICAL CONNECTION AND METHOD OF MAKING SAME**

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[58] Field of Search **339/17 R, 17 C, 17 LC, 339/252 S, 256 RT, 275 B, 254 R**

[56] **References Cited**

UNITED STATES PATENTS

2,444,433	7/1948	Erb	339/256 RT
3,076,164	1/1963	Ullman et al.	339/275 B X
3,503,033	3/1970	Kennedy	339/17 R

FOREIGN PATENTS OR APPLICATIONS

287,625	3/1928	United Kingdom	339/252 S
518,070	11/1955	Canada	339/252 S

Primary Examiner—Roy Lake

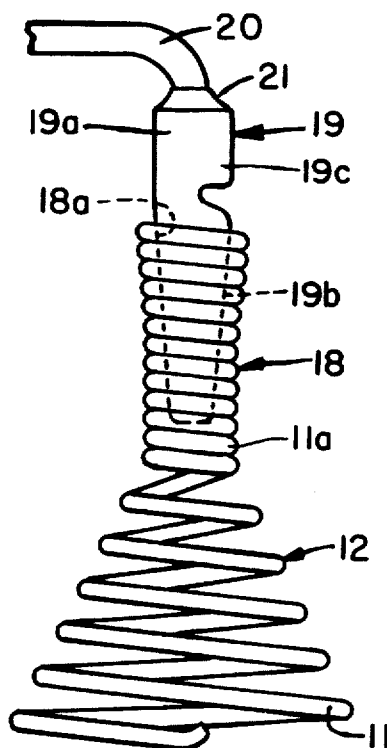
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[57] **ABSTRACT**

An electrical connection with an electrical contact member and comprising a cylindrical helix of electrically conductive resilient wire having a first end electrically connecting with the contact member and a second end adjacent the opening into the free end of the cylindrical helix, and a terminal member including a tapered longitudinal shank portion inserted through the helix opening and into the helix, and having an intermediate region contacting and frictionally engaging the inner periphery of the spiral at the free end of the helix when the shank portion of the terminal member is inserted into the helix. The terminal member can then be rotated to partially unwind the spirals of the helix while further inserting the shank portion of the terminal member into the helix for further frictional engagement between the shank portion and the inner peripheries of additional spirals of the helix. The method of making an electric connection with an electrical contact member is also covered.

10 Claims, 2 Drawing Figures



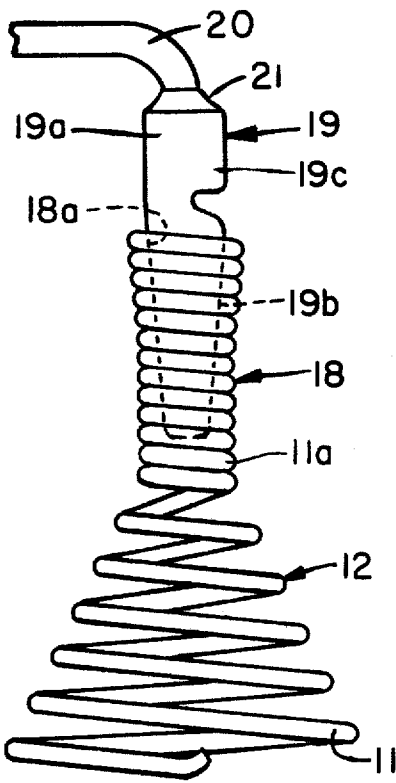


Fig. 1

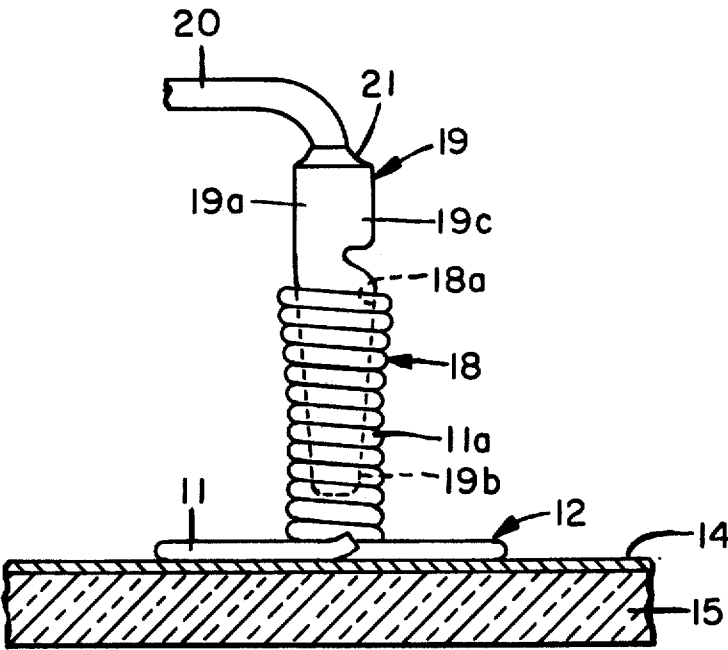


Fig. 2

ELECTRICAL CONNECTION AND METHOD OF MAKING SAME

BACKGROUND OF THE INVENTION

There is disclosed, for example, in copending application, Ser. No. 475,196, filed May 31, 1974 by Everett F. Kelm and assigned to the same assignee as the present application, an electrical contact member comprising a volute helix or conical spiral of a length of a resilient electrically conductive wire for making electric contact with an electrically conductive flat surface against which the largest spiral of the helix is first disposed and the helix then compressed to move the other spirals of the helix into physical and electrical contact with the flat surface. In order to readily make an electrical connection to a contact member such as disclosed in said copending application the electrical connection of the present application was developed, such electrical connection being readily removed or disconnected if or when it is desired to do so.

SUMMARY OF THE INVENTION

An adequate summary of the invention is believed to be set forth in the foregoing abstract of the disclosure and, therefore, in order to prevent repetition or redundancy and for the sake of brevity of the application to the extent possible, no further summary of the invention is believed necessary nor will any be given.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of an electrical contact member and an electrical connection with such contact member, such connection embodying the invention disclosed; and

FIG. 2 is a side elevational view of the contact member and connection of FIG. 1 when such member is used in making contact with a flat electrically conductive surface.

Similar reference characters refer to similar parts in each of the FIGS. of the drawings.

PREFERRED EMBODIMENT OF THE INVENTION

Referring to the two drawing figures in detail, there is shown in FIG. 1 an electrical contact member comprising a volute helix or conically spiraled length 12 of electrically conductive resilient wire 11 including a plurality of turns or spirals which progressively increase in size, that is, in diameter or circumference such that each succeeding spiral or turn will surround the immediately preceding spiral or turn, or the preceding spirals or turns when the volute helix or conically spiraled length 12 of wire 11 is compressed or flattened as illustrated in FIG. 2. The correspondence between the volute helix or conically spiraled length 12 of wire 11 of the present disclosure and the helix or spiraled length 12 of wire 11 of the electric contact member 10 of the aforesaid copending application, Ser. No. 475,196 of E. F. Kelm will be readily apparent from a brief comparison of the drawings of the applications.

In order to make a rapid and secure but readily disconnectable electrical connection with a contact member comprising a volute helix such as 12 of wire 11 such as discussed above and shown in the drawings, a cylindrical helix 18 of electrically conductive resilient wire such as 11a has a first end electrically connecting with the end of the smallest one of the spirals of volute helix 12 of wire 11 and a second end at or adjacent the open-

ing 18a into the free end of the cylindrical helix 18. It is preferable that wire 11a actually be, as shown in the drawings, a further length or a part of the length of wire 11 used to form volute helix 12 so that the wire forming cylindrical helix 18 is integrally electrically connected with such wire 11 forming helix 12. However, the length of wire 11a, if for some reason it is found to be desirable or expedient, can be a separate length of electrically conductive resilient wire which, as mentioned above, has a first end electrically connected to the end of the smallest one of the spirals of volute helix 12, such connection being made in any convenient manner such as, for example, by twisting and soldering of ends of wires 11 and 11a to each other.

An electrically conductive terminal member 19 is provided and includes a first portion 19a having a pair of opposite lugs such as 19c for electrically connecting an electrical conductor such as a wire 20 to terminal member 19 by inserting a short section of the length of wire 20 between said lugs and crimping the lugs about such wire section and, in some embodiments, also soldering the wire section and the lugs to each other by solder designated 21. Terminal member 19 further includes a longitudinal shank portion 19b which extends from first portion 19a of the terminal member and has a generally circular outer periphery which tapers from first portion 19a towards the end of the shank portion 19b of the terminal member with an intermediate region of such shank portion having a diameter corresponding in diameter to said opening 18a in the aforesaid free end of cylindrical helix 18. The end of shank portion 19b of terminal member 19 is inserted through opening 18a in the free end of helix 18 and into the interior of such helix until said intermediate region of shank portion 19b contacts and frictionally engages with the inner periphery of the spiral at the free end of helix 18. Terminal member 19 is then manually rotated to partially and temporarily or momentarily unwind some of the spirals of cylindrical helix 18 while the shank portion 19b of terminal member 19 is simultaneously further inserted into the cylindrical helix for frictional engagement between part of the outer periphery of said shank portion of the terminal member and the inner peripheries of additional spirals of the cylindrical helix. Terminal member 19 is then released and the partially unwound spirals of cylindrical helix 18 tend to return toward their wound conditions to tighten even further about the contacted outer periphery of shank portion 19b of terminal member 19 and provide tight physical and electrical contact between the contacted and engaged part of said shank portion and the inner peripheries of said additional spirals as well as said end spiral of helix 18.

In making electrical connections such as disclosed herein, the largest spiral of the volute helix or conically spiraled length 12 of electrically conductive resilient wire 11 is disposed in contact with a flat electrically conductive surface such as, for example, a thin electrically conductive film 14 deposited on a suitable flat substrate such as 15 as illustrated in FIG. 2, and such volute helix or spiraled length of wire is then compressed or flattened so that all of the spirals of the spiraled length or helix 12 of wire 11 are pressed into physical and electrical contact with said conductive film at, at least, two points on each said spiral. Terminal member 19 is then inserted into the interior of the cylindrical helix 18 and rotated as previously discussed to make

electrical connection to helix 18 and, thereby, to helix 12 and conductive film 14 on substrate 15. Alternatively, the electrical connection between helix 18 and terminal member 19 can be made before helix 12 is disposed against and compressed into contact with film 14 on substrate 15. The electrical connection between wire 20 and terminal member 19 can be made at any time, that is, prior to the time the electrical connection is made between helix 18 and terminal member 19, or subsequent to such time.

No claim is made herein to the volute helix or conically spiral length 12 of wire 11 per se, that is, to the electrical contact member per se comprising the volute helix of wire 12 and forming the electrical contact member shown in the drawings, since such member is the invention of the aforesaid E. F. Kelm as previously pointed out. Furthermore, although the electrical connection or electrical connection assembly of the invention covered by the present application is shown and described as an addition to a contact member such as covered by the aforesaid pending patent application of E. F. Kelm, it is pointed out that an electrical connection or assembly such as herein disclosed can be used with other suitable types of electrical contact members for making electrical contact with an electrical device or devices.

Although there is herein shown and described only a single form of an electrical connection embodying the invention, it will be understood that such is not intending to be in any way limiting but that various changes may be made therein within the purview of the appended claims without departing from the spirit and scope of the invention.

What is claimed is:

1. In an electrical contact member for making an electrical connection with an electrically conductive flat surface and including a volute helix of electrically conductive resilient wire including a succession of spirals progressively increasing in size such that each succeeding spiral will surround the preceding spirals when the helix is compressed against said flat surface, the combination therewith of an electrical connection with said contact member, such connection comprising; a cylindrical helix of electrically conductive resilient wire having a first end electrically connecting with the end of the smallest one of said spirals of said volute helix and a second end at the opening into the free end of such cylindrical helix; an electrically conductive terminal member including a first portion for connecting an electrical conductor to such terminal member and a longitudinal shank portion extending from said first portion of the terminal member, and having a generally circular outer periphery which tapers from said first portion towards the end of said shank portion of the terminal member with an intermediate region of such shank portion having a diameter corresponding in diameter to said opening in said free end of said cylindrical helix such shank portion of the terminal member being inserted through such opening and into the cylindrical helix with said intermediate region of the shank portion frictionally engaging the inner periphery of the end spiral of the cylindrical helix at said free end thereof, whereby said terminal member can then be manually rotated to partially and temporarily unwind some of the spirals of the cylindrical helix while simultaneously further inserting the shank portion of the terminal member into the cylindrical helix for frictional

engagement between the shank portion of the terminal member and the inner peripheries of additional spirals of the cylindrical helix.

2. The combination in accordance with claim 1 and further including a pair of oppositely disposed lugs on said first portion of said terminal member and an electrical conductor electrically connected with said lugs.

3. The combination in accordance with claim 2 and in which said electrical conductor is soldered to said lugs.

4. An electrical contact member and an electrical connection therewith comprising; a length of electrically conductive resilient wire, a first part of which is formed into a volute helix including a succession of spirals progressively increasing in size such that each succeeding spiral of such helix will surround the preceding spirals of the helix when the largest of the spirals of the helix is placed in contact with a flat surface and said helix is then compressed to move the remainder of the spirals of the helix into contact with such surface, and a second part of which wire is formed into a cylindrical helix having a first end integrally connecting with the end of the smallest spiral of said volute helix and a second end at the opening into the free end of such cylindrical helix, an electrically conductive terminal member including a first portion for connecting an electrical conductor to such terminal member and a longitudinal shank portion extending from said first portion of the terminal member and having a generally circular outer periphery which tapers from said first portion towards the end of the shank portion of the terminal member with an intermediate region of such shank portion having a diameter corresponding to said opening in said free end of said cylindrical helix, such shank portion of the terminal member being inserted through said opening and into the interior of the cylindrical helix with said intermediate region of the shank portion frictionally engaging the inner periphery of the end spiral of the cylindrical helix and then rotated and further inserting into the cylindrical helix for frictional engagement between the shank portion of the terminal member and the inner peripheries of additional spirals of the cylindrical helix.

5. An electrical contact member and electrical connection as in claim 4 and further including an electrically conductive lug on said first portion of said terminal member and an electrical conductor electrically connected to said lug.

6. An electrical contact member and electrical connection in accordance with claim 5 and in which said electrical conductor is soldered to said lug.

7. The method of making an electrical connection with an electrical contact comprising a length of electrically conductive resilient wire part of which is formed into a volute helix for pressing against an electrically conductive flat surface for making electrical contact therewith and the remaining part of such wire extending from the smallest spiral of such helix, said method comprising; forming said remaining part of said wire into a cylindrical helix; providing a longitudinal electrically conductive terminal member including a first portion having a lug for securing an electrical conductor to such terminal member and a longitudinal shank portion extending from said first portion of the terminal member and having a generally circular outer periphery which tapers from said first portion towards the end of said shank portion of the terminal member

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with an intermediate region of such shank portion having a diameter corresponding to the diameter of the opening in the free end of said cylindrical helix; inserting said shank portion of said terminal member through said opening and firmly into said cylindrical helix to provide physical contact and frictional engagement between said intermediate region of said shank portion and the inner periphery of the spiral of wire at said free end of such cylindrical helix; rotating said terminal member to partially unwind said cylindrical helix while further firmly inserting the shank portion of said terminal member into such helix to provide physical contact and frictional engagement between said intermediate region of such shank portion and the inner peripheries of additional spirals of the cylindrical helix; and then releasing said terminal member to permit the cylindrical helix to return towards its previously wound condition and said spirals of such helix to thereby securely tighten about said intermediate region of said shank portion of said terminal member.

8. The method in accordance with claim 7 and including the further step of electrically connecting an electrical conductor to said lug on said first portion of said terminal member.

9. The method in accordance with claim 8 and in which said electrical conductor is soldered to said lug.

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10. In combination with a contact member for making electrical contact with an electrical device, an electrical connection assembly comprising: a cylindrical helix of an electrically conductive resilient wire, such helix having a selected internal diameter and a first of its ends adapted for connecting with said contact member; and an elongate generally circular terminal member having a first portion adjacent the first end thereof and adapted for connecting with an electrical conductor, and a second portion extending between said first portion and the second end of the terminal member, such second portion tapering from a first diameter larger than said selected internal diameter of said helix to a second diameter smaller than such internal diameter, the smaller diameter end and part of the length of such second portion of said terminal member being inserted into the second end of said helix and into firm engagement with the spiral at such second end of the helix and then manually rotated to partially unwind said helix while inserting the second portion of the terminal member further into the helix; whereby said terminal member can then be released to permit the helix to rewind and tightly engage an intermediate region of the outer periphery of the second portion of the terminal member.

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