March 5, 1968

H. R. WENGEN

3,372,361

CABLE CONNECTOR

Filed June 15, 1965

3 Sheets-Sheet 1

FIG. 1.

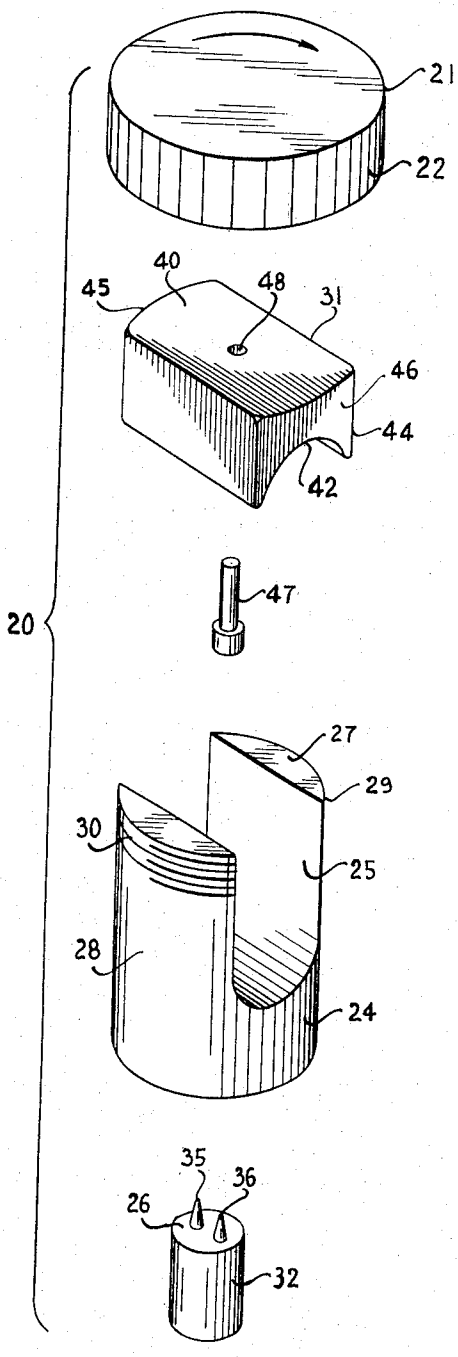

FIG. 6.

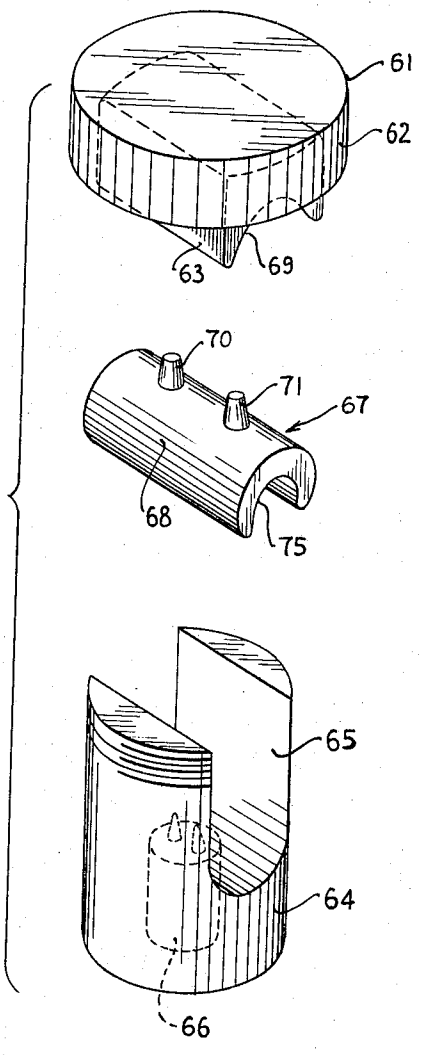

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FIG. 2.

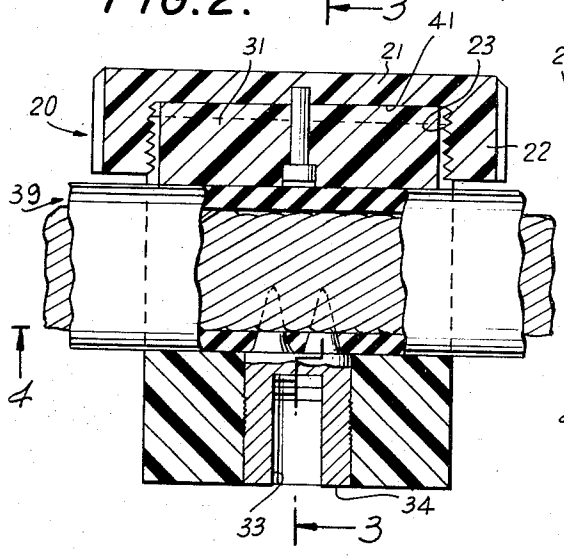


FIG. 3.

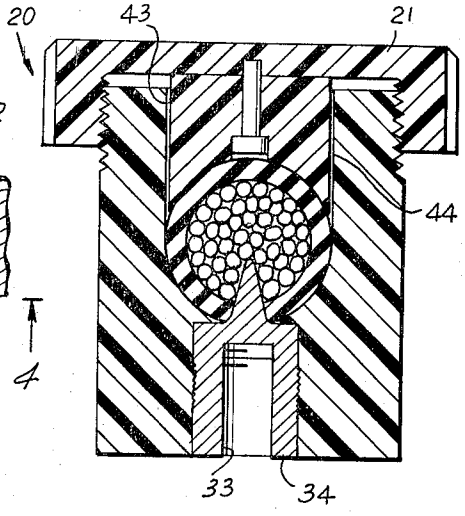


FIG. 7.

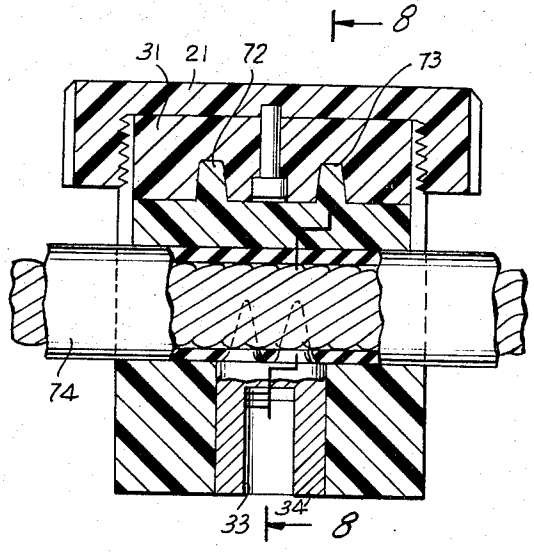
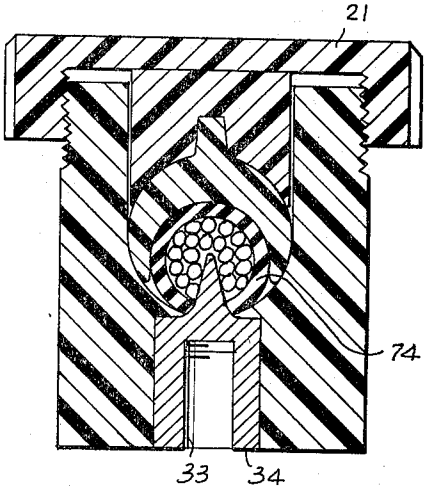


FIG. 8.



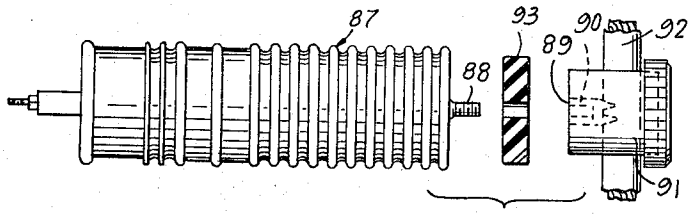


FIG. 10.

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FIG. 4.

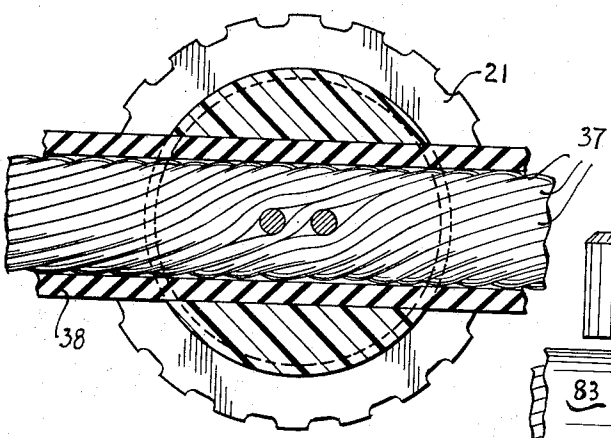
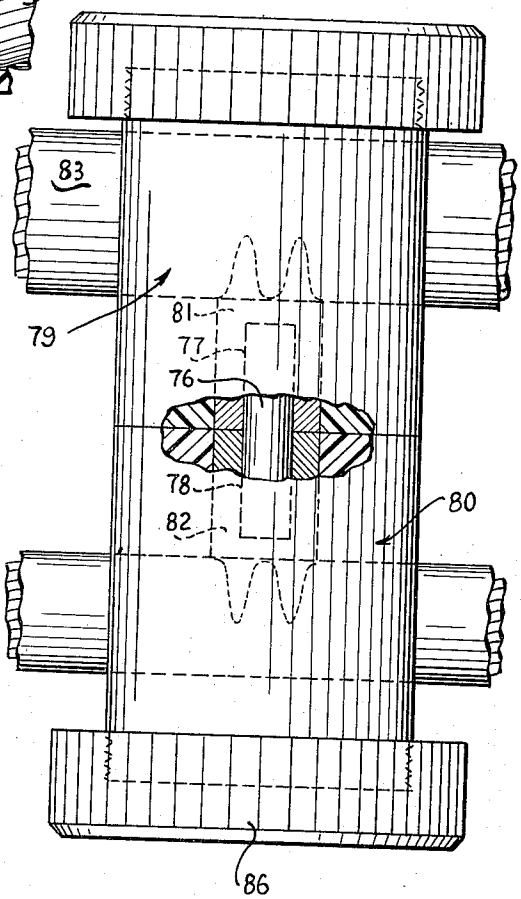


FIG. 9.



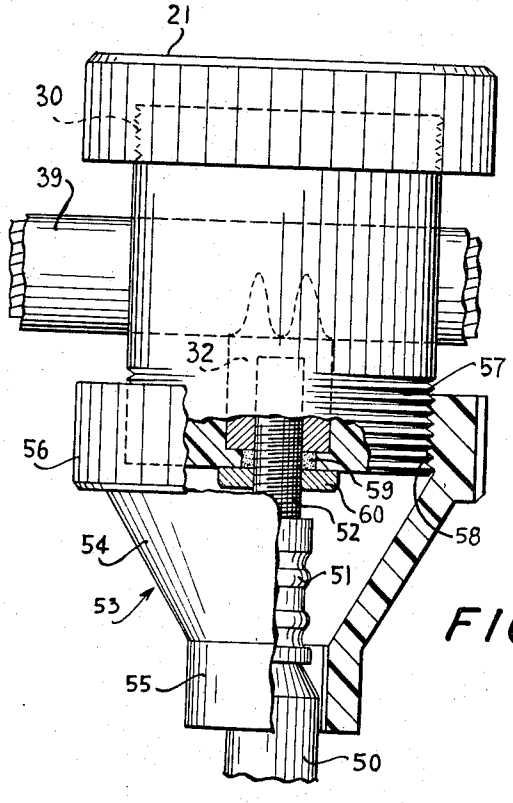


FIG. 5.

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CABLE CONNECTOR

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Filed June 15, 1965, Ser. No. 464,020
1 Claim. (Cl. 339—97)

This invention relates generally to electrical cable connectors and more particularly to a cable connector which can readily be applied to a cable by a lineman without removing the insulation from the cable.

In making connections between electrical cables when one of these is in place, or in tapping off of an existing cable, the lineman must work under the field conditions as they exist. Various type connectors have been designed for the lineman to use in tapping into an existing cable and each of these designs has attempted to solve certain practical problems which exist in the field. For the most part, however, these connectors have been impractical since they require a lineman wearing insulation gloves to make difficult hand or finger maneuvers or require him to perform a variety and plurality of operations. Since the cable to be tapped into is generally encircled wtih heavy insulation, it has been necessary in the past for the lineman to strip the insulation or bare the cable prior to using the connector in making the connection.

It is the principal object of this invention, therefore, to provide an electrical connector with which a lineman may tap into an existing cable and one which does not require baring or exposure of the conductor and one which eliminates the necessity of the removal of insulation.

It is another object of this invention to provide an electrical cable connector, the use of which will establish a good electrical connection and one that is insulated both electrically and from the weather.

It is another object of this invention to provide an electrical connector which can be used by a lineman in tapping off from an electrical cable in position with a minimum of operations and without the necessity of performing difficult functions with the arms or hands.

It is still a further object of this invention to provide an electrical cable connector which, without further operations, will leave the connection covered so that it is safe against accidental brush contact or short circuits from animals.

The invention consists essentially of an electrical connector having piercing contact means to pierce an insulated conductor to establish contact without the necessity of stripping the insulation; such piercing contact means being comprised of a single conducting point or a plurality of conducting points spaced from each other at distances suitable for straddling the strands of the conductor within the cable. The cable tension causes the adjacent strands within the cable to "zig-zag" around the piercing contact means to provide additional contact area and the configuration of the piercing contact means is such so as to provide an action which will not cut the strands.

An electrical cable connector embodying the invention and the manner of using the same is described herein with references to the drawings, in which:

FIG. 1 is an exploded perspective view of a connector constructed in accordance with the teachings of this invention;

FIG. 2 is a partially sectional elevational view of the connector shown in FIG. 1 in assembled condition;

FIG. 3 is a partially sectional view taken along the line 3—3 in the direction of the arrows as indicated in FIG. 2;

FIG. 4 is a partially sectional view taken along the line 4—4 in the direction of the arrows as indicated in FIG. 2;

FIG. 5 is a view of the connector when used as a tap off connection with a protective housing;

FIG. 6 is an exploded view of the connector shown in FIG. 1 but using an adaptor;

FIG. 7 is a partially sectional elevational view of the connector similar to the view in FIG. 2 but with the adaptor of FIG. 6 shown therein;

FIG. 8 is a partially sectional view taken along the line 8—8 in the direction of the arrows as indicated in FIG. 7;

FIG. 9 is an elevational view with portions cut away of an alternate embodiment of the invention utilized to connect two substantially parallel cables; and

FIG. 10 is a view of the cable connector disclosed herein utilized to electrically connect a lightning-arrester to a cable.

The connector which is the subject of this invention is indicated in FIGS. 1–4 by the numeral **20** and consists of circular cover **21** with downwardly directed peripheral skirt **22** having an internal threaded surface **23**, circular body **24** with a transverse U-cutout portion or groove **25** defined by the sides **27** and **28** which have threaded outside surfaces **29** and **30**, respectively, complementary with the inner threaded surface **23** of cover skirt **22**, pressure pad **31** and piercing contact member **32**.

The piercing contact member **32** is the only part of the connector which is not formed of an insulating material and is generally cylindrical in configuration with a threaded female insert portion **33** formed in end surface **34** and spaced piercing points **35** and **36** projecting from its remaining end **26** in the direction of pressure pad **31** in the assembled condition of the device.

Although two piercing points are utilized herein, more than two can be used and in some applications a single point of the configuration disclosed may be acceptable. The piercing points are long enough so that each can pass between two layers of conductor strands **37** after piercing insulation **38** of a cable such as cable **39** shown in FIGS. 2, 3 and 4 when the connector is assembled with cable **39** therein. The distance between piercing points **35** and **36** is chosen so that the points can straddle one strand of cable with the average "pitch" or "lay" of the cable size in connection with which the connector is to be used. The cable is normally under some tension providing a "zig-zag" effect and keeping additional contact at the piercing points since the strands **37** which are disposed substantially helically are drawn in the direction of the arrows indicated by the letters A and B in FIG. 4. Each of the piercing points is contoured so that there is an increasing of the diameter of the point as the base of the point is approached from its apex. This provides the points with a glancing action when they are made to go between strands **37**, displacing the strands slightly and allowing the points to enter between strands rather than hitting "dead center" which could cut a strand in two. Additionally, this contour also provides an improved weather-tight seal against the conductor insulation because there is a continuing tighter fit on the insulation due to the increase in diameter of the piercing teeth which aids in keeping moisture from entering the point at which the insulation **38** is pierced. The increasing diameter configuration allows for a good electrical contact in that it provides a wedging action of the surface of the piercing points against the strands **37**. Additionally, light serrations, not shown, can be formed on the teeth to abrade the contact surfaces with the cable strands to provide a lower resistance contact due to scratching of the wire.

Pressure pad **31** has a flat upper surface **40** which is pivotally connected to the under surface **41** of cover **21** and a lower contoured or arcuate surface **42** formed to receive therein in snug fit cable **39** and embrace the insulation **38** thereof. The pressure pad is generally rectangular in shape with sides **43** and **44** and ends **45** and **46**. The longitudinal dimension or length of pressure pad **31** is such that it can be rotated about its pivotal connection provided by pin **47** which passes through hole **48** in pad **31** to be embedded in the surface **41** of cover **21** without encountering skirt **22** of the cover. The ends **45** and **46** can be arcuate so as to complement the circular configuration of the skirt. The distance between sides **43** and **44**, or the width of the pressure pad, is less than the distance between sides **28** and **29** of body **24** so that the pressure pad can be disposed within U-slot **25** in the assembled condition of the device.

To use the connector, the lineman merely disposes the connector so that the cable is within groove **25** and then places pad **31** therein and engages the threads **23** of skirt **22** of cover **21** with the threads **29** and **30** of body **28**. As the cover is rotated in a clockwise direction, as seen in FIG. 1, the pressure pad pushes down on the insulation of the cable forcing the cable against the piercing points **35** and **36** which pierce insulation **38**. Sides **27** and **28** together with the insulation support the cable during the movement of the piercing points therein. The points find their way through the insulation and between strands **37** due to the configuration of the points and the spacing of the points. Since the piercing contact member **32** is formed of a conducting material, the contact member **32** is in electrical continuity with the strands of cable **39**.

In actual practice, when the connector is used for tapping off from cable **39**, the tap off line would be connected to contact member **32** through use of a connector having a threaded projecting portion which can be received within the threaded insert **33**.

In FIG. 5 a tap off line **50** is shown having affixed to its end a connector **51** with such a threaded projection which is indicated by the numeral **52** in FIG. 5. It is noted that in FIG. 5 a housing **53** having a funnel-shaped central portion **54**, cylindrical end **55** and a larger cylindrical end **56** is shown and the body of the connector in that embodiment has in addition to threads **29** and **30**, a threaded portion **57** which can receive the threads on the inside surface of cylindrical portion **56**, these threads being indicated by the numeral **58**. Housing **53** is designed so that its smaller cylindrical end **55** can firmly enclose the insulation of cable **50** and its cylindrical end **56** can be fastened to the connector body. It is noted also that although the cover **21** in FIG. 5 is the same cover used in FIGS. 1–4 and the cable is indicated by the numeral **39** as in the earlier figures, the body is different since it is provided with a well portion **59** in its face which receives the piercing contact member **32** so that the well can be filled with a corrosion inhibitor which becomes sealed as nut **60** is tightened. The corrosion inhibitor can be placed in well **59** at the factory and is useful in bimetallic connections such as where the material from which the contact material **32** is formed is different from the material from which the smaller connector **51** is formed.

FIGS. 6–8 show a connector which is substantially identical to the connector shown in the earlier figures having a cover **61** with a depending peripheral skirt **62** and a pressure pad **63** pivotally attached thereto. A body **64** is provided having a U-groove **65** and a piercing contact member **66**. The body **64** and piercing contact member **66** are respectively identical with body **24** and piercing contact **32** previously described. The cover **61** is identical to the cover **21**, previously described. In this embodiment, however, an adapter **67** is provided which is substantially cylindrical having a surface **68** which is complementary to the surface **69** of pad **63** and which has projecting members **70** and **71** which can be received within holes **72** and **73** formed in pressure pad **63**. The adapter **67** is provided with a groove which is arcuate and which is formed to receive therein a snug fit cable **74**, the groove being indicated by the numeral **75** in the figures.

In the subject invention it is important in certain applications to have as snug a fit as possible so that the cable is held firmly in position when the piercing points are allowed to enter into it. With small diameter cables the embodiment disclosed in FIGS. 1–4 may not be completely satisfactory and therefore provision is made in the embodiment in FIG. 6 of an adapter with projecting members received within complementary formed recesses in the pressure pad.

In FIG. 9 two connectors of the type shown in the embodiments previously described are shown but conducting pin **76** having threaded ends is received within the threaded inserts **77** and **78** of connectors **79** and **80**, respectively. Thus, the piercing contact member **81** of connector **79** provides continuity with the piercing contact member **82** of connector **80** to electrically connect cables **83** and **84** when covers **85** and **86** of connectors **79** and **80**, respectively, are tightened forcing the piercing points of members **81** and **82** into their respective cables. The cables **83** and **84** are therefore coupled together in substantially parallel relationship.

In FIG. 10 a lightning-arrester **87** is shown having a threaded projecting member **88** which can be received within the threaded insert **89** of piercing contact member **90** of connector **91** to couple the lightning-arrester to cable **92** with insulating washer **93** providing insulation against weather and against animals or dirt.

It is seen, therefore, that a reliable connector has been provided which has many applications and which provides both a weather-tight and animal-proof seal, which seal is made at the time the connector is applied and the connector can be applied without the necessity of the lineman stripping the insulation from the cables involved, which, of course, necessitates the reapplication of insulation after the connection is made. The seal can be more effectively insulated through the use of insulating grease which can be applied at the factory and which can be confined and firmly held in position as the connector is tightened and this insulation or insulating grease need not be applied by the lineman. When used in certain applications, an improved bimetal joint is made, such as when a transformer connection is made. For example, the teeth can be in contact with aluminum cable and these piercing contact members would also be aluminum and the fittings that go on the lead cable would be copper so that the transition of aluminum to copper in the stud could be sealed by factory installed inhibitor which, if an electrolyte is excluded prevents galvanic corrosion.

Thus, among others, the several objects in the invention, as specifically aforenoted, are achieved. Obviously, numerous changes in construction and rearrangement of parts might be resorted to without departing from the spirit of the invention as defined by the claim.

I claim:

1. A connector for a cable having a plurality of strands of substantially equal diameter and a surrounding insulation including in combination a non-conducting cylindrical body, a transverse groove formed in said body at one end thereof, a threaded portion of said body, a non-conducting cover, a threaded section of said cover engageable with said threaded portion, a non-conducting pressure pad pivotally attached to said cover and dimensionally formed to be received within said groove, said pad having a first arcuate surface of relatively large dimension, an adaptor adjacent said pressure pad nd formed to be embraced by said arcuate surface, a second arcuate surface of said adaptor having a dimension less than the dimension of said first arcuate surface, a contact member supported by said body and formed of a conducting material, an exposed threaded well of said contact member, a plurality of electrically conducting pierc-

ing points formed on said contact member and which project within said groove, each of said piercing points being in length sufficient to pass between two layers of strands of said plurality and said insulation and each of said piercing points having a contoured point with its apex away from said body and a base adjacent said body and being spaced from adjcent piercing points a distance greater than the diameter of one of said strands of said plurality allowing a straddling of said strands, whereby upon said threaded portion and said threaded section being engaged and said cover and said body drawn together said adaptor is forced against said cable and said piercing points are forced through said insulation and between strands, and means to maintain said adaptor in position on said pressure pad while the cable is being pierced.

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