

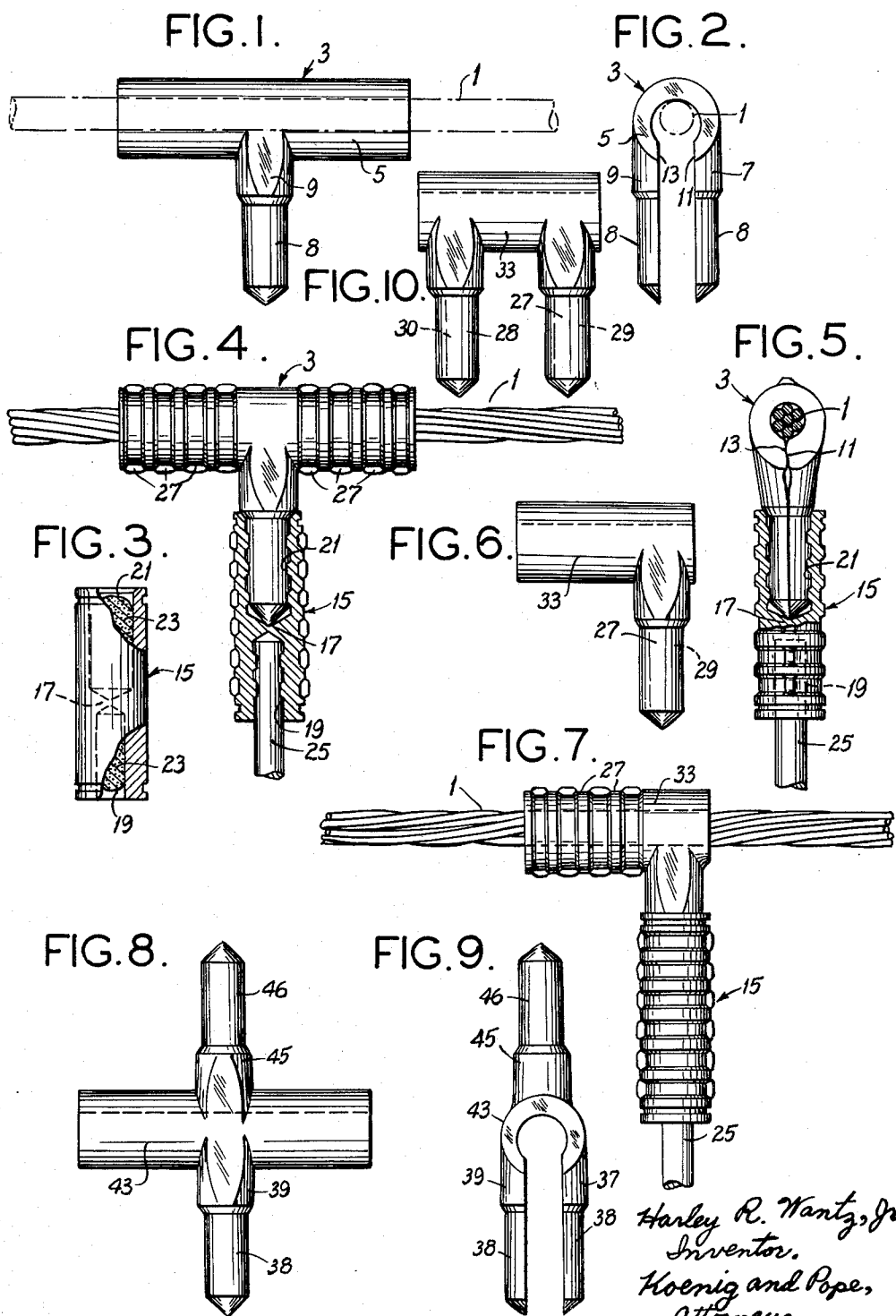
Sept. 19, 1961

H. R. WANTZ, JR

3,001,000

ELECTRICAL COMPRESSION CONNECTORS

Filed May 28, 1958



1

3,001,000

ELECTRICAL COMPRESSION CONNECTORS

Harley R. Wantz, Jr., Centralia, Mo., assignor to A. B. Chance Company, Centralia, Mo., a corporation of Missouri

Filed May 28, 1958, Ser. No. 738,537

8 Claims. (Cl. 174-71)

This invention relates to electrical compression connectors and more particularly to such connectors for interconnecting one or more electrical tap conductors to an electrical line conductor.

Among the several objects of this invention may be noted the provision of electrical compression connectors which will interconnect any combination of standard sizes of aluminum, copper or ACSR conductors; the provision of connectors in which the number of sizes thereof needed to interconnect all combinations of these various sized conductors is minimized; the provision of means for interconnecting tap conductors to line conductors which insures an initial and lasting high conductivity electrical and mechanical interconnection between conductors; the provision of such connectors which avoid the deleterious effects of so-called thermal ratcheting; and the provision of such electrical compression connectors which are inexpensive to manufacture and reliable in operation. Other objects and features will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the constructions hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawings, in which several of various possible embodiments of the invention are illustrated,

FIG. 1 is a side elevation of an electrical compression connector of the present invention positioned over a line conductor;

FIG. 2 is an end elevation of the connector of FIG. 1;

FIG. 3 is an elevation of a compression sleeve, with parts broken away, used in conjunction with the connector of FIGS. 1 and 2 in the interconnection of a tap wire to a line wire;

FIG. 4 is a side elevation with certain parts broken away illustrating the connector of FIGS. 1 and 2 secured to the sleeve of FIG. 3 permanently interconnecting a tap conductor to a line conductor;

FIG. 5 is an end elevation of the connector of FIG. 4 with parts broken away;

FIG. 6 is a side elevation of an alternate embodiment of an electrical connector of the present invention;

FIG. 7 is a side elevation of the connector of FIG. 5 and the compression sleeve of FIG. 3 constituting an L-connection for making a tap from a line conductor;

FIG. 8 is a side elevation of still another embodiment of an electrical compression connector of the present invention;

FIG. 9 is an end elevation of the connector of FIG. 8; and

FIG. 10 is a side elevation of an additional embodiment of an electrical connector of the present invention.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

In the interconnection of electrical conductors such as the tapping of a service conductor from a secondary or line conductor, it is important that high conductivity electrical connections be made. Not only must there be a good initial high conductivity connection, but it must be maintained over the years in spite of adverse ambient temperature and weather conditions. For example, the operating temperatures will vary with the ambient temperatures and electrical load conditions from values in excess of 100° C. to subzero Fahrenheit temperatures.

2

Even on a daily basis, there may be several cycles of wide temperature variation. In the usual T or L compression connectors which have a C-shaped body engaging the line conductor, this temperature cycling which continually expands and contracts the various metal components tends to effect what is termed as thermal ratcheting, whereby the mechanical pressure of the connector on the conductor tends to relax or lessen. Thus, the jaws of the C may be gradually pried apart, effecting a relaxation of the grip of the connector body on the conductor with an attendant increase of electrical resistance and a diminishing conductivity. Moreover, because of the large number of combinations of standard size line and tap conductors (#1/0, 1, 2, 4 and 6), it has heretofore been necessary to stock about fifteen sizes of connectors to enable a lineman to interconnect any of the standard size tap conductors to any of the standard size line conductors.

In accordance with the present invention, electrical connectors have been devised which are not susceptible to the thermal ratcheting described, and the relaxation of the connector relative to the conductor is prevented. Furthermore, only five different sizes of connectors need to be stocked to accommodate all combinations of interconnections that need to be made.

Referring now to the drawings, the bare electrical conductor constituting a small segment of a long run of a hot line is indicated at reference numeral 1. Positioned over and substantially encompassing conductor 1 is an electrical compression connector 3 comprising a one-piece casting of soft aluminum or some other malleable or deformable electrically conductive metal. Connector 3 includes an elongate trough-like body 5 of C-shaped cross section and integrally formed tongues or extensions 7 and 9 projecting outwardly from a central portion of the body on opposite sides of the C-opening and in the direction of the opening of the C. The inner surfaces of the C-opening of body 5 define or constitute a set of long jaws with opposing lips 11 and 13. These lips 11 and 13 are preferably substantially flat, but may be other configurations, such as having interlocking or mating surfaces. Extensions 7 and 9 are of semicircular cross section and constitute generally semicylindrical tongues with substantially flat inner surfaces generally opposed and parallel to each other and preferably coplanar with the surfaces of the lips 11 and 13 respectively. The spacing between the opposing inner surfaces of extensions 7 and 9 and the dimension of the inner periphery of the C-opening are determined by the circumference of the conductor over which the connector 3 is to be applied.

The outer ends or shanks of extensions 7 and 9 are reduced in radius as shown at 8 so that when the opposing surfaces thereof are brought together, as will be described below, the outer periphery is slightly less than the inner diameter of one of the sockets of a compression sleeve indicated generally at reference numeral 15. Sleeve 15 is a standard electrical component formed from an electrically conductive malleable metal such as soft aluminum and comprises a tubular body with a central partition or wall 17 defining two sockets 19 and 21. These sockets preferably contain measured amounts of any one of the usual electrical contact aid and inhibitor pastes 23 which improves conductivity and inhibits corrosion.

To interconnect a tap wire 25 to line conductor 1, connector 3 is slipped over a selected portion of conductor 1 and secured thereto by deforming the metal of the connector jaw several times as indicated at numerals 27. This is conveniently done by any of the various types of conventional crimping tools. This crimping operation not only presses the inner surfaces or jaws of the C-opening hard against the outer surfaces of conductor 1, but deforms the conductor surface, thereby mechanically interlocking them. This brings the opposing sur-

3

faces of extensions 7 and 9 together. These extensions are in effect half studs and when brought together constitute or form a whole stud, the reduced shank portion of which is diminished so as to fit relatively snugly into socket 21 of sleeve 15. The crimping operation is then repeated on the upper portion of the sleeve 15, thereby securing it to the split stud comprising extensions 7 and 9, as shown in FIGS. 4 and 5. To complete the tap, conductor 25 is inserted into socket 19 and the lower end of sleeve 15 is crimped to deform the side walls thereof, thereby securing conductor 25 within socket 19. This forms a T-connection between the tap wire and a line conductor 1 which will maintain a high conductivity electrical interconnection inasmuch as lips 11 and 13 of the jaws of the connector body 5 are permanently locked together by the retaining action of sleeve 15. This construction therefore prevents a decrease in clamping pressure of the jaws of body 5 on conductor 1 by thermal ratcheting.

The stud 8 is preferably made one standard size, e.g. corresponding to conductor size 1/0. Thus only five different size connectors 3 are needed to accommodate the five standard sizes of line conductors. The use of standard compression sleeves 15, which are stock items on a lineman's truck, is a further advantage because only five stock sizes, each with one socket dimensioned to accept this standard size stud, provides a most convenient arrangement for making all possible standard conductor interconnections.

In the embodiment of FIGS. 6 and 7, an L connector is illustrated. In this connector, extensions 27 and 29, formed integrally with an elongate body 33, project outwardly at right angles from an end portion of body 33. After body 33 is deformed by crimping to conductor 1, the split stud thereby formed by extensions 27 and 29 is secured within the upper socket of sleeve 15 while tap conductor 25 is similarly affixed within the lower sleeve socket, both operations being accomplished by crimping, as shown.

The embodiment of FIG. 10 is similar to that of FIG. 6 except that there is an additional pair of extensions 28 and 30 formed integrally with an elongate body 33 which project outwardly at right angles from the opposite end of body 33. This U-shaped connector after application to a line conductor has the additional advantage of having the jaws of the C-opening locked at both ends of body 33 when two sleeves 15 are applied to the two pairs of split studs. Thus, two different tap wires, or the ends of a U-shaped wire segment, can be interconnected to a line conductor, the latter arrangement forming a loop for attachment of detachable connectors.

The embodiment of FIGS 8 and 9 illustrates a connector which may be utilized to make two taps from a line conductor. This connector includes a body portion 43 and half studs or extensions 37 and 39, the reduced shank ends 38 of which are again adapted to be received in socket 21 of compression sleeve 15. A second stud 45 of generally circular cross section extends outwardly from body 43 in a direction opposite to that of extensions 37 and 39. This stud 45 is integral with body 43 and its reduced shank portion 46 is sized to fit in socket 21 of another sleeve 15. By introducing a line conductor into the C-shaped opening of body 43 and securing it thereto by crimping and similarly attaching two sleeves 15 to stud 45 and the mating half studs 37 and 39, a cross connection can be made between a line conductor and two different tap conductors of the same or different sizes.

It is to be understood that malleable metals of high electrical conductivity other than aluminum may be used to form the compression connectors of this invention. Also, it will be noted that the electrical conductors which are the same or dissimilar in size; solid or stranded; and aluminum, copper or ACSR may be conveniently interconnected by the connectors of this invention. The

4

crimping shown is of the banded indentation variety but it will be understood that other types of crimp indentations may be employed.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. An electrical compression connector comprising an elongate trough-like body of malleable conductive metal having a generally C-shaped cross section and adapted to be slipped over and substantially encompass a portion of a length of bare electrical conductor, said body having formed integrally therewith a pair of half studs, one of which projects therefrom at one side of the opening of the C and the other of which projects therefrom at the other side of the opening of the C, said half studs being spaced and opposed to one another, the opposed surfaces thereof all being substantially flat and lying in a single continuous plane, said body portion being adapted to be crimped around said bare conductor and said half studs being brought together with said flat opposed surfaces in close contact thereby to form a complete stud of substantially solid cross section adapted to have a compression sleeve applied thereto.

2. An electrical compression connector as set forth in claim 1 in which the half studs project outwardly from a central portion of the body in a direction normal to the longitudinal axis of said body, thereby forming a T-connector.

3. An electrical compression connector as set forth in claim 1 in which the half studs project outwardly from an end portion of the body in a direction normal to the longitudinal axis of said body, thereby forming an L-connector.

4. An electrical compression connector as set forth in claim 1 in which the half studs project outwardly from one end portion of the body in a direction normal to the longitudinal axis of said body, and which further includes a second pair of half studs projecting outwardly from the other end portion of the body in a direction normal to the longitudinal axis of said body, thereby forming a U-connector.

5. An electrical compression connector as set forth in claim 1 which further includes a second stud of generally circular solid cross section formed integrally with said body and projecting outwardly from the body in a direction normal to the longitudinal axis thereof.

6. An electrical compression connector as set forth in claim 1 in which the half studs are generally semicircular in cross section and the complete stud thereby formed has a reduced shank portion at its end away from the body.

7. An electrical compression connector comprising an elongate trough-like body of malleable conductive metal having a generally C-shaped cross section and adapted to be slipped over and substantially encompass a portion of a length of bare electrical conductor, the opening of the C constituting open jaws having substantially flat lips with opposing generally parallel surfaces, said body being formed integrally with a pair of half studs having generally semicylindrical studs, one of which projects from the body at one side of the opening at the C and the other of which projects from the body at the other side of the C, said studs having flat inner surfaces spaced from and opposed to one another, said opposed surfaces thereof all being substantially flat and lying in a single continuous plane, said stud surfaces being substantially coplanar with the respective lip surfaces, said body being adapted to be deformed by a crimping tool to completely surround and grip said bare conductor within said jaws,

5

the opposing surfaces of said half studs thereby being brought together to form a complete solid stud adapted to have a compression sleeve applied thereto and crimped therearound whereby said lip surfaces and said opposing stud surfaces are maintained in contact.

8. Means for interconnecting a bare electrical tap conductor to a bare electrical line conductor which comprises an electrical compression connector of malleable conductive metal comprising a longitudinally split tube, a length of bare electrical line conductor disposed within and substantially filling said tube, said conductor secured within said tube by deformed portions of said tube, a stud integral with and extending outwardly from said tube, said stud being split along a plane common with that of the split of the tube and thereby forming opposing inner faces which are substantially all flat and lying in a continuous plane, a compression sleeve, said split stud being fitted into one end of said compression sleeve and secured thereto by first deformed portions of said

6

sleeve, and a bare electrical tap conductor inserted into the other end of said sleeve and secured thereto by second deformed portions of said sleeve.

References Cited in the file of this patent

UNITED STATES PATENTS

186,503	Snook -----	Jan. 23, 1877
371,808	Waring -----	Oct. 18, 1887
2,136,814	Flynn -----	Nov. 15, 1938
2,811,706	Logan -----	Oct. 29, 1957

FOREIGN PATENTS

1,043,539	France -----	June 10, 1953
781,614	Great Britain -----	Aug. 21, 1957

OTHER REFERENCES

Publication I: "Crimpfit," Bulletin CR-57, published by Burndy Corporation, Norwalk, Conn., August 1957, page 16 relied on.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,001,000

September 19, 1961

Harley R. Wantz, Jr.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 66, for "studs" read -- shape --.

Signed and sealed this 20th day of February 1962.

(SEAL)

Attest:

ERNEST W. SWIDER

Attesting Officer

DAVID L. LADD

Commissioner of Patents

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,001,000

September 19, 1961

Harley R. Wantz, Jr.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 66, for "studs" read -- shape --.

Signed and sealed this 20th day of February 1962.

(SEAL)

Attest:

ERNEST W. SWIDER

Attesting Officer

DAVID L. LADD

Commissioner of Patents