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CIRCUIT CONTINUITY CHECK SPLICE

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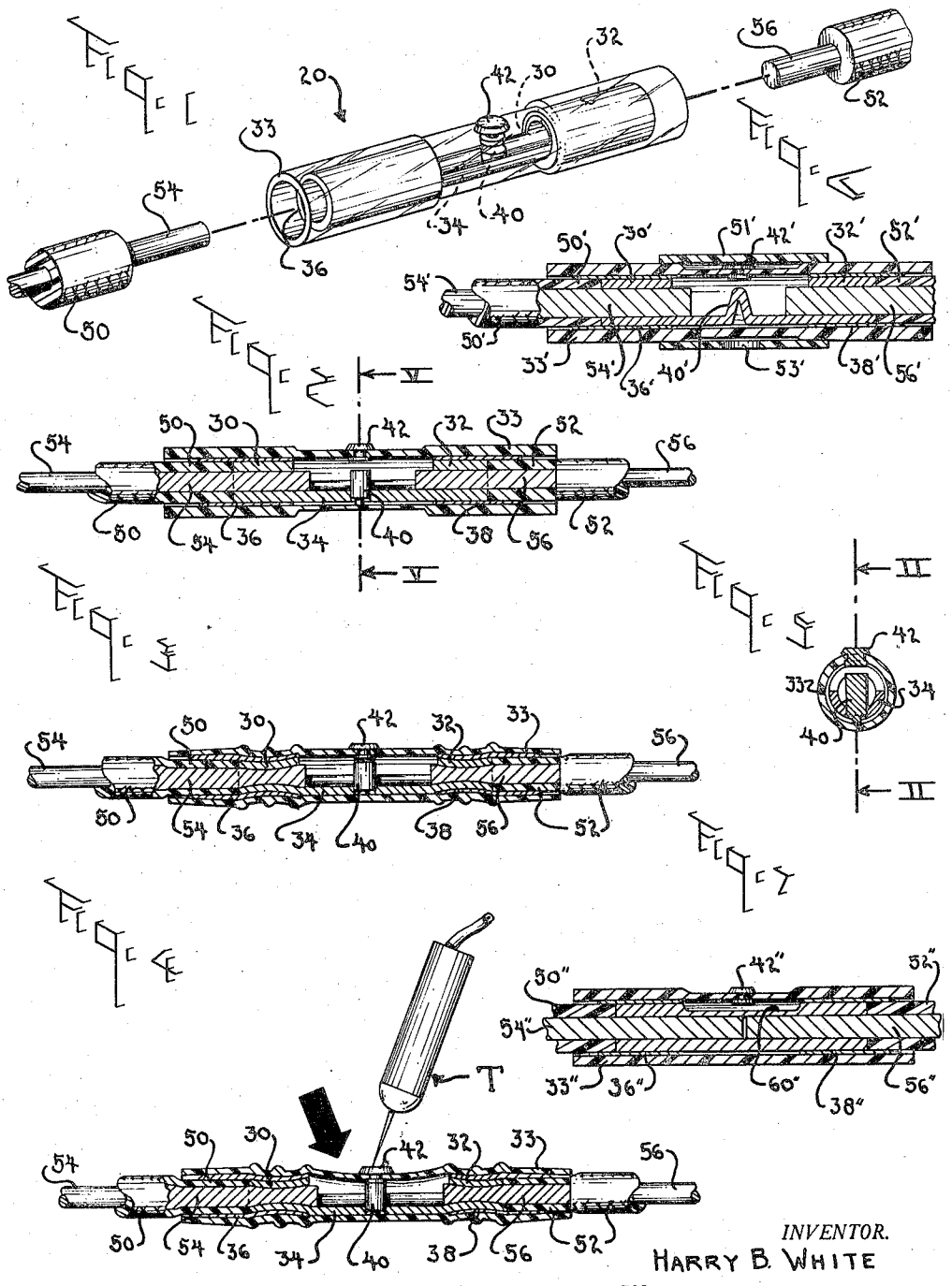

INVENTOR.
HARRY B. WHITE

BY

Curtis, Morris & Safford

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CIRCUIT CONTINUITY CHECK SPLICE

Harry B. White, Canton, Ohio, assignor to AMP Incorporated, Harrisburg, Pa.

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The technique of joining electrical wires has been considerably improved by use of the crimped electrical connector. This connector comprises a metal ferrule adapted to be cold forged onto the wire. Securing a wire to each end of the ferrule by means of a crimped connection achieves an excellent electrical connection.

A further improved form of the crimped type of electrical connection is disclosed in the patent to Watts, Patent No. 2,410,321. This patent teaches the improvement of providing an insulating sleeve over the outer surface of the connector to prevent the intrusion of moisture as well as prohibit the escape of electrical current from the circuit.

One difficulty in employing such a connection arises in the testing of the connection to ascertain whether or not a good electrically conductive joint has been formed. In a fairly complex circuit, several thousand (or more) of these crimped connections may be used. If a break occurs in the circuit, it is necessary to test each one of these conductive joints to determine whether or not it is carrying electricity.

It is an object of the present invention to provide an electrical connector which is sealed against the entrance of moisture, as well as the escape of electricity, wherein a means is provided for easily testing the electrically conductive joint without destroying it. This testing means is built into the connector without sacrificing any of the insulating properties described above.

It is also an object of this invention to provide an insulated electrical connection wherein the insulating sleeve is flexible so as to permit the contact in the circuit testing means to be operated between an open position and a closed position. Also the device incorporates a means for preventing over-flexure of the insulating sleeve, which may tend to destroy or weaken it, and a means for preventing inadvertent operation of the circuit testing assembly.

Other objects and attainments of the present invention will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings in which there is shown and described an illustrative embodiment of the invention; it is to be understood, however, that this embodiment is not intended to be exhaustive nor limiting of the invention but is given for purposes of illustration in order that others skilled in the art may fully understand the invention and the principles thereof and the manner of applying it in practical use so that they may modify it in various forms, each as may be best suited to the conditions of a particular use.

In the drawings:

Figure 1 is a perspective view of an electrical connector embodying principles of this invention;

Figure 2 is a plan view taken along cross sectional plane II—II of Figure 5 showing the device of Figure 1;

Figure 3 is a view similar to Figure 2 showing the electrical connector crimped onto a pair of electrical conductors;

Figure 4 is the identical connector of Figure 3, shown in its electrical conducting position;

Figure 5 is a plan view of a cross section taken through lines V—V on Figure 2; and

Figures 6 and 7 are modified forms of connectors embodying principles of this invention.

One embodiment of a connector incorporating principles of this invention is of the type known as a butt connector, as set forth in the patent to Broske, No. 2,478,082, issued August 2, 1949.

Referring now to the drawing, Figure 2 shows a pair of coaxial metal ferrules, **30**, **32** secured together by a metallic strap **34**. This assembly may be stamped out of a metallic sheet and rolled up so that the ferrules and the connecting strap are all integral. These ferrules are preferably made of copper, but may be made of any other material having good electrical conductive properties.

A seamless ferrule **36**, **38** may be placed over each of the ferrules **30**, **32** to prevent them from splitting open when crimping pressure is applied. Surrounding the entire assembly is a sleeve **33** of clear plastic insulation. This insulation is of the type capable of accepting crimping die pressure without shearing, rupturing or tearing. Preferably this plastic is transparent to permit visual inspection of the crimped connection.

The circuit continuity testing assembly comprises a metal stud or post **40** projecting from strap **34**. A metal contact member **42** is embedded in the surface of the insulating sleeve. As shown in Figures 2 through 5, the contact member **42** comprises a metal button which extends into the inner surface of the connector. The member **42** which extends into the inner surface of the connector is forced into snug engagement with the insulation sleeve and forms a waterproof seal therewith.

Insulated wires **50**, **52** having uninsulated end portions **54**, **56** are inserted within metal ferrules **30**, **32** respectively. As shown in the drawing, the inner edges of the wires **54**, **56** project through the ferrules **30**, **32** wherein they may be observed by the operator to assure proper positioning of the wires within the ferrules. The insulation on the wires is received by the outer metal ferrules **36**, **38** as well as the overlapping ends of the insulating plastic sleeve. In this position a plurality of crimps are impressed along the longitudinal surface of the insulating sleeve to join the outer ends of the sleeve to the insulation on the wire and the intermediate section of the connector to the conductor itself. This provides a mechanically secure, insulated, electrically conductive joint.

In this position the button **42** is disposed in spaced relationship from the stud **40** as illustrated in Figure 3. Electricity flowing through conductor **54** is conveyed through metal ferrule **30**, metal strap **34**, metal ferrule **32**, and into conductor **56**. When it is desired to test the joint to ascertain whether or not it is carrying an electrical current, the button **42** is depressed until it comes into contact with stud **40**. The flexible quality of the insulation permits movement of the button contact in this manner. A probe, designated by the letter T, or any other testing instrument may be applied to the contact **42** to take a reading of the electrical characteristics of the circuit.

The stud **40**, in addition to furnishing a means for testing the conductivity of the joint, also functions as a means for resisting over-flexure of the insulation sleeve. Since the button **42** may only be depressed the width of the air space between it and the post **40**, the degree of flexure required by the plastic is slight. The stud **40** prevents the insulation from being flexed an amount greater than the original distance between the contact **42** and the stud **40**.

It is also noted that the insulating sleeve **33** is recessed

slightly along its intermediate section, i. e., between the ferrules. This accommodates the contact button **42** while minimizing the diameter of the assembly in this area. Furthermore, this protects the button contact from accidentally touching a grounding means. However, even if this should happen, the member **42** will not make contact with the stud **40** unless the insulating sleeve **33** is depressed. The sleeve **33** is sufficiently rigid to require the application of positive pressure to depress the button **42**, which operates as another safeguard against accidental grounding of the circuit.

The embodiment depicted in Figure 6 is similar to the embodiment shown in Figures 1 through 5 except that a further precaution against accidental grounding resides in the provision of a slidable insulation sleeve **51'**, which insulates the contact **42'**. An opening **53'** in sleeve **51'** is located near the button **42'**. When it is desired to test the circuit, the sleeve may be either moved longitudinally or else rotated to align the opening **53'** and the button **42'** thus exposing the contact **42'**. After testing, the sleeve **51'** may be returned to its insulating position. The sleeve **50'** may be knurled at either or both ends to prevent accidental displacement.

Figure 6 also illustrates how the stud **40** may be omitted and the strap **34'** deformed in such a manner as to perform the same function as the stud. In this form the strap is bent into the shape of an inverted U **40'** with the bight of the U being disposed the desired distance from the button contact.

Figure 7 shows an embodiment of the invention, also similar to Figures 1 through 5, except that a reduced central portion **60''** is provided so that the distance between button **42''** and the central portion **60''** provides the necessary air space to permit the assembly to function as a testing device.

The embodiments shown in Figures 6 and 7 operate in the same manner as the embodiment shown in Figures 1 to 4. Elements in Figure 6, corresponding to elements in Figures 1 through 5 are designated by prime numbers. In Figure 7 double prime numbers are used.

Thus it is seen that applicant has provided a strong, secure, crimped connection which may be easily tested for conductivity without destroying the insulation and moisture proof properties.

Changes in construction will occur to those skilled in the art and various apparently different modifications and embodiments may be made without departing from the scope of the invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only. The actual scope of the invention is intended to be defined in the following claims when viewed in their proper perspective against the prior art.

I claim:

1. An insulated electrical connection joining a plurality of conductors and including a pair of coaxial metal ferrules joined by a metal strap, a metal stud extending from the strap, a flexible plastic sheath surrounding the entire assembly, and a metal contact member extending through the sheath in the vicinity of the metal stud, whereby the plastic sheath may be deformed to permit the metal contact member to engage the stud.

2. The device of claim 1 wherein the plastic sheath has a reduced external diameter in the vicinity of the strap.

3. An insulated electrical connector including a pair of coaxial metal ferrules joined by a metal strap, a flexible insulating sleeve tightly covering the ferrules and overlapping the outer ends of the ferrules, a metal member embedded in the plastic sleeve with one metal surface exposed to the interior of the sleeve and the opposite metal surface exposed to the interior of the sleeve, and said metal member being movable into or out of electrical engagement with the metal strap to permit testing the electrical continuity of the circuit.

4. The device of claim 3 including a second insulating sleeve surrounding the metal member, said insulating sleeves being relatively movable.

5. The device of claim 4 including an opening in the second insulating sleeve, said opening being aligned with the metal member in one relative position of the sleeves.

6. The device of claim 3 wherein the metal strap is U-shaped.

7. An electrical connector including a pair of longitudinally coaxial metal ferrules joined by a metal strap, a flexible insulation sleeve tightly covering the ferrules, a metal member embedded in the sleeve between the ferrules and opposed to the metal strap, a metallic projection on the strap extending toward the metal member, and said metal being normally spaced from the projection but movable by flexure of the insulation sleeve into contact with the projection.

8. An insulated electrical splice including a metal ferrule, a radially extending opening in the ferrule near its mid-point, a flexible insulating sleeve surrounding the ferrule, an electrically conductive member projecting from the ferrule in the vicinity of the opening, and an electrical contact member embedded in the plastic sleeve in the vicinity of the electrically conductive member and spaced therefrom projecting from the ferrule, whereby flexure of the insulating sleeve permits contact between the contact member and the electrically conductive member.

References Cited in the file of this patent

UNITED STATES PATENTS

2,025,564	Blake	Dec. 24, 1935
2,605,314	Schelke	July 29, 1952

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,852,631 September 16, 1958

Harry B. White

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

Column 4, line 17, claim 3, for the word "interior" read -- exterior --.

Signed and sealed this 16th day of December 1958.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents

UNITED STATES PATENT OFFICE

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