Nov. 4, 1941. E. E. HOLKE 2,261,372

MEANS FOR JOINING ELECTRICAL CONDUCTORS AND THE LIKE

Filed July 15, 1940

Fig. 1

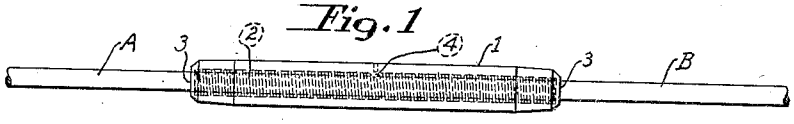


Fig. 2

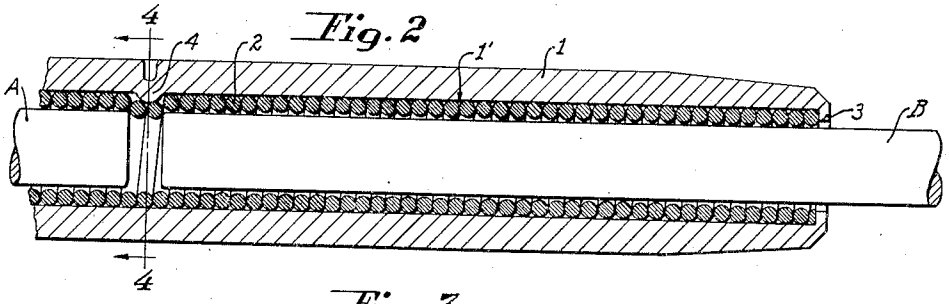


Fig. 3

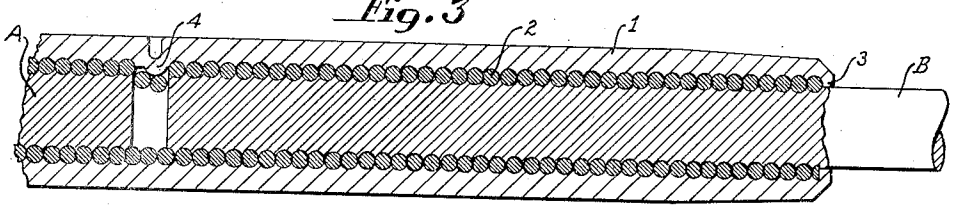


Fig. 5

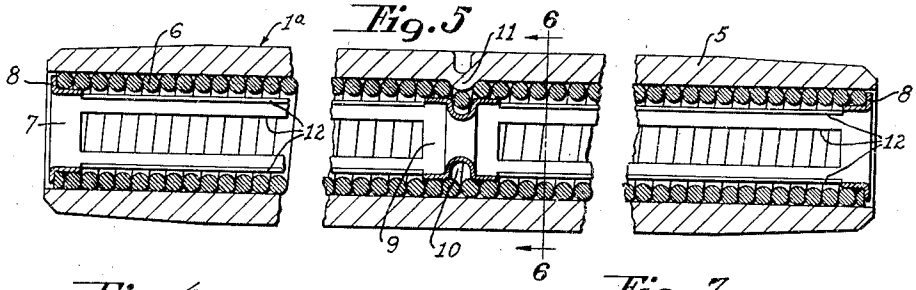


Fig. 4

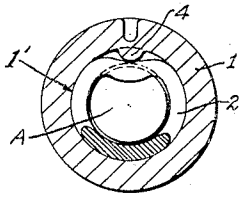


Fig. 7

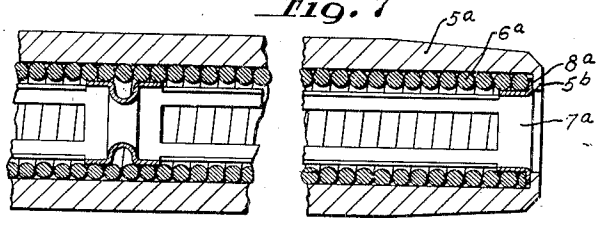
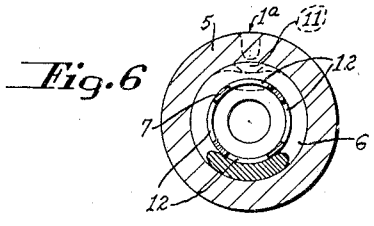


Fig. 6



INVENTOR
EUGENE E. HOLKE
BY Ewell Harrington,
ATTORNEY

Patented Nov. 4, 1941

2,261,372

UNITED STATES PATENT OFFICE

2,261,372

MEANS FOR JOINING ELECTRICAL CONDUCTORS AND THE LIKE

Eugene E. Holke, St. Louis, Mo., assignor to James R. Kearney Corporation, St. Louis, Mo., a corporation of Missouri

Application July 15, 1940, Serial No. 345,529

8 Claims. (Cl. 287—109)

This invention relates generally to the art of joining electrical conductors and the like, and more specifically to improved means for joining electrical conductors which involves the use of sleeve type connectors into the opposite ends of which end portions of the conductors to be joined are inserted after which the connectors are compressed, by pressure applied thereto, onto the inserted end portions of the conductors being joined, the predominant object of the invention being to provide an improved connector of the sleeve type, which, because of the unique construction and arrangement of the connector, serves to provide a joint of great mechanical strength and perfect electrical conductivity.

Fig. 1 is a side elevation of a joint between a pair of electrical conductors produced in accordance with this invention.

Fig. 2 is an enlarged fragmentary longitudinal section taken through an uncomplete joint as it appears when the elements of the joint have been assembled but before final completion of the joint.

Fig. 3 is a view similar to Fig. 2 but showing the joint in a completed condition.

Fig. 4 is a cross-section taken on line 4—4 of Fig. 2.

Fig. 5 is a fragmentary longitudinal section of a modified form of the invention showing the sleeve-type connector out of association with electrical conductors.

Fig. 6 is a cross-section taken on line 6—6 of Fig. 5.

Fig. 7 is a fragmentary longitudinal section of a slightly modified form of the form of the invention shown in Fig. 5.

In the drawing, wherein are shown for the purpose of illustration, merely, several embodiments of the invention, A and B designate in Figs. 1, 2, and 3, a pair of electrical conductors which in Figs. 1 and 3 are joined in accordance with the present invention, and in Fig. 2 are assembled for joining in accordance with the present invention. Associated with the conductors A and B is a connector 1 which is in the form of a sleeve open from end to end, said sleeve preferably being formed from a readily malleable material which is characterized by being a good conductor of electricity, such, for instance, as thoroughly annealed copper tubing. The connector 1 is preferably circular in cross-section, and if desired its opposite end portions may be slightly tapered as illustrated. Disposed within the connector 1 is a coil spring 2 whose outer diameter is approximately the same as the diameter of the opening 1' extended through the connector 1, said coil spring preferably being formed from material which is of greater hardness than the connector 1, such, for instance, as Monel metal. At the opposite ends of the connector 1 inwardly extended, annular flanges 3 are suitably formed thereon, the opposite ends of the coil spring 2 abutting against said flanges whereby the coil spring is retained within the connector when said connector is not in use. Also at the approximate longitudinal center of the connector 1 a portion 4 of the wall thereof is forced inwardly by a punching operation, or otherwise, as shown in Figs. 1, 2, and 3, the coils of the coil spring 2 immediately adjacent to said inwardly extended portion 4 being distorted and compressed slightly by said portion as shown to the best advantage in Fig. 4.

In producing a joint between a pair of conductors, or the like, in accordance with this invention, the end portions of the conductors to be joined are introduced into opposite ends of the connector 1 until the adjacent, inner ends of the conductors abut against the coils of the coil spring 2 which are distorted by the presence of the inwardly projected portion 4. When the end portions of the conductors have been so introduced into the connector 1 the adjacent inner ends of the conductors will be located at the approximate longitudinal center of the connector, thus insuring disposition of the proper length of each of the joined conductors within the connector to produce a secure joint. When the end portions of the conductors to be joined are disposed within the connector 1 as described the coils of the coil spring 2 are interposed between the outer surfaces of the conductors and the wall of the opening extended through the connector as shown in Fig. 2.

When the connector 1 and the conductors to be joined thereby are assembled as described, and as shown in Fig. 2, pressure is applied externally to the connector 1 by suitable means, such as forming rollers, forming dies, or otherwise, to force the wall of the connector into intimate contact with the inserted portions of the conductors, such operation resulting in a reduction of the diameter of the connector. As a result of the diameter-reducing pressure to which the connector 1 is subjected the harder coils of the coil spring 2 are embedded both in the material of the connector and in the material of the conductors, as shown in Fig. 3, and consequently a joint is provided between the conductors which is an interlocked mass of materials

which is of greater strength than the strength of the conductors themselves.

In the form of the invention illustrated in Figs. 5 and 6 the connector 1*a* comprises an outer sleeve 5 which is formed of copper or other readily malleable material, which outer sleeve may, if desired, be tapered at its opposite ends. Arranged within the outer sleeve 5 is a coil spring 6 formed of a material such as Monel metal which is harder than the material of the outer sleeve, and disposed within the outer sleeve 5 and the coils of the coil spring 6 is an inner, tubular element 7. The opposite end portions of the inner, tubular element 7 are preferably in the form of complete circles, having outwardly extended, annular flanges 8 at their outer ends against which the opposite ends of the coil spring 6 abut.

At the approximate longitudinal center of the inner tubular element 7 a portion 9 is provided which is also in the form of a complete circle, and the wall of this center portion 9 has an annular depression 10 formed therein, and a portion 11 of the wall of the outer sleeve 5 is forced inwardly by a punching or other operation to force a portion of one of the coils of the coil spring 6 into this depression as shown in Fig. 5. At the opposite sides of the center portion 9 of the inner, tubular element 7 the portions of said element 7 located between said center portion and the end portions at the opposite ends thereof are provided with a plurality of longitudinally extended slots 12 which are spaced circumferentially of said element as shown in Fig. 6. Because the inwardly forced portion 11 of the outer sleeve 5 is forced between a pair of coils of the coil spring 6 and because a coil of said coil spring is forced into the depression 10 of the inner, tubular element 7, the coil spring and the inner, tubular element are fixedly anchored in their proper positions within the outer sleeve 5.

The function of the inner, tubular element 7 is to prevent loose ends of conductors in the form of cables and burrs on improperly cut ends of single strand conductors from catching on the coils of the coil spring 6 and thereby interfering with convenient insertion of the end portions of the conductors into the connector 1*a*, said inner, tubular element serving as a guide for the end portions of the conductors as they are being inserted into the connector which leads the end portions of the conductors to their proper positions within the connector where their ends abut against the annular depressed portion of the center portion 9 of the inner, tubular element.

In producing a joint between a pair of conductors with the aid of the connector 1*a*, shown in Figs. 5 and 6, the same procedure is followed as that already described herein in connection with the form of the invention illustrated in Figs. 1 to 4, inclusive. In other words, external pressure is applied to the outer sleeve which reduces the diameter of said outer sleeve and causes the harder coils of the coil spring 6 to be embedded in the material of both the outer sleeve and the conductors being joined, this embedding of the coils of the coil spring taking place at the locations of the longitudinal slots 12.

The connector illustrated in Fig. 7 differs from the structure shown in Fig. 5 only in the manner of anchoring the coil spring 6*a* and the inner, tubular element 7*a* within the outer sleeve 5*a*. In other words, instead of employing an inwardly forced portion, such as the portion 11 of Fig. 5, which projects between coils of the coil spring, and forcing a coil of the coil spring into a depression of the inner, tubular element, such as the depression 10 of Fig. 5, the outer sleeve 5*a* of the connector of Fig. 7 is provided at its opposite ends with inwardly extended, annular flanges 5*b* which overlap and engage the flanges 8*a* of the inner, tubular element 7*a* and thus retain the coil spring and inner, tubular element in place therein.

I claim:

1. A connector for producing joints between electrical conductors comprising a hollow elongated element into the opposite ends of which end portions of a pair of conductors to be joined are inserted, a coil spring disposed within said hollow elongated element in such manner that the coils of said coil spring are interposed between the inner face of said hollow elongated element and the outer surfaces of the inserted portions of conductors to be joined by the connector, said coil spring being formed of material which is harder than the materials from which the hollow elongated element and the conductors are formed, said hollow elongated element being formed of readily malleable material and being adapted to be compressed onto the inserted portions of the conductors to be joined so as to cause the coils of the coil spring to be embedded in the material of both the hollow elongated element and the inserted portions of the conductors, and means for retaining the coil spring in its proper position within said hollow elongated element when the connector is not in use.

2. A connector for producing joints between electrical conductors comprising a hollow elongated element into the opposite ends of which end portions of a pair of conductors to be joined are inserted, a coil spring disposed within said hollow elongated element in such manner that the coils of said coil spring are interposed between the inner face of said hollow elongated element and the outer surfaces of the inserted portions of conductors to be joined by the connector, said coil spring being formed of material which is harder than the materials from which the hollow elongated element and the conductors are formed, said hollow elongated element being formed of readily malleable material and being adapted to be compressed onto the inserted portions of the conductors to be joined so as to cause the coils of the coil spring to be embedded in the material of both the hollow elongated element and the inserted portions of the conductors, and means for retaining the coil spring in its proper position within said hollow elongated element when the connector is not in use, said coil spring retaining means comprising portions at opposite ends of the hollow elongated element against which the opposite ends of the coil spring abut.

3. A connector for producing joints between electrical conductors comprising a hollow elongated element into the opposite ends of which end portions of a pair of conductors to be joined are inserted, a coil spring disposed within said hollow elongated element in such manner that the coils of said coil spring are interposed between the inner face of said hollow elongated element and the outer surfaces of the inserted portions of conductors to be joined by the connector, said coil spring being formed of material which is harder than the materials from which the hollow elongated element and the conductors are formed, said hollow elongated element being formed of readily malleable material and being adapted to be compressed onto the inserted por-

tions of the conductors to be joined so as to cause the coils of the coil spring to be embedded in the material of both the hollow elongated element and the inserted portions of the conductors, and means for retaining the coil spring in its proper position within said hollow elongated element when the connector is not in use, said coil spring retaining means comprising annular flange portions at opposite ends of the hollow elongated element against which the opposite ends of the coil spring abut.

4. A connector for producing joints between electrical conductors comprising a hollow elongated element into the opposite ends of which end portions of a pair of conductors to be joined are inserted, a coil spring disposed within said hollow elongated element in such manner that the coils of said coil spring are interposed between the inner face of said hollow elongated element and the outer surfaces of the inserted portions of conductors to be joined by the connector, said coil spring being formed of material which is harder than the materials from which the hollow elongated element and the conductors are formed, said hollow elongated element being formed of readily malleable material and being adapted to be compressed onto the inserted portions of the conductors to be joined so as to cause the coils of the coil spring to be embedded in the material of both the hollow elongated element and the inserted portions of the conductors, and means for limiting movement of the inserted end portions of the conductors to be joined by the connector inwardly of said hollow elongated element.

5. A connector for producing joints between electrical conductors comprising a hollow elongated element into the opposite ends of which end portions of a pair of conductors to be joined are inserted, a coil spring disposed within said hollow elongated element in such manner that the coils of said coil spring are interposed between the inner face of said hollow elongated element and the outer surfaces of the inserted portions of conductors to be joined by the connector, said coil spring being formed of material which is harder than the materials from which the hollow elongated element and the conductors are formed, said hollow elongated element being formed of readily malleable material and being adapted to be compressed onto the inserted portions of the conductors to be joined so as to cause the coils of the coil spring to be embedded in the material of both the hollow elongated element and the inserted portions of the conductors, and means for limiting movement of the inserted end portions of the conductors to be joined by the connector inwardly of said hollow elongated element, said means comprising an inwardly projected portion of the wall of said hollow elongated element which displaces a portion of said coil spring to provide an abutment for the ends of the inserted portions of the conductors.

6. A connector for producing joints between electrical conductors comprising a hollow elongated element into the opposite ends of which end portions of a pair of conductors to be joined are inserted, a coil spring disposed within said hollow elongated element in such manner that the coils of said coil spring are interposed between the inner face of said hollow elongated element and the outer surfaces of the inserted portions of conductors to be joined by the connector, said coil spring being formed of material which is harder than the materials from which the hollow elongated element and the conductors are formed, said hollow elongated element being formed of readily malleable material and being adapted to be compressed onto the inserted portions of the conductors to be joined so as to cause the coils of the coil spring to be embedded in the material of both the hollow elongated element and the inserted portions of the conductors, means for limiting movement of the inserted end portions of the conductors to be joined by the connector inwardly of said hollow elongated element, and means located at opposite ends of the hollow elongated element for retaining the coil spring in its proper position within the hollow elongated element when the connector is not in use.

7. A connector for producing joints between electrical conductors comprising a hollow elongated element into the opposite ends of which end portions of a pair of conductors to be joined are inserted, a coil spring disposed within said hollow elongated element in such manner that the coils of said coil spring are interposed between the inner face of said hollow elongated element and the outer surfaces of the inserted portions of conductors to be joined by the connector, said coil spring being formed of material which is harder than the materials from which the hollow elongated element and the conductors are formed, said hollow elongated element being formed of readily malleable material and being adapted to be compressed onto the inserted portions of the conductors to be joined so as to cause the coils of the coil spring to be embedded in the material of both the hollow elongated element and the inserted portions of the conductors, and a longitudinally slotted inner tubular element disposed within the coil spring for guiding end portions of conductors to be joined by the connector during their insertion into the connector.

8. A connector for producing joints between electrical conductors comprising a hollow elongated element into the opposite ends of which end portions of a pair of conductors to be joined are inserted, a coil spring disposed within said hollow elongated element in such manner that the coils of said coil spring are interposed between the inner face of said hollow elongated element and the outer surfaces of the inserted portions of conductors to be joined by the connector, said coil spring being formed of material which is harder than the materials from which the hollow elongated element and the conductors are formed, said hollow elongated element being formed of readily malleable material and being adapted to be compressed onto the inserted portions of the conductors to be joined so as to cause the coils of the coil spring to be embedded in the material of both the hollow elongated element and the inserted portions of the conductors, a longitudinally slotted inner tubular element disposed within the coil spring for guiding end portions of conductors to be joined by the connector during their insertion into the connector, and means for retaining said coil spring and said inner tubular element in their proper positions within said hollow elongated element.

EUGENE E. HOLKE.