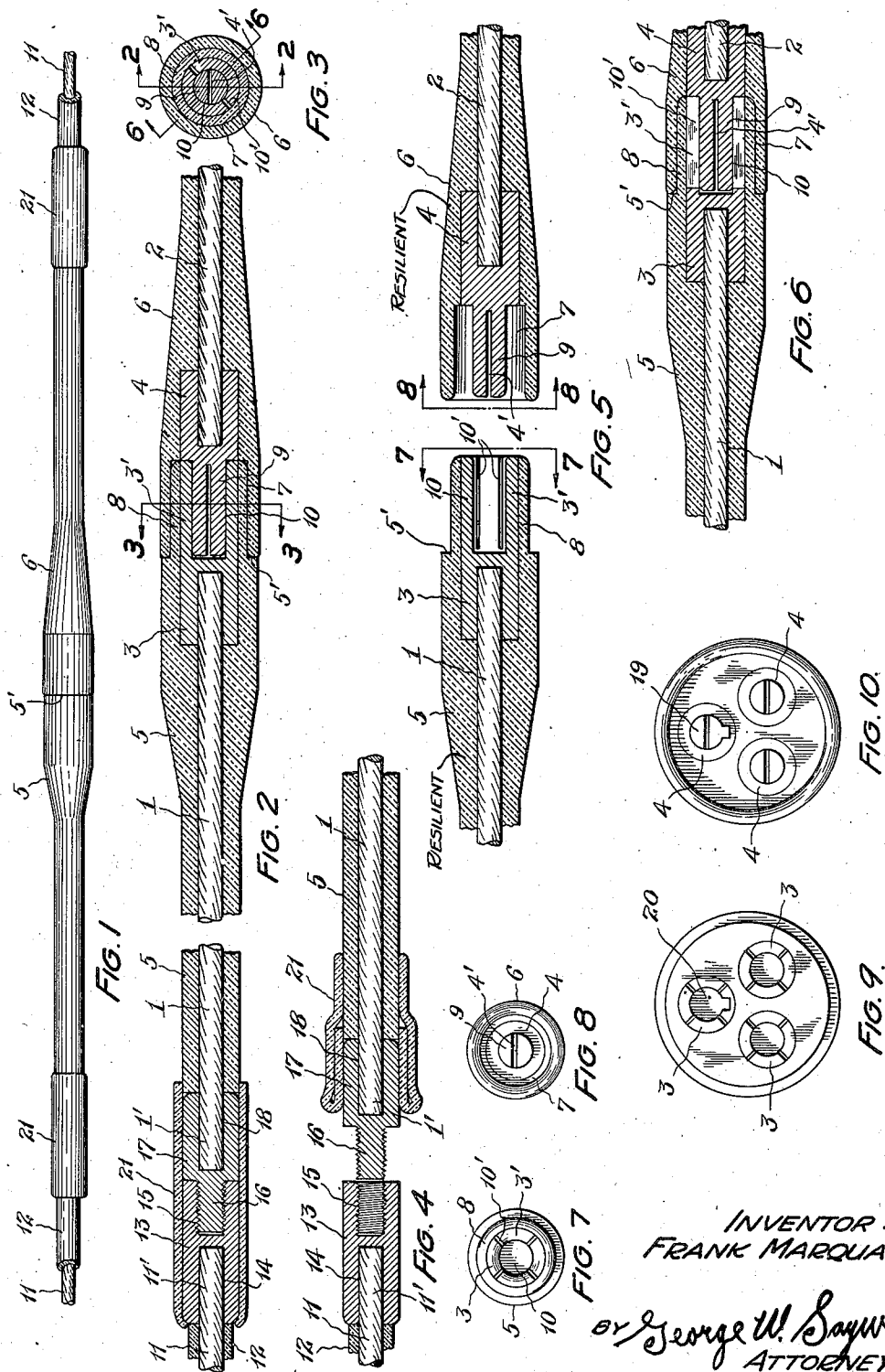


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F. MARQUART  
ELECTRICAL CONNECTER

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## ELECTRICAL CONNECTER

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My invention particularly relates to means of this character adapted to provide water-proof and weather-proof connections which are not subject to injury by dropping or contact with any hard object, which do not expose live wires and are not otherwise dangerous or subject to short circuits, which lend themselves to simple and cheap production and quick attachment or detachment, and which are very durable. My invention also includes an improved coupling member for detachably securing an electrical connector to a conducting wire, although no claims are included in this application to the particular coupling improvements. Although my improvements are applicable to all fields where electrical connectors of the described nature are used, these improvements find their largest field of usefulness in activities requiring rather frequent connection and disconnection of connector parts or re-arrangement of conductors with which the connectors co-operate, such as connections for lifting magnets, cranes, electric tractors, addition of new batteries, replacement of old batteries, etc.

The annexed drawing and the following description set forth in detail certain means embodying my invention, such disclosed means constituting, however, but two of the various forms in which the principle of the invention may be illustrated.

In said annexed drawing:

Figure 1 is an elevation of a complete connector embodying the several elements of my invention and including two of my coupling members;

Figure 2 is a broken axial section, taken in the plane indicated by the line 2—2, Figure 3, and upon an enlarged scale, of a portion of the elements shown in Figure 1, this view illustrating substantially the entire improvement, inasmuch as the omitted elements are either duplicates or parts of continuous conducting members which do not differ from those actually shown in this figure;

Figure 3 is a transverse section, taken in the plane indicated by the line 3—3, Figure 2;

Figure 4 is an axial section of two detached parts of the improved coupling member forming part of my invention;

Figure 5 is an axial section of the two parts of the improved connector, the two parts being shown in detached condition;

Figure 6 is a fragmentary axial section of the connector shown in Figure 2, this section being

taken, however, in the plane indicated by the line 6—6, Figure 3;

Figures 7 and 8 are end elevations taken, respectively, from the planes indicated by the lines 7—7 and 8—8, Figure 5;

Figure 9 is an end view, similar to Figure 7, of a socket member suitable for a three-wire conductor; and

Figure 10 is a view, similar to Figure 8, of a plug suitable for a three-wire conductor and adapted to cooperate with the socket member shown in Figure 9, these Figures 9 and 10 embodying the same improvements as those shown in Figure 5 with the addition of a finder for insuring that connection of the plug and socket which will bring the proper wires of the three-wire system into electrical communication.

Referring to the annexed drawing in which the same parts are indicated by the same respective numbers in the several views, conductors 1 and 2 are secured at one end within a brass socket 3 and a brass plug 4, respectively. Vulcanized to these conductors 1 and 2, respectively, and to the outer face of the socket 3 and to the inner portion of the plug 4 are a pair of insulating resilient casings 5 and 6 which are composed of soft flexible rubber. These casings 5 and 6 extend beyond the ends of the conductors 1 and 2; in fact, extend outwardly as far as the outer ends of the socket 3 and plug 4 so as entirely to cover said socket and plug laterally. The extreme outer end of the soft rubber casing 6 is separated from a reduced plug end portion 9 by an annular space 7 which is adapted to receive the inner end portion 3' of the socket 3 and a reduced male portion 8 extending from the body portion of the rubber casing 5 and vulcanized to said inner end portion 3' so as to permit the telescoping together of the two parts of the connector and their co-operative engagement. The telescoping portions of the soft rubber casings 5 and 6 are held together by frictional engagement inasmuch as the outer diameter of the annular recess 7 in the casing 6 is slightly smaller than the outer diameter of the end portion 8 of the casing 5, the flexibility of the casing 6, however, permitting the ready telescoping together and separation of the casing ends, whereby an extremely weather-proof connection is provided between the two casings.

The outside diameter of the casing portion 8 is such as to provide a substantially smooth joint between the contacting ends of the casings 5 and 6 when the casings are secured together and the extreme outer end of the casing 6 contacts

with the shoulder 5' of the casing 5. The wall of the chamber 10 of the conducting socket 3 is divided into a plurality of sections by longitudinal slits 10' and the plug portion 9 of the member 4 is centrally subdivided by a slit 4', so that the plug 9 which has a diameter as large or even slightly larger than the diameter of the chamber 10 in the socket 3 will easily enter said chamber but be held therein very tightly by reason of the frictional engagement of the members 9 and 10. The telescoping portions of the casings 5 and 6 have a tendency to compress the contractile and expansible socket portion 3', and consequently tend to press the complementary contact elements 3 and 4 together, when these contact elements are connected together. The brass contact elements 3 and 4, because of their inherent resiliency, also react resiliently on the telescoping portions of the casings 5 and 6. Hence the connecting portions of the casings and the connecting portions of the contact elements mutually contribute to each other's effectiveness. The construction thus far described provides a convenient connector for frequent connection and disconnection of two conductors.

In order that this improved connector may be incorporated with and between severed conductor ends to provide the advantages hereinbefore set forth, or two independent conductors so connected, I have provided improved coupling members for connecting such conductor ends or independent conductors to the two respective parts of the aforesaid improved connector. These coupling improvements are particularly shown in Figure 4. Assume that a conductor 11 has been severed, the same being provided with the usual insulation 12, and that the two extreme end portions 11' of the severed ends have been stripped of the insulation 12. The connector conductors 1 and 2 are stripped for a short distance at their outer ends of their insulating casings 5 and 6, as, for example, the outer end 1' of the conductor 1. Then it is the intention to connect the stripped end 11' with the stripped conductor end 1' by means of my improved coupling member. Two conducting cores, 13 and 17, of substantially the same diameter, are formed with bores 14 and 18, respectively, adapted to receive the stripped conductor ends 11' and 1'. The core 13 is formed with a threaded bore 15, and the core 17 is formed with a cooperating threaded stem 16. These cores 13 and 17 are secured together and there is then vulcanized to the core 17 a soft, pliable, rubber sleeve 21, which sleeve is of substantially the diameter of the adjacent portions of the soft rubber casings 5 and 6, and hence, of considerably smaller diameter than the outside diameter of the cores 13 and 17. This sleeve 21 can be turned back upon itself, as shown in Figure 4, to permit the engagement, or disengagement, of the stem 16 and the bore 15 and, when the cores 13 and 17 have been secured together, by the engagement of the stem 16 and bore 15, the folded-over part of the sleeve 21 can be turned back into the condition shown at the left-hand end of Figure 2 and the coupling conducting cores thus encased in a weather-proof and water-proof cover. The construction described applies to the left-hand end of Figure 1 and the same construction and operation provides a coupling member between the other severed end 11' of conductor 11 and the stripped end of conductor 2. When such a coupling member has been secured to the two ends

of the severed conductor 11, the extreme inner ends of these coupling members being formed into co-operating connector parts, such as shown in Figure 5, I have provided for the proper connections of the severed ends of the conductor, or two independent conductors, to the desired batteries, etc., and for the ready and convenient plugging in and detachment of moisture-proof connector parts.

If it is desired to incorporate these improvements in multiple conductor systems, such as a three-wire system illustrated in Figures 9 and 10, I provide a finder plug 19 and a co-operating socket 20 by means of a tongue and groove arrangement, for instance, whereby the two parts of the connector can not be secured together without necessarily connecting in each instance those two terminals which are intended to be in communication with each other.

What I claim is:

1. A connector for electrical conductors comprising two interfitting casings formed of resilient waterproof material and an electrical contact element embedded in each casing, the electrical contact elements engaging each other when the casings are fitted together, one casing being formed with a male portion having an external surface of revolution, the other casing being formed with a female portion having an internal surface of revolution which corresponds in shape and size to said external surface of revolution of said male portion and which interfits therewith so as to effect a waterproof connection of said casings, and the external surfaces of said casings being so formed that when the casings are fitted together the connector has its external surface continuously smooth lengthwise of the connector.

2. A connector for electrical conductors comprising two waterproof casings, a male electrical contact element carried in one casing, a contractile and expansible female electrical contact element carried in the other casing and adapted to receive and to engage said male contact element when the casings are connected together, and means for connecting said casings with a fluid tight seal and also for exerting a force tending to compress said female contact element on said male contact element, said means including a resilient portion on one casing closely surrounding and engaging said female contact element and a second resilient portion on the other casing, said resilient portions having complementary sealing surfaces, the external surface of the first-mentioned resilient portion being peripherally somewhat larger than the internal surface of the other resilient portion before the casings are connected together, and said external and internal surfaces being in close engagement about said contact elements when the casings are connected together.

3. A connector for electrical conductors comprising two interfitting casings formed of resilient waterproof material and an electrical contact element embedded in each casing, one casing being formed with a male portion extending from the body of the casing, the other casing being formed with a female portion having an internal surface which corresponds in shape and size to the external surface of said male portion and which interfits therewith so as to effect a waterproof connection of said casings, and the external surfaces of said casings being so formed that when the casings are fitted together the external surface of the connector is continuously smooth lengthwise of the connector.

4. A connector for electrical conductors having waterproof insulating covering, said connector comprising two soft rubber casings, a conducting plug secured within one of said casings, a conducting socket secured within the other casing and adapted to receive said plug for electrical contact therewith when the casings are fitted together, and conductors secured to said plug and socket, respectively, and extending through said casings, one of said casings having an open recessed end and the other casing having a projecting end which has an external surface corresponding in shape and size to the internal surface of said recessed end so that a close waterproof detachable telescopic connection of the two casings is had, said casings at their telescopic connection being substantially larger in cross-section than the covering of the conductors and at the junction of their external surfaces being of the same external shape and size, said casings when connected together having an entirely smooth external surface and having portions diminishing in cross-section toward the covering of the conductors in such manner that the connector throughout its length has a smooth flowing external surface, and said casings having waterproof connection with the coverings of their respective conductors.

5. A connector for electrical conductors comprising two conductors, soft rubber casings having waterproof connection with said conductors, one end of each casing extending beyond one end of a conductor and being formed with a longitudinal recess, a conducting plug secured in the recess of one casing and having electrical contact with one conductor, and a conducting socket secured in the recess of the other casing and having electrical contact with the other conductor, said socket being adapted to have electrical contact with said plug, said casings having telescopic surfaces adapted to effect a waterproof detachable connection of said casings, the external telescopic surface of one casing corresponding in shape and size to the internal telescopic surface of the other casing, and the casings being so formed that when fitted together they provide a continuously smooth flowing external surface lengthwise of the connector.

6. A connector for electrical conductors comprising two conductors, a soft rubber casing vulcanized to each conductor, one end of each casing extending beyond one end of the conductor vulcanized thereto and being formed with a longitudinal recess, a conducting plug vulcanized to one of the casings in the recess thereof and having electrical contact with the conductor vulcanized thereto, and a conducting socket

vulcanized to the other casing in the recess thereof and having electrical contact with the conductor vulcanized thereto, the extending end of one casing being of smaller external diameter than the extending end of the other casing and being adapted to fit telescopically therein with a close waterproof fit to secure the casings together, said socket being adapted to receive said plug in electrical contact when the casings are secured together, and said connector having a smooth flowing external surface throughout its length.

7. A connector for electrical conductors comprising two casings detachably connected together and contact elements which are carried by said casings and which are detachably connected together, said casings having means forming a fluid tight seal about said contact elements and also tending to compress said contact elements together, said means including telescopically interfitting sealing surfaces, at least one of which is resilient, and said casings when connected together having a continuously smooth external surface.

8. A connector for electrical conductors comprising two casings adapted to be detachably connected together and complementary contact elements which are carried by said casings and which are adapted to interfit resiliently when the casings are forced together into connected relation, one of said contact elements being resiliently contractible and expansible, said casings having means for forming a fluid tight seal about the contact elements when the casings are connected together, and said means including closely interfitting resilient rubber portions tending to compress the complementary contact elements in closely interfitting relation when connected together and having complementary resilient sealing surfaces.

9. A connector for electrical conductors comprising two waterproof casings, complementary elongated electrical contact elements carried in said casings, and means for connecting said casings with a fluid tight seal and also tending to compress said contact elements together, one of said contact elements being expansible and being adapted to receive another of said contact elements and to be expanded when receiving the latter, and said means including a resilient rubber portion on one casing closely surrounding and engaging said expansible contact element and a second resilient rubber portion on the other casing closely surrounding and engaging the first-mentioned rubber portion.

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