Jan. 3, 1956 H. J. GRAHAM 2,729,798

ELECTRICAL CONNECTOR

Filed July 6, 1950

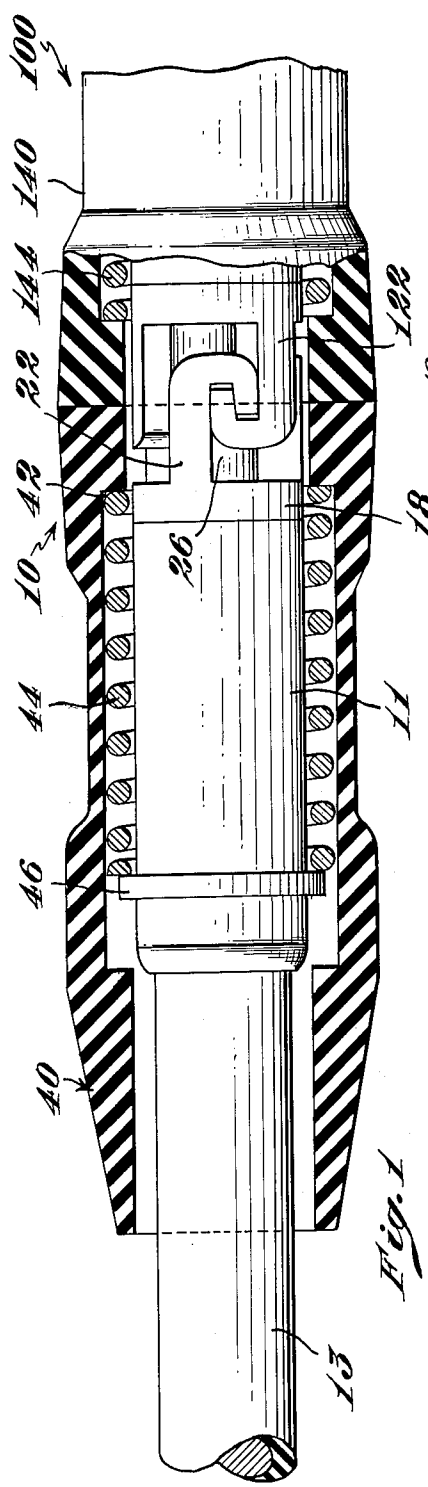

Fig. 1

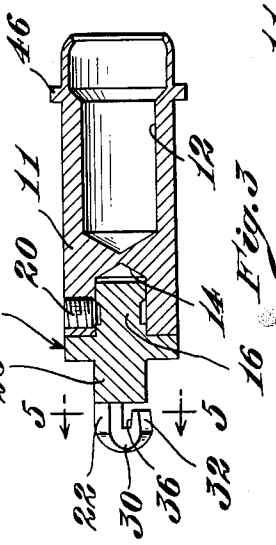

Fig. 3

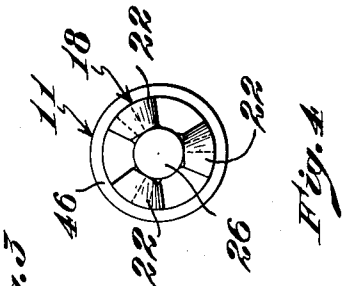

Fig. 4

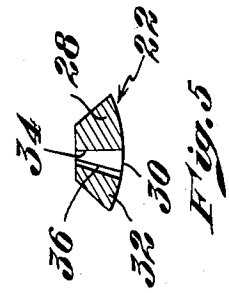

Fig. 5

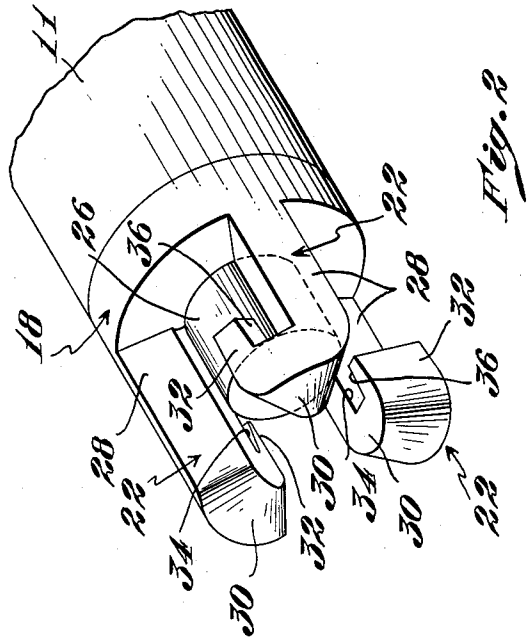

Fig. 2

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United States Patent Office 2,729,798 Patented Jan. 3, 1956

2,729,798

ELECTRICAL CONNECTOR

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Application July 6, 1950, Serial No. 172,314

5 Claims. (Cl. 339—47)

This invention relates to electrical connectors and more particularly to connectors such as are used for joining the ends of electrical cables or wires.

Objects of this invention are to provide an electrical connector which can be readily assembled and disassembled, which has component members which are identical in construction, which when assembled will not accidentally come apart, which will handle heavy currents, which has low electrical resistance, which makes good electrical contact between the component members, which is adapted to be insulated for high voltages, which has no exposed conducting elements when disassembled, which is simple and economical in construction, which is durable, reliable, convenient and safe in use and which advances the art generally.

In the principal aspect the invention contemplates an electrical connector comprising two identical component coupling members each of which includes a body, preferably cylindrically shaped, with means at one end thereof for securing the body to a respective electrical conductor or wire. At the other end of the body are arranged a plurality of equally spaced fingers whose inner and outer surfaces lie respectively in two coaxially disposed cylinders. Each finger includes a main portion projecting outwardly from the body and having a laterally extending shoulder at the end thereof. Such shoulder is provided with a lip arranged substantially parallel to the main portion of the finger to form a recess or cavity therebetween which has a width slightly greater than that of the lip. The distance between the side of the lip of one finger and the adjacent side of the main portion of the next finger is made greater than the distance from the same side of the lip and the corresponding side of the main portion of the same finger so that the two component parts or members can be assembled by inserting the fingers of one member into the slot between the fingers of the other member and relatively rotating the members to bring the lips of the respective members into alignment with the shoulder recesses of the other members. Yieldable means, such as a spring or springs, is arranged to move axially the lips into the corresponding recesses thereby to lock the members in assembled position. The surfaces of the lips forming one side of the recesses are preferably tapered to give a wiping action as the lips wedge into the corresponding recesses thereby insuring good electrical contact.

In another aspect one end of the body is recessed to receive an electrical conductor such as a cable or wire. The other end of the body is provided with a removable end piece, which may be but is not necessarily an insert, which carries the contacting fingers so that they can be readily replaced when burned or otherwise damaged.

In a further aspect the body of each member is surrounded by an insulating sheath which is spring biased to force the lips into the corresponding shoulder recesses by contacting the end of the sheet of the other member, for example by a helical spring arranged circumjacent

the body between an internal shoulder upon the sheet and an external shoulder upon the outer surface of the body.

In a still further aspect the sheaths have walls of sufficient thickness and are made of an insulating material such as a type of synthetic rubber of sufficient rigidity so that the sheaths are substantially noncollapsible while being elastic enough to withstand mechanical shock and hard usage. The length of each sheath is great enough to encase the associated body while the sheath is extended by the corresponding spring to cover the contact fingers when disassembled. The opposite end of each sheath is tapered and loosely fits about a respective electrical conductor so that as the extended end of one sheath is brought into contact with the corresponding end of the other sheath during assembly, the springs are compressed and the sheaths slid back along the respective conductors to permit interlocking of the fingers.

These and other objects and aspects will be apparent from the following description of an illustrative specific embodiment of the invention referring to drawings in which:

Fig. 1 is an elevation view in partial section showing the method of the interlocking of the component parts of a connector;

Fig. 2 is an isometric view of the contact fingers;

Fig. 3 is an axial cross sectional view of the body of the connector;

Fig. 4 is an end view of the contact fingers; and

Fig. 5 is a section on line 5—5 of Fig. 3.

Referring to Fig. 1 the electrical connector comprises two identical members or components designated as **10** and **100** respectively. The component **10** comprises a body **11** (see also Fig. 3) having an axially disposed recess **12** which is adapted to secure an electrical connector, such as the cable **13**, for example, by soldering. The opposite end of the body **11** is also recessed as at **14** to receive a stud **16** of an end piece such as the insert **18**. The stud portion **16** is provided with a circumferential groove which is engaged by the end of a set screw **20** threaded into an aperture in the body **11** thereby to secure the end piece and body at the same time permitting ready removal thereof.

Contact fingers such as **22** are arranged at the opposite end of the insert **18** from the stud portion **16** with the outer surfaces thereof lying in the same geometric cylinder as the outer surface of the body **11**. The inner surfaces of the fingers **22** lie in a geometric cylinder coaxially disposed with respect to the cylinder defining the outer surfaces of the fingers. This inner cylinder also defines the outer periphery of an integral reinforcing piece **26** which is arranged to extend to approximately half the axial length of the fingers.

Each of the fingers **22** comprises a main portion **28** attached at one end to the insert **18** and having at its outer end a laterally extending shoulder **30**. The end of the shoulder **30** is provided with a lip **32** which extends substantially parallel to the main finger portion **22** to form a recess **34** whose width is slightly greater than that of the lip **32**. The side of the lip **36** facing the main finger portion **22** is preferably provided with a slight taper.

Each component member is provided with a noncollapsible sheath **40** of an insulating material, such as synthetic rubber, arranged circumjacent the body **11** and having sufficient length to extend over the fingers **22** of the end piece **18**. One end of the sheath **40** is tapered to fit loosely about the conductor **13** and is provided with an internal shoulder **42** against which bears one end of a spring **44** arranged circumjacent the body **11**. The opposite ends of the springs **44** bear against a rib

or shoulder 46 on the outer periphery of the body 11 so that the sheath 40 covers the fingers 22 when the member 10 is not assembled with its mating component member 100.

The distance between the side of one lip 32 of one finger 22 and the adjacent side of the main portion 28 of the next finger is made greater than the distance between the same side of the first lip and the corresponding side of the main portion of the same finger so that the similar fingers designated 122 of the component member 100 can be inserted between the fingers 22 and the members rotated relatively to one another to bring the lips 32 of each member into axial alignment with the shoulder recesses 36 of the other member. As the fingers 22 are being inserted into the slot between the corresponding fingers of the outer member 100 the sheaths 40 and 140 come into contact with one another compressing the springs 44 and 144 and moving the sheaths back along the respective connecting conductors 13. After the members have been rotated relatively to one another and released, the force exerted by the compression of springs 44 and 144 wedges the lips 32 into the corresponding recesses 36 of the other member thereby securely locking the two component parts together. The tapered surfaces 136 of the respective lips form inclined or wedged surfaces which are wiped as the lips are brought into engagement thereby insuring good electrical contact therebetween.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

I claim:

1. An electrical connector comprising two identical coupling members each including a body having means at one end for securing the body to a respective electrical conductor and a plurality of equally spaced fingers at the opposite end for engaging the similar fingers of the opposite member, the inner and outer surfaces of the fingers lying, respectively, in two coaxially disposed cylinders, each of the fingers including a main portion projecting outwardly from said body and having a laterally extending shoulder with a lip arranged substantially parallel to the main portion of the finger to form a re-entrant recess having generally parallel side walls, the distance between the side walls being slightly greater than the width of the lip, the distance between the side of the lip of one finger and the adjacent side of the main portion of the next finger being greater than the distance between the same side of the lip and the corresponding side of the main portion of the same finger so that the members can be assembled by inserting the fingers of one member into the slots between the fingers of the other member and relatively rotating said members, and yieldable means for axially moving the lips into the recesses in the corresponding fingers thereby to lock the members in assembled position and insure good electrical contact therebetween.

2. An electrical connector comprising two identical coupling members each including a body having means at one end for securing the body to a respective electrical conductor and a plurality of equally spaced fingers at the opposite end for engaging the similar fingers of the opposite member, the inner and outer surfaces of the fingers lying, respectively, in two coaxially disposed cylinders, each of the fingers including a main portion projecting outwardly from said body and having a laterally extending shoulder with a lip arranged substantially parallel to the main portion of the finger to form a re-entrant recess having generally parallel side walls, the distance between the side walls being slightly greater than the width of the lip, the recess of the lip having a slight taper, the distance between the side of the lip of one finger and the adjacent side of the main portion of the next finger being greater than the distance between the same side of the lip and the corresponding side of the main portion of the same finger so that the members can be assembled by inserting the fingers of one member into the slots between the fingers of the other member and relatively rotating said members, and yieldable means for axially wedging the lips into the recesses in the corresponding fingers thereby to lock the members in assembled position and insure good electrical contact therebetween.

3. An electrical connector comprising two identical coupling members each including a cylindrical body having means at one end for securing the body to a respective electrical conductor, a shoulder disposed about the outer surface of the body, and a plurality of equally spaced fingers at the opposite end thereof for engaging the similar fingers of the other member, the inner and outer surfaces of the fingers lying respectively in two coaxially disposed cylinders, each of the fingers including a main portion projecting outwardly from said body and having a laterally extending shoulder with a lip arranged substantially parallel to the main portion of the finger to form a re-entrant recess having generally parallel side walls, the distance between the side walls being slightly greater than the width of the lip, the distance between the side of the lip of one finger and the adjacent side of the main portion of the next finger being greater than the distance between the same side of the lip and the corresponding side of the main portion of the same finger so that the members can be assembled by inserting the fingers of one member into the slots between the fingers of the other member and relatively rotating said members, two substantially noncollapsible cylindrical sheaths of insulating material each having an internal shoulder and a tapered end loosely fitting about each of the respective electrical conductors; and a spring arranged circumjacent each of the respective bodies and interposed between the shoulder of the correlated body and the internal shoulder of the surrounding sleeve so that the end of the sheath opposite the tapered end covers the finger upon disassembly, the ends of said sheaths bearing against each other to compress the springs and slide the sheaths back along the conductors upon the assembly of the fingers.

4. An electrical connector comprising two identical coupling members each including a body having means at one end for securing the body to a respective electrical conductor and a plurality of equally spaced fingers at the opposite end, the fingers having undercut portions forming shoulders for engaging the undercut portions of the fingers of the other member, two substantially noncollapsible cylindrical sheaths of insulating material each having a tapered end loosely fitting about each of the respective electrical conductors, and a spring arranged circumjacent each of the respective bodies and interposed between the correlated body and the surrounding sleeve so that the end of the sheath opposite the tapered end covers the fingers upon disassembly, the ends of said sheaths bearing against each other to compress the springs and slide the sheaths back along the conductors upon the assembly of the fingers.

5. An electrical connector comprising two identical coupling members each including a body having means at one end for securing the body to a respective electrical conductor and a plurality of fingers at the opposite end for engaging the similar fingers of the opposite member, two substantially noncollapsible cylindrical sheaths of insulating material each having an internal shoulder and a tapered end loosely fitting about each of the respective electrical conductors, and a spring arranged circumjacent each of the respective bodies and interposed between the shoulder of the correlated body and the internal shoulder of the surrounding sleeve so that the end of the sheath opposite the tapered end covers the fingers upon dis-

assembly, the ends of said sheaths bearing against each other to compress the springs and slide the sheaths back along the conductors upon the assembly of the fingers.

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