Oct. 26, 1965 R. NEIDECKER 3,214,721

ELECTRICAL CONNECTOR OF THE PLUG-AND-JACK TYPE

Filed Aug. 30, 1962

2 Sheets-Sheet 1

Fig.1

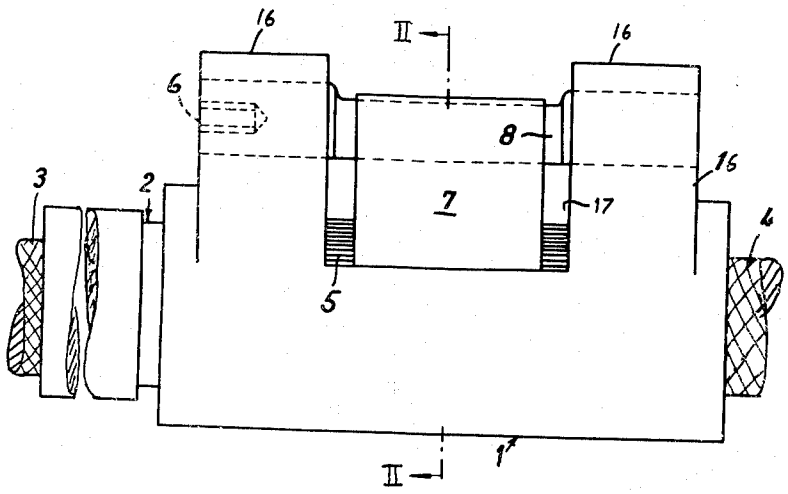


Fig.2

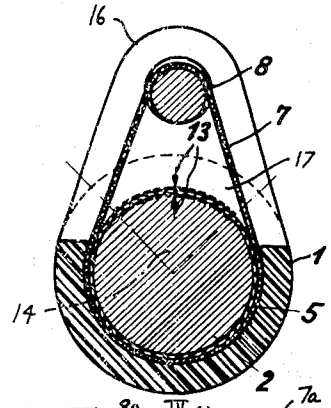


Fig. 4

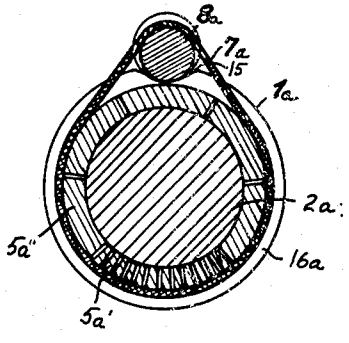
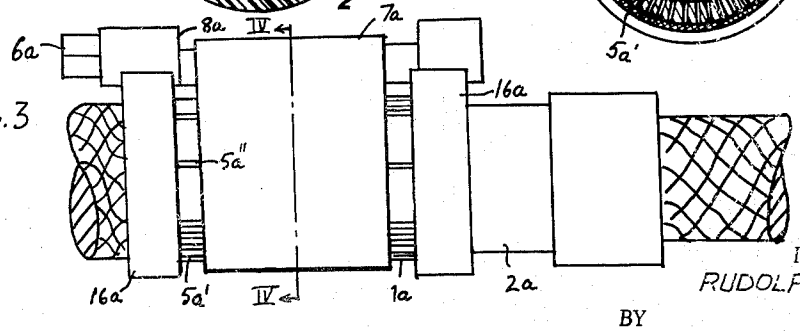


Fig.3



INVENTOR:
RUDOLF NEIDECKER

BY

Karl F. Ross

AGENT

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Fig. 5

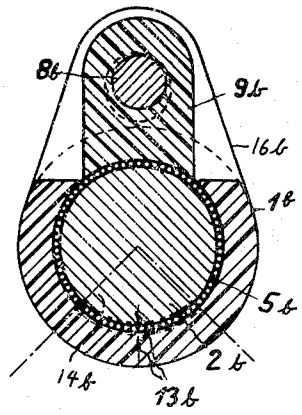


Fig. 6

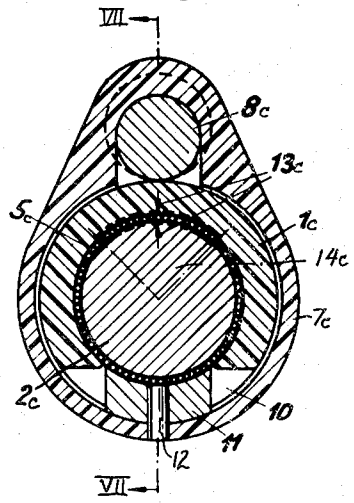
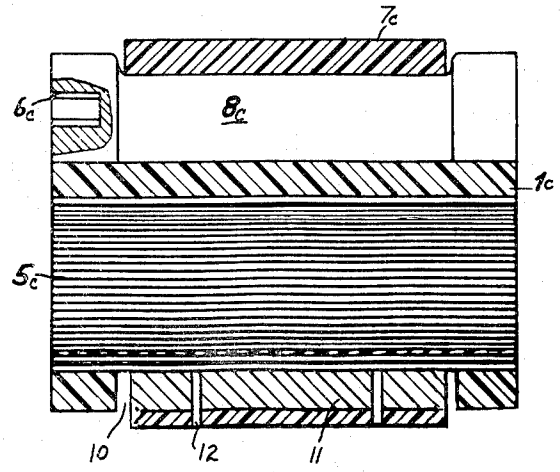


Fig. 7



INVENTOR:
RUDOLF NEIDECKER

BY

Karl F. Ross

AGENT

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ELECTRICAL CONNECTOR OF THE PLUG-AND-JACK TYPE

Rudolf Neidecker, Basel, Switzerland, assignor to Multi-Contact AG, Basel, Switzerland, a corporation of Switzerland

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7 Claims. (Cl. 339—91)

My present invention relates to an electrical connector consisting of a male member or plug and a female member or jack releasably engageable with each other.

At least one of the connector members, usually the jack, conventionally comprises an array of resilient elongated conductors, hereinafter referred to as contact springs, which elastically bear upon a conductive portion of the other connector member when the two are interengaged. It is evident that, in such an assembly, the current-carrying capacity increases with the contact pressure between the two members which reduces the transfer resistance along the area of interengagement and should, therefore, be as great as possible. The extent to which this contact pressure can be increased is, however, limited by mechanical considerations and also by the need for easy interconnection and disengagement of the parts.

The general object of my invention is to provide means for selectively increasing the contact pressure in such connector in the engaged position of its members to enable its operation with a current-carrying capacity approaching the rated capacity of each individual member. A related object is to provide means for preventing accidental disengagement of such members from each other.

These objects are realized, pursuant to a feature of the present invention, by the provision of an adjustable biasing element adapted to urge the contact springs of one member, preferably the jack, against a conductive surface of the other member .

Advantageously, the active member (e.g. the jack) has a generally cylindrical array of contact springs bearing concentrically upon a solid metallic portion of the passive member (e.g. the plug). The biasing element may then comprise a flexible strap of limited elasticity, e.g. of textile fabric, leather, or thermoplastic material, which embraces a major part of the contact-spring array and is tensionable by a suitable setting mechanism such as, for example, a manually rotatable crank shaft. Alternatively, a low-elasticity pressure block may be disposed between such crank shaft and a part of the array to place its contact springs under increased stress. In either instance it will be desirable to select the shape of the setting element and/or the coeffcient of friction between the latter and the biasing element in such manner as to insure a self-locking of the assembly in stressed position.

The above and other objects, features and advantages of the present invention will become more fully apparent from the following detailed description of certain embodiments, reference being made to the accompanying drawing in which:

FIG. 1 is a side-elevational view of an assembled plug-and-jack connector according to the invention;

FIG. 2 is a cross-sectional view taken on the line II—II of FIG. 1;

FIG. 3 is a view similar to FIG. 1 showing a modification thereof;

FIG. 4 is a cross-sectional view taken on the line IV—IV of FIG. 3;

FIGS. 5 and 6 are further cross-sectional views, similar to FIGS. 2 and 4, which illustrate additional modifications; and

FIG. 7 is a longitudinal sectional view taken on the line VII—VII of FIG. 6 with the plug removed.

The connector shown in FIGS. 1 and 2 comprises a female member or jack **1** and a male member or plug **2** received therein. Jack **1** is generally in the shape of a cylindrical sleeve with two peripherally projecting lugs **16** axially spaced from each other and with a peripheral gap **17** between these lugs. The plug **2** is also of cylindrical configuration and, as here shown, may be a solid metallic rod; one of its extremities is conductively connected in conventional manner not further illustrated, to a flexible cable **3** while a similar cable **4** is connected to the conductive portion of jack **1** represented by a tubular array of contact springs **5**. The springs **5** extend axially within the preferably non-conductive housing portion of jack **1** to which they are anchored on opposite sides of the gap **17**; they may be slightly bent inwardly, i.e. toward the common axis of members **1** and **2**, so as to bear with moderate pressure upon the surface of plug **2** when the latter is inserted into the jack **1**.

A flexible strap **7** surrounds the major part of the array of contact springs **5** and also embraces the offset portion of a crank shaft **8** which is journaled in the lugs **16** and may be manually rotated with the aid of, for example, a suitable key (not shown) insertable into a polygonal socket **6** thereof. In its illustrated position the crank shaft **8** leaves the strap **7** relatively slack so that the contact springs **5** engage the plug **2** only or mainly under their inherent stress of deformation; when the shaft is rotated through 180° into an operative position in which it is retained by its frictional engagement with the strap **7**, the latter is tensioned so as materially to increase the pressure exerted upon the plug **2** by most of the contact springs **5**. The sector **14** of the array represents a region within which the upward tension of strap **7** is opposed by the downward reaction of the spring mounting within the housing portion of jack **1**; arrows **13** denote the opposing forces as the springs in that sector are initially spread apart upon insertion of the plug **2** and are further deflected upwardly by the operation of crank shaft **8**. As will be seen in FIG. 2, the spacing of the spring array forming a housing wall of the jack corresponds to substantially the width of strap **7**.

FIGS. 3 and 4 show a connector whose jack **1*a*** is a metallic tube that has been longitudinally slitted along an intermediate portion to form contact springs **5*a'*** and **5*a''***. Rings **16*a***, preferably of insulating material, surround the unslitted extremities of the tube and are formed with arcuate recesses **15** in which a crank shaft **8*a*** is cradled; this shaft has a polygonal head **6*a*** engageable by a key or wrench for the purpose of manual operation. Strap **7*a*** embraces the shaft **8*a*** and the major part of the spring array **5*a'***, **5*a''***: it will be noted that the narrower, more easily deflected contact springs **5*a'*** are distributed over a sector opposite the shaft **8*a***, the reaction force being provided by the wider springs **5*a''***. Strap **7*a***, in addition to providing a biasing force for the contact springs, also serves as a means for holding the shaft **8*a*** in position.

The connector shown in FIG. 5 comprises a jack **1*b*** and a plug **2*b*** generally similar to those of FIGS. 1 and 2. Crank shaft **8*b***, journalled in a pair of lugs **16*b*** on the jack housing, traverses a pressure block **9*b*** (e.g. of polystyrene) which acts upon the upper contact springs **5*b*** of the array surrounding the plug **2*b***. The reaction sector has been designated **14*b***, the arrows **13*b*** again indicating the displacement of the contact springs within that sector.

FIGS. 6 and 7 illustrate the manner in which a convenentional jack **1*c*** can be adapted for use with a biasing element according to the invention. For this purpose the tubular jack housing is cut away at **10** so as to expose a minor segment of the array of contact spring **5*c*** surrounding the plug **2*c***. A strap **7*c***, which may be

molded from plastic material such as polystyrene, embraces the jack 1*c* in the region of gap **10** and coaxially surrounds the array of springs 5*c*, the clearance between this array and the lower part of strap 7*c* being occupied by a spacer block **11** which is held onto the strap by means of pins **12**. Crank shaft 8*c*, provided with a socket 6*c*, bears with its concentric extremities directly upon the jack 1*c* in which it is held in position solely by the strap 7*c*. The arrows of the opposing forces and the sector of their interaction have been indicated in FIG. 6 at 13*c* and 14*c*, respectively.

As will be apparent from the foregoing description, the herein disclosed means for additionally biasing the contact springs of a connector member operate in each instance to reduce the contact resistance of the connector, thereby increasing its current-carrying capacity, and to prevent inadvertent or spontaneous separation of its parts. Departures from the specific arrangements described and illustrated are, of course, possible within the spirit and scope of the invention as defined in the appended claims.

I claim:

1. A connector for electrically linking a pair of conductors, said connector comprising a female member having a longitudinal bore, a generally cylindrical male member secured to a first one of said conductors and receivable in said bore, said female member including a tubular array of contact springs disposed about the periphery of said male member and connected to the second one of said conductors, said contact springs being engageable with a conductive surface portion of said male member, setting means including a crankshaft rotatably supported on said female member on one side of said bore, and selectively actuable and generally radially shiftable biasing means operatively connected with said crankshaft, said biasing means having a longitudinally extending surface diametrically opposite said crankshaft and coaxial with said bore while being juxtaposed and engageable with at least a segment of said array diametrically opposite said crankshaft with respect to said bore for urging said contact springs against said surface portion of the male member.

2. A connector for electrically linking a pair of conductors, said connector comprising a female member having a longitudinal bore, a generally cylindrical male member secured to a first one of said conductors and receivable in said bore, said female member including a tubular array of contact springs disposed about the periphery of said male member and connected to the second one of said conductors, said contact springs being engageable with a conductive surface portion of said male member, setting means including a crankshaft rotatably supported on said female member, and selectively actuable biasing means operatively connected with said crankshaft and engageable with at least a segment of said array for urging said contact springs against said surface portion of the male member, said biasing means comprising a tensionable strap embracing said array and said crankshaft.

3. A connector according to claim **2** wherein said female member comprises a metallic tube provided with longitudinal slits whereby said contact springs are formed as integral parts of said tube.

4. A connector according to claim **3** wherein said slits are more numerous at a segment of said tube remote from said setting means.

5. A connector according to claim **2** wherein said female member comprises a tubular housing supporting said array, said housing having a peripheral gap exposing said array at a location remote from said setting means for admitting said strap into contact with said array.

6. A connector according to claim **5**, further comprising a spacing block inserted in said gap between said strap and said array.

7. A connector according to claim **1** wherein said biasing means comprises a pressure block bearing laterally upon said array and said crankshaft is journaled in said female member in contact with said block for urging the same toward said array.

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JOSEPH D. SEERS, *Primary Examiner.*