United States Patent [19]

Obert

[11] **3,839,697**

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[54] **CONNECTOR FOR AUTOMATICALLY ESTABLISHING ELECTRIC CONNECTIONS BETWEEN VEHICLES, PARTICULARLY BETWEEN RAILROAD VEHICLES**

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[73] Assignee: **Burndy Electra S.p.A.,** Torino, Italy

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Feb. 11, 1972 Italy 67424/72

[52] **U.S. Cl.** **339/42,** 339/196

[51] **Int. Cl.** **H01r 13/44**

[58] **Field of Search** ..... 339/36, 40, 42, 45, 46, 339/34, 196 A, 195 A, 89, 90, 184, 186, 210

[56] **References Cited**

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[57] **ABSTRACT**

A connector for establishing electric connections between vehicles, particularly between railroad vehicles is described. Said connector comprises two connection members each of which comprises male contact elements and female contact elements secured to it; a bush provided with holes for housing corresponding male contact elements and slidable axially relative to the corresponding connection member, so as to expose a part of said male contact elements; projecting portion provided on each connection members and on each bush, each of said projecting portions, in the position in which said bush does not expose the male contact elements, surrounding at least part of a corresponding male contact element so as to electrically insulate the same from the adjacent ones.

5 Claims, 7 Drawing Figures

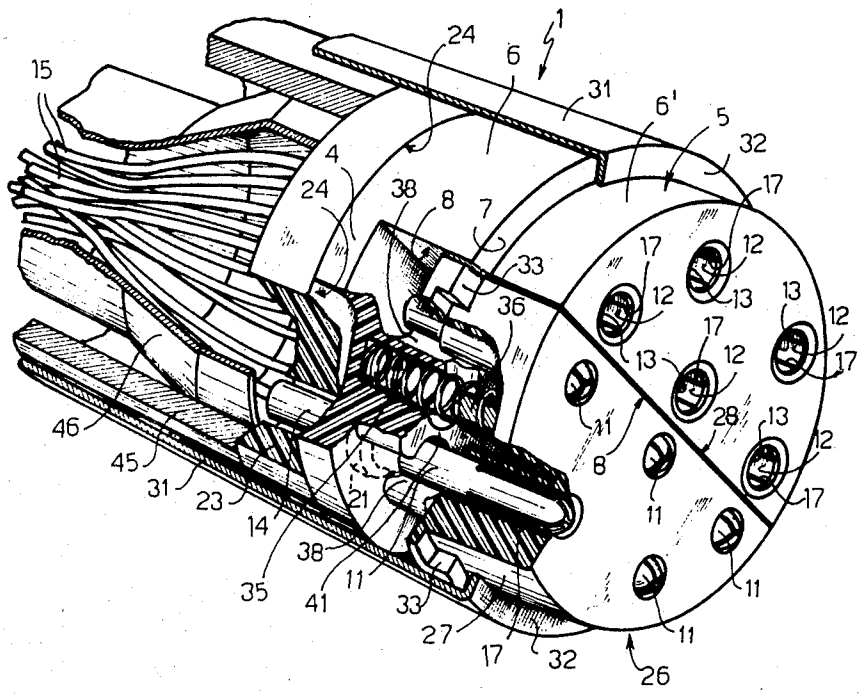

FIG. 1

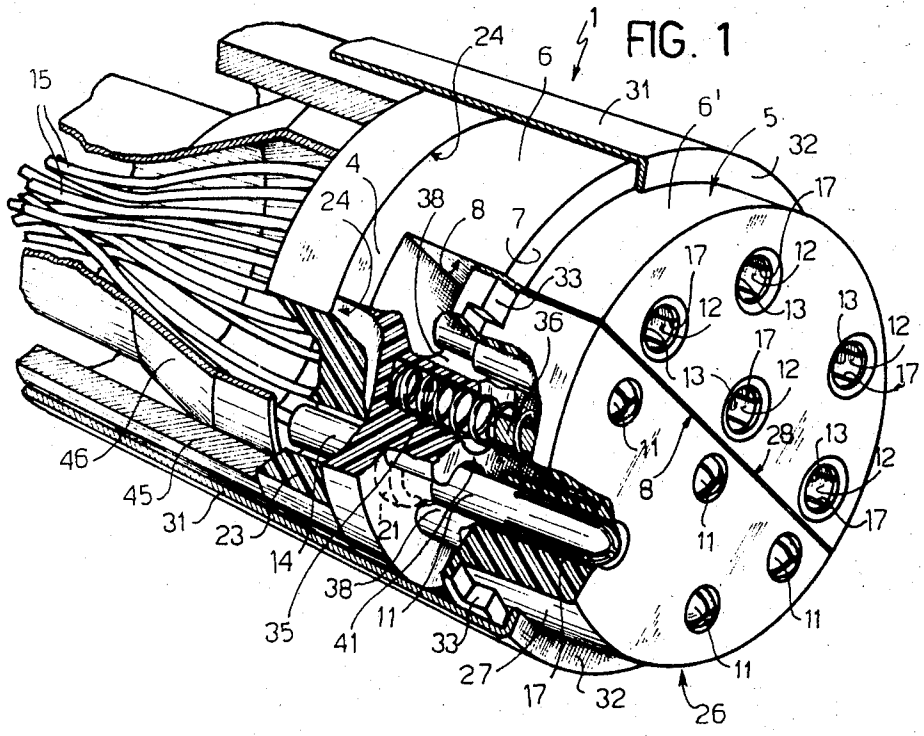
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FIG. 2

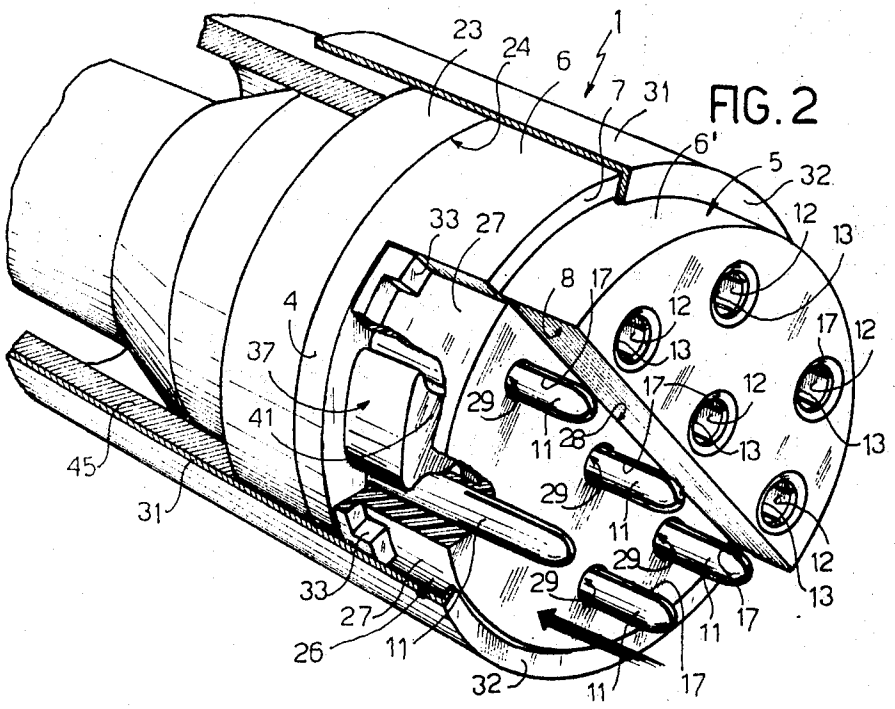
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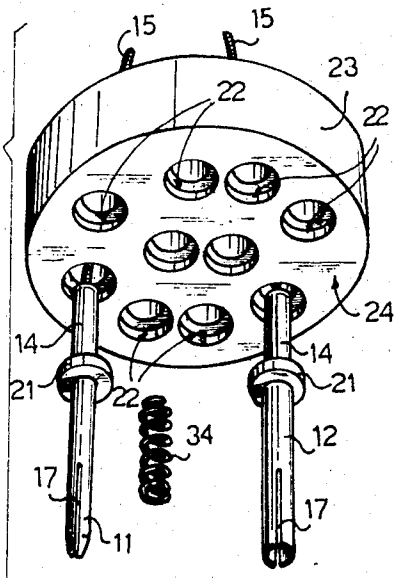
FIG. 3



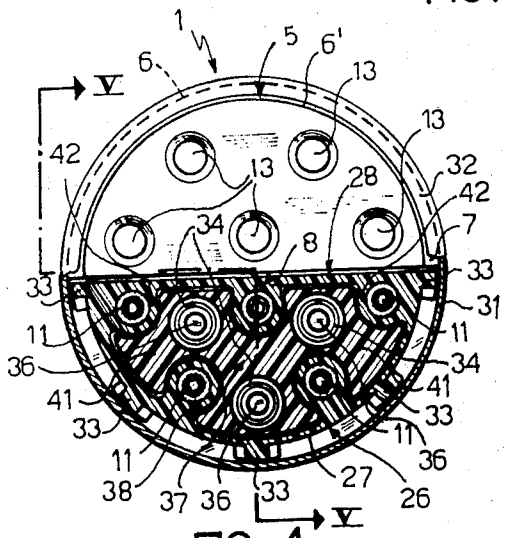
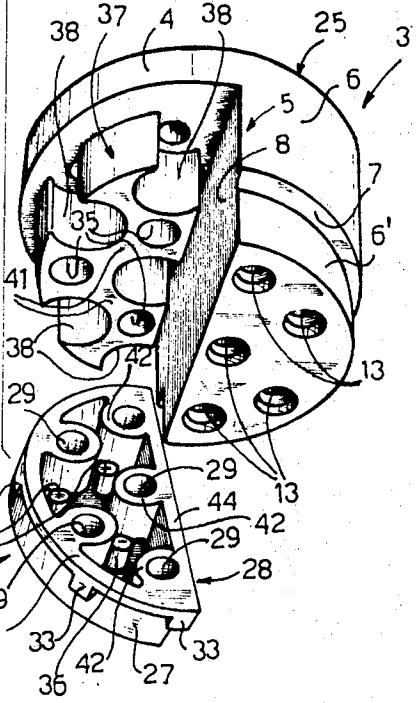


FIG. 4



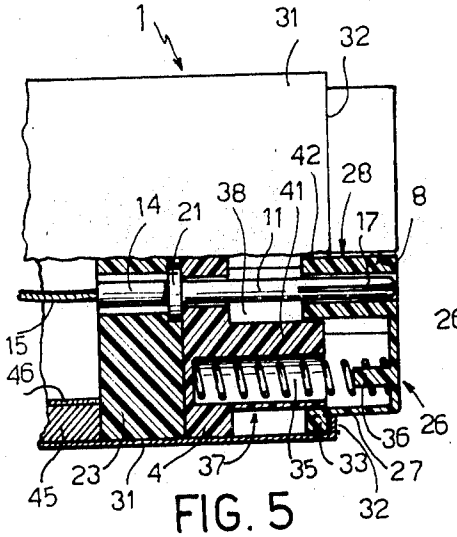
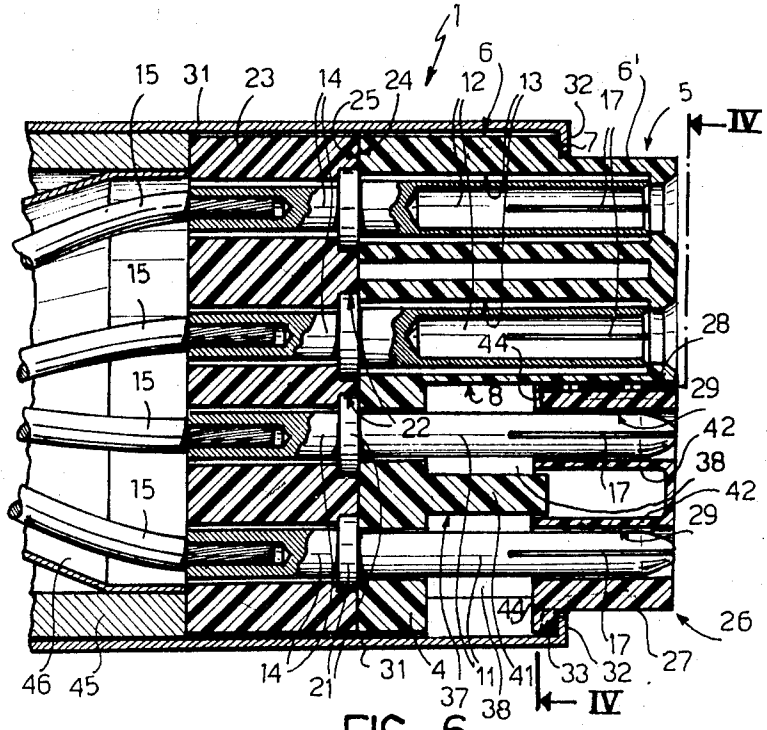


FIG. 5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15 31 23 14 24 12 13 32 17 6' 5
IV
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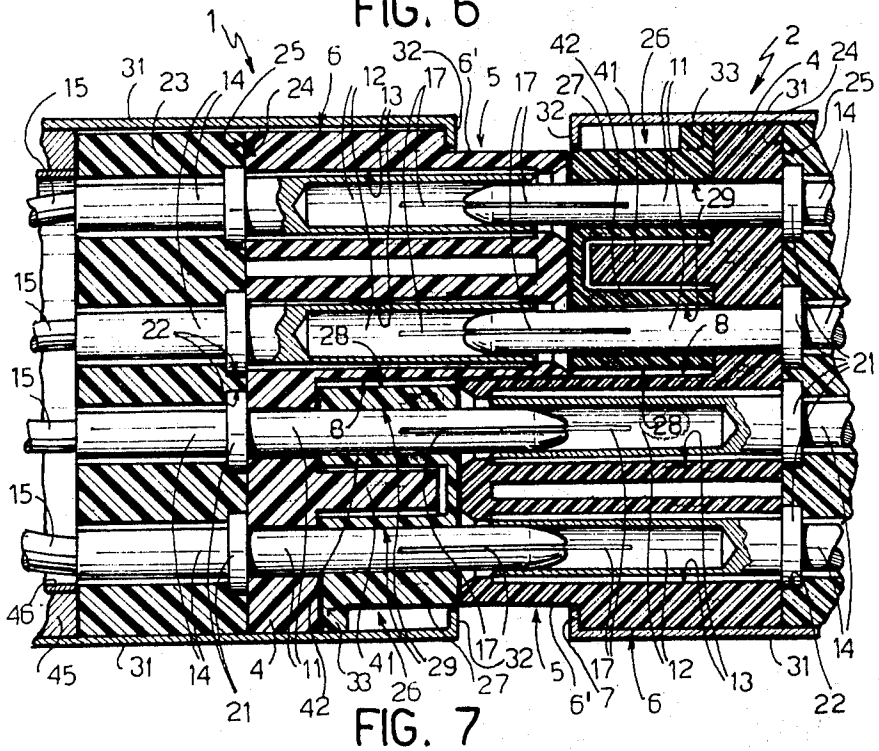
46 45 14 21 31 4 11 41 33 32
37 38
IV

FIG. 6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45 31 14 21 4 42 11 33 41 26 29 27 17 32 5 17 6' 7 6 12 13 31 14 22

FIG. 7

CONNECTOR FOR AUTOMATICALLY ESTABLISHING ELECTRIC CONNECTIONS BETWEEN VEHICLES, PARTICULARLY BETWEEN RAILROAD VEHICLES

CROSS REFERENCE TO RELATED APPLICATION

Applicant claims priority from corresponding Italian Pat. application Ser. No. **67424-A/72** filed Feb. 11, 1972

BACKGROUND OF THE INVENTION

This invention relates to a connector adapted to automatically establish electric connections between vehicles, particularly between railroad vehicles, which enables to establish a very high number of connection without encountering any difficulty and by means of which a perfect insulation of the contact elements of the connector can be attained.

As is well known, the connectors of the kind referred to above comprise two substantially equal connection members, each of which is of cylindrical shape and is provided with male and female contact elements. The female contact elements are housed in a first portion of each connection member, which is substantially defined by a plane passing through the axis of said member, whilst the male contact elements are instead secured to a second portion of the same member and housed in holes of a half-bush mounted slidably in axial direction relative to said member. This half-bush is biased by helical springs coaxial with the male contact elements, which, in the position of rest of the corresponding connection member, normally hold the front face of said half-bush aligned with the front face of the first portion of said connection member. During use of the connector, said first portion of each connection member will apply an axial force to the corresponding half-bushing of the other member, so as to displace the same in an axial direction and thus expose the male contact elements which are thereby inserted into the female contact elements.

The major drawback of the connectors just described resides in the fact that, when either said contact elements are coupled together or not, the insulation between a contact elements and those adjacent thereto is not established by means of an insulating material proper but, in some areas, such insulation is given by the air only, which, as is well known, in particular conditions is not adapted to establish a perfect insulation.

Another disadvantage is due to the position of the aforementioned springs, which do not exert on each half-bush any resultant elastic force, applied to the center of gravity of said half-bush. For this reason, the axial movement of the half-bush can be inexact and jammings can easily occur during use.

SUMMARY OF THE INVENTION

According to the present invention there is provided a connector for establishing electric connections between vehicles, particularly between railroad vehicles, comprising two connection members each of which comprises:

male contact elements and female contact elements secured to it;

a bush provided with holes for housing corresponding male contact elements and slidable axially relative to the corresponding connection member, so as to expose a part of said male contact elements;

projecting portions provided on each connection member and on each bush; each of said projecting portions, in the position in which said bush does not expose the male contact elements, surrounding at least part of a corresponding male contact element so as to electrically insulate the same from the adjacent ones, and the shape of said projecting portions being such as to allow each projecting portion of a connection member not to interfere with the corresponding projecting portion of said bush when the latter is displaced axially to expose a part of said male contact elements.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention, one particular embodiment thereof will now described, merely by way of non-limiting example, with reference to the accompanying drawings, wherein:

FIG. **1** is a perspective view, partly in section, of one connection member of the connector in accordance with the present invention, in its rest position;

FIG. **2** is a perspective view, partly in section, of the connection member shown in FIG. **1**, in its position of use, i.e., in the position where a similar connection member, which is displaced by 180° relative to the first member, will apply to the latter an axial force sufficient to displace a bush provided thereon;

FIG. **3** is a perspective view, with parts broken away, showing some components comprising the connection member of FIGS. **1** and **2**;

FIG. **4** shows a front view of the connection member of FIGS. **1** and **2**, partially in section along lines IV—IV;

FIG. **5** shows a side view, partly in section, of part of the connection member of FIG. **4**, along lines V—V;

FIG. **6** shows a vertical section of the connection member of FIG. **1**, and

FIG. **7** shows a section similar to that of the preceding figure, i. e., when the member shown in said figure has been coupled with the other connection member of the connector.

DETAILED DESCRIPTION OF THE INVENTION

The connector in accordance with the present invention comprises two substantially equal connection members, one of which, indicated at **1**, is shown in FIGS. **1**, **2** and **6**, whilst the other, indicated at **2**, can be seen in FIG. **7** only, where it is coupled with the first-mentioned connection member.

Each connection member comprises substantially a support **3** (FIGS. **1**, **2** and **3**) which comprises, in turn, a base **4** and a projecting portion **5** (FIG. **3**), laterally defined by two cylindrical surfaces, **6** and **6'** respectively, and by a substantially flat surface substantially passing through the axis of said support. Between the two cylindrical surfaces **6**, **6'**, which are of different diameter, a step **7** is provided.

Male contact elements **11** (FIGS. **1**, **2** and **3**) and female contact elements **12** are fastened to the base **4** of said support **3**. The former are secured to the portion of the base **4** (FIG. **6**) which is free from the projecting portion **5**, whereas the latter are fastened to the remaining part of said base and housed inside corresponding holes **13** of said projecting portion.

Each contact element **11**, **12**, known per se, substantially comprises a cylindrical connecting section **14**

(FIGS. 3, 6 and 7), which is adapted to be connected, in any suitable manner, with a corresponding electric conductor 15. Each male contact element 11 is of substantially cylindrical shape and is provided with longitudinal slots 17, whilst each female contact element 12 is in the form of a bush, also provided with slots 17. The cylindrical connecting section 14 of each contact contact element comprises an annular ridge 21 which can be housed in a corresponding hole or recess 22 provided in a cylindrical plate 23. This plate is disposed behind the support 3 (FIG. 6), so that its surface 24 (FIGS. 3 and 6) will be in contact with the corresponding surface 25 of said support. As can be clearly seen from FIG. 6, each contact element 11, 12 is locked on one connection member 1 or 2 by disposing the corresponding annular ridge 21 inside the hole 22 of the plate 23 associated therewith and by bringing the surface 24 of the latter in contact with the corresponding surface 25 of the support 3.

In the embodiment of the invention illustrated in the drawings, each connection member 1, 2 is provided with five male contact elements 11 (FIGS. 1 and 2) and five female contact elements 12, substantially disposed along two rows.

A bush 26 (FIGS. 1, 2 and 3), laterally defined by a cylindrical surface 27, having substantially the same diameter as the surface 6' of the projecting portion 5, and by a flat surface 28 (FIG. 3), arranged for coupling with the surface 8 of said portion, is slidable relative to the support 3. Said bush is provided with holes 29 passed through by the male contact elements 11, which will guide the bush during its axial displacement.

A cylindrical casing 31, normally made of metal, surrounds each connection member 1, 2 and is provided with an overturned end lip 32 which coacts with the step 7 of the support 3. Projecting parts 33 of the bush 26, by cooperating with the lip 22 of said casing 31, act as a stop for the forward movement of said bush 26.

This bush is normally biased forward by three helical springs 34 (FIGS. 1, 4 and 5); one end of said springs is housed in a corresponding hole 35 (FIG. 5) provided in the support 3, whilst the opposite end rests upon said bush and is centered by a corresponding pin 36. The position of the three springs 34 is chosen so that the resultant of the forces applied by each of them to the bush 26 will substantially pass through the center of gravity of said bush. To obtain this, the axes of the springs 34 are disposed along the vertices of a triangle one side of which is parallel to the surface 8 of the projecting portion 5, as seen in FIG. 4.

On the base 4 of the support 3 a projecting portion 37 (FIGS. 3, 6 and 7) is provided, which defines five cavities 38 of substantially cylindrical shape, inside each of which a section of a corresponding male contact element 11 is housed, as clearly shown in FIG. 6. Said projecting portion 37 will define, therefore, walls 41 (FIGS. 3, 6 and 7) which surround said sections of the contact elements 11. The bush 26 is provided with sleeves 42 (FIGS 3 and 6), each of which is provided, in turn, with a hole 29 for receiving a corresponding contact element 11 and is of such dimensions to be telescopically inserted inside a corresponding cavity of the support 3, as clearly shown in FIGS. 6 and 7. The sleeves 42 are integral with a side wall 44 (FIG. 3) of the bush 26.

Preferably, a tubular member 45 (FIGS. 1 and 2) abuts against said plate 23; inside this member, a guide element 46 for the conductors 15 is disposed.

The support 3, the plate 23 and the bush 26 can be made of any insulating material, preferably a synthetic material, such as, for instance, a plastic material.

The operation of the connector described above is as follows:

One connection member 1, 2 is normally secured to the front or rear side of one of two vehicles between which an electric connection has to be established by means of the connector of the invention. The two aforementioned connection members are fastened to the front or rear side of one of the two vehicles in such positions that, when the latter are suitably brought close to one another, the axes of said members will be coincident. Moreover, the two members arranged for establishing the connection are rotated substantially through 180° relative to one another, so that, when they are brought close together, the projecting portion 5 of each of them will abut against the sliding bush 26 of the other.

The connector described above can be associated with any other coupling device with which the vehicles can be possibly provided. In particular, in the case when the connector in accordance with the invention is utilized on railroad vehicles, it can form part of an automatic coupling device provided on said vehicles.

In the position of rest of the device, i. e., when each vehicle is separated from the others and no electric connection has to be established between them, the parts of each connection member are in the relative position shown in FIGS. 1 and 6. In this position, the bush 26 is displaced in a forward direction by the action of the springs 34, so that the projecting parts 33 will rest upon the overturned lip 32 of the casing 31. Therefore, the front surface of said bush will lie substantially in the same plane of the front surface of the projecting portion 5.

As clearly shown in FIG. 6, in the rest position of each connection member, each male contact element 11 is completely insulated from the adjacent ones. In fact, each of said elements is separated from the others by both the walls 41 between the cavities 38, defined by the projecting portion 37 of the support 3, and the sleeves of the bush 26. Said walls 41 establish the insulation of each contact element 11, whilst the sleeves 42 will establish the insulation of the remaining portion of said elements. This insulation has proved to be perfect inasmuch as the separation of each contact element from the adjacent ones is attained by means of insulating material; furthermore, the conditions of insulation are virtually not affected by the ambient conditions of the connector, as is instead the case with the connectors of the prior art.

When the bush 26 (FIG. 2) of each connection member is acted upon by the force (indicated by the arrow in FIG. 6) exerted by the projecting portion 5 of the other connection member which is brought in contact with the former, said bush will be displaced backwards, i. e. in the position shown in FIG. 2. In this position, the male contact elements 11 (FIG. 7), upon being inserted in the female contact elements 12, will establish the electric connection. FIG. 7 shows the connector of the invention upon completion of this connection operation.

As clearly shown in FIG. 7, in the working position of the connector, the insulation of each male contact element 11 is still better than in the preceding case (position of rest), inasmuch as each of these elements is insulated from the adjacent ones by insulating material, of both the sleeves 42 and the walls 41.

To loosen the electric connection established by the connector, it is only necessary to axially displace one connection element relative to the other in the direction opposite to the former. During displacement of one element from the other, the springs 34 will displace the bush 26 in an axial direction, until the latter is brought back to the position of FIG. 1.

It should be noted that, during said displacement of the bush 26, the three springs 34, owing to their position relative to said bush, will be able to apply to the latter a resultant force whose line of action passes substantially through the center of gravity of the bush. As a result, the movement of the latter in axial direction will be smooth and free of any jamming, as contasted with the embodiments of the prior art wherein the resultant force applied to said bush does not pass through the center of gravity of the same. Therefore, the connector in accordance with the invention enables to realize a very high number of cycles without any trouble.

It will be apparent that many modifications and variations can be introduced in the embodiment of the present invention described above, without departing from the scope of the invention. In particular, the male contact elements 11 and the female contact elements 12 can have a structure

What we claim is:

1. An improved connector for establishing electric connection between vehicles, particularly between railroad vehicles, comprising two corresponding connection members (1) each of which has a substantially cylindrical shape and is provided with male contact elements (11) and female contact elements (12) secured to it and having a bush (26) with holes (29) therein for housing corresponding male contact elements (11) and slidable axially relative to the corresponding connection member, (1) so as to expose a part of said male contact elements, (11) each bush (26) being biased axially by a helical spring, (34) wherein the improvement comprises:

a. a first flat wall (8) on each bush (26)

b. a second flat wall (28) on each bush, (26) slidable relative to a corresponding flat wall (8) of the corresponding connection member (1);

c. a cylindrical wall (27) on each bush (26);

d. a small block (37) on each said connection members (1), provided with holes (38);

e. a plurality of sleeves (42) on each bush (26) each of said sleeves (42) being telescopically engaged in a corresponding hole (38) of said small block and telescopically slidable into it, so as to electrically insulate the corresponding male contact element (11) from the adjacent ones in any operating position of the connector; and

f. parts (33) projecting radially from said cylindrical wall portion (27) adapted to abut with a corresponding lip (32) of said connection member (1) for arresting the sliding of the bush (26).

2. A connector as claimed in claim 1, wherein one end of each of said springs (34) is housed in a corresponding hole (35) of said small block, (37) while the opposite end thereof is guided by a projection (36) of said bush (26).

3. A connector as claimed in claim 1, wherein each connection member (1) comprises a support element (45) and a thin plate (23) which is provided with holes and adapted to rest upon said support element (45), each contact element (11, 12) being provided with an annular ridge (21) adapted to the housed in a corresponding anular cavity (22) of said plate (23) so as to axially lock the contact element with respect to the support element and the plate.

4. A connector as claimed in claim 1, wherein each helical spring (34) is disposed so as to generate a resultant force whose line of action passes substantially through the center of gravity of the corresponding bush (26).

5. A connector as claimed in claim 3, wherein three springs (34) are provided with their axes passing through the vertices of a triangle one side of which is parallel to said first flat wall (28).

* * * * *