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DISENGAGEABLE ELECTRIC CONNECTOR

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Fig.1

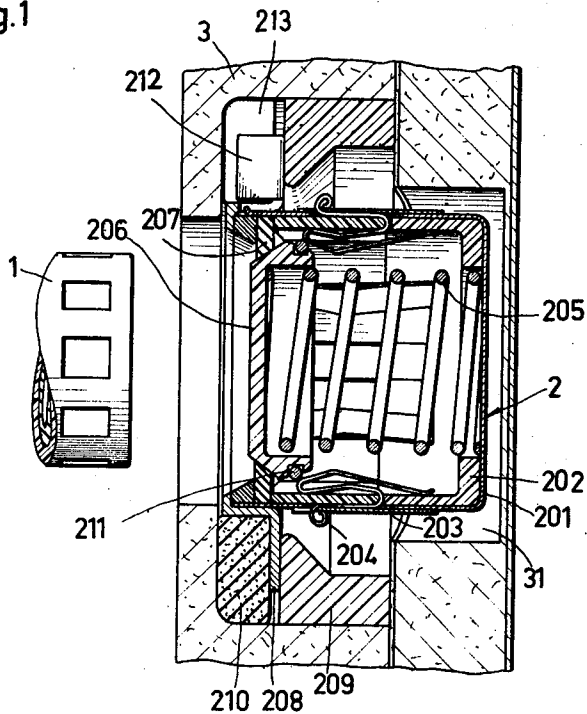
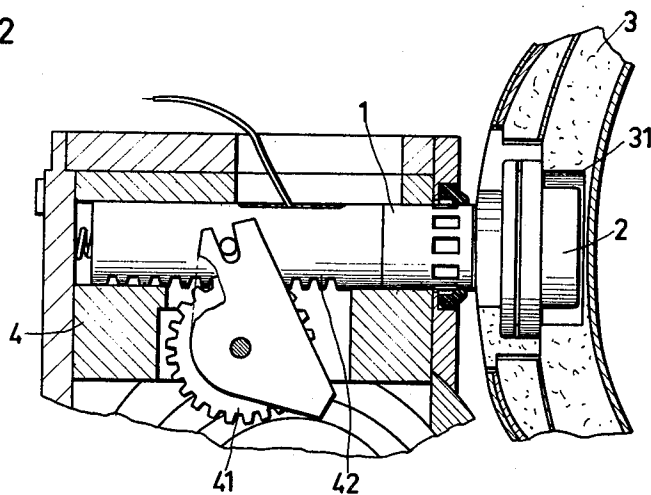


Fig.2



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DISENGAGEABLE ELECTRIC CONNECTOR

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8 Claims

ABSTRACT OF THE DISCLOSURE

A disengageable electrical connector includes a plug and a socket or receptacle cooperable with the plug. The connection is designed, for example, to electrically interconnect circuits on a missile launching apparatus with circuits in a missile support on the apparatus. The receptacle is arranged in a substantially larger recess in the missile support and has a flange which bears on an abutment concentrically embracing the receptacle. An elastically deformable ring engages the opposite surface of the flange which is the surface facing an opening in the receptacle receiving recess of the support. The abutment is preferably made of tetrafluorethylene and the ring is preferably made of chlorobutane rubber. The abutment and ring allow displacement of the receptacle for accurate alignment with the plug when the plug is moved into the receptacle by suitable operating means.

BACKGROUND OF THE INVENTION

Disengageable electrical connectors for simultaneously interconnecting a plurality of circuits are known. It is furthermore known to design such electrical connectors, or either the plug or the receptacle thereof, so that engagement between contacts in the unplugged or disconnected state of the electrical connector is made impossible. Thus, and as shown in German Gebrauchsmuster No. 1,812,283, for example, the receptacle, when the plug is disengaged therefrom, is secured by a plate automatically closing the plug receiving opening. This plate is so designed that it automatically renders effective the electric contacts of the receptacle when the plug is inserted into the receptacle.

Automatic loading apparatus and launching apparatus for guided missiles, for example, require electrical connectors to establish the electric connection between a guided missile and its launching apparatus, connected with a guiding or tracking device. For this purpose, the receptacle of the electrical connector is preferably connected with the missile or with its associated launching tube, the receptacle being arranged for cooperation with a plug connected with the launching apparatus. In order to make sure that the plug fits exactly into the receptacle when a missile, or a launching tube carrying a missile, is brought to the launching apparatus, complicated mechanical devices are required which align the missile, or the launching tube, during connection with the launching apparatus so that the plug and the receptacle oppose each other in axial alignment.

SUMMARY OF THE INVENTION

This invention relates to disengageable electrical connectors for interconnecting a plurality of electrical circuits and, more particularly, to an improved disengageable electrical connector designed to accommodate a limited relative axial displacement between the two parts thereof, for example, upon insertion of a plug into a receptacle.

With the disengageable electrical connector of the in-

vention, the requirements imposed upon mechanical devices required for automatic alignment of two elements to be electrically interconnected, for example, a missile launching tube and a launching apparatus, are maintained relatively low by a special design of the electrical connector so that a predetermined axial displacement between the two parts thereof can be accommodated.

In accordance with the invention, an electrical connector for interconnecting a plurality of electric circuits, and including a plug and receptacle, is so designed that the receptacle has a flange forming a bearing which bears against an abutment arranged concentrically of the receptacle. An elastically deformable ring associated with the receptacle holds the receptacle flexibly in a central position in a receptacle recess of one of the devices to be interconnected.

If care is taken that sufficiently large centering surfaces are provided on the plug and the receptacle, it is possible, with the invention arrangement, to substantially reduce the cost of the mechanical devices for aligning, for example, a missile launching tube with a launching apparatus. At the same time, the reliability of such a mechanical device is greatly increased by reducing the number of components thereof.

In accordance with a preferred embodiment of the invention, the abutment supporting the receptacle is made of tetrafluorethylene, which is characterized by a minimum coefficient of friction. The elastically deformable ring consists preferably of chlorobutane rubber, which is characterized by a long service life and properties of elasticity which remain substantially stable during the service life.

An object of the invention is to provide an improved disengageable electrical connector for interconnecting a plurality of electrical circuits.

Another object of the invention is to provide such a disengageable electrical connector including a plug and a receptacle so designed that a limited axial displacement of the plug and the receptacle is possible while still permitting engagement of the plug in the receptacle.

A further object of the invention is to provide such a disengageable electrical connector for use in connecting, for example, electrical circuits on a missile launching tube with electrical circuits on launching apparatus, and in which there is a substantial reduction in the design requirements of mechanical devices necessary for automatic alignment of the launching tube with the launching apparatus.

Yet, another object of the invention is to provide such a disengageable electrical connector including a receptacle having a flange forming a bearing engaging an abutment arranged concentrically with the receptacle, and including an elastically deformable ring embracing the receptacle and holding the receptacle flexibly in a central position in a receptacle receiving recess.

A further object of the invention is to provide such a disengageable electrical connector in which the abutment is made of tetrafluorethylene and the elastically deformable ring is made of chlorobutadiene rubber.

BRIEF DESCRIPTION OF THE DRAWINGS

For an understanding of the principles of the invention, reference is made to the following description of a typical embodiment thereof as illustrated in the accompanying drawings.

In the drawings:

FIG. 1 is a sectional view illustrating a disengageable electrical connector embodying the invention, with the plug being shown only partially; and

FIG. 2 is a sectional view illustrating the disengageable electrical connector as used in a missile launching tube to be connected with a launching apparatus.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The disengageable electric connector shown in FIG. 1 comprises a plug 1, which has not been completely illustrated, and a receptacle or plug box 2 which is arranged in a device 3. The device 3 may comprise, for example, a launching tube for guided missiles, and has not been illustrated in full because it forms no part of the present invention except for those parts thereof that actually cooperate with the receptacle 2.

Receptacle 2 comprises a cup-shaped housing 201 whose inner bottom surface is lined with another cup-shaped housing 202 comprising electrical insulating material. Housing 201 is provided with openings distributed around its circumference and into which are inserted contact springs 204, bearing with the interposition of insulating material, against housing 201. The lining housing 202 has its bottom formed with a central opening to receive a coil spring 205 engaging the bottom of housing 201, the opposite end of housing 201 engaging a plate 206 of electrically insulating or dielectric material. Plate 206 is designed as a shallow hollow cylinder, and seats, under the bias of spring 205, against an opening of housing 201.

An annular packing washer 207 is disposed inside the opening in housing 201 and is formed, with respect to plate 206, that it forms a mechanical stop for plate 206 which is biased by coil spring 205. Washer 207 thus fixes the rest position of plate 206, with the plug withdrawn, and at the same time closes housing 202, in a liquid-tight and dust-tight manner with respect to the exterior. Around the periphery of plate 206, there is arranged a cylindrical metal ring 211 which short circuits contact springs 204 when plate 206 is engaged with washer 207.

Adjacent its open end, housing 202 is formed with a flange 208 which has its inner surface engaged with an annular abutment 209 of tetrafluorethylene, and is supported, with respect to recess 3, by its opposite surface engaging a ring 210 of chlorobutane rubber. A lug 212 on flange 208 engages in a slot or recess 213 of ring 210 and thus anchors receptacle 2 against rotation. The recess 31 provided in the element 3 is sufficiently large that the receptacle, consisting substantially of cup-shaped housing 201, has freedom of movement in all directions with flange 208 sliding substantially friction-free on abutment ring 209.

The inside diameter of the receptacle increases gradually in an axially outward direction in the opening of the so that, when plug 1 is introduced into receptacle 2, the position of receptacle 2 adapts itself to any axial displacement between receptacle 2 and plug 1. Thus, ring 210 is elastically deformed, permitting displacement of flange 208 and thus of the entire receptacle 2. Flange 208 is arranged close to the opening of receptacle 2 in order to maintain the receptacle centered, through ring 210 with a relatively large lever arm and to return the receptacle into the centered position after disengagement of the plug connection.

FIG. 2 illustrates a part of a missile launching tube 3, which has not been shown in detail, and which has the recess 31 for receiving receptacle 2 such as shown in FIG. 1. Opposite launching tube 3 there is arranged that part of a launching apparatus 4 carrying plug 1, the launching apparatus not being shown in further detail as it forms no part of the invention. Plug 1 is moved to engage in receptacle 2 by a gear 41 which engages a rack 42 on plug 1, the arrangement being such that automatic engagement of plug 1 in receptacle 2 and disengagement of plug 2 from receptacle 1 is made possible.

If launching tube 3, carrying a guided missile (not shown) is brought automatically to launching apparatus 4 by a loading device, which has not been shown, the exact alignment of launching tube 3, which ensures coincidence of the axes of plug 1 and receptacle 2, is not nec-

essary. Any axial displacement between receptacle 2 in launching tube 3 and plug 1 connected with launching apparatus 4 has no adverse effect on the introduction or insertion of plug 1 into receptacle 2, since such axial displacement is compensated by the displacement possibility of receptacle 2 in recess 31 of launching tube 3, as described in connection with FIG. 1.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. In a disengageable electrical connector for selectively interconnecting a plurality of electrical conductors on a first element to corresponding electrical conductors on a second element, the connector including a plug on the first element and a mating receptacle mounted in an outwardly opening recess in the second element: the improvement comprising, in combination, a housing for said receptacle, disposed in said recess; the interior dimensions of said recess being substantially in excess of the exterior dimensions of said housing; said housing having a radially outwardly projecting flange intermediate its ends; an abutment in said recess loosely laterally surrounding said housing, said flange slidably engaging said abutment; and resilient means engaged laterally between said housing and said recess and biasing said housing into concentric relation with said abutment.

2. In a disengageable electrical connector, the improvement claimed in claim 1, in which said resilient means comprises an elastically deformable ring engaging the exterior of said housing.

3. In a disengageable electrical connector, the improvement claimed in claim 2, in which said elastically deformable ring engages the surface of said flange facing the opening of said recess.

4. In a disengageable electrical connector, the improvement claimed in claim 3, in which said housing has an open outer end; said flange extending from said housing adjacent said open outer end.

5. In an electrical connector, the improvement claimed in claim 1, in which said abutment is made of tetrafluorethylene.

6. In an electrical connector, the improvement claimed in claim 1, in which said resilient means comprises a ring of chlorobutane rubber laterally embracing said housing.

7. In a disengageable electrical connector, the improvement claimed in claim 6, in which said abutment comprises a ring of tetrafluorethylene.

8. In a disengageable electrical connector, the improvement claimed in claim 1, in which said first element constitutes part of a guided missile launching apparatus; said second element being a guided missile retainer arranged for aligned mounting on said launching apparatus; said plug being normally retracted; and means on said launching apparatus operatively associated with said plug and operable automatically, responsive to alignment of said missile retainer on said launching apparatus, to project said plug into said receptacle to establish said electrical interconnections.

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