Feb. 28, 1956 H. DE JUR ET AL 2,736,870

EASY-RELEASE DISCONNECTABLE ELECTRICAL CONNECTOR

Filed Feb. 5, 1953 2 Sheets-Sheet 1

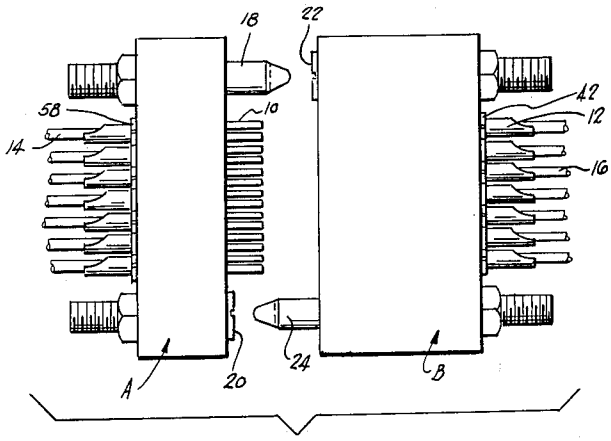


Fig. 1.

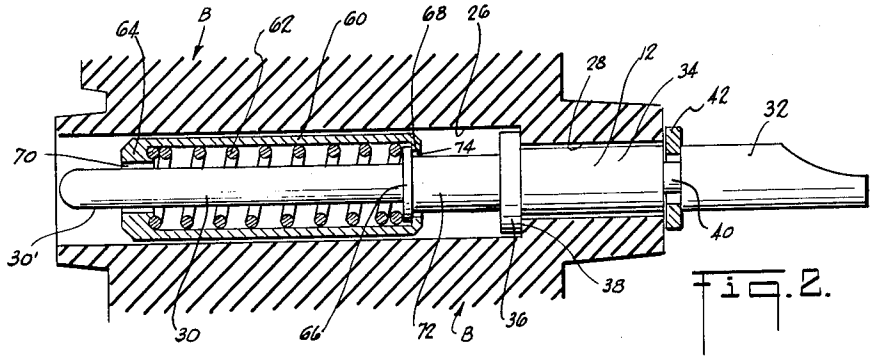


Fig. 2.

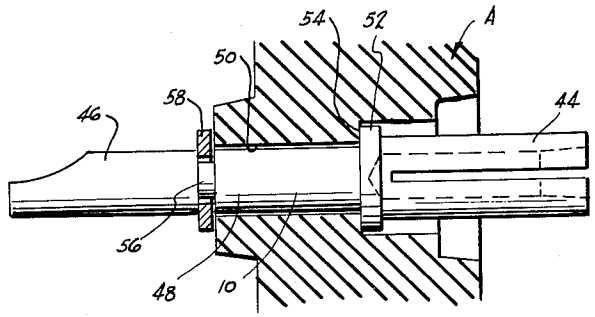


Fig. 3.

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EASY-RELEASE DISCONNECTABLE ELECTRICAL CONNECTOR

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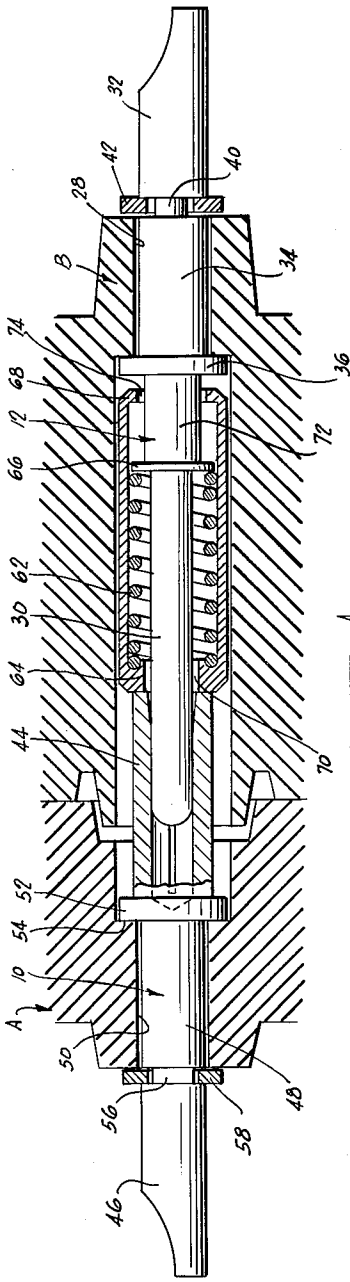


Fig. 4.

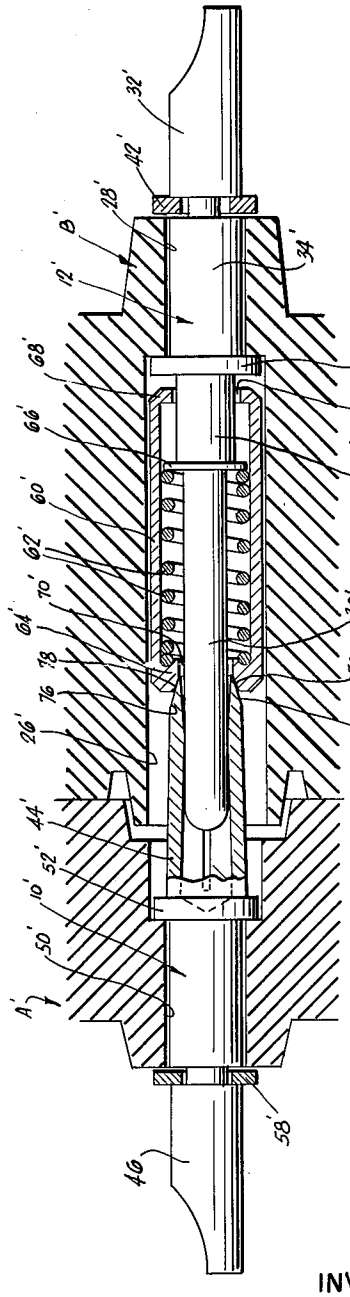


Fig. 5.

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EASY-RELEASE DISCONNECTABLE ELECTRICAL CONNECTOR

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4 Claims. (Cl. 339—45)

This invention relates to an improved easy-release disconnectable electrical connector particularly of the multiple pin and socket type.

In multiple pin and socket connectors, especially when they are made in small or miniature form, difficulties are encountered in both coupling and uncoupling the connector parts. In coupling the connector parts, due to the impossibility of obtaining perfect alignment in each pair of pin and socket contacts in a multiple or group pin and socket structure, it is difficult to effect the coupling with the desired ease and without binding taking place and without imposing an undue strain, oft-times a breaking strain, on the contact elements and their moorings. In uncoupling the connector parts, considerable force is required to effect separation, particularly because of the binding action that has taken place when the parts were forcibly coupled together. To assist in uncoupling the connector parts, spring-biasing means have been embodied in the contacts of prior multiple connectors of this type, which are intended to be active for assisting in separating the parts when a locking or holding means associated with the connector is released.

The present invention has for its prime object the provision of a multiple pin and socket connector employing a spring-biased releasing means in which the above described difficulties are effectively solved or overcome by a construction employing the following principles and functional behavior:

(1) The spring-biased releasing means, associated with and structurally related to each pin contact (which latter is mounted in the connector to have a limited transverse free-floating movement) is so arranged with reference to the pin contact that the free end or portion of the pin contact which is exposed for electrical connection is permitted the freedom of a limited transverse floating action which enables ready or self-alignment of such pin contact with its mating socket contact. This self-alignment action between each pair of contacts in the group of contacts is a factor in enabling the connector parts to be coupled together with the desired ease and without introducing binding or other undue strains met with in the performance of prior structures, and

(2) This achieved result, in minimizing or eliminating initial binding action in itself permits an easier separation of the connector parts when these are uncoupled. In addition, due to the referred to transverse free-floating action of the pin contact and particularly the free end of the connector pin and due also to the more relative freedom of action of the spring-biased releasing means which is provided, the releasing of the pin-and-socket contacts is more readily effected in the uncoupling of the connector parts.

Other functional advantages of the construction of the present invention will appear from the following description thereof.

To the accomplishment of this object and such other objects as may hereinafter appear, the invention relates to the electrical connector as sought to be defined in the

appended claims and described in the following specification taken together with the accompanying drawings, in which:

Fig. 1 is a view somewhat schematic showing two connector parts of a multiple connector of the type in which the structure of the present invention is embodied, the connector parts being shown in uncoupled relations;

Fig. 2 is a view, with parts shown in section, of a portion of a connector part showing a pin contact of the connector embodying the improvement of the present invention;

Fig. 3 is a view, also with parts shown in section, of a socket contact of the connector adapted for coupling relation to the pin contact shown in Fig. 2;

Fig. 4 is a view with parts shown in section, showing the pin contact of Fig. 2 and the socket contact of Fig. 3 moved into aligned and coupling relation, and

Fig. 5 is a view similar to that of Fig. 4 and showing a preferred modification.

Referring now more in detail to the drawings, and having reference first to Fig. 1 in which the connector parts are shown in generalized or schematic relation, the electrical connector in which the improvements of the present invention are embodied, comprises a connector part A and a connector part B, shown in Fig. 1 in uncoupled relation and adapted to be coupled together for electrical connection of the contacts embodied therein. The connector parts A and B are of the monoblock type. These connector parts or blocks A and B are made of a molded insulation material, molded with suitable cavities to receive the contact and other parts which make up the assembled connector. The block A is shown provided with a plurality of socket contacts **10**, **10** and the block B is shown provided with a plurality of pin contacts **12**, **12** for mating relation with the socket contacts **10**, **10**; and to the terminals of these contacts are connected the wires **14** and **16** respectively. These connector blocks are also customarily provided with centering members also of the pin and socket variety, the centering members being arranged so that the parts or blocks A and B may be fitted only in one way; the block A being provided for this purpose with the pin type centering member **18** at its upper end and with a socket type centering member **20** at its lower end, intended for mating relation respectively with the socket type centering member **22** and the pin type centering member **24** of the connector part or block B.

In Fig. 2 is shown the detailed construction of the pin contact member **12** and its mounting in the connector part or block B. The connector part B has formed therein a pin contact-receiving cavity comprising a relatively deep well or recess **26** and a pin mounting bore **28** of lesser diameter than that of the recess **26**. The pin contact **12** comprises a front portion **30**, the free and exposed end **30¹** of which is adapted for electrical connection, an opposite terminal end portion **32** and an intermediate mounting portion **34**, a connecting wire such as **16** being adapted to be secured as by soldering to the terminal end portion **32**. This pin contact **12** is securely fixed to the connector block or part B at the base of the recess **26**; and for this purpose the pin contact is formed with a flange part **36** engaging a shoulder **38** formed in the insulating block, and is provided with a reduced portion **40** adapted to receive the locking spring washer **42**. The mounting portion **34** of the pin contact is received by the mounting bore **28**, spaced, however, from the wall of the bore sufficiently to permit the pin contact **12**, and in an accentuated way its front portion **30**, to have a limited transverse free-floating movement in the connector part or block B.

In Fig. 3 is shown in detail a socket contact and its mounting adapted for mating relation with the pin contact of Fig. 2, and which is also of a well-known construction.

The insulating block A is formed with suitable cavities to receive the socket contact 10. The socket contact 10 comprises a socket end or portion 44 (of a split type), a terminal end or portion 46 to which a connecting wire 14 (see Fig. 1) is secured as by soldering, and an intermediate mounting portion 48. The socket contact is fixedly mounted or moored in the cavity 50 by means similar to that described in connection with Fig. 2, namely, by providing the socket contact with a flange part 52 engaging a shoulder 54 in the insulating block and by forming the contact with a reduced section 56 which receives a split spring washer 58. The mounting portion 48 of the socket contact is lodged in the mounting part of the cavity 50, in the same way as described for the mounting portion 34, whereby the socket contact 10 also possesses a limited transverse free-floating movement in its connector block A.

The spring-biased releasing means referred to is structurally associated with the pin contact assembly. Reverting now to Fig. 2 of the drawings, the spring-biased releasing means comprises a sleeve member 60 surrounding the front pin portion 30, the said sleeve being mounted in the recess 26 for axially slidable movement therein between limits and closely spaced from and guided by the walls of said recess. This sleeve 60 is spaced circumferentially from the front pin portion 30. The sleeve 60 comprises the operating element of the releasing means and is spring biased by means of a compression spring 62 which encircles the contact pin portion 30 and which is completely housed by the sleeve 60. The spring 62 has as its anchoring points the enlarged front end 64 forming part of the sleeve 60 and an enlargement 66 formed intermediate the ends of the pin contact 12. The sleeve 60 is assembled to the pin contact member 12 by being slipped over the front portion 30 of the pin contact and by spinning or inbending the end 68 of the sleeve into a position to engage the enlargement 66 of the pin contact when the parts assume the position shown in Fig. 2.

It will be observed that the spring anchoring end 64 of the sleeve has its inner wall spaced radially from the pin contact portion 30', the spacing being indicated as 70, and that the inbent or spun end 68 of the sleeve also has its inner wall spaced from the contiguous enlarged part 72 of the contact pin, the space provided being indicated as 74. By means of this construction, the spring-biased released sleeve 60 is free of lateral engagement with any part of the pin contact, while the said sleeve is movable or slidable axially with considerable freedom in the recess 26 of the insulating block, being guided in this motion by the walls of the said recess. As a consequence of this construction, the front pin contact portion 30 is spaced (by means of the spaces 70 and 74) circumferentially from the sleeve 60, this spacing, taken together with the described mounting of the pin contact, permitting a limited transverse free-floating movement or motion of the front contact portion 30 and particularly the free and exposed pin contact portion 30', which movement is about the mounting end 34 of the pin contact, thus enabling a freedom of alignment or a self-alignment of the pin contact when the same is coupled to the socket contact. It will be observed that the sleeve 60 is movable in the recess 26 within limits, the outward movement being limited by the engagement of the inbent sleeve portion 68 with the pin enlargement 66.

In Fig. 4, the pin contact assembly of Fig. 2 and the socket contact assembly of Fig. 3 are shown in coupled relation. When the connector parts are thus coupled together, the pin contact portion 30 aligns itself with the socket contact portion 44 and these are coupled electrically as indicated. At the same time, the forward end of the socket portion 44 engages the forward end 64 of the sleeve 60 with the result that the sleeve 60 is moved inwardly against the tension of the compression spring 62. These connector parts, when mounted on a suitable instrument such as, for example, a radio set, are associated with a retaining or locking means which locks the connector parts in their coupled relation. When such retaining or locking means is unloosened or opened, the connector parts A and B may then be separated, and it is in the separation of the parts that the spring-biased releasing means or sleeve 60 becomes active in assisting the release of the socket contact 10 from the pin contact 12.

In Fig. 5 we show a modification of the electrical connector which is the same in all respects as the structure shown in Fig. 4, except for the tapering of the contiguous and meeting ends of the socket and the spring sleeve or housing, similar parts in Fig. 5 being designated by the same, but primed, reference characters as employed with Fig. 4. In this modification the terminal or free end of the socket 44' is tapered as at 76 and the contiguous end of the portion 64' of the spring-biased sleeve 60' is matingly tapered as at 78.

When the connector parts of this modification structure are coupled together the pin contact portion 30' aligns itself with the socket contact portion 44' during the initial act of engagement between the socket contact and the pin contact. The forward end of the socket portion 44' then engages the forward end 64' of the sleeve 60', as before, with the result that the sleeve 60' is moved inwardly against the tension of the compression spring 62'. As these socket and pin contacts are moved to their "home" position, the mating inter-engagement of the tapered portions 76, 78 of the socket and sleeve become effective for contracting the parts of the socket contact 44' with the result that electrical contact between the pin and socket is assured, and with the further result of locking the pin and socket in its electrical engagement. When the connector parts A' and B' are to be separated the unlocking of these parts requires but a slight initial pull in the act of separation and as soon as the unlocking takes place, and particularly when the socket contact moves beyond the released sleeve or housing, the pin and socket are rendered completely free for their respective transverse floating motion to complete the easy release of the socket contact member from the pin contact member.

The structure and operation of the easy-release disconnectable electrical connector of the present invention and the principles and functional advantages attributed thereto, as described in the statement of invention, will, in the main, be fully understood from the above detailed description.

Other functional advantages of the construction of this invention are as follows:

(*a*) The spring 62 is completely enclosed and retained in the sleeve or housing 60, which latter rides in the recess 26 close to the walls of the latter; thereby dirt or other foreign matter can be effectively excluded from the parts of the releasing means;

(*b*) The spring housing 60, by its even pressure and because it runs freely within the wall of the molded cavity, helps to guide and release the contacts, and a minimum of friction is accomplished in the release of the contacts;

(*c*) The contact pin portion 30 is of uniform diameter and does not contain any undercuts which would tend to weaken or bend this portion of the pin contact. Since this portion of the contact pin is of a uniform diameter and contains no undercuts, full current capacity is carried uninterruptedly through the contact pin; also, since the sleeve 60 and its compression spring do not ride on the pin contact, no current is carried away from the pin contact;

(*d*) The enlarged portion 72 of the pin contact strengthens the structure and permits a desired foreshortening of the pin portion 30, only the front end 30' of which is engaged in the electrical connection;

(*e*) Extreme vibration does not affect the contact assembly structurally or electrically since the pin contact is a permanently affixed, non-removable component which cannot be jarred loose; and

(*f*) The free end 30' of the pin contact projects be-

yond the spring-biased housing or sleeve 60 to permit immediate self-alignment of the pin contact with the socket contact before the spring is compressed. Also, since the front end of the pin contact is exposed, the pin contact has the desired floating action in the molding without losing any floating action in the housing.

It will be apparent that changes may be made in the described construction without departing from the essence of the invention as defined in the following claims.

We claim:

1. An easy-release disconnectable electrical connector comprising two couplable connector parts, one connector part comprising an insulating support and a socket contact fixed thereto, and the other connector part comprising an insulating support provided with a deep recess and a pin contact fixed at one end to the insulating support at the base of the recess and having a front portion provided with a free and exposed end for electrical connection, the socket contact and pin contact being arranged for alignment and electrical connection when the connector parts are coupled together, and a spring-biased releasing means for the connector parts comprising a sleeve surrounding but spaced circumferentially from the front portion of said pin contact, and adapted to be engaged and moved axially by said socket contact, said sleeve being mounted in said recess for axially slidable movement therein between limits and guided by the walls of said recess, the said circumferential spacing permitting a limited transverse free-floating action of the said front portion of the pin contact for enabling initial self-alignment of said pin contact with said socket contact, and a spring fully housed by said sleeve and active between a part of said pin contact and a part of said sleeve for biasing said sleeve towards the socket contact to effect the easy-release of the connector parts.

2. An easy-release disconnectable electrical connector comprising two couplable connector parts, one connector part comprising an insulating support and a socket contact fixed thereto, and the other connector part comprising an insulating support provided with a deep recess and a pin contact fixed at one end to the insulating support at the base of the recess and having a front portion provided with a free and exposed end for electrical connection, the socket contact and pin contact being arranged for alignment and electrical connecion when the connector parts are coupled together, and a spring-biased releasing means for the connector parts comprising a sleeve surrounding but spaced circumferentially from the front portion of said pin contact, and adapted to be engaged and moved axially by said socket contact, the free end of said pin contact normally extending axially beyond said sleeve, sufficiently to effect said alinement and electrical connection before said sleeve is engaged by the socket contact, said sleeve being mounted in said recess for axially slidable movement therein between limits and guided by the walls of said recess, the said circumferential spacing permitting a limited transverse free-floating action of the front portion of the pin contact for enabling self-alignment of the free end of said pin contact with said socket contact, and a spring encircling the contact pin and fully housed by said sleeve and active between a part of said pin contact and a part of said sleeve for biasing said sleeve towards the socket contact to effect the easy-release of the connector parts.

3. The electrical connector of claim 2 in which the contiguous ends of the socket contact and the sleeve are tapered for mating inter-engagement whereby, as the socket and pin contacts are moved to their "home" position, the mating inter-engagement of the tapered ends of the socket and sleeve become effective for contracting the socket contact with the result of locking the pin and socket contacts in their electrical engagement.

4. An easy-release disconnectable electrical connector comprising two couplable connector parts, one connector part comprising an insulating support and a socket contact fixed thereto, and the other connector part comprising an insulating support provided with a deep recess and a pin contact fixed at one end to the insulating support at the base of the recess and having a front portion provided with a free and exposed end for electrical connection, the socket contact and pin contact being arranged for alignment and electrical connection when the connector parts are coupled together, and a spring-biased releasing means for the connector parts comprising a sleeve surrounding but spaced circumferentially from the front portion of said pin contact, said sleeve being mounted in said recess for axially slidable movement therein and guided by the walls of said recess, the said circumferential spacing permitting a limited transverse free-floating action of the front portion of the pin contact for enabling self-alignment of said pin contact with said socket contact, said pin contact having an enlargement between its ends and said sleeve having a part for engaging the said enlargement to limit the outward movement of said sleeve, and a spring housed by said sleeve and active between a part of said pin contact and a part of said sleeve for biasing said sleeve outwardly towards the socket contact to effect the easy-release of the connector parts.

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