April 5, 1949. H. H. BURTT 2,466,370

ELECTRICAL CONNECTOR

Filed May 22, 1946 2 Sheets-Sheet 1

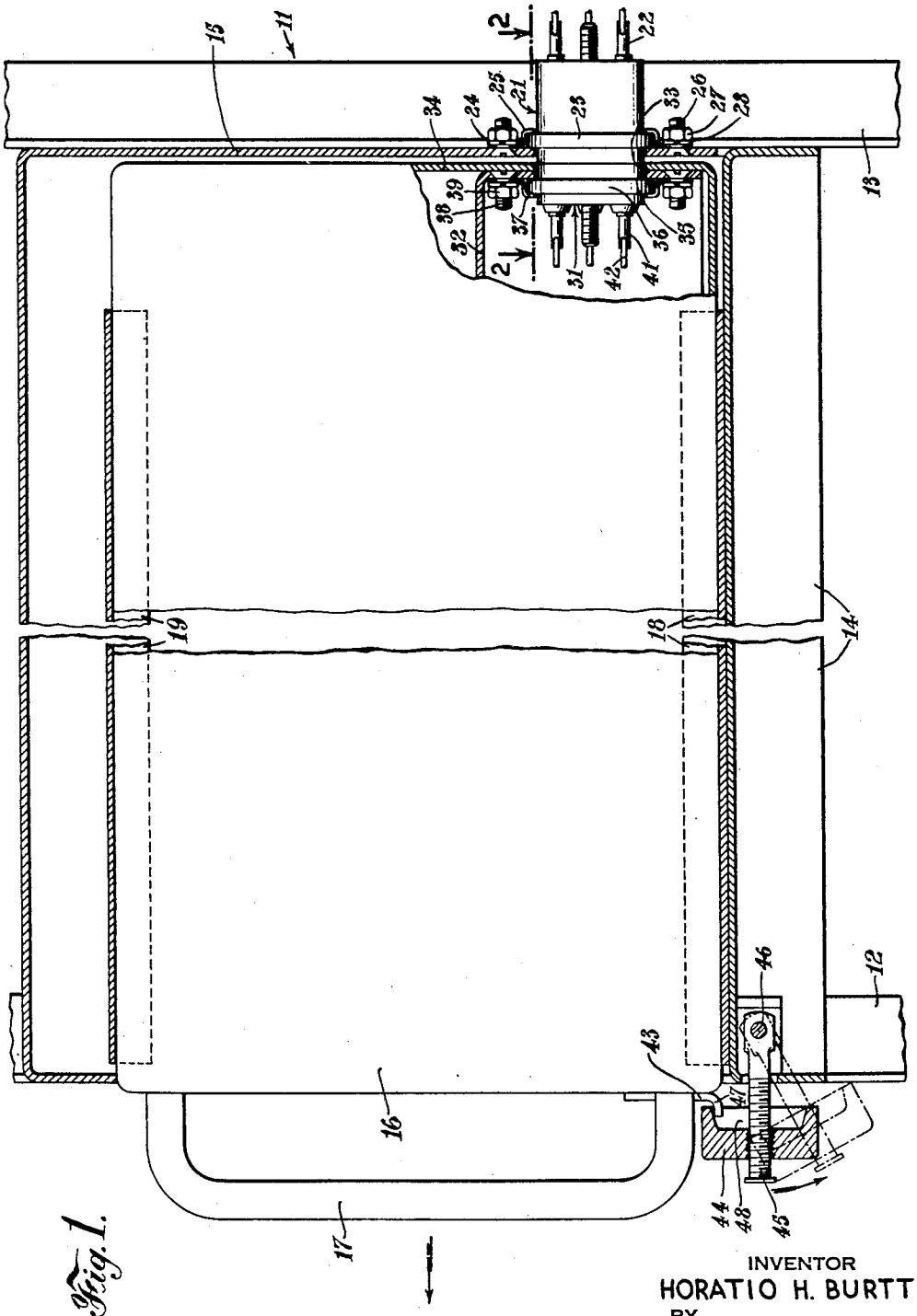


Fig. 1.

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Fig. 2.

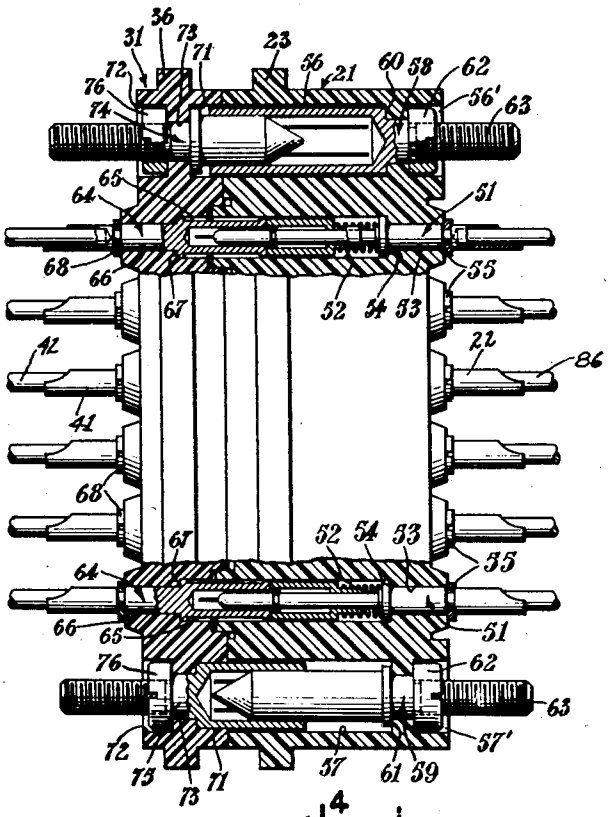


Fig. 4.

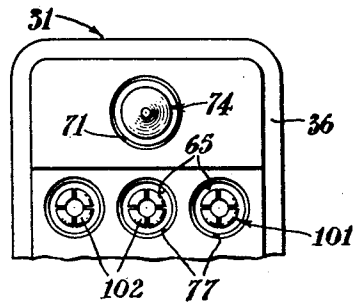
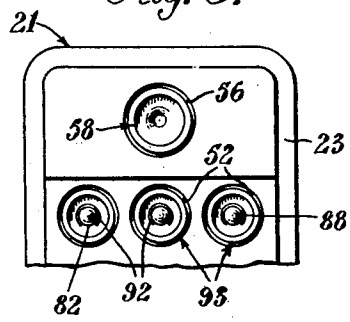


Fig. 5.



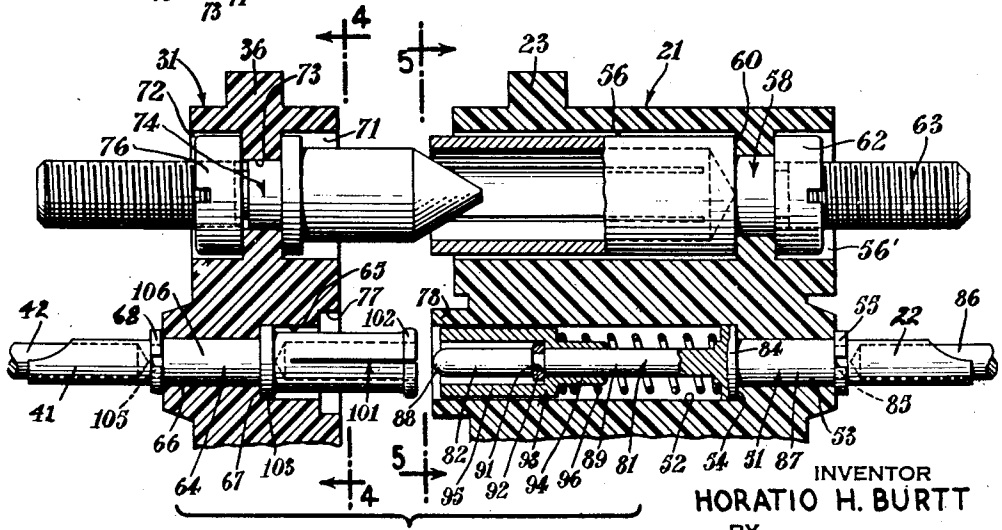


Fig. 3.

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ELECTRICAL CONNECTOR

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3 Claims. (Cl. 173—328)

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This invention relates to electrical disconnect connectors.

Heretofore, great difficulty has been encountered in freeing the coupled parts of multiple pin and socket type connectors from one another at times when the parts are being disconnected. Such pin and socket contact connectors cling or freeze and usually become bent or destroyed before the connector parts are finally separated from one another. Without the application of a great deal of force, it has been practically impossible to separate the connector parts.

It is accordingly among the objects of the present invention to provide a multiple pin and socket contact connector wherein the pin and socket contacts will be instantly separated from one another when the coupling body parts retaining them are released from one another and whereby the prying and pulling action usually required in separating prior multiple pin and socket contact connectors will be banished.

It is another object of the invention to provide a connector embodying pin and socket type contacts in which the coupling parts may under certain installations, as well as the contacts be readily and positively freed from one another when the parts are uncoupled or released, and wherein the separation of the parts is easy and instantaneous and done without damage to the contacts and without the application of physical force.

It is another object of the invention to provide a quick-disconnect connector or coupling in which each individual pin contact of a multiple contact connector will be respectively provided with a device for separating the engaged contacts independently of the coupling parts that contain the contacts, wherein said separating device for each of the contacts is carried on the contact itself whereby to provide a self-contained assembly adapted for easy union with the connector part.

It is another object of the invention to provide a quick disconnect connector which is of monoblock construction.

It is still another object of the invention to provide a connector in which polarized pin and socket devices may serve to center and align the connector parts as they are brought together.

According to the present invention, there has been provided a quick-disconnect connector bearing pin and socket contacts in which there is carried by each of the pin contacts a combination spring and ejecting sleeve adapted to be depressed by the socket contact as the two coupling parts with the contacts are brought together and adapted when the coupling parts are released to individually force or free the socket contacts of the pin contacts whereby the coupling or connector parts are quickly, readily and positively freed from one another thereby eliminating the necessity for further muscular exertion to finally free the coupling parts and the contacts from one another. Further, the said spring and sleeve is pre-assembled upon the pin contact to provide a self-contained unit whereby to render easy their assembly to the coupling part at the time the connector is manufactured. By such an arrangement, the springs are handled at a time when the pin contacts are free of the coupling parts and when better control of the springs can be maintained. Polarized pin and socket devices are carried by the connector which are so arranged as to prevent engagement of the body parts should they be reversed and to center the body parts when in the right order for proper alignment of the contacts at the time their engagement is made.

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To the accomplishment of the foregoing and such other objects as hereinafter will appear, my invention consists in the elements and their relation one to the other, as hereinafter particularly described and sought to be defined in the claims, reference being had to the accompanying drawings which show a preferred embodiment of my invention, and in which

Fig. 1 is a fragmentary view partly in cross section, of a rack carrying one connector part and on which there is supported an electrical or radio device bearing the other connector part and adapted to be slid into the rack so that its connector part is coupled to the connector part of the rack, and of means for obtaining the electrical union of the parts against the action of the several contact springs within the connector parts,

Fig. 2 is an enlarged top view looking in the direction of the arrows 2—2 of Fig. 1, upon the connector and with portions of the connector parts removed to show in full the centering members and two pairs of contacts,

Fig. 3 is an enlarged fragmentary and cross-sectional view of the centering members at one end of the connector and of the contacts and with the connector parts slightly detached from one another,

Fig. 4 is a fragmentary plan view looking upon the contact face of the connector part containing the socket contacts,

Fig. 5 is a fragmentary plan view looking upon the contact face of the connector part containing the pin contacts.

Referring now to Fig. 1, 11 is a rack having front and rear vertical frame pieces 12 and 13 connected together by a horizontally-extending shelf 14. This shelf 14 carries a casing or shield 15 adapted to house an electrical or radio unit 16 having a vertically-extending handle 17 on its front face and adapted to be thrusted into or removed from the casing 15 by a push or a pulling operation upon the handle. In order that the movement of the unit 16 will be maintained true upon its insertion and removal from the casing 15, there are provided top and bottom guides 18 and 19 extending from the front of the casing 15 toward the rear thereof. These guides are of angular formation and the top guide 19 serves to prevent upward movement of the unit during its movement into and out of the casing 15 as well as preventing the lateral movement thereof.

The casing 15 has attached to it a coupling part 21 from which contact terminals 22 extend rearwardly for the attachment thereto of wires brought toward the same from the rear of the rack. The connector part 21 has a flange 23 by which it is fastened to the casing 15. The flange abuts the rear face of the casing 15 and is retained thereagainst by a washer-like piece 24 having portions 25 engaging the rearward face of the flange 23 and fastened to the casing 15 by screw bolts 26 and nuts 27 retained in locked position against the frame piece 24 by lock washers 28.

Cooperating with the connector part 21 is a connector part 31 fastened to a sub-frame 32 within the radio unit 16 and extending through an opening 33 in a rear wall 34 of the radio unit 16. The part 31 also extends through an opening 35 in the sub-frame and has a flange 36 by which it is fastened to the front face of the sub-frame 32 by a washer-like piece 37 and fastening bolts 38 and nuts 39. Contact terminals 41 extend forwardly from the connector part 31 for connection with wires 42 leading to devices within the radio unit.

It will be apparent from the description just now made that the connector parts are aligned with one another for engagement and that the engagement is accordingly effected when the radio set is inserted into the casing 15 and forced home so that the coupling parts are completely coupled and abut one another.

In order that the radio set may be retained in its coupled or inserted position there is provided adjacent the lower end of the handle 17, a lug 43 adapted to be engaged by a locking nut 44 threaded upon a vertically-swingable bolt 45 pivoted at 46 to the forward end of the shelf 14. The projection 43 is provided with a forwardly bent portion 47 adapted to enter a recess 48 in the engaging face of the locking nut 44. With the locking nut 44 first screwed toward the rear of the bolt, the bolt 45 may be swung to a horizontal position to align the nut recess 48 with the portion 47. The nut 44 is then tightened upon the projection 47 so as to finally lock the radio set 16 in its slid-in position within the casing 15.

Referring now to Figs. 2, 3, 4 and 5, there is shown the details of the connector embodying the features of the present invention. The connector parts 21 and 31 are of monoblock construction and formed by a molding operation in which openings for containing the contacts and the centering pins are provided.

The part 21 is molded to contain eighteen pin contact assemblies indicated generally at 51. This

opening is molded in two diameters, one for effecting an opening 52 of large diameter extending for the greater distance through the material and adapted to contain the operable parts of the assembly 51, and the other a small opening 53 adjacent the terminal face of the coupling part to provide a shoulder 54 by which the contact assembly can be locked against axial displacement when secured on its terminal end by a spring clip 55. The smaller opening 53 may be preferably provided with a flat portion matching the flat portion on the pin assembly 51 to prevent the turning of assembly in the opening 53.

At opposite sides of the part 21 there are provided relatively large diameter openings 56 and 57 for retaining long centering members 58 and 59, respectively. These openings are similarly provided with shoulders 60, 61 against which the members 58 and 59 are locked by a nut 62 as it is tightened upon a threaded shank portion 63. Relatively short openings 56', 57' at the terminal face of the part serve respectively to house the nuts 62. Shoulders 60 and 61 may also be provided with a flat portion to prevent the pins from turning.

It will be noted that the centering member 58 at one side is of the socket type whereas the member 59 at the opposite side of the coupling is of the pin type. This is so that the coupling parts can be fitted together in only one way. By such an arrangement the coupling part cannot be swung end for end and fitted in an opposite manner. It will be apparent to do so that with the terminal connections already made they would not match or correspond with the terminals of the other part and serious harm right result.

The coupling part 31 is thinner than the coupling part 21. This is so because socket contacts 64 thereof do not need to carry parts movable relative to it as in the case of the pin assembly 51. Part 31 has an opening with large and small diameter portions 65 and 66 for each socket contact 64. The socket contact may also have a flat portion cooperating with a flat area in the small diameter portion 66 so as to prevent turning. With a shoulder 67 of socket contact 64 in place in the opening and fastened by a spring clip 68, the socket contact 64 will be held against axial displacement therein.

The part 31 has openings with large and small diameter portions 71, 72 and 73 at opposite sides of the part to contain centering members 74 and 75 adapted to respectively cooperate with the centering members 58 and 59 of the coupling part 21. Retaining nuts 76 are housed within the short large diameter portions 72 adjacent the terminal face of the part 31. The members 74, 75 may likewise have flat portions to cooperate with a corresponding flat portion along the small diameter portion 73 to prevent turning of the centering member. As the parts are located adjacent one another to be connected, the tapered points of the centering members will draw the parts and their contacts into proper alignment preparatory to the making of their actual engagement. Polarizing lead wires may be connected to these centering members.

Referring now particularly to Fig. 3 it will be seen that there is provided within the contact face of the connector part 31 a countersunk surface 77 within each of the openings 65. This countersunk surface 77 is not of great length but is sufficient to receive a sleeve projection 78 on the contacting face of the coupling part 21 and

surrounding the pin contact assembly 51. This increases the length of possible arcing paths between pairs of connected contacts.

The pin contact assembly 51 includes a shank 81 having a contact surface 82 and the terminal portion 22 at opposite ends thereof. Adjacent the shoulder 54 is a flange 84 having the diameter of the large opening 52 and held in abutment against the shoulder 54 by the spring clip 55 bearing against the terminal face of part 21 and fitted in a reduced portion 85 of the shank especially provided for the purpose. The terminal portion 22 is hollowed and receives a wire end 86 which may be retained therein by soldering. A portion 87 between the flange 84 and the reduced portion 85 fills the reduced opening 53. The contact surface 82 of the shank 81 is rounded at its tip 88 to make good starting engagement with the socket contact 64.

Upon the shank 81 and slidable along a portion 89 between the flange 84 and a reduced portion 91 bearing a spring clip 92, is an ejector sleeve or member 93 having a bearing portion 94 and an ejecting portion 95 adapted to extend over the contact surface 82 when the ejector sleeve 93 is against the clip 92 whereby to positively force or effect the socket contact 64 of the coupling part 31 from and free of a tip 88 of the contact surface 82. The ejector sleeve 93 is backed up by an ejector spring 96 surrounding the portion 89 within the opening 52 and reacting between the flange 84 and the portion 95 of the sleeve 93. The portion 94 of the ejector sleeve 93 serves as a pilot for one end of the spring 96.

It should be apparent that the assembly 51, not including the clip 55, may be made up before the assembly is fitted into the openings 52 and 53 of the part 21. The spring 96 and sleeve 93 is fixed in place on the shank 81 and retained by the spring clip 92 while the parts thereof are free of the openings 52, 53. It will thus be seen that the assemblies 51 are self-contained units with the contact shank itself providing the portion on which its ejector sleeve is guided and supported. The sleeve 93 is not dependent upon the wall of the opening 52 for guiding its movement axially of the pin contact.

The socket contact 64 has a slitted hollowed portion 101 with a flanged head end 102. At the base and inner end of the hollowed portion 65 is a flange 103 adapted to rest against the shoulder 67 as the socket 64 is secured in place by the locating of the spring clip 68 over a reduced portion 105 to cooperate with the terminal face of the coupling part 31. A portion 106 lies within and fills the reduced opening 66 and is flattened to cooperate with flat portions of the opening to prevent turning. A hollowed terminal portion 41 is provided at the end of the socket contact 64 for receiving the lead wire 42.

It will thus be seen from the description which has already been made that the pin assembly 51 and the socket contact 64 are rigidly retained against both axially and rotational displacement within their respective openings.

It will be noted that the hollow or pin receiving portion 101 and the flanged head 102 of the socket contact 64 protrudes or projects to a considerable distance from the contact face of the coupling part 31. As the parts 21 and 31 containing their respective centering and contact elements are brought together as when the radio set 16 is thrusted into its slid-in position within the casing 15 of the rack 11, the flanged head 102 of the socket contact 64 abuts the portion 95 of the ejector sleeve 93 on the male contact and forces it inwardly against the action of the ejector spring 96 as engagement is made by the hollow portion 101 of the socket 64 with the contact surface 82 of the pin assembly.

The connector parts will likely be kept in place by the friction of the radio set along its sliding surfaces but to be certain of their engagement the swingable bolt 45 is brought up and the nut 44 screwed into place on the projection 47. Once the set is released and with slight movement of the set to overcome friction, the contacts will separate themselves. With cable mountings the force of the contact springs may be sufficient to bodily move the surrounding parts from one another upon their locking means being released. As long as this nut is retained in its locking or tightened up position the ejector springs 96 will remain compressed and the contact of the socket 64 with the contact surface 82 is sustained. The radio set 16 will thus operate in its normal fashion.

It will now be apparent that the radio set 16 can be readily freed of the casing 15 when the locking nut 44 is released thereby making it unnecessary that a difficult and perhaps harmful pull be made of the radio set to break the coupling parts or disconnect the contacts. The extra force required to separate conventional pin and socket contact connectors has been eliminated.

While the present description has been made with reference to a radio set connector, it will be understood that the invention may be equally embodied in the ordinary free cable connectors of the socket and pin type having some means for retaining the parts in coupled relationship.

While I have shown my invention in the preferred form, it will be obvious that many changes and modifications may be made in the structure disclosed without departing from the spirit and scope of the invention, as defined by the following claims.

What is claimed is:

1. A self-separable electrical disconnect connector comprising two parts adapted to be coupled together, means for retaining the parts in coupled relations, a socket contact carried by one of the parts, and a self-contained pin contact structure assembled as a unit upon the other connector part for alignment with the socket contact as the parts are coupled together, said pin contact unit comprising a pin contact having an axially-extending contact surface and spring-biased ejecting means carried upon the pin contact and slidable over substantially the full extent of the pin contact surface, said spring-biased ejecting means operating between limits upon the pin contact and adapted to substantially bodily disconnect the socket contact from the pin contact and to uncouple the parts when parts are released from the retaining means.

2. A self-separable disconnect connector comprising two interfitting body parts of insulating material, axially-aligned counterbored openings provided in each of the parts, normally contracted, yieldable socket contacts extending respectively through the openings of one of the parts and having a hollow contacting portion protruding from the body part, a pin contact assembly disposed in each of the openings of the other part, each pin contact assembly including a pin contact surface with a shank having a flanged portion adapted to abut the shoulder provided by the counterbored opening and serving to prevent

axial movement of the shank in one direction through the opening, a spring clip on the shank and cooperating with the body part for preventing axial movement of the shank through the opening in the opposite direction, said pin contact having an axially-extending contacting surface adapted to be engaged by the socket contact as the parts are brought together, an ejector sleeve slidable upon the shank and over substantially the full extent of the axially-extending contact surface and adapted to abut the socket contact, stop means on the shank for limiting further outward movement of the sleeve over the pin contacting surface as when the socket member has been made free of the contacting surface, a strong spring acting between the sleeve and the flange on the shank to cause the sleeve to free the socket contact of the pin contact surface at times when it is desired that the parts be disconnected, and both the socket contact and the pin contact shank being respectively provided with terminal portions for the attachment of a wire thereto.

3. A self-separable electrical disconnect connector comprising two parts adapted to be coupled together, means for retaining the parts in coupled relation, a socket contact carried by one of the parts, a self-contained pin contact assembly carried as a unit upon the other connector part for alignment with the socket contact as the parts are coupled together, said pin contact assembly comprising a pin contact member having a shank with a flange thereon, said other connector part having an opening for receiving the pin contact assembly with a shoulder therein, said flange engaging with said shoulder of the other connector part, said shank having a groove

rearwardly of the flange, a washer seated in said groove to secure the shank against axial displacement in the connector part opening from one direction, said flange preventing the movement of the shank through said opening in the opposite direction, said pin contact member having a second groove forwardly of the flange and a contacting surface, an ejector sleeve slidable on said shank and extendable over the contacting surface to remove the socket contact of the one connector part from the pin contact, a washer in said second groove for limiting the outward movement of said ejector sleeve, and an ejecting spring surrounding the shank of the pin member and reacting between the ejector sleeve and the flange of the pin member.

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