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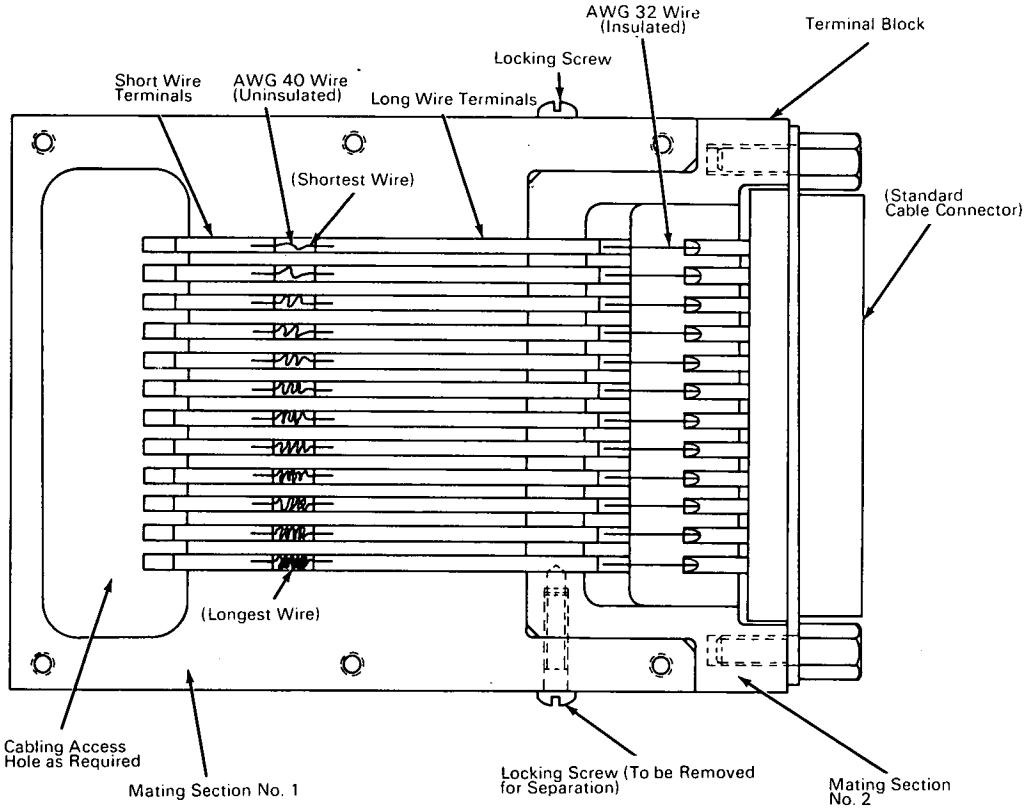
NASA TECH BRIEF

Breakaway Electrical Connector



A one-shot, breakaway multiwire cable connector, such as is used with umbilical cables which temporarily connect a space vehicle or a missile to launch systems, has been investigated. Such connectors are used in relatively small quantity and because of high reliability requirements they are custom made at relatively high cost. Extreme care must be taken to ensure that uniform, low-friction disengagement of mating pins and receptacles is achieved to prevent binding or wedging.

The new separable connector can be economically fabricated by using a number of small-diameter interconnecting wires, each of which, differing incrementally in length, is welded to neighboring pin and cable terminations. As the body portions of the connector pull apart during separation, each of the fine wires is broken in turn at a constant applied force. This design eliminates frictional binding or wedging and provides highly reliable cable interconnections

(continued overleaf)

until the connector is disengaged at the required instant.

The connector consists of two mating sections, no. 1 and no. 2, with section no. 2 fitting within a recess in section no. 1, which contains guides designed to ensure friction-free disengagement of the two sections. The sections are held together by locking screws which are removed just prior to the time that separation will be effected. Section no. 2 carries a standard multiwire cable connector. In-line grooves in each section accommodate the number of wire terminals required for the specific application. Section no. 1 contains short wire terminals which are permanently fixed in the grooves, and section no. 2 contains long wire terminals which are temporarily shiftable in the grooves to facilitate assembly.

A special fixture (not illustrated) is used for positioning the long wire terminals during assembly and welding the ends of the fine wires to each pair of short and long wire terminals. This ensures free interconnection between neighboring terminals by eliminating frictional engagement of contacts. After the wires have been welded to the terminals, the assembly fixture is removed and the long wire terminals are shifted to the positions shown in the illustration, with each fine wire looped, as indicated, to take up differences in length. The long wire terminals are then secured in their assembled positions, either mechanically or with a suitable adhesive. Connections between each of the long wire terminals and the corresponding terminals of the standard cable connector are made by welding or soldering. The space between the sections is then filled with an electrically nonconducting grease. The grease should be tightly packed about the interconnecting wires to exclude air and protect the wires against breakage.

As mentioned above, the locking screws are removed when separation of the two sections is required. Separation may be accomplished by conventional means, such as preloaded spring or explosive devices. As the connector sections part, the wires will break in order of increasing length as the distance between the connector sections increases.

Notes:

1. The conducting wires should be in the full hard condition, ensuring minimum elongation without excessive brittleness. Wires with this characteristic will not stretch during separation, but they will snap apart under the applied force.
2. Documentation is available from:
   Clearinghouse for Federal Scientific
   and Technical Information
   Springfield, Virginia 22151
   Price $3.00
   Reference: TSP69-10474

Patent status:

This invention is owned by NASA, and a patent application has been filed. Royalty-free, nonexclusive licenses for its commercial use will be granted by NASA. Inquiries concerning license rights should be made to NASA, Code GP, Washington, D.C. 20546.

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