

July 21, 1970

R. L. ANDREWS

3,521,222

CABLE CONNECTOR

Filed Nov. 24, 1967

FIG. 1

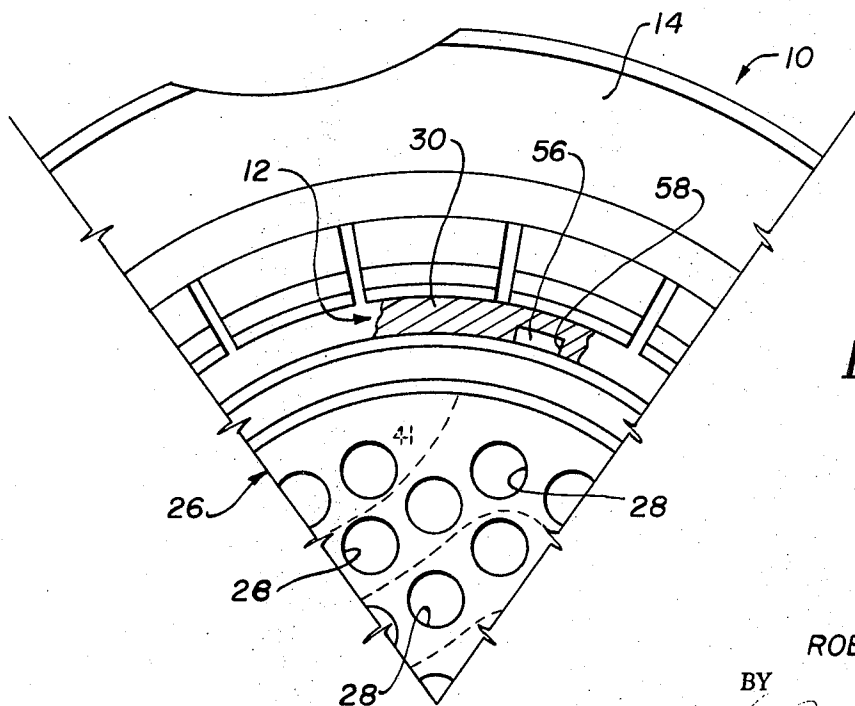
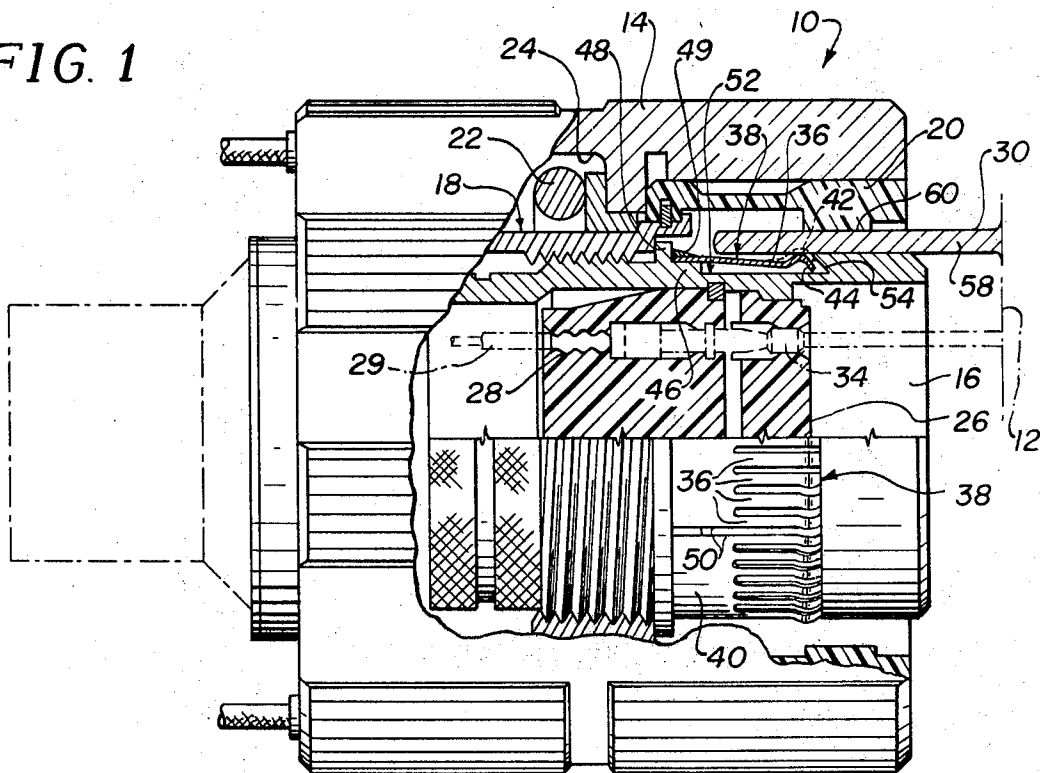


FIG. 2

INVENTOR.
ROBERT L. ANDREWS

BY

L. F. Hammond
ATTY.

1

2

3,521,222

CABLE CONNECTOR

Robert L. Andrews, Simi, Calif., assignor to The Bunker-Ramo Corporation, Oak Brook, Ill., a corporation of Delaware

Filed Nov. 24, 1967, Ser. No. 685,649

Int. Cl. H01r 23/06

U.S. Cl. 339-143

1 Claim

ABSTRACT OF THE DISCLOSURE

An electrical connector of the multi-contact type wherein the plug and receptacle have conductive outer shells functioning as shielding for the contacts and conductors therein when used in installations where electromagnetic and electrostatic disturbances are encountered, the construction including multiple spring contact fingers arranged to establish secure electrical contact engagement between the shells of the plug and receptacle around their peripheries to minimize the disadvantageous effects of such disturbances.

SUMMARY OF THE INVENTION

A shielded electrical connector wherein the conductive shell of one connector part (plug) has a large number of flexible spring fingers arranged to engage the conductive shell of the other connector part (receptacle) with means confining the tips of the fingers to prevent accidental damage thereto, but exposing other portions of said fingers for direct electrical contact with the mating shell, by resilient pressure engagement.

A specific object of the invention is to provide a cable connector of the foregoing general character wherein the spring contact fingers are of cantilever design and self-biased so that the fingers may be flexed individually, and including means for confining the shiftable ends of the fingers to prevent snagging by the opposite connector part when the connector shells are moved into interconnecting position, but wherein the spring fingers have other portions, generally curved, providing camming surfaces for maximizing the spring bias for the individual fingers upon engagement with the opposed connector shell for assuring firm and secure engagement between the fingers and shell.

Still another object is to provide a cable connector of the character just referred to, in which, because the spring fingers are confined, they may be provided with a greater bias than would be practical otherwise, with consequent more effective electrical contact engagement effect.

DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

FIG. 1 is a view of one of the connector parts, partially in axial section, partially in outer elevation, and partially with a portion removed showing an underportion in elevation, this view also including a fragment of the opposed connector part; and

FIG. 2 is an end view taken from the right of FIG. 1, but showing only a fragment of the connector part.

Referring in detail to the accompanying drawings, the mating plug and receptacle of the connector are indicated at 10 and 12 respectively, the former being shown in substantial detail. The connector part 10 includes an outer tubular coupling ring 14 of suitable material within which are an inner shell 16 of conducting material, a sleeve 18 threaded on the shell 16, and a sleeve 20 of suitable dielectric material. A compression spring 22 is disposed in a counterbore 24 in the outer shell for biasing various parts relatively in axial direction.

Within the shell 16 is an insert 26 of suitable dielectric material and provided with a relatively large number of apertures 28 for receiving the plurality of connector pins and socket usual in such a cable connector. The connector pins 29 mentioned are mounted in the apertures 28 and carried by the insert 26.

The connector receptacle 12 is shown only fragmentarily, and includes a generally tubular shell or body indicated diagrammatically at 58. Mounted in and carried by the body 58 are a plurality of connector sockets 34 which enter into the apertures 28 upon connecting the parts together, and establish contact engagement with the respective contact pins 29. The overall construction of the insert 26, and the contact pins 29 and contact sockets 34 are of known kind and need not be described in detail. These contact pins and sockets provide the inner conductors of the cable, which is conventionally enclosed by a tubular outer conductor (not shown) which functions as a shield. This outer conductor includes the shell 16. This shell 16 has contact engagement with the connector plug 12 by means of a plurality of spring fingers 36 formed by slotting or cutting away inwardly from one edge of a spring metal strip 38, leaving a continuous unslotted band portion 40. Adjacent the free ends of the fingers are bowed contact portions 42 beyond which are inclined terminal tips 44.

The spring finger strip 38 is applied to the shell 16 by wrapping the continuous band portion 40 around an annular shoulder 46, butting it against a flange or bead 48 and securing thereto as by soldering, as indicated at 49. The strip 38 nearly surrounds the shell as indicated at the lower portion of FIG. 1 where the ends 50 nearly meet.

Forwardly of, or beyond the shoulder 46 of the shell is a circumferential groove 52 which extends to and is bounded by a reversely overhanging flange 54, inclined substantially in the same direction as the free ends or terminal tips 44 of the fingers; these elements are confined under that flange 54, being inserted into such position in the placement of the strip 38 in position. The spring fingers 36 are of cantilever design, secured only along the continuous band portion 40 but pre-stressed and self-biased radially outwardly so that the tips 44 thereof firmly engage the flange 54 when the fingers are in free position, and radially spaced from the inner surface of the counterbore 52. With this biasing arrangement of the fingers, the bowed elements 42 tend to project radially beyond the adjacent outer surface of the shell 16 as indicated in dotted lines in FIG. 1.

The shell 16 is provided with a plurality of keys 56, spaced around its circumference, and preferably of different sizes and spaced irregularly, received in corresponding grooves in the inner surface of the tubular shell 58 of the connector receptacle 12, for properly positioning the parts relatively angularly.

In the act of moving the connector parts together into interconnected position, the tubular shell 58 is inserted into the annular space 60 between the shell 16 and the dielectric sleeve 20, and in being so moved, the leading edge of the shell engages the bowed contact portions 42 of the spring fingers, and the curved shape of these bowed portions acts as a camming element for camming the spring fingers radially inwardly, the spring fingers then being positioned as indicated by solid lines.

The spring fingers are of substantial length, axially of the connector, and each is enabled to spring and flex a substantial amount in radial direction, and all of them to so flex without hindrance from any of the others. The spring fingers are relatively large in number, being for example in the neighborhood of fifty in number in a strip having a diameter such for example as an inch and a quarter, this number obviously being representative and

3

not limiting. Such a large number of spring fingers assures accurate and full contact engagement between the finger member 38 and the tubular body 32 of the connector receptacle 12. This arrangement accommodates any accidental inaccuracies in shape or dimensions of the tubular shell 58.

The free ends of the spring fingers 36 being confined by the flange 54, prevents snagging of those free ends with the shell 58, eliminating an obvious disadvantage that existed heretofore. The shape and dimensions of the parts, including particularly the flange 54 and the contact portions of the finger elements 44, assures substantial radial projection of the bowed contact portions 42 into the path of the inner surface of the shell 58, with consequent effective contact engagement between the spring fingers and the shell.

An additional and specific advantage resides in the fact that because of the confinement of the outer ends of the spring fingers, the fingers may be provided with greater outward self-bias than would otherwise be practical or possible, since the flange 54 limits the outward movement of the fingers, with the consequence that much greater contact engagement is established between the fingers and the inner surface of the shell 58, than would be the case if the outward bias in the fingers should be more limited which would be necessary in the absence of the confining flange 54.

What is claimed is:

1. A connector of the character disclosed having a pair of mating parts comprising a plug and receptacle, each having conductor lines therethrough including an outer conductor or shield and each of the said connector parts

4

including a conductive shell forming a portion of said shield; a large plurality of axially extending cantilever spring fingers positioned around the periphery of a first one of said shells and fixedly secured at one end only to said shell with each of said spring fingers also having at a location spaced from said secured end a shape retaining contact portion engageable with the shell of the other connector part and a cam surface adapted to engage said shell to flex the fingers in a direction whereby the spring action of the fingers exerts resilient pressure on the contact surfaces thereof; said first shell also including stop means for contacting the tips of said fingers to limit radial movement thereof in a direction toward the shell of the other connector part and being relieved radially of said stop means to permit radial movement of the tips of said fingers in the opposite direction in response to flexing of said fingers in the zones between their secured ends and contact portions.

References Cited

UNITED STATES PATENTS

2,762,025	9/1956	Melcher	339—143
3,051,925	8/1962	Felts	339—177 X
3,086,190	4/1963	Neidecker et al.	339—177
3,097,033	7/1963	Felts	339—177 X
3,398,392	8/1968	Henderson	339—177 X

DAVID J. WILLIAMOWSKY, Primary Examiner

P. C. KANNAN, Assistant Examiner

U.S. Cl. X.R.

339—177