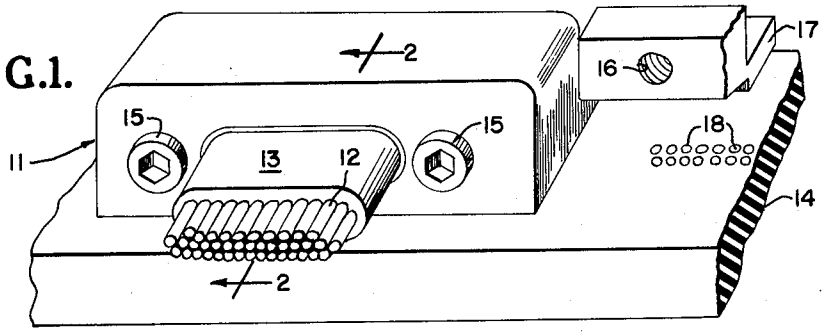
July 21, 1964 J. H. ARMSTRONG 3,141,716

MULTI-CONTACT CONNECTOR FOR PRINTED CIRCUIT BOARDS

Filed Sept. 28, 1962

FIG.1.



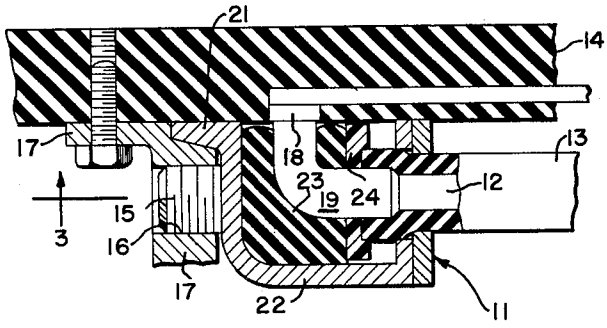


FIG.2.



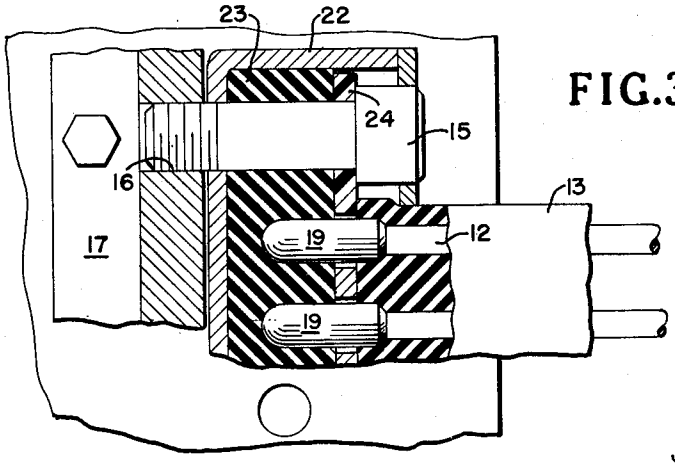


FIG.3.

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MULTI-CONTACT CONNECTOR FOR PRINTED CIRCUIT BOARDS

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2 Claims. (Cl. 339—61)
(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates to electrical connectors and more particularly, to a miniature multi-pin electrical connector that may be utilized with a switchboard, the connection between the terminals on the switchboard and the connector being made by a butt-type engagement or pressure contacts.

In the field of multi-pin connectors, it has been the general practice to employ stab-type connectors of the male and female type for connecting one subassembly together with a second subassembly. When for example, the subassemblies have been printed circuits, it has been necessary to provide an additional terminal board or some other connector means for connecting the printed circuit board to the leads of the stab-connectors. Through the miniaturization of the component parts these devices have served the purpose but have not proved entirely satisfactory under all conditions of service for the reason that where space and weight are critical these connectors have been considered undesirable because of their weight and space requirements, but heretofore have been used because other connectors were not considered sufficiently reliable. In addition, it was also necessary to provide additional unused volume so that the connectors could be installed and removed with the components to which they were attached.

The general purpose of this invention is to provide a connector that is capable of being directly attached to a printed circuit board, that will not require any excess space for installation or removal, that is capable of carrying from five to fifty amps. of current while maintaining good electrical contact even when subjected to accelerations varying from 500 G's to 900 G's, and that will have a minimum of parts thus insuring complete reliability.

It is an object of this invention to provide a butt-connected contact assembly that may be installed with a minimum of space and be capable of withstanding extremely high G's without loss of contact.

Another object is to provide a butt-type contact for a printed circuit board that may be installed and removed in a minimum of space while maintaining a continuously low electrical resistance between the contact parts.

Still another object is to provide a plurality of butt-type connectors that may be easily installed on a terminal board of the printed circuit type and in which the butt contacts are resiliently held in place on the terminal board.

A further object is to provide a pressure contact between the connector and the printed circuit terminal board wherein the resistance between the connecting parts remains substantially constant even when subjected to high gravity forces.

Yet another object is to provide a butt connector that may be held in continuous contact with the terminal board by insulation material surrounding the butt contact and having a durometer rating sufficiently high so that it is substantially incompressible under moderate pressures.

Further objects and the entire scope of the invention will become further apparent in the following detailed description and in the appended claims. The accompanying drawings display the general construction and operation principle of the invention; it is to be understood, however, that the drawings are furnished only by way of illustration and not in limitation thereof.

In the drawings:

FIG. 1 is a perspective view of a multiple connector mounted on a circuit board utilizing the principles of this invention;

FIG. 2 is an enlarged sectional view taken along the plane of line 2—2 of FIG. 1; and

FIG. 3 is an enlarged sectional view taken along the plane of line 3—3 of FIG. 2.

Referring now to the drawings, wherein like reference numerals designate like parts throughout the several views, there is a butt-type connector, designated generally by the reference numeral **11**, having a plurality of contacts **19** embedded therein. The contacts **19** are connected to electrical leads **12** encased in a plastic-covered cable **13**. The connector **11** is mounted on a printed circuit board **14** by bolts **15** which enter threaded holes **16** in a retaining block **17** mounted on the back portion of the printed circuit board. The printed circuit board **14** has prespaced terminals **18** for making contact with the contacts **19** in connector **11** as shown in FIG. 2. The connector **11** is held in position so that contacts **19** are aligned with terminals **18** on the circuit board by a wedge **21** integral with the connector housing **22** which slips under the retainer block **17** substantially as shown in FIG. 2. The retainer block may be located on the circuit board by any means known in the art, such for example, as being bolted thereto.

The butt-type contacts **19** are substantially surrounded by a resilient material **23** within the housing **22** in such manner that the contacts are completely encased except for the butt contact portion exposed at the bottom of the housing. The resilient material **23** may be of any plastic or rubber material capable of being poured or molded around the contacts and that will not flow under moderate pressure. A resilient material having a durometer rating of approximately 70 is considered to be satisfactory. A press plate **24**, which may be made of any rigid material, is located along the front side of the connector **11**, as viewed in the drawing, and will be used to compress the resilient material surrounding the connector. As shown in FIG. 3, the connecting bolts **15** pass through the front part of the housing adjacent to the cable entrance, passing through the resilient material with the bolt head making contact with press-plate **24** and the threaded section passing through the back of the connector housing into the retainer block **17**. This connection locks the connector housing **11** on to the retainer block and the circuit board. By tightening the connecting bolts **15** pressure is applied to the rigid plate **24** adjacent to the insulation material covering the connectors and this pressure is distributed by the resilient material in the housing. Since the resilient material has a durometer rating of 70 it has sufficient hardness so that it acts like an incompressible fluid, that is, the force applied by the plate **14** is distributed around the inside of the housing and around the contacts **19**. The pressure force on contacts **19** is unequal due to the configuration of the contacts. The resultant force on the contacts pushes the contacts **19** out of housing **22** into engagement with the terminals **18**. When the pressure on the resilient material is released the material returns to its original shape without any distortion.

It can be seen that the amount of space required for making a positive connection can be limited to an area just slightly larger than the connector housing **22** and thereby eliminating auxiliary connectors that require addi-

tional space and weight to the vehicle on which they are installed.

It has been found that a more uniform contact plane for the connectors has been achieved by making the contact surfaces slightly longer than required and then grinding the surfaces to the proper desired length.

While applicant has shown the housing dovetailed in the retainer block it is obvious that other methods of construction are available and that essentially all that is necessary is that the connector housing be locked into contact with the circuit board.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood, that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. An electrical connector for establishing electrical contact with a plurality of surface terminals on a circuit board comprising:

a connector housing adapted to be secured to said circuit board in overlying relationship to said surface terminals,

a plurality of butt-type contacts in said connector housing,

a body of resilient material encasing said butt-type contacts and holding them forcibly against said surface terminals, and

means for adjusting the force with which said butt-type contacts bear on said surface terminals, said force adjusting means comprising a rigid plate disposed in said connector housing against said resilient means and means for variably pressing said rigid plate against said resilient means.

2. A butt-type electrical connector for establishing contact between a plurality of electrical leads and a plurality of surface terminals on a circuit board comprising:

a retainer block secured to said circuit board near said surface terminals, said retainer block having a face thereof extending perpendicular to the surface of said circuit board and a threaded hole opening through said face with its axis parallel to the surface of said circuit board,

a connector housing adapted to be secured to the face of said retainer block in overlying relationship to said surface terminals,

a plurality of L-shaped butt contacts contained in said connector housing, one leg of each contact extending perpendicular to said circuit board and being in contact with said surface terminals,

a body of resilient material encasing said butt contacts and holding them forcibly against said surface terminals,

a rigid plate disposed against said resilient material,

and headed bolt means extending transversely through said connector housing and threadedly engaging said threaded hole in said retainer block, the head of said bolt abutting said rigid plate so that rotation of said bolt means will impart compressive force to said resilient means to vary the force with which said butt contacts engage said surface terminals.

References Cited in the file of this patent

UNITED STATES PATENTS

546,471	Neher	Sept. 17, 1895
1,757,177	Eichner	May 6, 1930
2,647,225	Cole et al.	July 28, 1953
2,685,071	McCreary	July 27, 1954
2,688,735	Hubbell	Sept. 7, 1954