Fig. 1

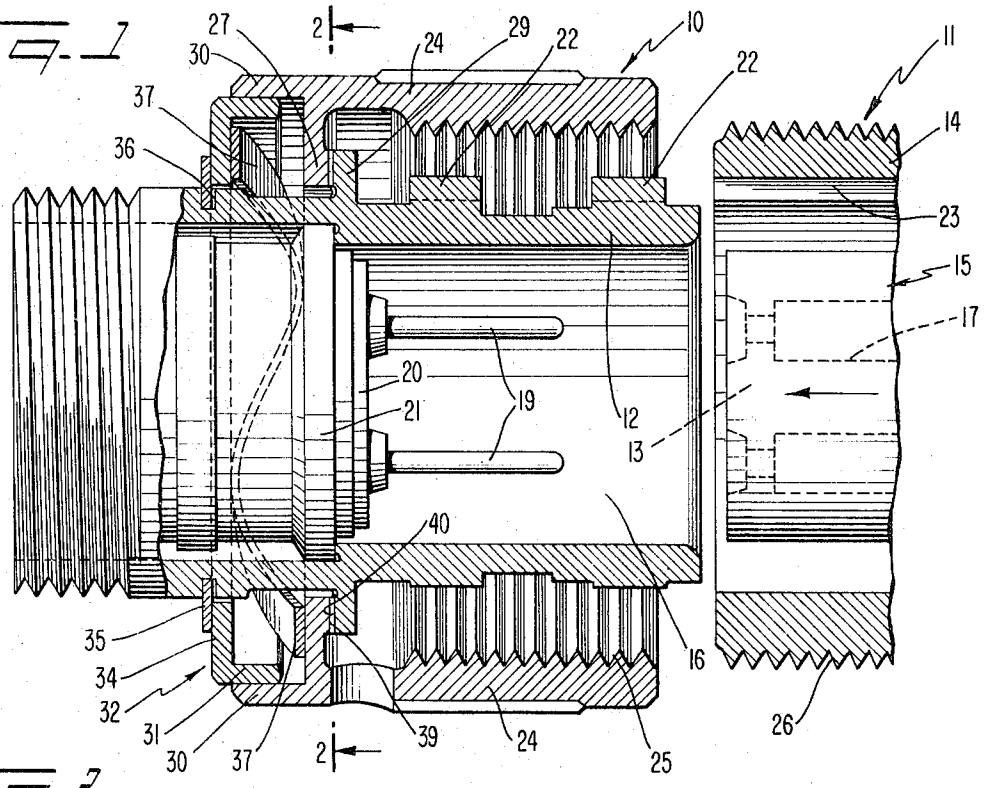
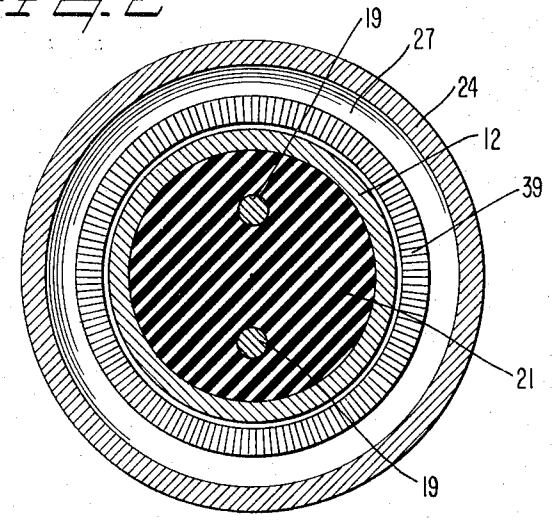


Fig. 2



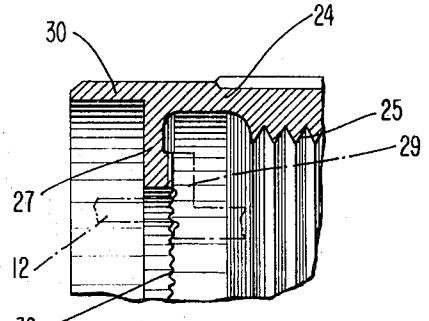
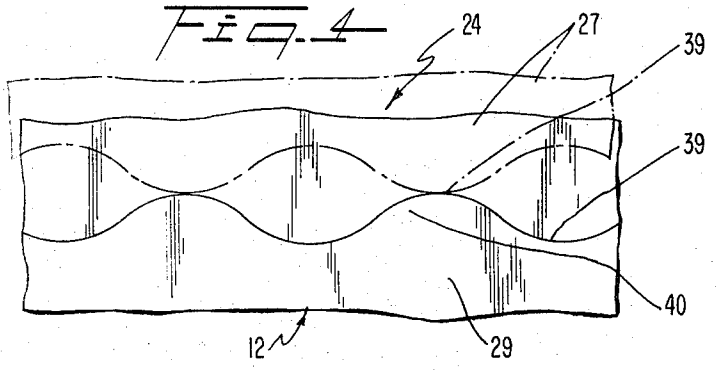


Fig. 3

Fig. 4



INVENTOR.
DAVID S. BRANDT

BY

Bauer and Seymour
ATTORNEYS

SEPARABLE ELECTRICAL CONNECTOR

This invention relates to a separable electrical connector, and more particularly to a connector having two units which are held together in mated relationship by a nut.

The invention has among its objects the provision, in a separable electrical connector of the type indicated, of means for yieldably retaining the nut from rotation with respect to the connector unit of which it is a part.

Other objects of the invention are the provision of a nut retaining means which is simple and rugged in construction, is economically made, and adds little, if any, to the weight and bulk of the connector.

The above and further objects and novel features of the invention will more fully appear from the following destailed description when the same is read in connection with the accompanying drawings. It is to be expressly understood, however, that the drawings are for the purpose of illustration only, and are not intended as a definition of the limits of the invention.

In the drawings, wherein like reference characters refer to like parts throughout the several views,

FIG. 1 is a fragmentary exploded view of an illustrative separable electrical connector in accordance with the invention, the units of the connector being shown about to be coupled, the view being partially in longitudinal axial section and partially in elevation;

FIG. 2 is a view in transverse section on a reduced scale through the first, left-hand connector unit in FIG. 1, the section being taken on line 2—2 of FIG. 1;

FIG. 3 is a fragmentary view in axial section through the portion of the nut on the first connector unit which bears a first element of the means for releasably retaining the nut from rotation, a portion of the casing of the first unit which bears a second element of the nut retaining means being shown, by dot-dash lines, cooperating with said first element; and

FIG. 4 is a developed view on an enlarged scale along a small section of the annular surfaces of the cooperating teeth on said first and second elements of the nut retaining means, the view being taken in the plane of line 2—2 of FIG. 1.

The separable electrical connector of the invention may be used advantageously in installations wherein the connector is subjected to appreciable vibration. The nut retaining means of the invention holds the nut securely in a large number of angular positions on the casing of its unit, but does not prevent the deliberate turning of the nut by the application of reasonable force. The nut retaining means is of such construction that no manipulation other than the turning of the nut is required to overcome such nut retaining means in order to permit the connector units to be released and separated.

The connector shown has two units, a plug **10** and a receptacle **11**, which are designed for mating telescopic engagement. The unit **10** has a tubular shell or casing **12**, and the unit **11** has a tubular shell or casing **14**, the right-hand, forward end of casing **12** being receivable within the left-hand, forward end of the casing **14** when the connector units are mated. The receptacle unit **11** carries within it a central contact supporting insert or body **15**, the forward portion **13** of which is spaced radially inwardly from the inner wall of casing **14**. The body **15** is receivable within a central space or recess **16** in the forward end of casing **12** of the plug unit **10**, and the forward end of casing **12** is receivable in the annular space between the inner wall of casing **14** and the outer surface of body **15**.

In the embodiment shown, the electrically insulating receptacle body **15** carries at least one (two shown) socket contact **17** which receives a pin contact **19** carried in an electrically insulating insert **21** which is fixedly secured in casing **12** and has a resilient interface disc **20** thereon. When the units **10** and **11** are fully mated, the electrically insulating inserts **13** and **20**, **21** in said units are in resilient face-to-face engagement.

In casings **12**, **14** are retained from relative rotation about their axes by keys or longitudinal ribs **22** on the outer surface of the casing **12** and keyways or longitudinal grooves **23** in the inner surface of casing **14** which receive such keys as the telescoped connector units are advanced toward fully mated position. After the casings of the units **10**, **11** have been preliminarily telescoped, with the forward ends of the keys **22** within the forward ends of the keyways **23**, said units **10**, **11** are pulled together into fully mated position by the turning of a nut **24** which is rotatably mounted on casing **12** of unit **10**. As shown, nut **24** has internal threads **25** which receive external threads **26** on the casing **14** but a so-called bayonet or pin-and-groove type coupling may be employed.

The nut **24** is held from forward movement with respect to casing **12** on which it is rotatably mounted by engagement between a radially inwardly extending annular flange **27** on the nut near its rear end and a radially outwardly extending annular flange **29** on casing **12** disposed forwardly of the flange **27**. The forward transverse annular face of flange **27** is maintained constantly in engagement with the rear transverse annular face of flange **29** in the following manner.

Rearwardly of flange **27**, the nut **24** extends in the form of an axially short annular hood **30**. Telescoped within the hood is the short axial sleeve **31** of an annular member **32**, such member having a radially inwardly directed annular flange **34** with a central opening therethrough receiving the rear portion of casing **12**. Rearward movement of member **32** with respect to casing **12** is limited by an abutment in the form of a split spring ring **35** having its radially inner edge portion disposed in an annular groove **36** in casing **12** and its outer portion overlying the rear surface of the flange **34**. A wavy annular spring **37** is telescoped about the casing **12** within the annular space provided between the flange **27** and the flange **34** of member **32**. The spring is so constructed as constantly forcibly to engage both the rear surface of flange **27** and the forward surface of flange **34** and thus to yieldably maintain the nut **24** in its forward position on casing **12** with flanges **27**, **29** in engagement.

The forward radially inner annular face of flange **27** and the rear radially outer annular face of flange **29** are provided with interfitting radial "teeth" **39** and **40**, respectively. The teeth **39** and **40**, which are shallow and symmetrical from side to side and complementary to each other so as to interfit, have contours which vary from their radially inner to their radially outer edge. The shape of the teeth at one radial zone thereof is shown in the developed view of FIG. 4. In such figure the teeth **39**, **40** are shown in full lines in the position in which they interfit; teeth **39** are also shown in phantom lines in a position which they repeatedly assume, when their peaks confront the peaks of teeth **40**, as the nut **24** is being turned.

The symmetrical, smoothly curved contour of the teeth **39**, **40** permit such teeth to move past each other without the use of undue force as the nut **24** is being rotated on casing **12**. At all times, whether the units **10** and **11** are connected or not, the wavy spring **37** tends to urge the teeth **39** into full mating engagement with teeth **40** because of its constant forward thrust upon flange **27**. As the units **10**, **11** approach their fully mated relationship, and particularly after the forward end of insert **13** and resilient disc **20** begin to engage each other, the forward pull upon nut **24** exerted by threads **26** on casing **14** is added to that of the wavy spring **37** in forcing the flanges **27**, **29** together. This adds to the force with which the nut **24** is retained by the ratchet-like means **39**, **40** against rotation in a nut loosening direction.

As above pointed out, the units **10**, **11** of the connector may be released and disconnected without the imposition of an unduly high torque upon the nut. After the nut has been initially turned to loosen it, continued turning of the nut in the same direction causes the nut to back up to some extent against the opposition of the spring **37**, acting between flanges **27** and **34**, the latter of which transmits its thrust to casing **12** by way of ring **35**. After the nut **24** has been turned sufficiently for the casings **12**, **14** to be fully disconnected, the nut retaining means **39**, **40** continues to retain the nut from turning with respect to casing **12**. This is of advantage if the nut has been turned no more than is necessary to disconnect the casings, since the nut will remain in the proper angular position to permit the nut to be engaged with thread **26** immediately, upon the reassembly of the connector units.

United States Patent

Bruner

[15] **3,663,927**

[45] **May 16, 1972**

[54] BATTERY TERMINAL

[72] Inventor: **Peter Martin Bruner,** Mechanicsburg, Pa.

[73] Assignee: **AMP Incorporated,** Harrisburg, Pa.

[22] Filed: **Feb. 19, 1970**

[21] Appl. No.: **12,792**

[52] **U.S. Cl.** ..... **339/95 B,** 339/232

[51] **Int. Cl.** **H01r 11/26**

[58] **Field of Search** 339/95, 232

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Primary Examiner—Joseph H. McGlynn

Attorney—Curtis, Morris and Safford, Marshall H. Holcombe, William Hintze, William J. Keating, Frederick W. Raring, John R. Hopkins, Adrian J. La Rue and Jay L. Seitchik

[57] **ABSTRACT**

The disclosure relates to a battery terminal which can quickly and easily be secured to a battery post without the aid of tooling and which is resistant to battery acids relative to prior art battery terminals. This is provided by the use of a threaded connector element which is inwardly compressable by a threaded cap, resistant to battery acids and the like, which is threaded on to the connector and compresses the portions thereof inwardly to make a frictionally locking contact with the battery post.

1 Claims, 4 Drawing Figures