April 25, 1967 H. W. DEMLER, SR 3,316,522

CONNECTOR ELEMENTS

Filed April 6, 1964 2 Sheets-Sheet 1

Fig. 1

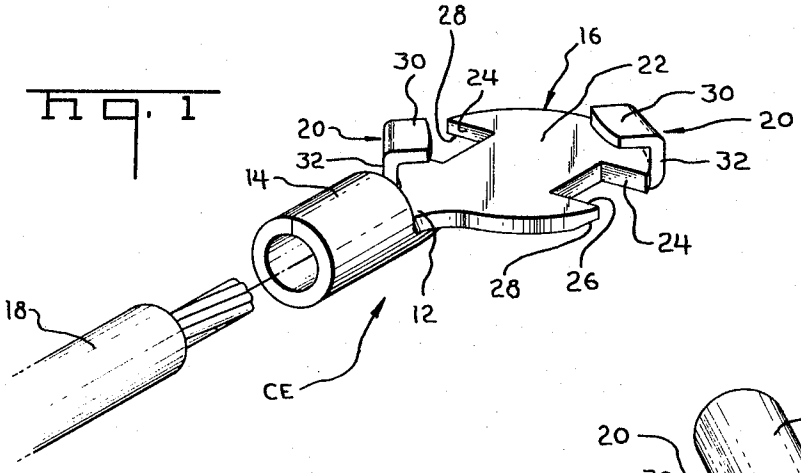


Fig. 2

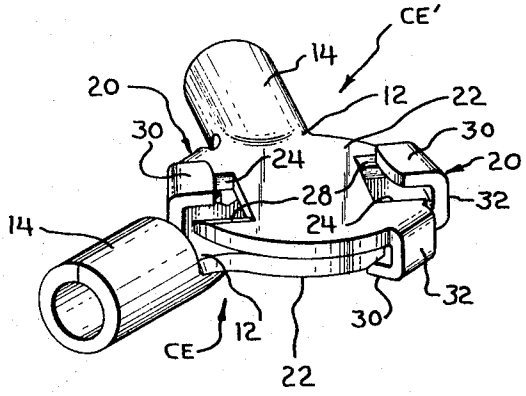


Fig. 3

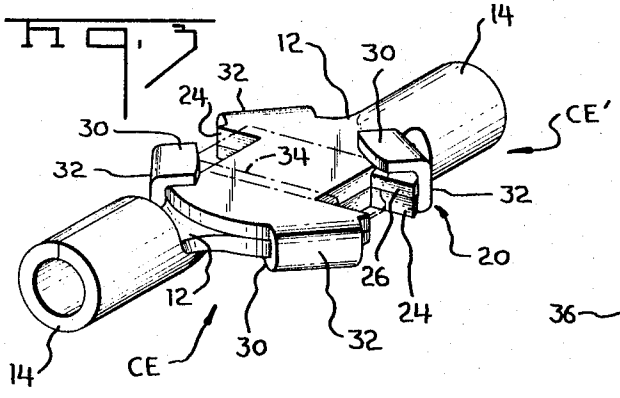
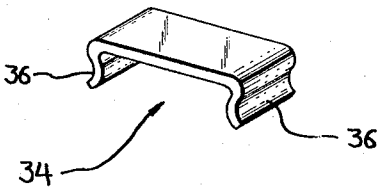


Fig. 4



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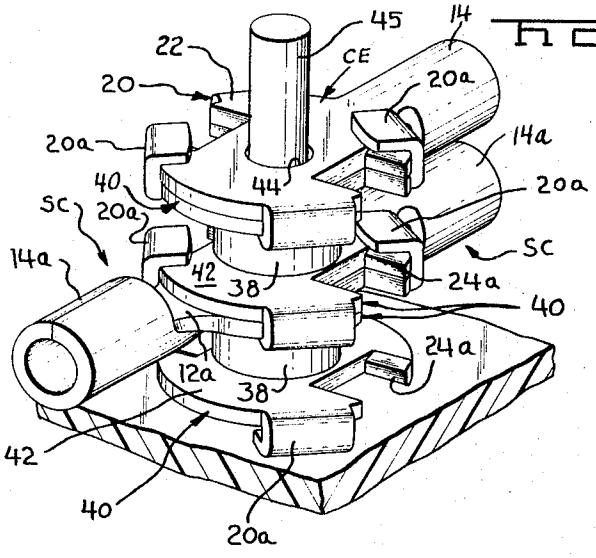


Fig. 5

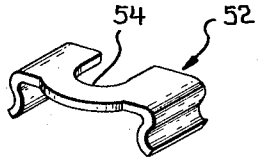


Fig. 5A

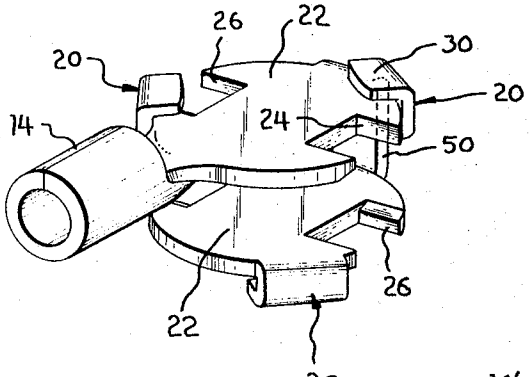


Fig. 6

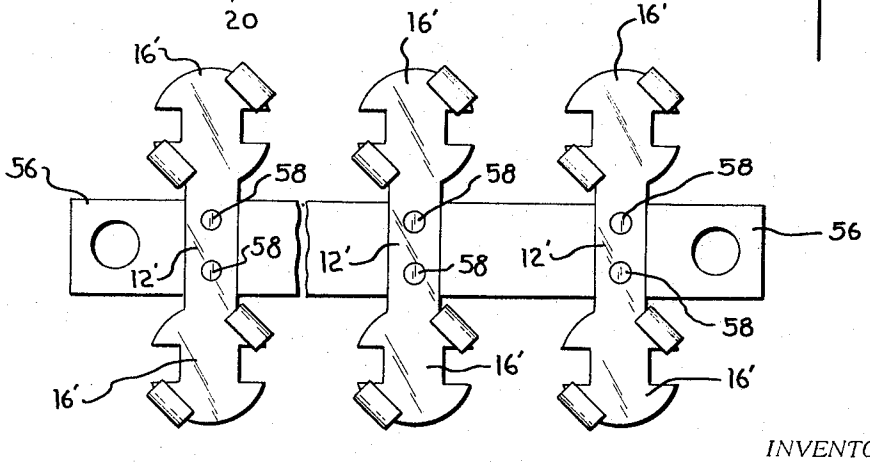


Fig. 7

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3,316,522

CONNECTOR ELEMENTS

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11 Claims. (Cl. 339—47)

This invention relates to connectors for wires, cables, cords and the like and has for its general object improvements in connectors of the type in which interengaging members can quickly be brought into connecting relation to each other and quickly disconnected when desired.

More precisely the invention relates to connector elements of the type in which a terminal member, having means for connection to a wire, cable, cord or the like, is provided with a connector portion having a plurality of lug means thereon, said lug means extending outwardly and turned back and over the connector portion and spaced therefrom a distance slightly less than the thickness thereof.

For most applications the characteristics desired in connectors of the present type include, among others, high current-carrying capacity, high tensile strength or resistance to disconnection, maximum contact surface, and low connective force.

The principal object of the invention is to provide means to prevent separation of two connector elements while also providing means by which similar connector elements can be easily connected and disconnected when desired.

Another object of the invention is to provide connector elements that when in intergaging relationship will possess a maximum of the above-stated desired characteristics; high current-carrying capacity, maximum contact surface, low connective force, and high tensile strength.

Still another object of the invention is to provide a connector element that has means by which it can be placed over a pin-type terminal and make contact therewith.

An additional object of the invention is to provide connector elements that, when in interengaging connection, cannot be disconnected by a lengthwise pull or thrust, but must be rotated one connector element with respect to the other connector element before disconnection can be made.

Other objects and attainments of the present invention will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings in which there are shown and described illustrative embodiments of the invention; it is to be understood, however, that these embodiments are not intended to be exhaustive nor limiting of the invention but are given for purposes of illustration and principles thereof and the manner of applying them in practical use so that they may modify them in various forms, each as may be best suited to the conditions of a particular use.

In the drawings:

FIGURE 1 is a perspective view of a connector element embodying the invention having a single connector portion;

FIGURE 2 is a perspective view of two connector elements, showing the position into which they must be brought before effecting a proper connection or disconnection therebetween;

FIGURE 3 is a perspective view of two interengaging connector elements, similar to those in FIGURE 2, showing the position of the connector elements when proper connection is made therebetween;

FIGURE 4 is a perspective view of a lock strip;

FIGURE 5 is a perspective view of an interengagement of a plurality of connector elements each having a double connector portion;

FIGURE 5*a* is a perspective view of a lock strip for use with an engagement of connector elements similar to that in FIGURE 5;

FIGURE 6 is a perspective view of a connector element with a double connector portion, a modification of that shown in FIGURE 5; and

FIGURE 7 shows an alternative embodiment of the connector element.

Referring now to FIGURES 1, 2 and 3, being one illustrative embodiment of the present invention, connector element CE includes a shank **12**, on one end of which is a conductor receiving portion or ferrule **14**, and on the other end of which is a connector portion **16** which is formed in such a manner so as to make connection with a similarly formed connector, as seen in FIGURES 2 and 3. Connector CE may be conveniently formed by shaping a sheet metal blank of a material with suitable electrical conductivity; the metal being sufficiently hard and resilient to give a spring quality to connector portion **16** but preferably malleable to permit cold-forging or crimping of the wire receiving portion **14** onto the end of conductor **18** so as to make electrical and mechanical connection therewith.

Connector portion **16** is provided with lug means **20** integral therewith and extending outwardly from and folded back over a portion of the connector base **22** while being spaced therefrom a distance slightly less than the thickness thereof. Slots **24** are provided in the connector base **22** of connector portion **16**. The slots, spaced from lug means **20**, extend into connector base **22** a distance slightly greater than the distance lug means **20** are folded back over connector base **22**. Slots **24** are adapted to receive additional lug means **20** on a similar connector element CE′ as shown in FIGURES 2 and 3.

To facilitate engagement between the connector elements, the leading edge **26** of slots **24**, i.e., the edge of the slot first passing between the connector base **22** and lug means **20** of an engaging connector element, may be provided with an inclined surface **28**.

Lug means **20** may be formed with a tongue **30** extending over connector base **22** and a foot **32** juxtaposed to and integral with connector base **22**. In forming the lug means, foot **32** is made greater in width than tongue **30** thus defining a limit to confine the engaging connector portions in relative alignment in order to facilitate interengagement of the connector portions.

In performing the engagement of the connector elements herein disclosed, the operator merely takes one of the connector elements in each hand, brings the surfaces of the connector bases opposite each other so that lug means **20** are in alignment with respective slots **24** and the connector bases are brought into engagement with the lug means passing through the slots. Then the connector elements are rotated in opposite directions, with respect to each other, until the engaged connectors are in linear alignment, as shown in FIGURE 3, thereby completing the connection. For optimum results, the angular rotation will be about 45° for engagement as well as disengagement and one of the lug means of each connector element engages the shank of the other connector element thereby defining a stop means. If the positions of the lug means and slots are reversed, then the opposing lug means will engage each other to also define a stop means. Of course, the disposition of the lug means and slots can be arranged in any desirable manner.

When the connector elements are in engagement as shown in FIGURE 3, lug means **20**, due to their strength and resiliency, provide the required force to maintain a

high degree of mechanical and electrical connection between the connector bases **22**.

From considering the foregoing description in conjunction with FIGURE 3, it will be seen that the connector elements, when completely engaged, cannot be separated either by a direct thrust longitudinally of the connection or by a direct pull thereon and that the only way they can be separated is to again be brought into the angular disposition shown in FIGURE 2.

To prevent movement in such a manner that the angular relationship shown in FIGURE 2 is not attained accidentally, a U-shaped lock strip **34**, shown in FIGURES 3 and 4, may be placed in slots **24** of the interengaged connector elements and thus negate any movement in the angular direction since the slots of each connector portion are in alignment. The lock strip is made of any metal having sufficient hardness and resiliency to impart a spring quality to leg portions **36** thereby allowing lock strip **34** to be removably secured to the connector elements through slots **24**. The lock strip is a flat metal strip of width slightly less than the width of the slots **24** in the connector base **22** and each leg is bent into an S-shape configuration.

When lock strip **34** is connected to the interengaged connector elements CE and CE' of FIGURE 3, it will be observed that relative movement of the two connector elements in an angular direction is eliminated, consequently the connection is maintained against positive angular forces as well as the above-mentioned longitudinal push or pull forces.

Referring now to FIGURE 5, being a second illustrative embodiment of the present invention, the connector element, generally designated by SC, includes a shank **12***a* having a conductor receiving portion or ferrule **14***a* at one end and a connector portion **40** at the other end. Cylindrically-shaped member **38** has one end connected to connector portion **40** of shank **12***a* and the other end connected to another connector portion **40**, each connector portion being greater in diameter than member **38**. Lug means **20***a* extend from the periphery of and fold back over a portion of connector base **42** and are spaced therefrom a distance slightly less than the thickness thereof. Slots **24***a* are formed in connector base **42** of connector portion **40**. The slots are spaced from lug means **20***a* and extend into connector base **42** a distance slightly greater than the distance lug means **20***a* are folded back over connector base **42**. Connector base **42**, cylindrically-shaped member **38** and connector element CE have a hole **44** extending therethrough so that the connector elements may be placed on a pin connector **45** for engagement therewith.

Also in this embodiment as indicated above in relation to FIGURES 1, 2, and 3, the ease of engaging the connector elements may be increased by providing a leading edge **26***a* of each slot **24***a* with an inclined surface **28***a*. The inclined surface will facilitate the entrance of leading edge **26***a* of slots **24***a* into the space between connector base **42** and lug means **20***a*.

In this embodiment of the invention, as in the embodiment described and referred to in FIGURES 1, 2, and 3, the required force to maintain a high quality mechanical and electrical connection between the connector elements is obtained from the strength and resiliency in lug means **20***a*.

The engagement of the connector elements shown by this embodiment of the invention is accomplished in the same manner as the embodiment shown in FIGURES 1, 2, and 3.

The connector element referred to in FIGURE 5 is formed to adapt itself to a stacking connector, i.e., a plurality of such connector elements SC can be interengaged to form a multiple interconnection of the connector elements to define a commoning connection point and connector element CE with a hole **44** therein can be connected thereto.

A U-shaped lock strip **52**, shown in FIGURE 5*a*, which is a modification of that described in relation to FIGURE 3, will prevent angular movement of the engaged connector elements thereby negating accidental disengagement.

This lock strip is shaped in a similar manner to that described in relation to FIGURE 3, except that the flat portion of lock strip **52** has a semi-circular portion **54**, thus permitting it to go around cylindrically-shaped member **38**.

The connector element as shown in FIGURE 6 is similar to that of FIGURE 5 except that instead of the connector portions extending outwardly from a cylindrically-shaped portion, the connector portions are interconnected by an extension **50** and more than one of these can be provided.

FIGURE 7 shows an alternative embodiment of the connector element. In this embodiment, the connector element is the same as that of FIGURE 1 except that shanks **12'** have a connector portion **16'** at each end and the shank is disposed within an insulated mounting block **56**. Shanks **12'** may be embedded within the mounting block during molding thereof or may be secured thereto by conventional securing means **58**, such as, rivets, screws, etc. As in FIGURES 2 and 3, a similar connector element CE' is secured to connector portions **16'**. This type of connector element eliminates the use of a stud, such as, for example, a screw or similar means.

In the engagement of connectors encompassing this invention, it is important to note that the contacting areas are large and are under sustained spring tension when the connector elements are in engaged relation and that the surfaces of engaging connector bases are scraped by the sliding action thereof thereby de-oxidizing the contact areas. In so doing, the resistance to current flow is reduced to a minimum.

Among the variations and modifications of connectors encompassed in the sphere of the present invention, and to which one skilled in the art would be aware, is a connector element similar to that shown in FIGURE 1 in which the connector base is pierced to allow for connection with a pin terminal as is shown in FIGURE 5.

The examples of the construction shown serve merely to emphasize the production possibilities in adapting the present invention to chosen forms and uses. A number of other variations and modifications can be made without departing from the principles and spirit of this invention.

The disclosure herein explains the principles of the invention and the best mode contemplated in applying such principles. It is not intended that this disclosure in any way limits the extent of the present invention, but, in fact, merely serves to teach those in the art the new, novel, and inventive principles claimed to be the invention.

I claim:

1. A connector element comprising a conductor-receiving portion adapted to secure a conductor means therein, a connector portion spaced from said conductor-receiving portion, lug means extending outwardly from said connector portion, said connector portion having slots therein spaced from said lug means with which additional lug means on a similar connector element mate to lock the connector elements together upon relative movement therebetween, and a metal strip passable over one face of the connector portion and through opposing slots on this and at least one similar connector element engaged therewith, thereby preventing relative movement of the engaged connector elements.

2. A connector element according to claim **1** in which the lug means are integral with the connector portion and are folded back and over the said connector portion and spaced therefrom a distance slightly less than the thickness thereof.

3. A connector element according to claim **2** in which the slots have an inclined leading edge to facilitate interengagement of the connector elements.

4. A connector element according to claim **2** in which

the width of the part of the lug means extending over the connector portion is substantially less than the width of the rest of the lug means, thereby defining a limiting means.

5. A connector element comprising a conductor-receiving portion adapted to secure a conductor means therein, two substantially similar connector portions each spaced from said conductor-receiving portion, lug means extending outwardly from and back over each of said connector portions and spaced therefrom a distance slightly less than the thickness thereof, said connector portions having slots therein spaced from said lug means with which additional lug means on a similar connector element mate to lock the connector elements together upon relative movement therebetween, one of said connector portions folded down and back under the other of said connector portions in substantial opposition thereto to provide a connector element defining two substantially similar connector portions.

6. A connector element according to claim 5 in which the connector portions are substantially circular in shape.

7. A connector element comprising a conductor-receiving portion adapted to secure a conductor means therein, a cylindrically shaped member spaced from said conductor-receiving portion, a substantially circular connector portion at each end of said cylindrically shaped member, lug means extending outwardly from and back over each of said connector portions and spaced therefrom a distance slightly less than the thickness thereof, said connector portions having slots spaced from said lug means with which additional lug means on a similar connector element mate to lock the connector elements together upon relative movement therebetween.

8. A connector element according to claim 7 in which the diameter of the connector portions is greater than that of the cylindrical member, the lug means extend outwardly from the periphery of said connector portions, and said slots extending into said connector portions from the edges thereof a distance sufficient to allow additional lug means

on a similar connector element to pass therethrough to lock the connector elements together.

9. A connector element according to claim 8 in which one of the edges of said slots has an inclined surface to facilitate engagement of the slots and the engaging lugs on similar connector elements on relative movement between said connector elements.

10. A connector element according to claim 9 in which said connector portions and said cylindrical member have a hole extending therethrough adapted to engage a pin-type connector element.

11. An electrical connector comprising two identical connector portions, lug means extending outwardly from and back over each of said connector portions, said lug means spaced from said connector portions a distance slightly less than the thickness thereof, said connector portions having slots therein spaced from said lug means, said slots mateable with other lug means on similar electrical connectors to lock the connector elements together upon relative movement therebetween, means extending between said connector portions and connecting said connector portions together, and means disposable in said slots of mated electrical connectors to prevent relative movement between the mated electrical connectors.

References Cited by the Examiner

UNITED STATES PATENTS

Re. 23,869	9/1954	Macy	339—47 X
1,689,824	10/1928	Goelz	339—47
2,615,736	10/1952	Bergan et al.	339—47
2,629,763	2/1953	Macy	339—49

FOREIGN PATENTS

811,155	1/1937	France.
17,614	1891	Great Britain.

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