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ELECTRICAL CONNECTOR

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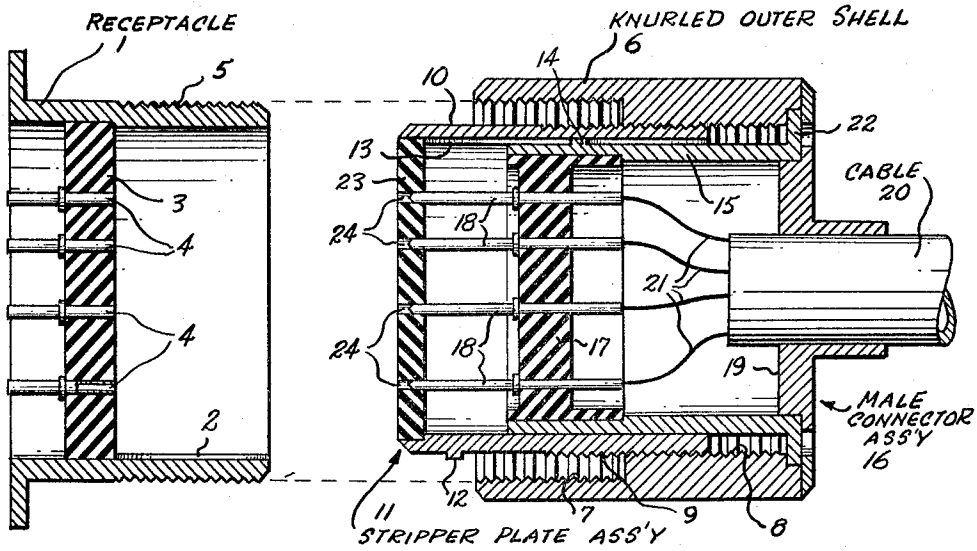


Fig. 1.

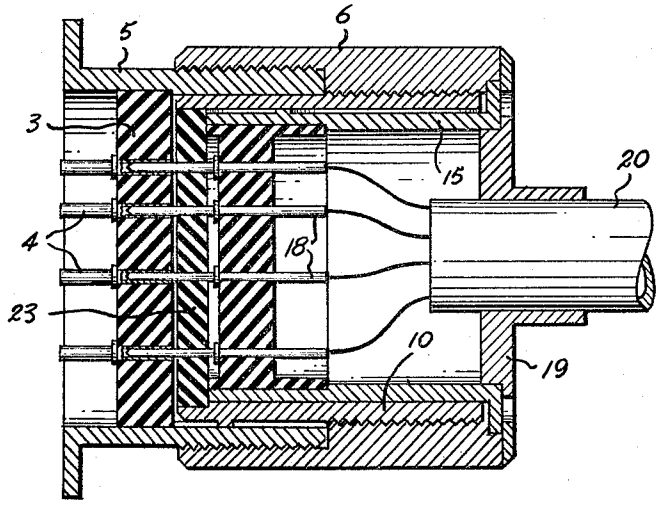


Fig. 2.

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ELECTRICAL CONNECTOR

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This invention relates to electrical connectors and more particularly to electrical connectors having a positive acting stripper plate assembly to prevent damage of the connector pins.

In the use of known electrical connectors, considerable trouble has been experieneced both due to the extended pins or contacts and to carless insertion or removal of such connectors from their complementary extension couplings, outlets, receptacles, etc. The extending pins become damaged from misalignment during installation, from lying around on the floor or being dropped thereon, and inexperienced employees may further damage the connectors by attempting to straighten the pins, or to pry the pins out of their receptacles when disconnecting the same.

Much time and money are wasted due to electrical connector damage. Failure reports indicate that much expenesive equipment has been put out of operation due to bent connector pins, or burned up because connector pins were shorted out. In systems such as Minuteman for example, straightening a bent pin tends to destroy the protective plating which reduces the integrity of the contact under extended storage condition, thus requiring replacement of the connector to insure reliability of the system.

The following electrical connector problems are considered to be the most important, and are the ones for which this invention provides a solution: (1) connector pins bent when the male connector, on the cable, is dropped or misused; (2) connector pins bent when the pins are engaged before the connector halves are properly aligned; and (3) equipment damaged by shorting out connector pins (male) either by dropping or in pin probing; and (4) unsafe conditions due to explosive atmosphere or exposed connector pins.

A partial solution to the above problems has been the spring loaded striper plate. This, however, is not considered adequate protection for a connector which is dropped, for the spring can compress; nor is it adequate to prevent misalignment of the connector pins during connection or disconnection; nor is it adequate to provide an explosive proof make or break connection between the pins and their sockets; nor is it adequate to prevent exposure of hot connector pins.

The invention involves a springless electrical connector arrangement having a positive acting stripper plate assembly in the male member which protects the pins in the open configuration and prevents their exposure or their being damaged such as by bending resulting in misalignment when coupling is attempted. The outer shell of the male assembly is provided with two sets of internal threads. The foremost set coact with those of the female member to couple the composite arrangement prior to enegagement of the connector pins with their sockets and the aftward set coact with those on the stripper plate assembly to force the pins through the plate into the mated position after the composite is coupled. The pins are therefore never exposed when not in completely mated configuration.

Therefore, it is an object of this invention to provide an electrical connector.

A further object of the invention is to provide an electrical connector having means for preventing damage of the connector pins when the connector is dropped and for preventing misalignment and damage to the pins during connection and disconnection.

Another object of the invention is to provide an electrical connector having a positive acting stripper plate assembly to prevent connector pin damage and to provide assist during connecting operations.

Another object of the invention is to provide an electrical connector having means for positive movement of the connector pins after alignment of the connector and an associated receptacle have been insured to prevent unsafe connect and disconnect conditions.

Other objects of the invention not specifically set forth above will become readily apparent from the following description and drawings in which:

FIG. 1 is a view, partly in cross-section, of an embodiment of the invention showing the connector and receptacle elements in disengaged position; and

FIG. 2 is a view partly in cross-section showing the connector and receptacle elements of FIG. 1 engaged.

As shown in FIG. 1, the receptacle unit comprises a body member **1** having keyways **2** therein, only one keyway being shown, and a female connector assembly comprising plate **3** within which a plurality of connector sockets **4** are positioned. Member **1** is provided with a set of external threads **5**. The connector unit or plug comprises a knurled outer shell **6** which is provided with two sets of internal threads **7** and **8**, thread set **7** being designed to coact with thread set **5** of the receptacle body member **1** and the thread set **8** coacting with a set of external threads **9** of a housing **10** of a stripper plate assembly generally indicated at **11**. Housing **10** is provided with protruding keys **12**, only one being shown, adapted to coact with keyways **2** of the receptacle body member **1** when the units are interconnected. Housing **10** is additionally provided with keyways **13**, only one of which is shown, which coact with keys **14**, only one being shown, positioned on body member **15** of a male connector assembly generally indicated at **16**. Male connector assembly **16** comprises, in addition to body member **15**, a plate **17** having a plurality of connector pins **18** positioned therein, and a collar **19** through which an electrical cable **20** extends, cable **20** being connected to connector pins **18** via wires **21**. Body member **15** includes a flange portion **22** which extends into a groove or slot in outer shell **6**. Mounted in housing **10** of the stripper plate assembly **11** is a stripper plate **23** which is provided with a plurality of apertures **24**, one for each connector pin **18** to provide protection therefor.

FIG. 2 shows the receptacle and connector units inter connected wherein connector pins **18** are positioned within connector sockets **4** and stripper plate assembly **11** is withdrawn due to the coaction of thread sets **8** and **9**.

To assemble the electrical connector of the invention, the two halves (receptacle and connector units) are brought together, the key **12** in the stripper plate assembly **11** is aligned with keyway **2** in the receptacle body member **1** and the connector unit is pushed into the receptacle unit up to the point where the thread sets **5** and **7** engage. Note that at this point male connector pins **18** are protected by the stripper plate **23**.

The outer shell **6** is now turned to pull the connector unit the rest of the way into the receptacle unit. Concurrently with this operation, the pins **18** are pushed through stripper plate **23** and into the sockets **4** in the receptacle unit by the coaction of thread sets **8** and **9** and as a result of flange portion **22** of the male connector assembly **16** sliding in the slot of the outer shell **6**, the male connector assembly being held against rotation by the keyed connection (**13–14**) between stripper plate assembly **11** and male connector assembly **16**.

When the connector and receptacle units are mated, the pins **18** are sealed from the surrounding atmosphere by the air tight mating of (1) the leading surface of plate **17** and the rear surface of stripper plate **23** and (2) the leading surface of stripper plate **23** and the mat-

ing surface of plate 3. This is important in high voltage applications to prevent breakdown between pins.

When the units are separated, the reverse action described above takes place, leaving the connector pins 18 again protected by the stripper plate assembly 11.

The electrical connector of the invention is inherently explosive proof since the pin contact is made or broken only when the connector halves are mated, the completeness of the seal being controlled by the tolerances and material selected.

From a safety standpoint, the connector of this invention can be separated without turning off the power thereto, since there are no exposed contacts or connector pins to touch.

While not shown, an interlock can be provided on the connector unit such that the pins could not be exposed while the plug was disengaged. Also, a pin engagement indicator to show when the pins are seated to the proper depth could be incorporated into the electrical connector described.

If desirable, the stripper plate could be made of a close fitting semi-resilient material, such that the pins would be wiped clean during each operation and dirt would be kept out of the inner connector assembly.

It has thus been shown that this invention provides an electrical connector having a positive acting stripper plate assembly which serves to protect the male connector pins from damage due to misalignment during installation or from dropping or other causes when the connector unit is disconnected from its receptacle unit, as well as providing a safe and explosive proof connector. In addition, this invention provides an assist for mating of pins and sockets due to the coaction between the thread portions, such assist being needed on multi-circuit connectors.

Although a particular embodiment of the invention has been illustrated and described, it will be obvious to those skilled in the art that various changes and modifications may be made without departing from the invention, and it is intended to cover in the appended claims all such changes and modifications that come within the true spirit and scope of the invention.

What I claim is:

1. An electrical connector comprising in combination: a connector unit and a receptacle unit; said connector unit including a movable outer shell having a pair of threaded portions; a connector assembly including a member operatively connected to said outer shell, and means for holding a plurality of connector pins; a stripper assembly including a housing portion and a plate portion, said housing portion having a threaded portion coacting with one of said threaded portions of said shell, said plate portion having a plurality of apertures through which said pin means are adapted to move; said connector assembly and said stripper assembly being provided with means to prevent rotation therebetween; said receptacle unit including a body member and a plate member, said plate member having a plurality of connector sockets, said body member including a threaded portion adapted to coact with the other thread portion of said shell; and means for aligning said connector unit and said receptacle unit.

2. The combination comprising:

(a) a female member having socket means,

(b) a male member having pin means to mate with said socket means,

(c) a stripper plate member engaging said pin means and mounted to said male member in a manner as to be movable from a first position where said stripper plate member covers said pin means to a second position to expose said pin means,

(d) a connecting member mounted to said male member,

(e) said connecting member having thread means to engage said female member upon rotation with respect to said female member and thus cause mating engagement of said male and female members, and to disengage said male and female members by a counter-rotation of the connecting member,

(f) said connecting member having an operative connection with both said male member and said stripper plate member, said connection being such that said rotation of the connecting member moves said stripper plate from its first position to its second position, and said counter-rotation of the connecting member moves the stripper plate member back to its first position.

3. The combination as recited in claim 2, wherein said operative connection of the connecting member comprises thread means engaging at least one of said stripper plate member and said male member.

4. The combination as recited in claim 2, wherein said operative connection is such that said connecting member is rotatably mounted to said male member and threadedly engages said stripper plate member.

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