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54 **Repairable electric cable connector with backshell.**

57 A spacer separates a threaded self-locking connector adapter from a cable transition piece. When the spacer is in place, the self-locking backshell slides over the transition piece, the spacer and threaded portion of the connector to provide support and shielding for the wires. The spacer includes locking teeth which fit into locking teeth on the connector and transition piece to prevent the connector from rotating relative to transition piece. The transition piece includes a locking detent mechanism. The outer shield of the cable is clamped by a cable clamp. The Shielded wires run through the center of transition piece and the individual shields from the wires are clamped to the transition piece by the clamp.

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The present invention relates, in general, to electric cable connectors and, more particularly, to a repairable electric cable connector including a backshell.

Reference is made to co-pending applications US Serial Nos. 07/805,134 and 07/805,135 filed 11 December 1991 (Our Ref: 13DV-10311 and 13DV-10993).

#### Background of the Invention

Electric cables for modern aircraft engines normally include a number of individually shielded wires surrounded by a shielded jacketed cable or a conduit which is itself surrounded by a shield. Since most discontinuities in such cables occur at the cable connectors, it would be advantageous to design a cable termination wherein the individual wires would be easily accessible and repairable. It would further be advantageous if the cable termination or connector were designed such that repairs to individual wires did not destroy the EMI shielding or the environmental seal of the connector. Finally, it would be advantageous to eliminate the potting material normally used to protect individual wires between the cable end and the connector.

#### Summary of the invention

In one aspect, the invention provides a cable termination comprising a connector including a threaded portion; an adapter adapted to detachably connect to said threaded portion of said connector; a wire guide including holes therethrough and being sized to fit within said adapter; a cable transition piece; an antirotation spacer adapted to separate said adapter and said transition piece; and a backshell adapted to connect said adapter to said transition piece.

In a further aspect, the invention provides a cable connector comprising: a transition piece including raised central locking detents, a first end adapted to receive an outer shield of a cable, a second end adapted to receive shields of wires in said cable; an adaptor including a threaded portion, locking teeth at one end of said threaded portion and a coupling nut; an antirotation spacer adapted to fit between said transition piece and said connector; and a backshell including a threaded portion which mates with said threaded portion of said connector and a locking detent mechanism which mates with locking detents on the transition piece.

In a still further aspect, the invention provides a cable transition comprising a backshell; a cable transition piece; an antirotation piece; and a connector wherein said antirotation piece is disposed between said transition piece and said connector and said backshell is adapted to fit over said an-

tirotation piece and connect said transition piece to said connector.

An antirotation spacer separates a threaded self-locking connector adapter from a cable transition piece. When the spacer is in place, a self-locking backshell slides over the transition piece, the spacer and the threaded portion of the connector. The backshell provides support and shielding. The spacer includes locking teeth which fit into locking teeth on the connector and transition piece to prevent the connector from rotating relative to the transition piece. The transition piece includes a locking detent mechanism. The outer shield of the cable is attached to the transition piece by a cable clamp. Individually shielded wires run through the center of transition piece and the individual shields from the wires are attached to the transition piece by a cable clamp.

#### Brief Description of the Drawings

The novel features of the invention are set forth with particularity in the appended claims. The invention itself, however, both as to organization and method of operation, together with further objects and advantages thereof, may best be understood by reference to the following description taken in conjunction with the accompanying drawings in which:

Figure 1 is an exploded view of a cable connector according to the present invention.

Figure 2 is a view of a partially assembled cable connector according to the present invention.

Figure 3 is a view of an assembled connector according to the present invention.

Figure 4 illustrates an alternate embodiment of the present invention.

#### Detailed Description of the Invention

Figure 1 illustrates an improved cable termination 12. In the embodiment of Figure 1, an electrical connector 55, including a body 50 and a threaded portion 54, is connected to self-locking connector adapter 8 by threaded portion 54 which includes locking teeth 2 adapted to engage self-locking detents (not shown) in adapter 8. Wire guide 52, which includes individual holes for each of wires 10, fits into adapter 8. Wire guide 52 aligns wires 10 with connector pins in connector 50. Wires 10 may be, for example, twisted pairs comprising two insulated wires surrounded by a shielding material 60 which is stripped away to form pigtailed 30. Shielding material 60 may be referred to as an inner shield.

Cable transition 3 in Figure 1 includes knurled portions 32 and 34 and raised portion 36. Raised portion 36 includes locking teeth 2 and antirotation

detents 5.

In cable 110, a conduit or outer jacket 6 surrounds wires 10 and interior shields 30. Conduit 6 may be covered by an external shield 20 of, for example, a metallic mesh.

Backshell 80 is adapted to slip fit over cable 110 and includes self-locking springs (not shown) adapted to mate with antirotation detents 5 on raised portion 36. Antirotation spacer 100 includes locking teeth 2 adapted to mate with locking teeth 2 on raised portion 36 and locking teeth 2 on adapter 8.

Spacer 100 separates threaded self-locking connector adapter 8 from a cable transition piece 3. When spacer 100 is in place, self-locking backshell 80 slides over transition piece 3, spacer 1 and threaded portion 40 of connector 8 to provide support and shielding for cable termination 12. Spacer 100 includes locking teeth 2 which fit into locking teeth 2 on adapter 8 and transition piece 3 to prevent adapter 8 from rotating relative to transition piece 3.

In Figure 2, wire guide 52 is fitted into adapter 8 with, for example, a friction fit to hold wires 10 straight and adapter 8 is screwed onto connector 55. Pigtailed 30 are clamped to knurled portion 32 of cable transition 3 with a band clamp 62. Outer shield 20 is clamped to knurled portion 34 of cable transition 3 with band clamp 64. Antirotation spacer 100 is not shown in Figure 2.

In Figure 3, antirotation spacer 100 is positioned between cable transition 3 and adapter 8 to prevent relative rotation between cable transition 3 and adapter 8. Backshell 80 is positioned over antirotation spacer 100 and screwed to adapter 8 while locking detents 5 of cable adapter 3 engage locking springs in backshell 80, preventing it from backing off. Thus, spacer 8, antirotation spacer 100 and transition piece 3 are held securely together.

In an alternate embodiment of the present invention is illustrated in Figure 4. In Figure 4, connector 150 is a 90° adapter which incorporates the antirotation spacer 100 and transition piece from the embodiment of Figure 1 in a single structure. In Figure 4, connector 150 is connected to cable transition piece 103 and backshell 180. Connector 150 includes a self-locking coupling nut 156. Wire guide 152 which is substantially identical to wire guide 52 of Figure 1 fits inside of connector 150 and is shown in dotted line. Self locking cap 157 and 159 provide access to connector 150. In the embodiment of Figure 4, connector 150 is split to allow access to the wires and pin connections. Cap 157 and backshell 180 hold the two halves of connector 150 together when the complete cable termination is assembled. It will be apparent to those of skill in the art that the connector may be manufactured at any suitable angle (e.g., 45 de-

grees) to the backshell without departing from the spirit and scope of the present invention.

As illustrated in Figure 4, transition piece 103 may include interior threads adapted to receive convoluted tubing which may comprise the cable conduit. In this arrangement, the convoluted tubing may be threaded into transition piece 103 and sealed thereby by using, for example, a thread lock sealing material.

While preferred embodiments of the present invention have been shown and described herein, it will be obvious to those skilled in the art that such embodiments are provided by way of example only. Numerous variations, changes, and substitutions will now occur to those skilled in the art without departing from the invention. Accordingly, it is intended that the invention be limited only by the spirit and scope of the appended claims.

## Claims

1. A cable termination comprising:
  - a connector including a threaded portion 54;
  - an adapter adapted to detachably connect to said threaded portion of said connector;
  - a wire guide including holes therethrough and being sized to fit within said adapter;
  - a cable transition piece;
  - an antirotation spacer adapted to separate said adapter and said transition piece; and
  - a backshell adapted to connect said adapter to said transition piece.
2. A cable termination according to claim 1 wherein:
  - said cable transition piece includes a raised central portion including locking detents adapted to mate with locking springs in said backshell.
3. A cable termination according to claim 2 wherein:
  - said cable transition piece includes teeth in said raised portion adapted to mate with teeth on said antirotation spacer; and
  - said adapter includes teeth adapted to mate with teeth on said antirotation spacer.
4. A cable connector comprising:
  - a transition piece including raised central locking detents, a first end adapted to receive an outer shield of a cable, a second end adapted to receive shields of wires in said cable;
  - an adapter including a threaded portion, locking teeth at one end of said threaded portion and a coupling nut;
  - an antirotation spacer adapted to fit be-

tween said transition piece and said connector;  
and

a backshell including a threaded portion which mates with said threaded portion of said connector and a locking detent mechanism which mates with locking detents on the transition piece. 5

5. A cable transition comprising:
- a backshell; 10
  - a cable transition piece;
  - an antirotation piece; and
  - a connector wherein said antirotation piece is disposed between said transition piece and said connector and said backshell is adapted to fit over said antirotation piece and connect said transition piece to said connector. 15
6. A cable transition according to claim 5 wherein: 20
- said antirotation piece is integral with said connector.
7. A cable transition according to claim 5 wherein: 25
- a wire guide is disposed within said connector;
  - said transition piece includes locking detents; and
  - said backshell includes locking springs adapted to mate with said locking detents. 30

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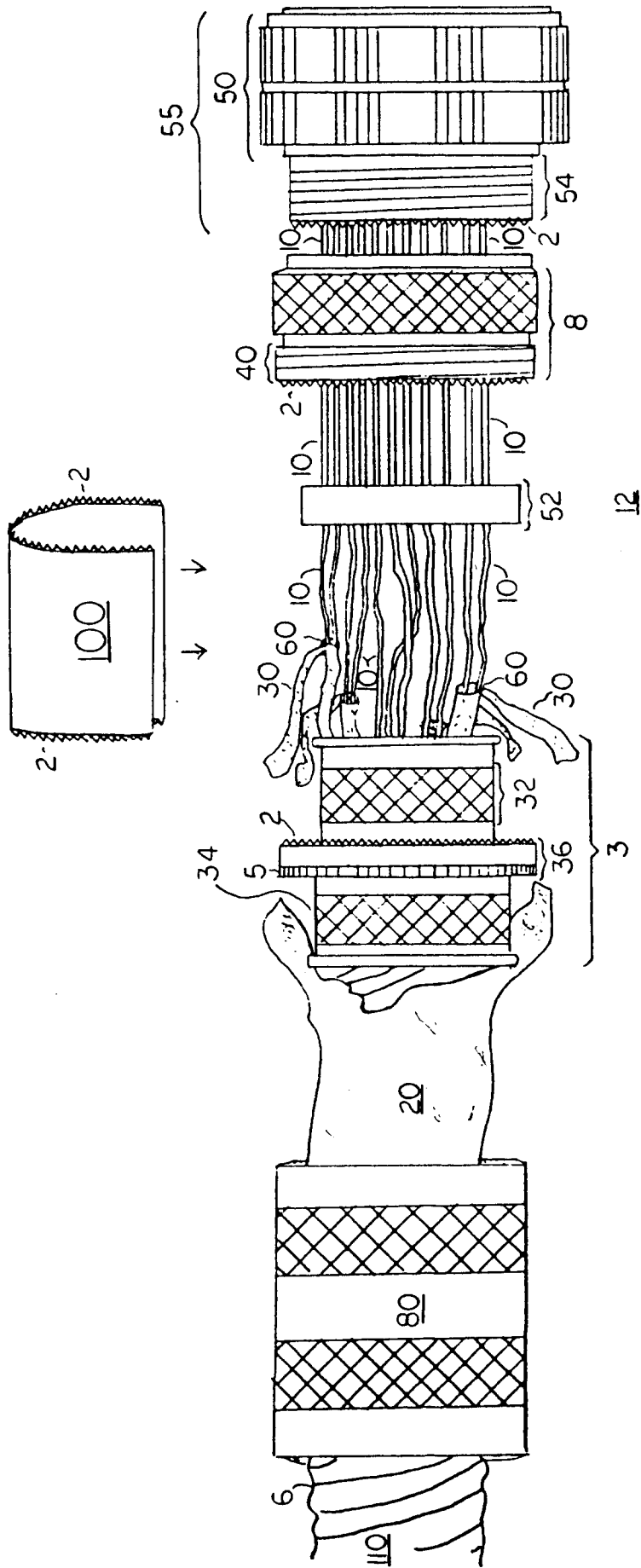


FIG. 1

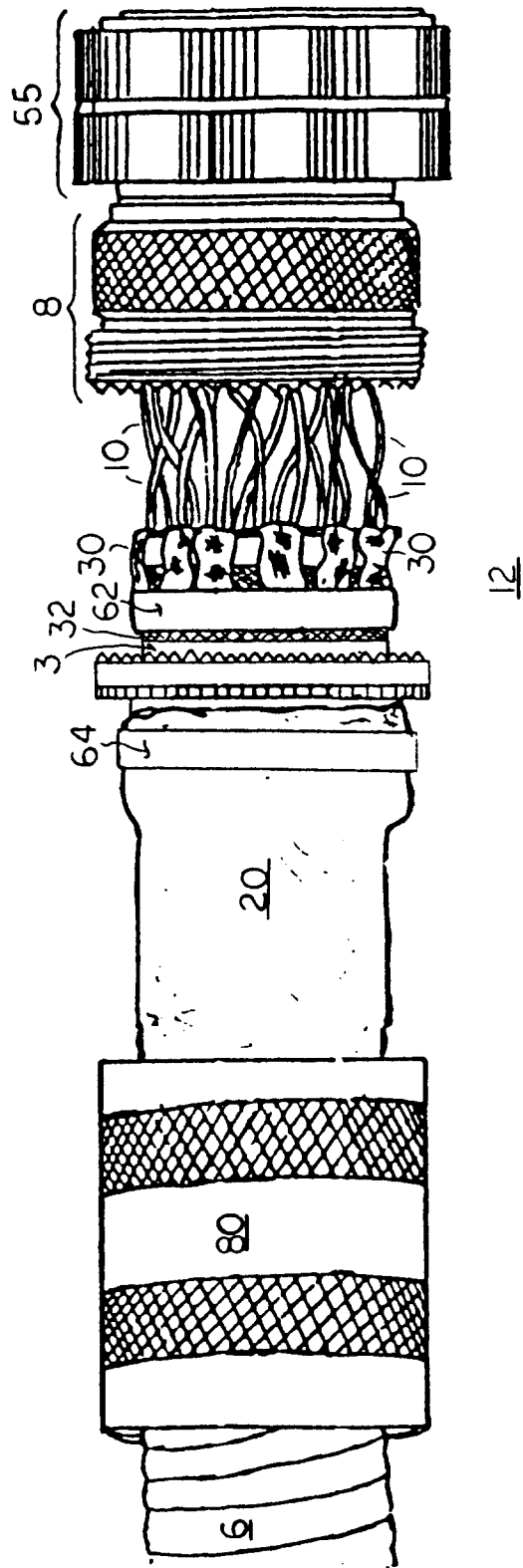
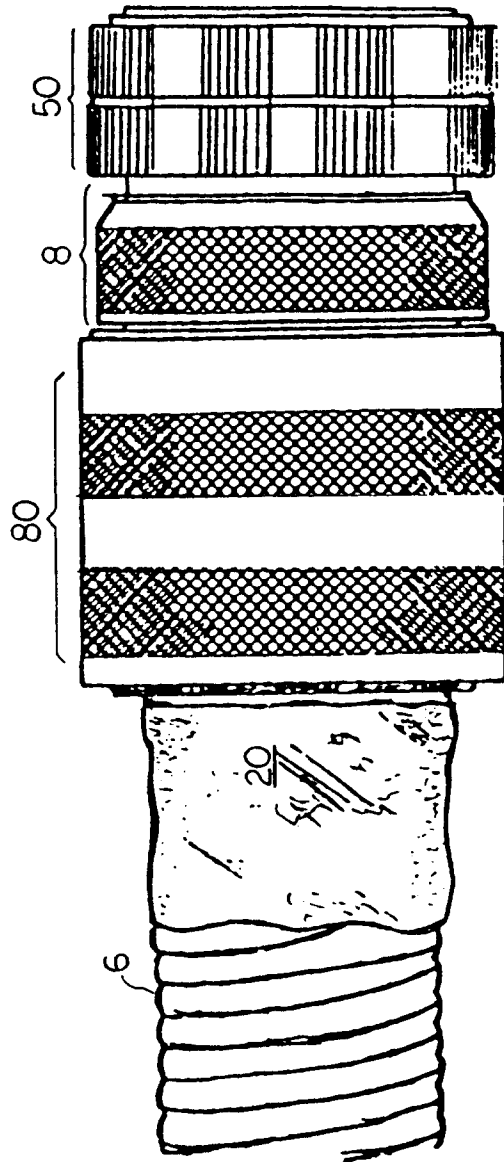


FIG. 2



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FIG. 3

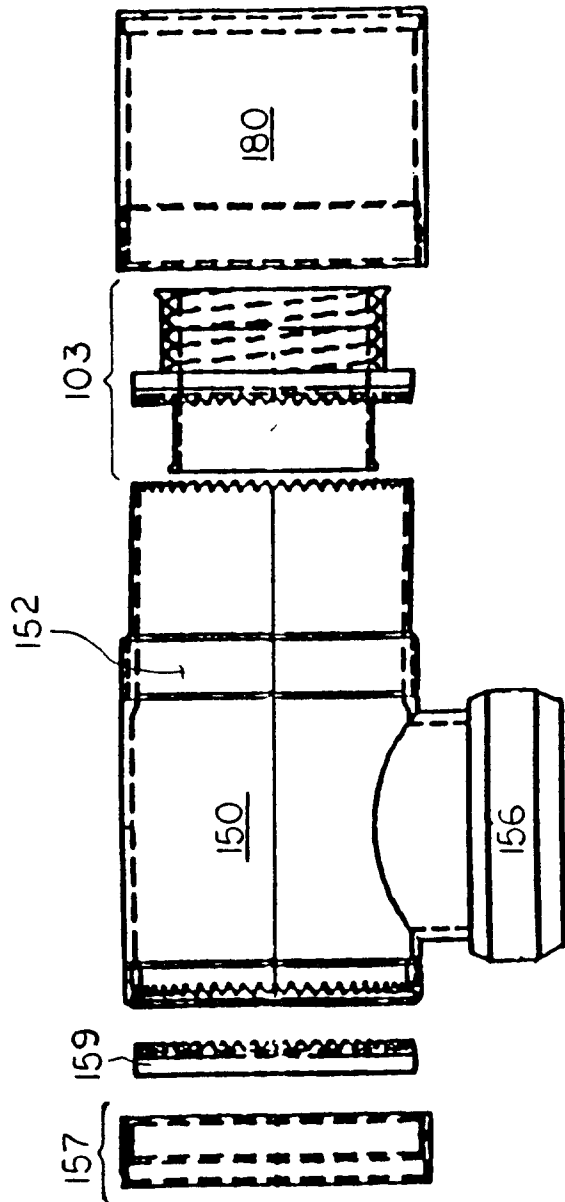


FIG 4