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(54) **An electrical connector having improved dampening means.**

(57) An electrical connector (10) having a connector portion (12) and a locking ring (22) rotatably mounted about the connector portion (12) for mating with a complementary connector (16) which is mounted to the bulkhead or housing (17). The locking ring (22) comprises a plurality of locking lugs (26) which cooperate with corresponding locking grooves (28) on the complementary connector (16) to force the connector portion (12) into operative mating engagement with complementary connector (16) when the locking ring (22) is rotated. The locking ring (22) comprises a plurality of generally L-shaped resilient fingers (32). As the locking ring (22) is rotated from an unlocked to a locked position, the resilient fingers (32) engage the bulkhead or firewall (17) and resile radially away from complementary connector (16). The plurality of resilient fingers (32) are resilient and absorb shock and vibration, such that the electrical connection between connector portion (12) and complementary connector (16) is not interrupted.

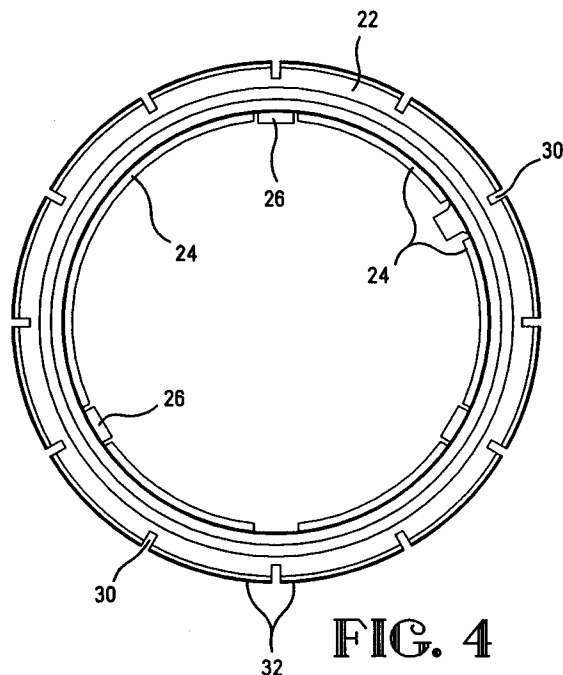


FIG. 4

This invention relates to an electrical connector according to the preamble of claim 1. This invention provides an electrical connector having improved means for dampening vibration of the electrical connector.

In the past, it was not uncommon to have a bayonet-type electrical connector mounted, for example, to a firewall or similar bulkhead in an automobile. The electrical connector typically comprised a receptacle connector which was mounted to the firewall and which had a plurality of locking grooves about its periphery. The electrical connector also comprised a mating connector having a locking ring which was rotatably mounted thereon. The mating connector had a plurality of locking lugs which would cooperate with the locking grooves to lock the mating connector to the receptacle connector. A compressible seal was positioned between the locking ring and the firewall. When the locking ring was tightened to a locked position, the compressible seal would compress and bias the locking lugs into a locked position in the locking grooves on the receptacle connector which, in turn, facilitated reducing vibration of the electrical connector. European Patent Application No. 0378845 A1, which is assigned to the same assignee as the present application, teaches of an electrical connector which uses this type of compressible seal.

A problem with compressible seals is that the seals tended to dry out, harden and conform to the shape of the firewall so that their vibration absorption capacity was degraded.

The invention provides an electrical connector as defined in claim 1. Preferred embodiments are defined in the dependent claims.

In one aspect of a preferred embodiment of the invention, this invention comprises an electrical connector for coupling to a complementary connector which is mounted on a housing, said electrical connector comprising a connector portion for operatively mating with said complementary connector; and dampening means associated with said connector portion for operatively engaging said housing when said electrical connector is mounted to said complementary connector in order to dampen vibration of said electrical connector so that the electrical connection between said complementary connector and said electrical connector is not interrupted, said dampening means being incompressible and resilient.

This invention provides an electrical connector having improved means for dampening vibration so that any electrical connection between the electrical connector and its complementary mating connector will not be interrupted.

An embodiment of this invention provides an electrical connector having a locking ring compris-

ing a plurality of resilient fingers which are integrally formed as part of the locking ring, thereby eliminating the need for a compressible seal.

Another embodiment of this invention provides an electrical connector having improved dampening means comprising a plurality of resilient fingers which cooperate with and engage a housing wall to ensure that the electrical connection between the electrical connector and a complementary mating connector will not be interrupted.

An example of an electrical connector of this invention will now be described with relation to the Drawing, where:

Fig. 1 is a plan view of an electrical connector, showing a locking ring rotatably mounted on a connector portion;

Fig. 2 is a sectional view, taken along the line 2-2 of Fig. 1, showing a locking latch on the connector portion and a locking rim on the locking ring;

Fig. 3 is a cross-sectional view of the connector portion, showing details of the apertures for receiving electrical terminals;

Fig. 4 is a plan view of the locking ring of Fig. 1, showing a plurality of resilient fingers and also showing a plurality of locking lugs;

Fig. 5 is a side view, partly in section, showing a plurality of axial slots which define the plurality of resilient fingers shown in Fig. 4; and

Fig. 6 is a side view of a complementary connector mounted to a housing, showing locking grooves for receiving locking lugs.

Referring now to Fig. 1, an assembled view of an electrical connector, hereinafter designated electrical connector 10, is shown. The electrical connector 10 comprises a stationary connector or connector portion 12 having a plurality of electrical terminals 14 therein. The connector portion 12 operatively mates with a complementary connector 16 (Fig. 6) which may be mounted to a firewall, bulkhead or similar housing 17, as best shown in Fig. 6. After complementary connector 16 is mounted to housing 17, electrical connector 10 may be mounted and dismounted from complementary connector 16 in the manner described later herein. The connector portion 12 comprises a resilient latch 18 (Figs. 2 and 3) which cooperates with an end 12b to define a locking space 20. The function of the locking space 20 is described below.

Electrical connector 10 also comprises a cylindrical locking ring 22 which is rotatably mounted about the connector portion 12, as best illustrated in Fig. 2. The locking ring 22 comprises a locking rim 24 (Figs. 2, 4 and 5). When mounting locking ring 22 on an end 12a (Fig. 3) of connector portion 12, connector portion 12 is moved in the direction of arrow A in Fig. 5 into locking ring 22 until locking rim 24 becomes positioned in locking space 20.

The resilient latch 18 on connector portion 12 and locking rim 24 cooperate to lock the locking ring 22 onto connector portion 12 while permitting the locking ring 22 to rotate freely on connector portion 12. In the embodiment being described, connector portion 12 and locking ring 22 are generally cylindrical and made of plastic.

As best illustrated in Fig. 4, locking ring 22 comprises a plurality of locking lugs 26. The locking lugs 26 cooperate with a plurality of locking grooves 28 (Fig. 6) on the complementary connector 16 to permit the electrical connector 10 to be coupled to complementary connector 16. Although not shown, the connector portion 12 and complementary connector 16 may comprise detents (not shown) for locking the complementary connector 16 and connector portion 12 together and for retaining the locking lugs 26 in a locked position. As best shown in Fig. 4, locking lugs 26 are located on an inner surface 25 of locking ring 22. The locking lugs 26 are received in the locking grooves 28, such that when the locking ring 22 is rotated in a counterclockwise direction (as viewed in Fig. 1), the connector portion 12 is moved into operative engagement with an operative end 16a of complementary connector 16. The operation of the locking grooves 28 and locking lugs 26 is substantially similar to that shown and described in European Patent Application No. 0378845 A1 which is assigned to the same assignee as the present application and which is hereby incorporated by reference.

The electrical connector 10 also comprises dampening means associated with connector portion 12 for operatively engaging housing 17 (Fig. 6) when electrical connector 10 is mounted to complementary connector 16. The function of dampening means is to dampen vibration of the electrical connector 10, thereby facilitating the maintenance of an electrical connection between the connector portion 12 of complementary connector 16 and electrical connector 10. In the embodiment being described, dampening means is incompressible and resilient. As best illustrated in Figs. 1, 2, 4 and 5, dampening means comprises a plurality of axially aligned grooves or slots 30 which define a plurality of resilient fingers 32 on an end 22b of locking ring 22. Each of the plurality of resilient fingers 32 is generally L-shaped in cross-section and has an engaging end 32a (Fig. 5) which engages housing 17 when electrical connector 10 is coupled to complementary connector 16.

As best illustrated in Figs. 1 and 4, the plurality of resilient fingers 32 define a circumference and are angularly spaced an equidistant apart along the circumference. In the embodiment being described, the diameter of the circle defined by the engaging ends 32a of the plurality of resilient fingers 32 is

approximately 2.375 inches, and the circumference is approximately 7.50 inches. The plurality of resilient fingers 32 may be integrally formed on the engaging end of locking ring 22, thereby providing a locking ring 22 having a single one-piece construction. It is to be noted that each engaging end 32a is beveled to facilitate the movement of the plurality of resilient fingers 32 in a radial direction away from connector portion 12, as described below. The assembly and operation of electrical connector 10 will now be described.

After the locking ring 22 is mounted on connector portion 12, the electrical connector 10 is mounted to complementary connector 16 (Fig. 6). In this regard, the connector portion 12 is operatively aligned with end 16a of complementary connector 16, and the locking lugs 26 are then positioned in locking grooves 28 on complementary connector 16. The locking ring 22 is then rotated in a counterclockwise direction (as viewed in Fig. 1) so that the connector portion 12 is drawn into operative engagement with complementary connector 16. The locking ring 22 is rotated until the plurality of resilient fingers 32 engage the housing 17 and connector portion 12 mates with complementary connector 16. It is to be noted that, as locking ring 22 is tightened, each of the plurality of resilient fingers 32 deflects or resiles radially away from the connector portion 12. The plurality of resilient fingers 32 absorb and dampen shock and vibration of electrical connector 10, so that the electrical connection between electrical connector 10 and complementary connector 16 remains uninterrupted.

To unlock or disconnect electrical connector 10 from complementary connector 16, locking ring 22 is rotated in a clockwise direction (as viewed in Fig. 1) until the locking lugs 26 exit locking grooves 28 on complementary connector 16. It is to be noted that each of the plurality of resilient fingers 32 resile back to their original home position shown in Figs. 1, 2, 4 and 5 when the locking ring 22 is in its unlocked position. If desired, the electrical connector 10 can be remounted on complementary connector 16 in the manner described above.

Advantageously then, this electrical connector 10 has dampening means comprising a plurality of resilient fingers 32 which absorb shock and vibration and which eliminate the need for a compression type seal or similar device.

Various changes or modifications in the invention may occur to those skilled in the art without departing from the true spirit or scope of the invention. The above description of the invention is intended to be illustrative and not limiting and it is not intended that the invention be restricted thereto but that it be limited only by the true spirit and scope of the appended claims.

Claims

1. An electrical connector for coupling to a complementary connector which is mounted to a panel, said electrical connector comprising a housing portion for operatively coupling with said complementary connector and dampening means associated with said housing portion in order to dampen vibration of said electrical connector so that the electrical connection between said complementary connector and said electrical connector is not interrupted, said connector being characterized in that said dampening means are brought into an engaging position with said panel by latching actuator means when said electrical connector is mounted to said complementary connector, said dampening means being incompressible and resilient. 5 10 15 20
2. The electrical connector as recited in claim 1 characterized in that said complementary connector comprises a plurality of locking grooves, said connector housing portion comprising a stationary connector for mating with said complementary connector a locking ring rotatably mounted about said stationary connector, said locking ring comprising a plurality of locking lugs which cooperate with said locking grooves to force said dampening means against said housing when said locking ring is rotated from an unlocked position to a locked position. 25 30
3. The electrical connector as recited in either claim 1 or 2 characterized in that said dampening means comprises a plurality of resilient fingers located on an end of said locking ring. 35
4. The electrical connector as recited in claim 3 characterized in that each of said plurality of resilient fingers are generally L-shaped in cross section and have an engaging end which engages said housing, said plurality of resilient fingers resiling radially away from said stationary connector when said locking ring is rotated from an unlocked to a locked position, biasing said locking ring away from said housing. 40 45
5. The electrical connector as recited in either of claims 3 or 4 characterized in that said stationary connector is generally cylindrical and comprises at least one resilient latch, said locking ring comprising a locking rim which cooperates with said at least one resilient latch to lock said locking ring onto said stationary connector such that said locking ring becomes rotatably mounted on said stationary connector. 50 55
6. The electrical connector as recited in any of claims 3-5 characterized in that said locking ring has a circumference, said plurality of resilient fingers being angularly spaced an equidistance apart along said circumference.
7. The electrical connector as recited in claim 2 characterized in that an engaging end of said locking ring has a plurality of axial slots which define a plurality of resilient fingers, said plurality of axial slots and said plurality of resilient fingers being spaced equidistant apart.
8. The electrical connector as recited in any of claims 3-7 characterized in that said engaging end of each of said plurality of resilient fingers is beveled.
9. The electrical connector as recited in any of claims 3-7 and 8 characterized in that said plurality of resilient fingers are integrally formed as part of the locking ring.

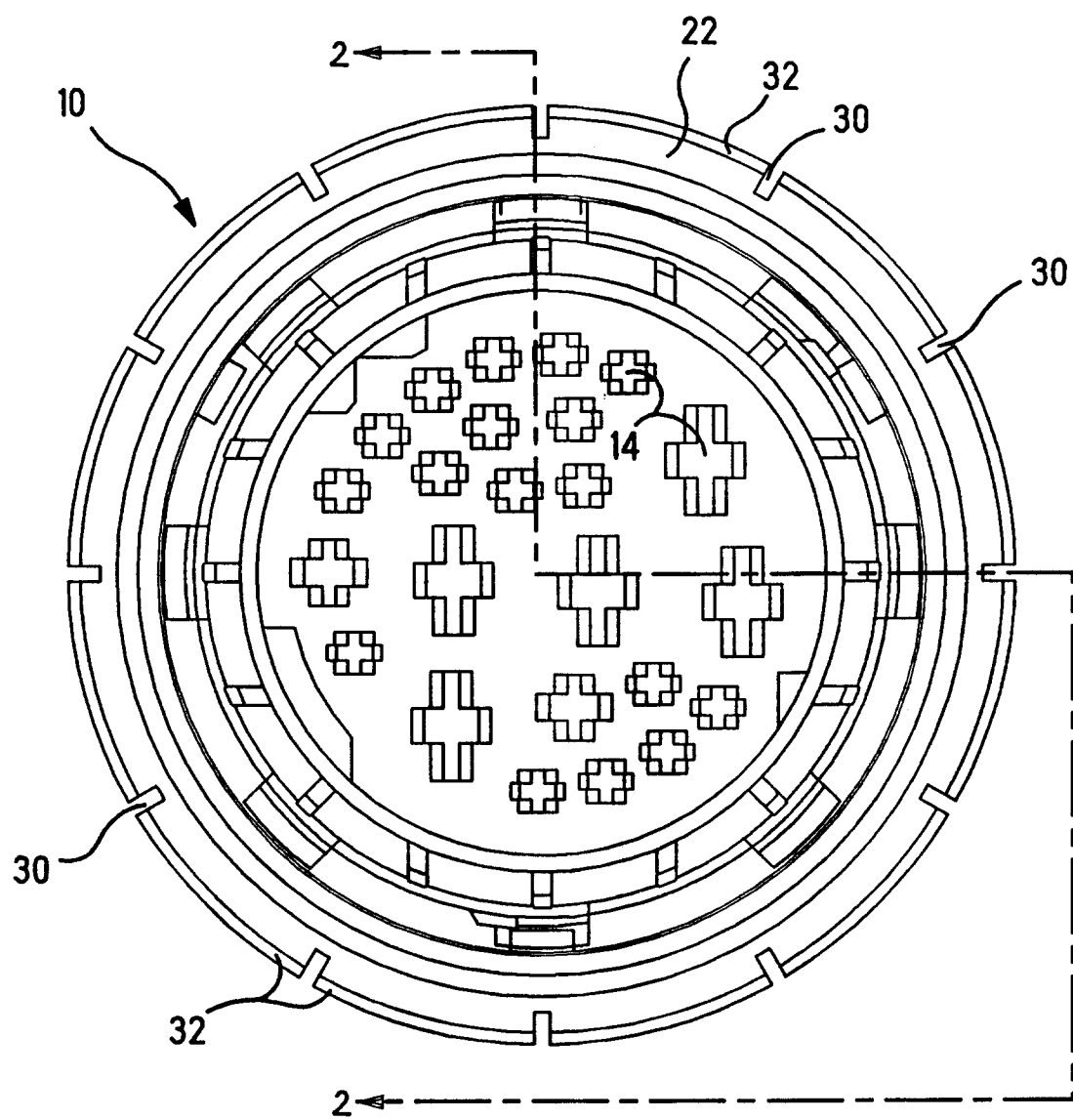


FIG. 1

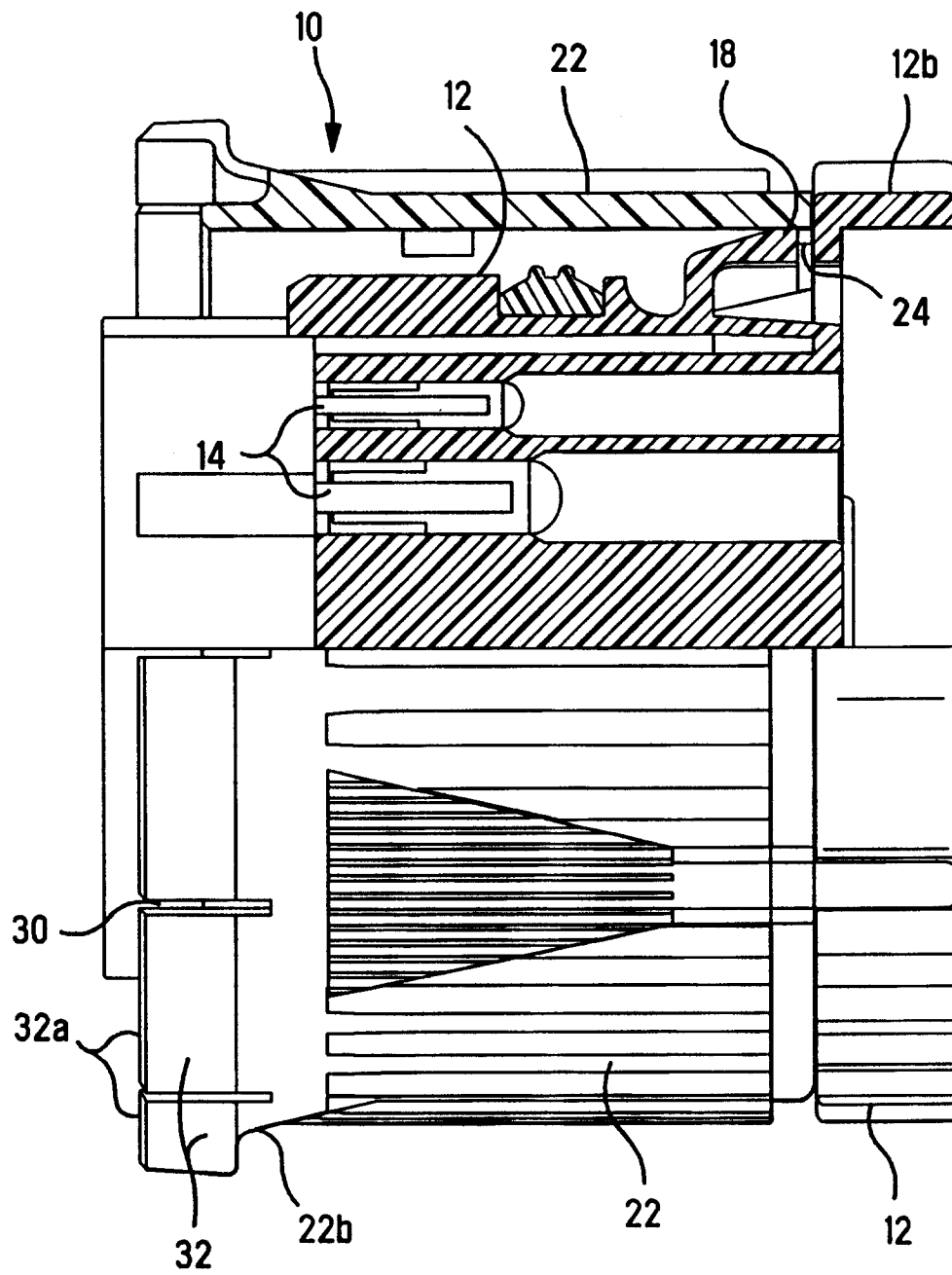


FIG. 2

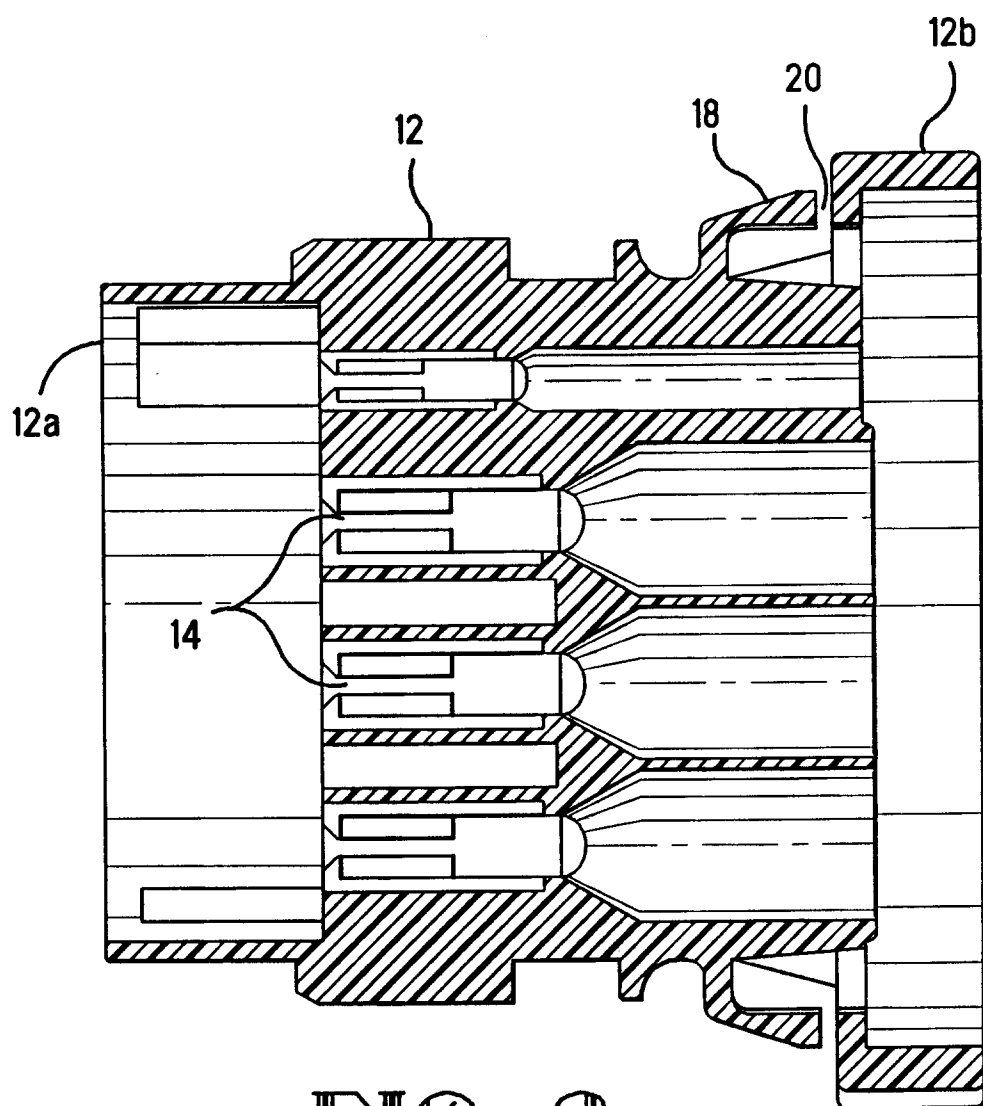
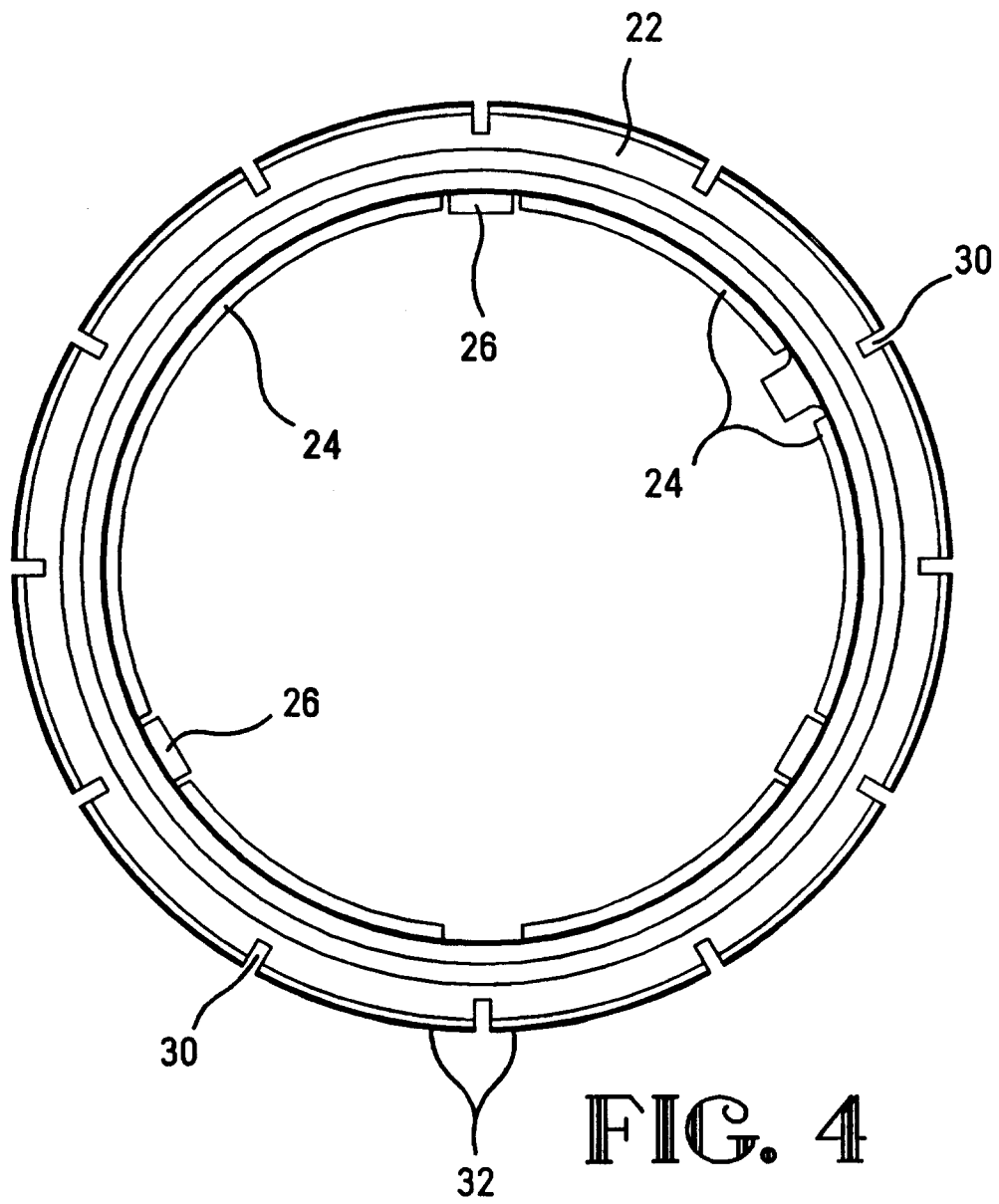


FIG. 3



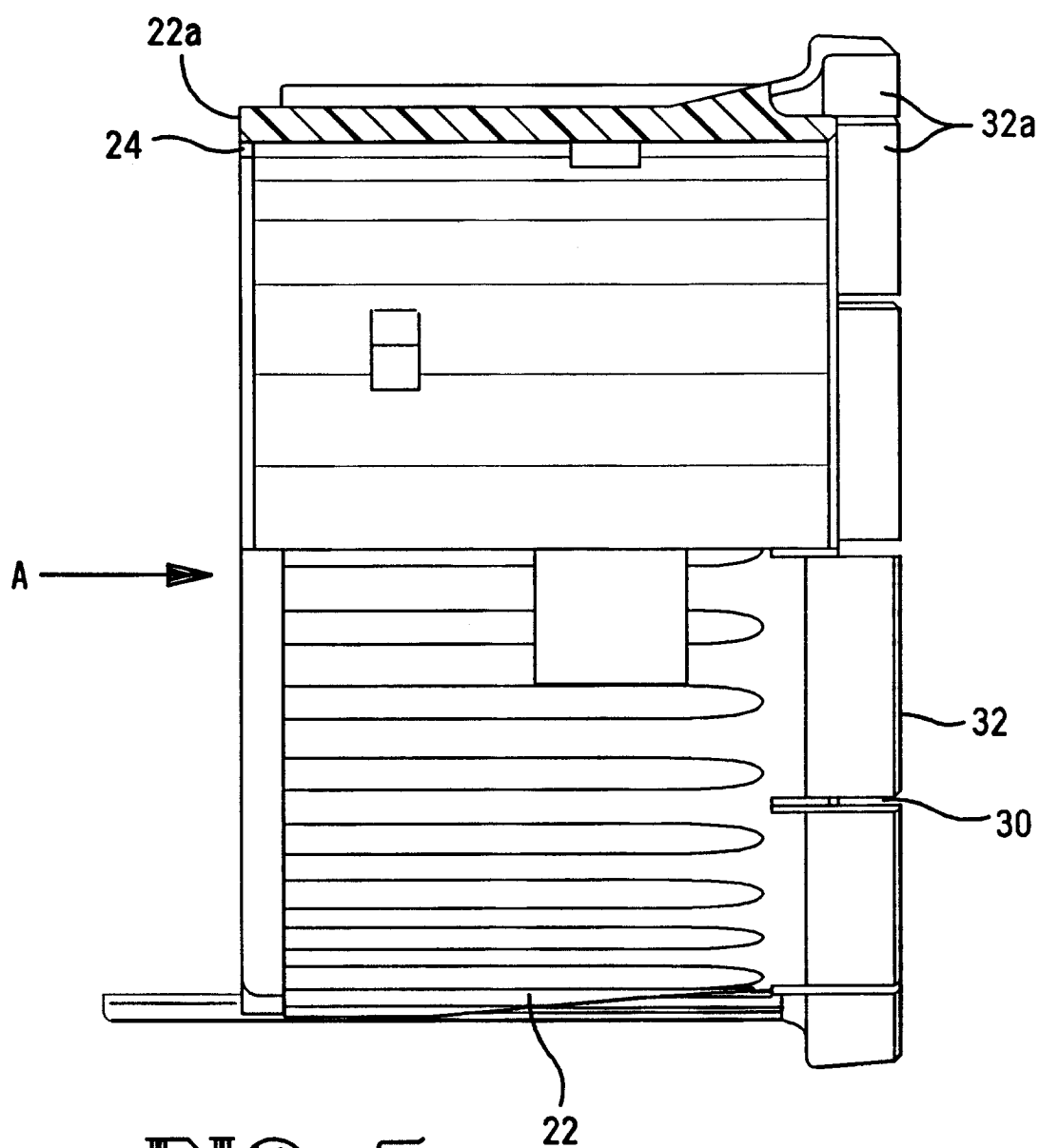
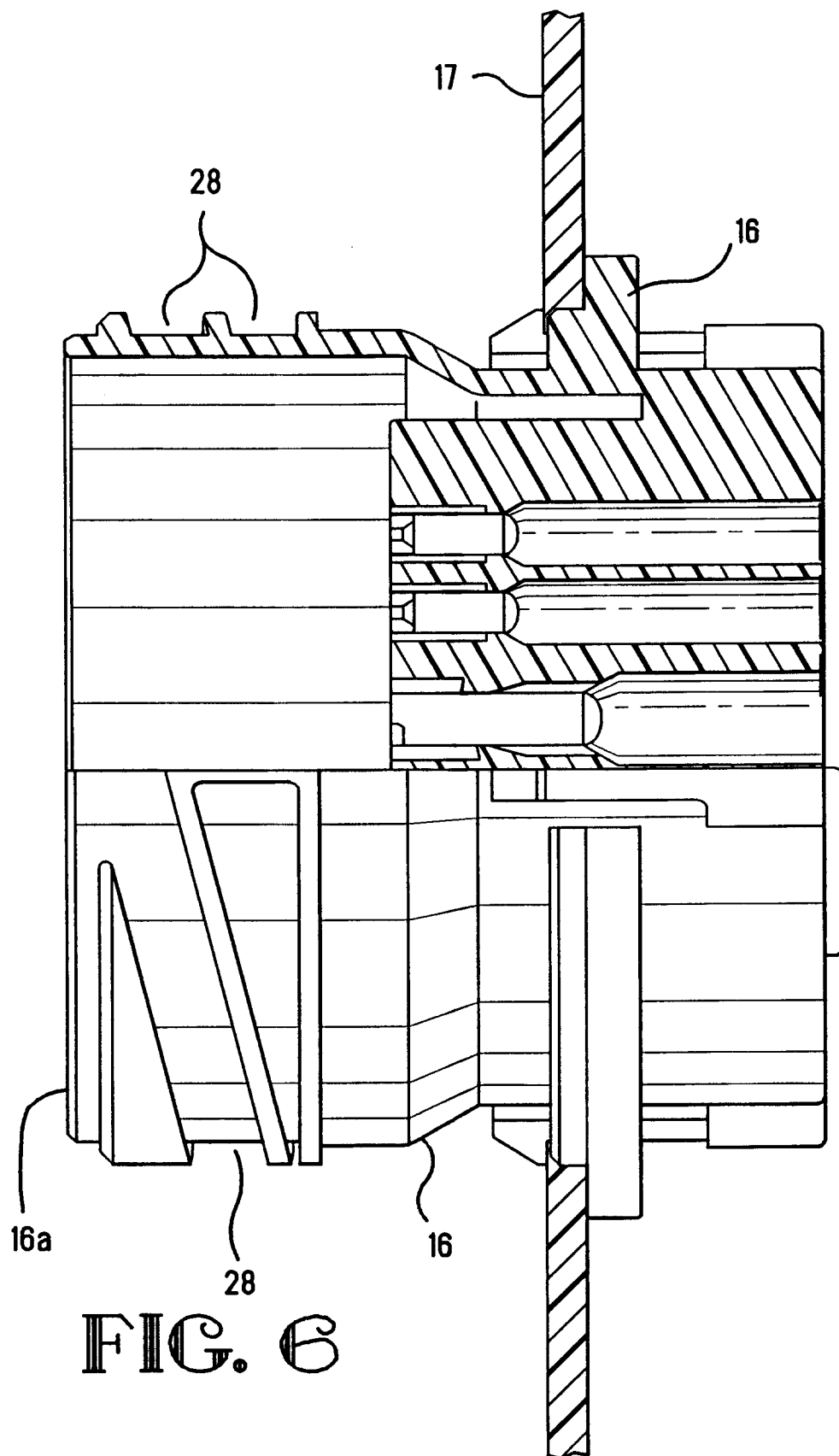


FIG. 5





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 93 11 0886

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	DE-B-1 225 258 (COMMISARIAT À L'ÉNERGIE ATOMIQUE) * column 4, paragraph 2 * * column 4, last paragraph * ---	1-6,8	H01R13/533
A	EP-A-0 043 636 (AUTOMATION INDUSTRIES INC.) * page 19, line 22 - line 25; claim 9; figure 1 * ---	1,3-6,8	
A	FR-A-1 204 000 (BENDIX AVIATION CORP.) ---	1,3-4,7	
A,D	EP-A-0 378 845 (AMP INC.) * the whole document * ---	1	
A	US-A-5 046 964 (WELSH ET AL.) * column 4, line 32 - line 38 * -----	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			H01R
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 29 SEPTEMBER 1993	Examiner SIBILLA S.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application I : document cited for other reasons & : member of the same patent family, corresponding document			