

(19)



Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11)

**EP 0 676 830 B1**

(12)

**EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention  
of the grant of the patent:  
**20.12.2000 Bulletin 2000/51**

(51) Int. Cl.<sup>7</sup>: **H01R 13/629**

(21) Application number: **95105028.5**

(22) Date of filing: **04.04.1995**

(54) **Electrical connector housing assembly with improved locking means**

Elektrisches Steckergehäuse mit verbesserter Verriegelungsvorrichtung

Boîtier de connecteur électrique avec système de verrouillage amélioré

(84) Designated Contracting States:  
**DE ES FR GB IT SE**

(30) Priority: **08.04.1994 GB 9407015**

(43) Date of publication of application:  
**11.10.1995 Bulletin 1995/41**

(73) Proprietor:  
**THE WHITAKER CORPORATION  
Wilmington, Delaware 19808 (US)**

(72) Inventors:  
• **Hahn, Joachim Alfred  
D-61389 Schmitten (DE)**

- **Ries, Annette Carola  
D-63517 Rodenbach (DE)**
- **Jetter, Rolf  
D-64291 Darmstadt (DE)**
- **Bömmel, Christian Otto  
D-61118 Bad Vilbel (DE)**

(74) Representative:  
**Klunker . Schmitt-Nilson . Hirsch  
Winzererstrasse 106  
80797 München (DE)**

(56) References cited:  
**EP-A- 0 544 558                      EP-A- 0 556 762**  
**DE-U- 8 700 210                      DE-U- 8 714 016**

**EP 0 676 830 B1**

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

## Description

**[0001]** This invention relates to a rack and pinion type of locking means for the coupling of complementary connectors.

**[0002]** A rack and pinion mechanism for coupling mating connectors together is known from German Utility Model G 8714016 and shown in Figure 1, whereby a receptacle connector assembly 4' comprises a gear 10' pivotable about an axis and attached to a lever arm 14'; and a pin header connector assembly 3' comprises a rack 11' along a wall of a cavity 13' receiving the receptacle connector 4'. Mating of the connectors 2' and 3' is effectuated by simply inserting the receptacle connector into the cavity of the pinheaded connector whereby engagement of the rack 11' and pinion 10' causes the gear arm 14' to rotate and allow full insertion of the receptacle connector into the male housing cavity. Uncoupling of the mating connectors 2', 3' is effectuated by simply rotating the lever 14' in the opposite sense.

**[0003]** In order to ensure locking of the mated connectors, the lever can be latched in its final position by some resilient latching means. In the open position however, the lever arm 20 should be held in a fixed position such that coupling of the connectors is rapidly done by merely inserting the connectors and snapping them together. The gear lever arm of the Utility Model engages the receptacle housing with a dimple thereon for resiliently holding the lever in the fully open position, the lever being rotatable into the closed position by simply exerting sufficient torque to the gear (which occurs when firmly pressing the mating connectors together).

**[0004]** One of the problems associated with the prior art open-position retention means, is that after a few connections and disconnections, the dimple may wear and be less effective in holding the gear lever open. Furthermore, as the retention means must be releasable with a reasonable force, the gear lever may also be accidentally rotated from the open position, the operator then requiring to first open the lever prior to mating.

**[0005]** It is therefore an object of this invention to provide a rack and pinion coupling means for mating connectors that is reliable, reduces handling costs and is cost-effective to manufacture.

**[0006]** It is a further object of this invention to provide a rack and pinion coupling means for mating connectors that allows reliable and rapid coupling of the mating parts whilst requiring low coupling forces.

**[0007]** The objects of this invention have been achieved by providing a connector assembly according to claim 1.

**[0008]** The preferred embodiment of this invention will now be described in detail with reference to the figures, whereby;

Figure 1 is a side view of mating connector assemblies of the prior art;

Figure 2 is a side view of part of a connector assembly comprising a gear member according to the preferred embodiment of this invention;

Figures 3, 4 and 5 are cross-sectional views through line 3-3 of Figure 2 but including a second connector assembly matable with the first, showing, respectively, different steps during coupling therebetween; and

Figure 6 is an isometric view of part of the connector housing without the gear member showing more clearly the gear retention member.

**[0009]** Referring first to Figure 2, a receptacle connector assembly 3 comprising a housing 4 having a main housing 6 for receiving electrical terminals therein, and a gear member 8 comprising a pinion 10 with gear teeth 12, and a lever arm 14. The gear member 8 is pivotally attached to an axis 16 of the housing 4. The terminals mountable in the main housing section 6 project towards a mating face 18 thereof, the connector assembly 3 being matable to a complementary connector assembly 2' (see Figure 3) similar to the connector assembly 2' of the prior art. The mating connector assembly would thus comprise a rack similar to the rack 6' for engagement with the gear teeth 12 of the pinion 10 during mating and unmating of the connector assemblies. Similarly to the prior art shown in Figure 1, the connector housing 4' would be inserted into a cavity of the complementary connector assembly whereby the pinion 10 and rack would engage causing the gear member 8 to pivot until the fully mated position indicated by the gear lever member 8 shown in dotted lines.

**[0010]** Referring to Figures 1-6, the connector housing 4 further comprises a resilient latching member 20 attached to the main housing section 6 proximate the mating face 18 and extending rearwardly therefrom to a free end 22. Referring to Figures 2 and 3, the resilient retention arm 20 is shown comprising, proximate the free end 22, a retention shoulder 24 engageable against a retention shoulder 26 of the lever arm 14 when in the fully opened position, and a tapered portion 23 for engaging the lever arm during opening thereby biasing the retention arm prior to locking engagement therewith. Intermediate the free end 22 and attached end 21, the retention arm 20 comprises a camming portion 28 projecting outwardly therefrom and engageable with a wall 30 of the complementary connector housing for biasing of the resilient retention arm 20 out of locking engagement with the lever arm retention shoulder 26 as can be seen in Figure 4.

**[0011]** Figure 4 shows initial insertion of the connector housing 4 into a cavity 32 of a complementary connector housing 34. During this initial insertion, the retention arms 20 are resiliently biased and release the lever arm 14 such that when the gear teeth 12 engage the rack of the complementary connector, the gear member 8 is free to rotate and allow full insertion of the connector housing 4 into the cavity 32 as shown in Fig-

ure 5. Camming of the resilient retention arms 20 during mating, thus allows a low mating force between the complementary connector assemblies 2, 3 whilst nevertheless providing a very secure retention means that does not suffer from wear during coupling and uncoupling.

**[0012]** Advantageously therefore, the gear member coupling means is securely and reliably maintained in the open position ready for coupling, and automatically released during the coupling without significantly increasing the mating forces required.

### Claims

1. An electrical connector assembly (3) matable to a complementary connector assembly (2), the connector assembly (3) comprising a housing (4) having a main housing section (6) for receiving electrical terminals therein matable with electrical terminals of the complementary connector assembly (2), the connector housing (4) further comprising a rotatable gear member (8) having a lever arm (14) and a pinion (10) attached to one end of the lever arm, the pinion having gear teeth (12) engageable with a rack of the complementary connector assembly (2), characterized in that the connector housing (4) comprises a resilient retention arm (20) securely locking the gear member (8) to the main housing section (6) in an open position prior to mating, the retention arm (20) comprising a camming portion (28) engageable against a wall portion (30) of the complementary connector assembly (2) during mating for allowing the gear member (8) to rotate.
2. The connector assembly of claim 1 characterized in that the retention arm (20) is a cantilevered beam.
3. The connector assembly of any preceding claim characterized in that the retention arm (20) is integrally attached to the main housing section (6) proximate a mating face (18) thereof.
4. The connector assembly of any preceding claim characterized in that a free end (22) of the retention arm (20) comprises a tapered portion (23) for engaging the lever arm (14) during opening thereof to resiliently bias the retention arm prior to locking engagement therewith.

### Patentansprüche

1. Elektrische Verbinderanordnung (3), die mit einer komplementären Verbinderanordnung (2) in Eingriff kommen kann, wobei die Verbinderanordnung (3) ein Gehäuse (4) mit einem Hauptgehäuseabschnitt (6) für das Aufnehmen elektrischer Anschlußklemmen darin aufweist, die mit elektrischen Anschluß-

klemmen der komplementären Verbinderanordnung (2) in Eingriff kommen können, wobei das Verbindergehäuse (4) außerdem ein drehbares Eingriffselement (8) mit einem Hebelarm (14) und einem Ritzel (10), das an einem Ende des Hebelarmes befestigt ist, aufweist, wobei das Ritzel Zahnradzähne (12) aufweist, die mit einer Zahnstange der komplementären Verbinderanordnung (2) in Eingriff kommen können, dadurch gekennzeichnet, daß das Verbindergehäuse (4) einen elastischen Arretierarm (20) aufweist, der das Eingriffselement (8) sicher am Hauptgehäuseabschnitt (6) in einer offenen Position vor dem Eingriff verriegelt, wobei der Arretierarm (20) einen Nockenabschnitt (28) aufweist, der am Wandabschnitt (30) der komplementären Verbinderanordnung (2) während des Eingriffes in Eingriff kommen kann, damit sich das Eingriffselement (8) drehen kann.

2. Verbinderanordnung nach Anspruch 1, dadurch gekennzeichnet, daß der Arretierarm (20) ein freistehender Träger ist.
3. Verbinderanordnung nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß der Arretierarm (20) fest am Hauptgehäuseabschnitt (6) in unmittelbarer Nähe einer Eingriffsfläche (18) dieses befestigt ist.
4. Verbinderanordnung nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß ein freies Ende (22) des Arretierarmes (20) einen kegelförmigen Abschnitt (23) für einen Eingriff mit dem Hebelarm (14) während dessen Öffnen aufweist, um den Arretierarm vor dem verriegelnden Eingriff damit elastisch vorzuspannen.

### Revendications

1. Assemblage de connecteur électrique (3) pouvant être accouplé à un assemblage de connecteur complémentaire (2), l'assemblage de connecteur (3) comprenant un boîtier (4) comportant une section de boîtier principale (6) destinée à recevoir des bornes électriques, pouvant être accouplées avec les bornes électriques de l'assemblage de connecteur complémentaire (2), le boîtier de connecteur (4) comprenant en outre un élément d'engrenage rotatif (8) comportant un bras de levier (14) et un pignon (10) fixé à une extrémité du bras de levier, le pignon comportant une denture (12) pouvant s'engager dans une crémaillère de l'assemblage de connecteur complémentaire (2), caractérisé en ce que le boîtier de connecteur (4) comprend un bras de retenue élastique (20) verrouillant de manière sûre l'élément d'engrenage (8) sur la section de boîtier principale (6) dans une position ouverte

avant l'accouplement, le bras de retenue (20) comprenant une partie à cames (28) pouvant s'engager contre une partie de paroi (30) de l'assemblage de connecteur complémentaire (2) au cours de l'accouplement pour permettre la rotation de l'élément d'engrenage (8). 5

2. Assemblage de connecteur selon la revendication 1, caractérisé en ce que le bras de retenue (20) est une barre en porte-à-faux. 10
3. Assemblage de connecteur selon l'une quelconque des revendications précédentes, caractérisé en ce que le bras de retenue (20) est intégralement fixé sur la section de boîtier principale (6), près d'une face d'accouplement correspondante (18). 15
4. Assemblage de connecteur selon l'une quelconque des revendications précédentes, caractérisé en ce qu'une extrémité libre (22) du bras de retenue (20) comprend une partie effilée (23), destinée à s'engager dans le bras de levier (14) au cours de l'ouverture correspondante pour exercer une poussée élastique sur le bras de retenue avant de s'engager par verrouillage dans celui-ci. 20  
25

30

35

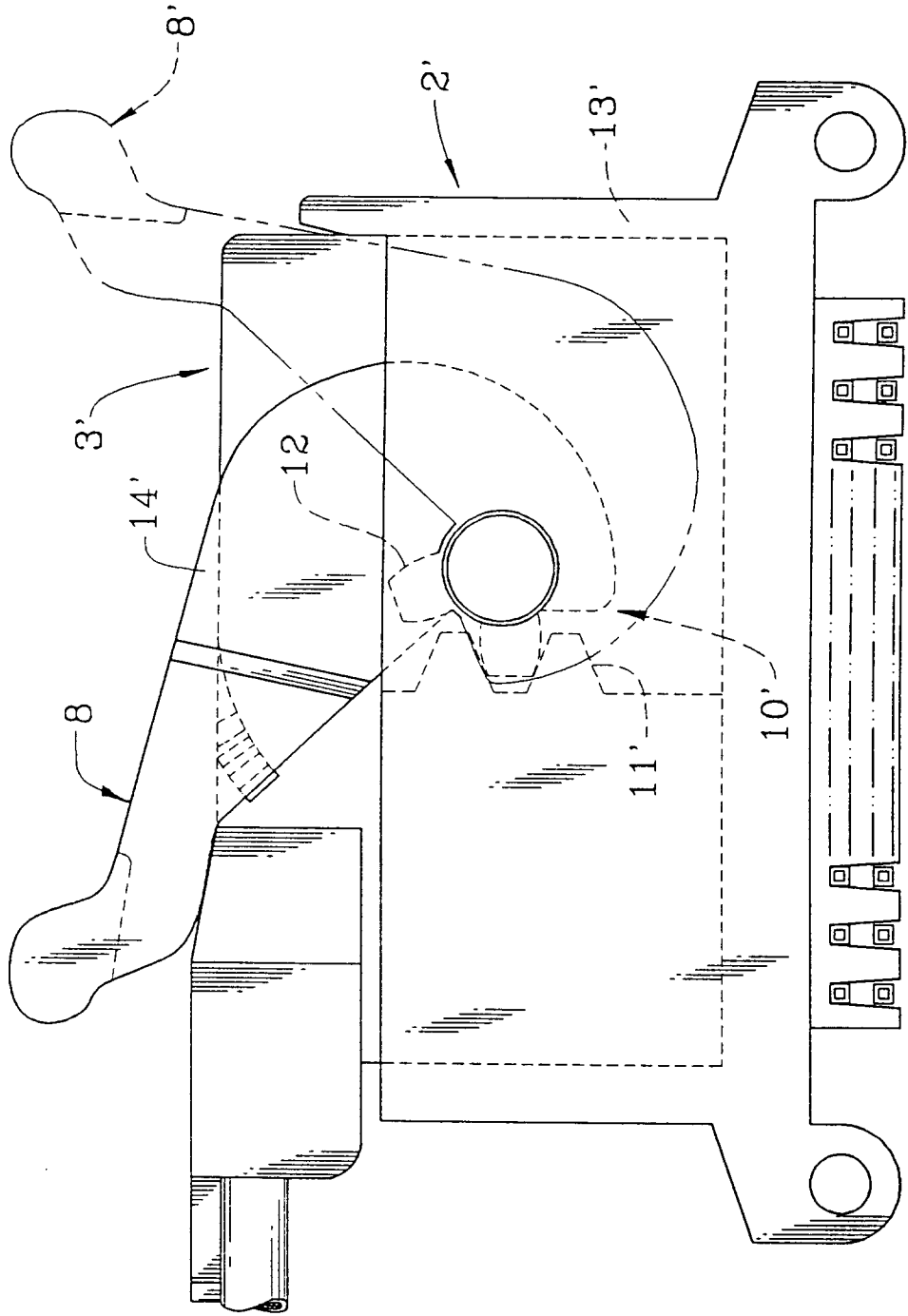
40

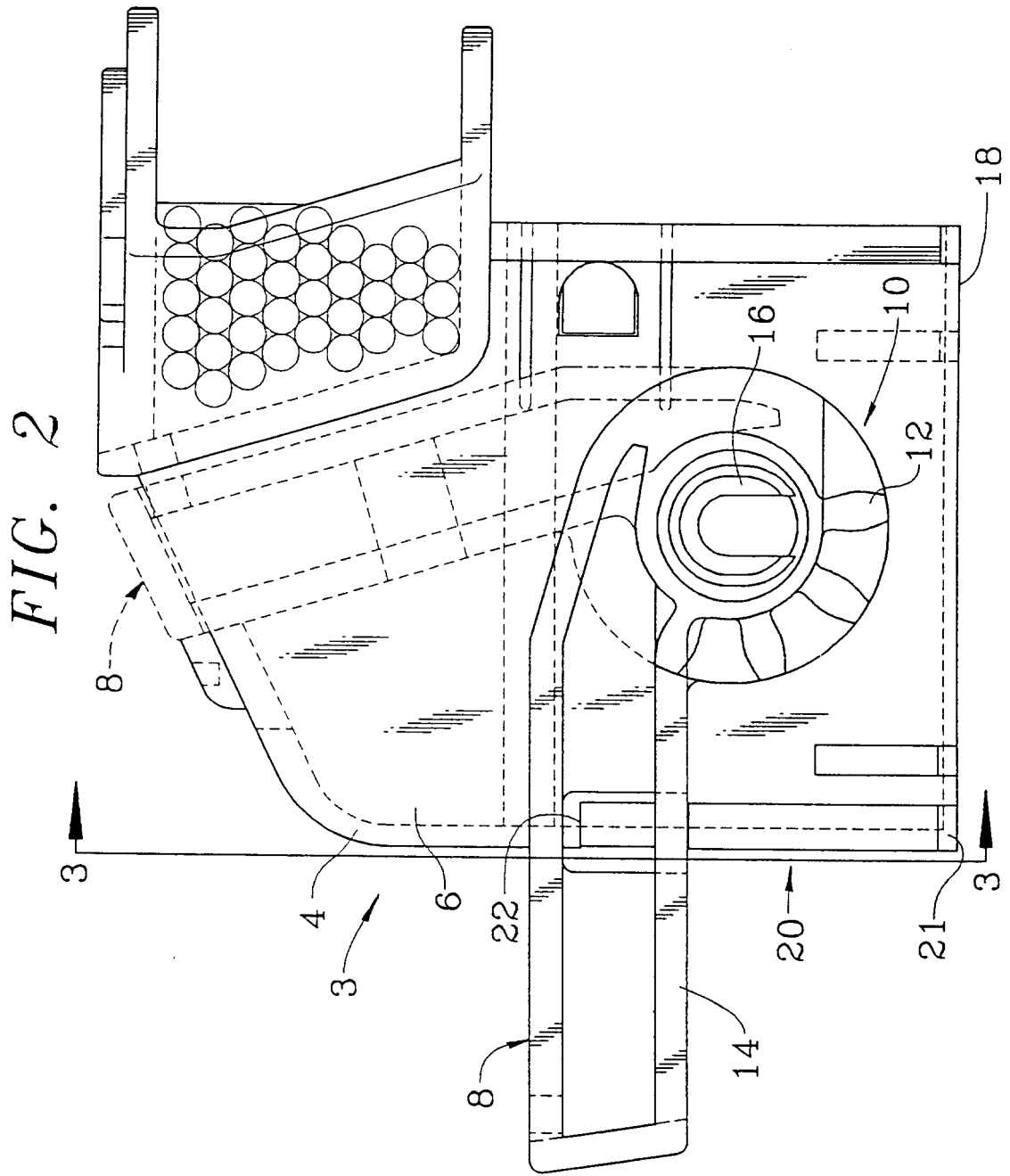
45

50

55

*FIG. 1*  
( PRIOR ART )





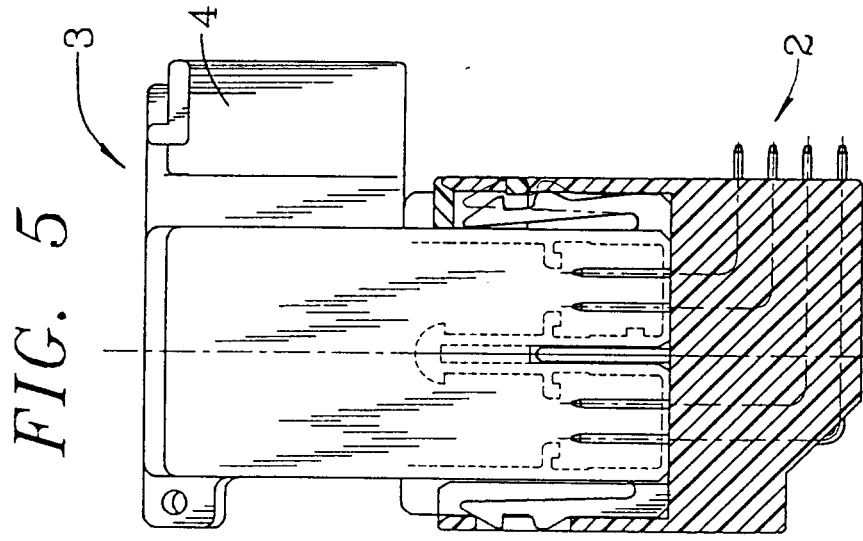
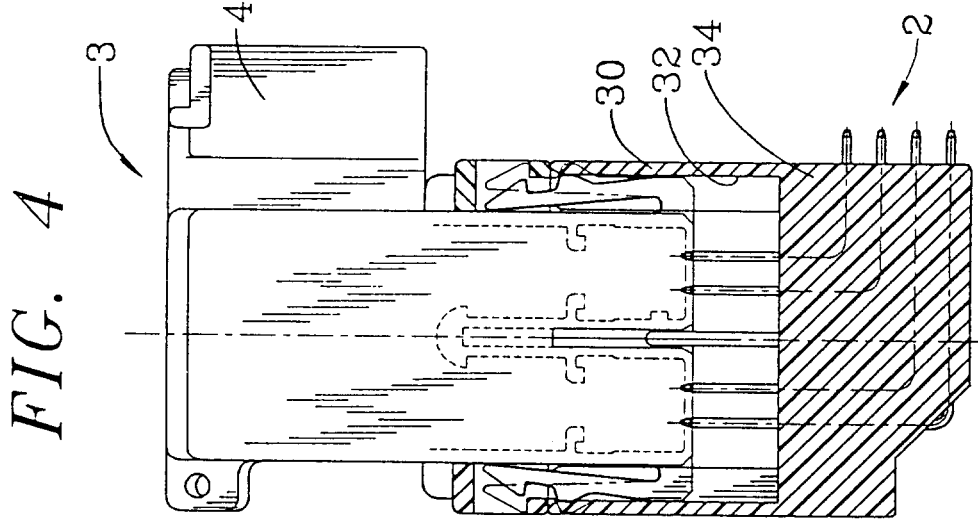
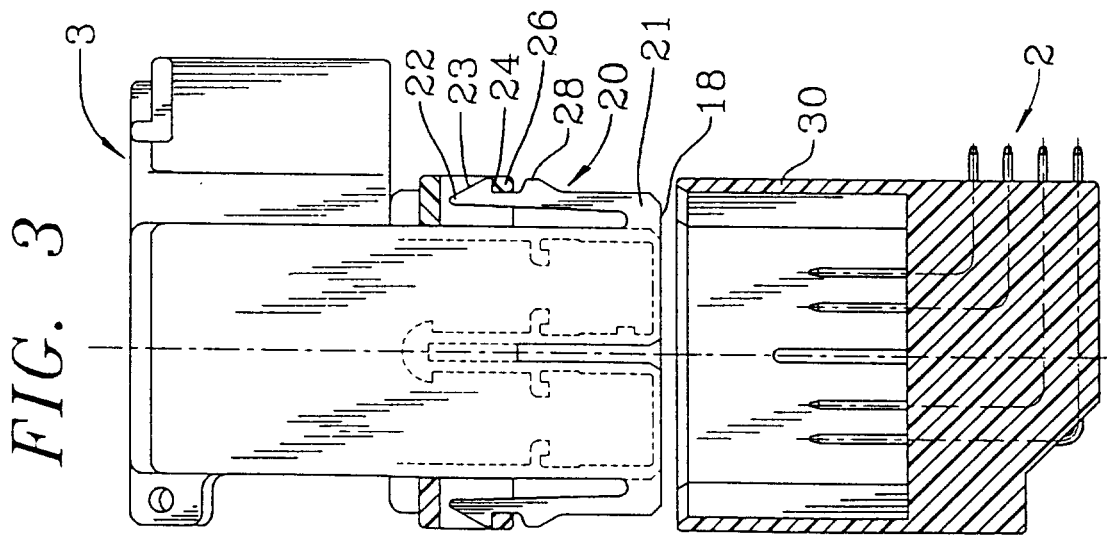


FIG. 6

