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(54) **Housing adapted to an electrical connector position assurance system**

Gehäuse angepasst an ein Lagesicherungssystem für einen elektrischen Verbinder

Boîtier adapté pour système d'assurance de position d'un connecteur électrique

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(56) References cited:
EP-A- 0 717 465 US-A- 4 925 398
US-A- 4 946 404 US-A- 5 203 719
US-A- 5 507 666

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Description

Field of the Invention

[0001] This invention generally relates to the art of electrical connectors and, particularly, to a connector housing being adapted to a position assurance system in an electrical connector assembly.

Background of the Invention

[0002] There often is a need to provide secure mechanical and electrical engagement between a pair of mateable electrical connectors or between an electrical connector and another mateable electrical device. Various latching techniques have been used to provide the secure engagement. An electrical connector of the above described type is disclosed in United States Patent 4,946,404. This document discloses a locking security mechanism for an electrical connector having a pair of male and female connectors, a locking arm member with the locking member opening and a locking security member mounted in a male connector member in a normally undetachable manner and maintained in a pre-engagement position with a pre-engagement releasing means in a female connector member.

[0003] In addition, various uses of electrical connectors require that some form of assurance system be provided which absolutely assures that the connectors are fully mated and can be used to indicate such mating. For instance, in an electrical circuit system for automobiles or other vehicles, such as in a safety circuit for an air bag, there is concern directly for human life in the event of an emergency. Therefore, it is necessary to take measures to prevent incomplete fitting and locking or an incomplete mating of electrical connectors in the wiring circuit and when fully and properly mated to prevent inadvertent unlocking. The present invention is directed to providing a simple, efficient and cost effective connector housing adapted to an assurance system for electrical connectors of the character described above. In addition it is intended according to the invention to provide a connector housing having only a small number of parts and facilitating mounting of a position assurance system to an electrical connector assembly.

Summary of the Invention

[0004] An object, therefore, of the invention is to provide a new and improved connector housing adapted to a connector position assurance system in an electrical connector assembly. The invention is defined in claim 1.

Brief Description of the Drawings

[0005] The features of this invention which are believed to be novel are set forth with particularity in the appended claims. The invention, together with its objects

and the advantages thereof, may be best understood by reference to the following description taken in conjunction with the accompanying drawings, in which like reference numerals identify like elements in the figures and in which:

FIGURE 1 is a perspective view of a pair of mating connectors in an electrical connector assembly embodying the connector housing of the invention being adapted to a connector position assurance system; FIGURE 2 is a perspective view similar to that of Figure 1, with the CPA removed from the second connector to facilitate the illustration;

FIGURE 3 is a perspective view of the underside of the CPA;

FIGURE 4 is a fragmented section taken in the axial or mating direction through the connectors prior to mating of the connectors and with the CPA in its initial position;

FIGURE 5 is a sequential view similar to that of Figure 4, with the connectors partially mated, with the latching member in an intermediate position, and with the CPA still in its initial position;

FIGURE 6 is a sequential view similar to that of Figure 5, with the latching member fully latched and the connectors fully mated, but with the CPA in its activated position;

FIGURE 7 is a sequential view similar to that of Figure 6, with the CPA being moved toward its final position;

and

FIGURE 8 is a sequential view similar to that of Figure 7, with the CPA now in its final position while the connectors are fully mated.

Detailed Description of the Preferred Embodiment

[0006] Referring to the drawings in greater detail, and first to Figure 1, the housing (24) of the invention being adapted to a connector position assurance system is embodied in an electrical connector assembly, generally designated 10 which includes a first connector, generally designated 12, and a second connector, generally designated 14. The connectors are mateable in the direction of arrows "A".

[0007] First connector 12 includes a housing 16 defining a receptacle 18. The housing/receptacle is generally rectangular and includes a top wall 16a. A latch boss 20 having a forwardly facing chamfered surface 20a is located generally centrally of and projects upwardly from top wall 16a. A pair of activating bosses 22 also project upwardly on opposite sides of latch boss 20. Each activating boss 22 includes a forwardly facing chamfered surface 22a and a rearwardly facing chamfered surface 22b. Although not visible in the drawings, a plurality of pin terminals project forwardly within receptacle 18 of first connector 12.

[0008] Second connector 14 is a plug connector having

a portion receivable in receptacle 18 of connector 12. The second connector includes the housing 24 having a plurality of terminal-receiving passages 26 within which are mounted a plurality of female terminals for interengagement with the pin terminals within receptacle 18 of the first connector. A connector position assurance device (CPA), generally designated 28, is slidably mounted on a latching member, generally designated 30, on top of second connector 14. The CPA is movable relative to the latching member in the direction of double-headed arrow "B".

[0009] Referring to Figure 2 in conjunction with Figure 1 CPA 28 (Fig. 1) has been removed to facilitate a better illustration of latching member 30 of the invention. More particularly, housing 24 of second connector 14 is unitarily molded of dielectric material, such as plastic or the like, and latching member 30 is mounted to the top of the housing by a pair of integral pivots 32 which define fulcrums about which the latch member is pivotable in the direction of double-headed arrow "C". A rear end 34 of latching member 30 is accessible by an operators finger so that pushing down on rear end 34 will cause a front end 36 of the latch member to pivot upwardly. A pair of arms 38 extend front-to-rear of latching member 30 and a latch shoulder 40 spans the arms at the front of a slot 42. The latch shoulder is at an elevation below the tops of arms 38. A pair of stop wings 44 project outwardly from arms 38 of latch member 30.

[0010] Referring to Figure 3 in conjunction with Figures 1 and 2 CPA 28 includes a central body portion 46 cantilevered from a cross base portion 48. The central body portion has a distal end 50 which defines a blocking tongue, for purposes described hereinafter. A pair of stop arms 52 also project forwardly from cross base portion 48 on opposite sides of central body portion 46. Lastly, four hooked mounting tabs 54 project downwardly from central body portion 46.

[0011] The hooked mounting tabs project through slot 42 (Fig. 2) in latching member 30 and the hooked portions of the mounting tabs snap beneath the underside of the latching member. Therefore, hooked mounting tabs 54 of CPA 28 received in slot 42 of latching member 30 provide a means for slidably mounting the CPA on the latching member for movement relative to the latching member in the direction of double-headed arrow "B" (Fig. 1). The rear end 34 of the latching member 30 closes off the slot 42 providing a stop for the CPA. Figure 1 shows that the top of the CPA is provided with a serrated ramp 56 to facilitate movement of the CPA, as by an operators thumb or finger.

[0012] Figures 4-8 show various sequential positions of first connector 12, second connector 14, latching member 30 and CPA 28 during a mating operation of the connectors. Before proceeding with a description of that operation, and referring to Figure 4, each stop arm 52 of CPA 28 is provided with a downwardly projecting hook 58 at the forward distal end thereof. The hook defines a forwardly facing stop surface 58a, a forwardly and down-

wardly chamfered surface 58b and a rearwardly facing chamfered surface 58c.

[0013] Turning now to the mating of the connectors and the operation of the connector position assurance system, Figure 1 shows first connector 12 and second connector 14 in completely unmated condition. Latching member 30 is in its static or inoperative position, and CPA 28 is in its retracted or rear initial inactive position.

[0014] Figure 5 shows first connector 12 and second connector 14 only partially mated. In this position, front end 36 of latching member 30 has moved up chamfered surface 20a of latch boss 20 and is resting on top of the boss. During this movement, stop wings 44 (Fig. 2) at the sides of the latching member (which are not visible in Figure 5) clear activating bosses 22 of first connector 12 and are not interfered thereby. In this intermediate mating condition of the connectors shown in Figure 5, CPA 28 still is in its rearward or initial inactive position. It should be noted in Figures 4 and 5 that CPA 20 cannot move forwardly because stop surfaces 58a of stop arms 52 will abut against the rear edges of stop wings 44 of latching member 30. This provides a complementary interengaging stop means between the CPA and the latching member to prevent the CPA from moving from its initial position to its final position when the connectors are not mated.

[0015] Figure 6 shows first and second connectors 12 and 14 respectively, in their fully mated position. Front end 37 of latching member 30 now has dropped downwardly in the direction of arrow "D", and latch shoulder 40 now has dropped behind the abrupt front end of latch boss 20.

[0016] In this position, the connectors cannot be unmated simply by pulling the connectors apart. The only way that they can be unmated is by pushing down on rear end 34 of latching member 30 to pivot front end 36 and latch shoulder 40 back upwardly sufficiently to clear latch boss 20. However, it can be seen that stop arms 52 remain in an elevated position because hook portions 58 of the stop arms now are resting on top of activating bosses 22. In other words, the activating bosses of the first connector are effective to release the stop means which prevents the CPA from moving forwardly.

[0017] Figure 7 shows first and second connectors 12 and 14, respectively, still in fully mated condition, and with front end 36 of latching member 30 latched behind latch boss 20 of the first connector. However, CPA 28 has been moved forwardly in the direction of arrow "E" away from its initial position and to an intermediate position whereat chamfered surfaces 58b at the front end of stop arms 52 have moved over stop wings 44 of the latching member until the hook portions 58 of stop arms 52 have moved onto the tops of stop wings 44.

[0018] Figure 8 again shows the fully mated condition of first and second connectors 12 and 14, respectively, but CPA 28 has now been moved completely forwardly in the direction of arrow "F" to its final indicating position which indicates that the connectors are fully mated. Stop

arms 52 have dropped downwardly in the direction of arrow "G", as hook portions 58 of the stop arms move forwardly of and clear stop wings 44 of latching member 30.

[0019] It should be noted that in the final position of CPA 28 as shown in Figure 8, blocking tongue 50 at the front of the CPA has moved under a ledge 60 which forms a part of housing 24 of second connector 14, as seen in Figures 1 and 2. Therefore, if any attempt is made to unlatch the connectors by pushing down on rear end 34 of latching member 30, the latching member cannot be pivoted away from its latched condition because blocking tongue 50 being seated beneath ledge 60 prevents the entire assembly of the latching member and the CPA from pivoting away from the final latched condition of the components.

[0020] In order to unlatch the connectors, CPA 28 is moved back rearwardly opposite the direction of arrow "F" (Fig. 8) to cause rearwardly facing chamfered surfaces 58c of hook portions 58 of the CPA to ride over the tops of stop wings 44 and allow the CPA to move back to its initial position. After the CPA is moved back rearwardly relative to latching member 30, the front blocking tongue 50 of the CPA moves out of engagement beneath ledge 60, whereby latching member 30 can be pivoted away from its latched position, and the connectors can be unmated.

[0021] It will be understood that the invention may be embodied in other specific forms without departing from the claims. The present examples and embodiments, therefore, are to be considered in all respects as illustrative and not restrictive, and the invention is not to be limited to the details given herein.

Claims

1. A connector housing (24) for a connector position assurance system for use in an electrical connector assembly (10), said electrical connector assembly (10) comprising: a first electrical connector (12) and a second electrical connector (14); said second electrical connector (14) is mateable with the first connector (12) and wherein said connector housing (24) is for the second electrical connector; said first electrical connector (12) including a second housing (16) having a latch portion (20); said connector housing (24) for the second electrical connector having a latching member (30) movable into engagement with the latch portion (20) of the first connector (12) when the connectors are mated; the connector housing for the second electrical connector having a connector position assurance device (CPA) (28); and said connector housing (24) for the second electrical connector has means (44) preventing the CPA (28) from moving relative to the latching member (30) from its initial position to its final position when the connectors are not mated **characterized**

in that the CPA (28) is mounted on the latching member (30) for movement relative thereto between an initial inactive position and a final indicating position to indicate that the connectors are mated.

2. The housing of claim 1 wherein said CPA (28) is located in its final position blocking movement of the latching member (30) out of engagement with the latch portion (20).
3. The housing of claim 1, including means (42,54) slidably mounting the CPA (28) on the latching member (30) for movement between said positions.
4. The housing of claim 1, including means (32) mounting the latching member (30) on the housing (24) of the second connector (14) for pivoting movement into and out of engagement with the latch portion (20).
5. The housing of claim 1 wherein said stop means include a spring loaded stop arm (52) on the CPA (28) biased into engagement with a stop shoulder (44) on the latching member (30).
6. The housing of claim 1, including an activating portion (22), complementary interengaging stop means (44, 58a) between the CPA (28) and the latching member (30) to prevent the CPA from moving from its initial position to its final position when the connectors are not mated; and said activating portion (22) of the first connector (12) effectively allowing the CPA (28) to move from its initial position to its final position when the connectors are mated.
7. The housing of claim 6, wherein said CPA (28) is located in its final position blocking movement of the latching member (30) out of engagement with the latch portion (20).
8. The housing of claim 6, including means (42, 54) slidably mounting the CPA (28) on the latching member (30) for movement between said positions.
9. The housing of claim 6, including means (32) mounting the latching member (30) on the housing (24) of the second connector (14) for pivoting movement into and out of engagement with the latch portion (20).
10. The housing of claim 6 wherein said stop means include a spring loaded stop arm (52) on the CPA (28) biased into engagement with a stop shoulder (44) on the latching member (30).

Patentansprüche

1. Verbindergehäuse (24) für ein Verbinder-Lagesicherungssystem zur Nutzung in einer elektrischen Verbindieranordnung (10), wobei die elektrische Verbindieranordnung (10) umfasst:

einen ersten elektrischen Verbinder (12) und einen zweiten elektrischen Verbinder (14), wobei der zweite elektrische Verbinder (14) mit dem ersten Verbinder (12) gepaart werden kann und wobei das Verbindergehäuse (24) für den zweiten elektrischen Verbinder bestimmt ist, wobei der erste elektrische Verbinder (12) ein zweites Gehäuse (16) mit einem Verrastungsabschnitt (20) aufweist, wobei das Verbindergehäuse (24) für den zweiten elektrischen Verbinder ein Verrastungselement (30) aufweist, das bis zum Eingriff mit dem Verrastungsabschnitt (20) des ersten Verbinders (12) bewegt werden kann, wenn die Verbinder gepaart werden, wobei das Verbindergehäuse für den zweiten elektrischen Verbinder eine Verbinder-Lagesicherungsvorrichtung (CPA) (28) aufweist und wobei das Verbindergehäuse (24) für den zweiten elektrischen Verbinder Mittel (44) aufweist, welche verhindern, dass sich die CPA (28) in Bezug auf das Verrastungselement (30) aus ihrer Anfangsstellung in ihre Endstellung bewegt, wenn die Verbinder nicht gepaart sind,

dadurch gekennzeichnet, dass

die CPA (28) an dem Verrastungselement (30) montiert ist, und zwar im Hinblick auf eine Bewegung relativ zu dieser zwischen einer inaktiven Anfangsstellung und einer Endanzeigestellung zum Anzeigen, dass die Verbinder gepaart sind.

2. Gehäuse nach Anspruch 1, bei welchem die CPA (28) in ihrer Endstellung positioniert eine Bewegung des Verrastungselements (30) aus dem Eingriff mit dem Verrastungsabschnitt (20) heraus blockiert.
3. Gehäuse nach Anspruch 1, welches Mittel (42, 54) umfasst, durch welche die CPA (28) verschiebbar an dem Verrastungselement (30) zur Bewegung zwischen diesen Stellungen gelagert ist.
4. Gehäuse nach Anspruch 1, welches Mittel (32) umfasst, durch welche das Verrastungselement (30) an dem Gehäuse (24) des zweiten Verbinders (14) im Hinblick auf eine Schwenkbewegung bis zum Eingriff mit dem Verrastungsabschnitt (20) und aus diesem heraus gelagert ist.

5. Gehäuse nach Anspruch 1, bei welchem Anschlagmittel einen federnd vorgespannten Anschlagarm (52) an der CPA (28) umfassen, der zum Eingriff mit einer an dem Verrastungselement (30) vorgesehenen Anschlagschulter (44) vorgespannt ist.
6. Gehäuse nach Anspruch 1, welches einen Aktivierungsabschnitt (22) umfasst, komplementär aneinander in Anlage kommende Anschlagmittel (44, 58a) zwischen der CPA (28) und dem Verrastungselement (30), um zu verhindern, dass sich die CPA aus ihrer Anfangsstellung in ihre Endstellung bewegt, wenn die Verbinder nicht gepaart sind; und bei welchem der Aktivierungsabschnitt (22) des ersten Verbinders (12) effektiv ermöglicht, dass sich die CPA (28) aus ihrer Anfangsstellung in ihre Endstellung bewegt, wenn die Verbinder gepaart werden.
7. Gehäuse nach Anspruch 6, bei welchem die CPA (28) in ihrer Endstellung positioniert eine Bewegung des Verrastungselements (30) aus dem Eingriff mit dem Verrastungsabschnitt (20) heraus blockiert.
8. Gehäuse nach Anspruch 6, welches Mittel (42, 54) umfasst, durch welche die CPA (28) verschiebbar an dem Verrastungselement (30) zur Bewegung zwischen diesen Stellungen gelagert ist.
9. Gehäuse nach Anspruch 6, welches Mittel (32) umfasst, durch welche das Verrastungselement (30) an dem Gehäuse (24) des zweiten Verbinders (14) im Hinblick auf eine schwenkbare Bewegung bis zum Eingriff mit dem Verrastungsabschnitt (20) und aus diesem heraus gelagert ist.
10. Gehäuse nach Anspruch 6, bei welchem die Anschlagmittel einen federnd vorgespannten Anschlagarm (52) an der CPA (28) umfassen, der zum Eingriff mit einer an dem Verrastungselement (30) vorgesehenen Anschlagschulter (44) vorgespannt ist.

Revendications

1. Boîtier (24) de connecteur pour un système d'assurance de position de connecteur destiné à être utilisé dans un assemblage (10) de connecteurs électriques, ledit assemblage (10) de connecteurs électriques comportant :

un premier connecteur électrique (12) et un second connecteur électrique (14) ; ledit second

- connecteur électrique (14) peut être accouplé avec le premier connecteur (12), et dans lequel ledit boîtier (24) de connecteur est destiné au second connecteur électrique ; ledit premier connecteur électrique (12) comprenant un second boîtier (16) ayant une partie de verrou (20) ; ledit boîtier (24) de connecteur pour le second connecteur électrique ayant un élément de verrouillage (30) mobile jusqu'à enclenchement avec la partie de verrou (20) du premier connecteur (12) lorsque les connecteurs sont accouplés ; le boîtier de connecteur pour le second connecteur électrique ayant un dispositif d'assurance de position de connecteur (CPA) (28) ; et ledit boîtier (24) de connecteur pour le second connecteur électrique comporte un moyen (44) empêchant le dispositif CPA (28) de se déplacer par rapport à l'élément de verrouillage (30) de sa position initiale à sa position finale lorsque les connecteurs ne sont pas accouplés, **caractérisé en ce que** le CPA (28) est monté sur l'élément de verrouillage (30) afin d'effectuer un mouvement par rapport à celui-ci entre une position initiale inactive et une position finale d'indication pour indiquer que les connecteurs sont accouplés.
2. Boîtier selon la revendication 1, dans lequel ledit CPA (28) est placé dans sa position finale, bloquant un mouvement par lequel l'élément de verrouillage (30) se dégage de la partie de verrou (20). 30
 3. Boîtier selon la revendication 1, comprenant des moyens (42, 54) de montage coulissant du CPA (28) sur l'élément de verrouillage (30) pour un mouvement entre lesdites positions. 35
 4. Boîtier selon la revendication 1, comprenant des moyens (32) de montage de l'élément de verrouillage (30) sur le boîtier (24) du second connecteur (14) pour un mouvement de pivotement en engagement et hors d'engagement avec la partie de verrou (20). 40
 5. Boîtier selon la revendication 1, dans lequel lesdits moyens d'arrêt comprennent un bras d'arrêt (52) rappelé par ressort sur le CPA (28), rappelé en engagement avec un épaulement d'arrêt (44) sur l'élément de verrouillage (30). 45
 6. Boîtier selon la revendication 1, comprenant une partie d'activation (22), des moyens d'arrêt (44, 58a) s'enclenchant entre eux de façon complémentaire entre le CPA (28) et l'élément de verrouillage (30) pour empêcher le CPA de se déplacer de sa position initiale à sa position finale lorsque les connecteurs ne sont pas accouplés ; et ladite partie d'activation (22) du premier connecteur (12) permettant en fait au CPA (28) de se déplacer de sa position initiale à sa position finale lorsque les connecteurs sont accouplés. 50
 7. Boîtier selon la revendication 6, dans lequel ledit CPA (28) est placé dans sa position finale bloquant tout mouvement de l'élément de verrouillage (30) hors d'engagement avec la partie de verrou (20). 55
 8. Boîtier selon la revendication 6, comprenant les moyens (42, 54) de montage coulissant du CPA (28) sur l'élément de verrouillage (30) pour un mouvement entre lesdites positions.
 9. Boîtier selon la revendication 6, comprenant des moyens (32) de montage de l'élément de verrouillage (30) sur le boîtier (24) du second connecteur (14) pour un mouvement de pivotement en engagement et hors d'engagement avec la partie de verrou (20).
 10. Boîtier selon la revendication 6, dans lequel lesdits moyens d'arrêt comprennent un bras d'arrêt (52) rappelé par ressort sur le CPA (28), sollicité en engagement avec un épaulement d'arrêt (44) sur l'élément de verrouillage (30).

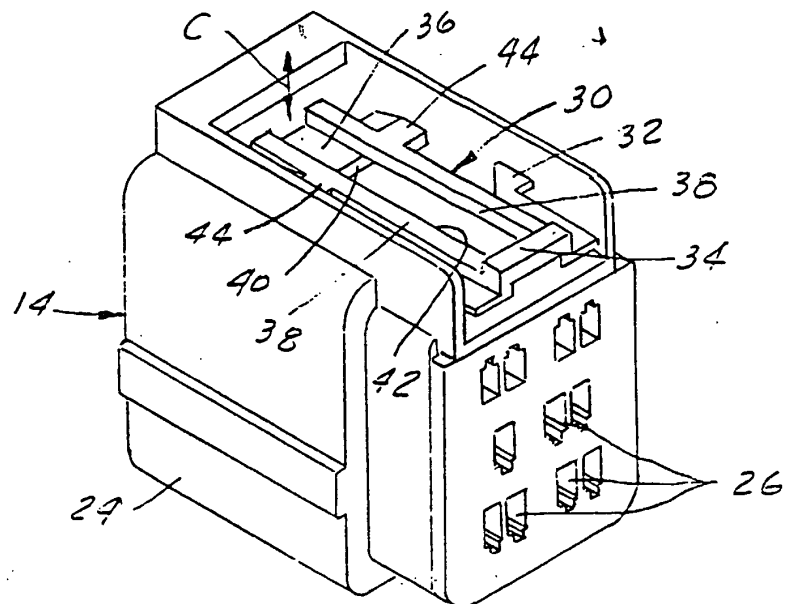
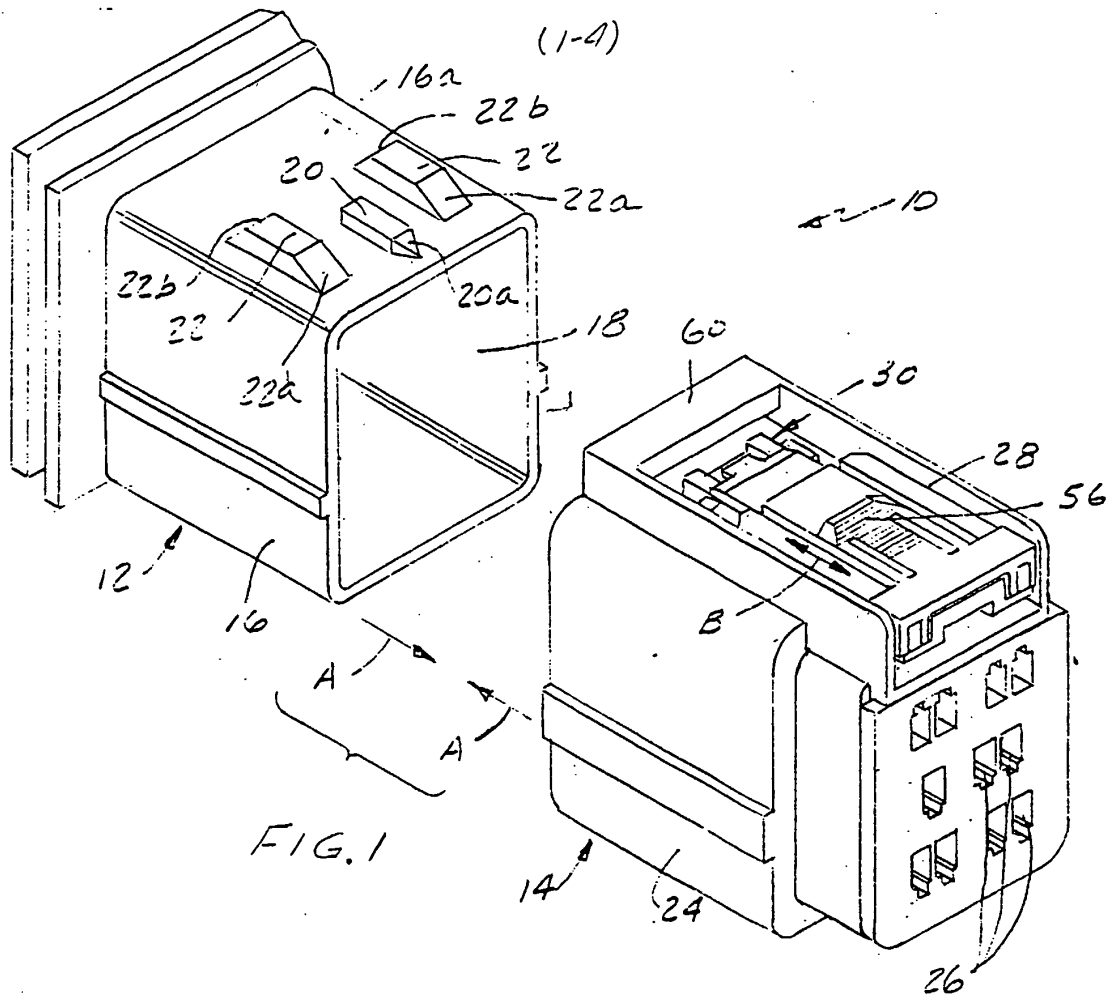


FIG. 2

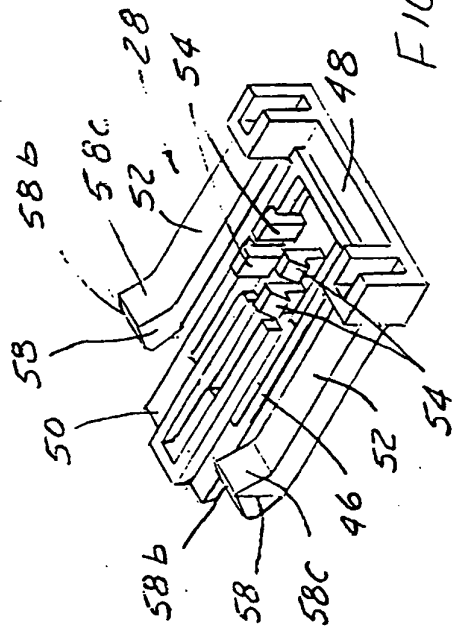


FIG. 3

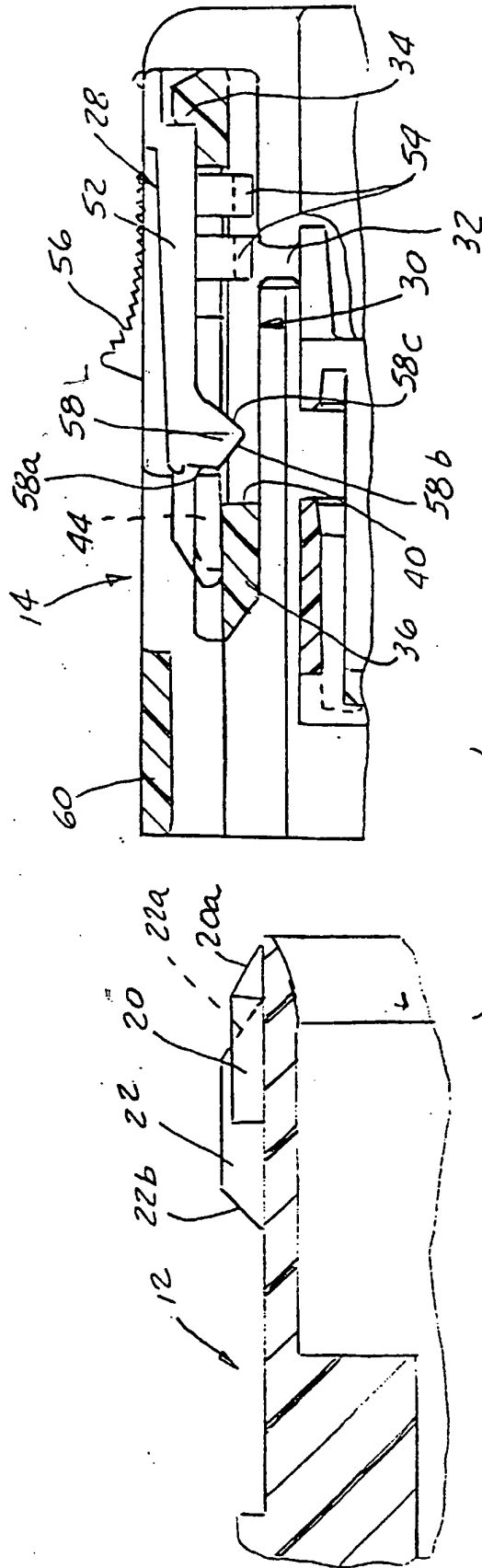


FIG. 4

