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(54) **Electrical connector with a cap**

Elektrischer Verbinder mit Kappe

Connecteur électrique comprenant un capot

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US-A- 5 391 092

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Description

[0001] The invention relates to an electrical connector with a housing containing contacts attached to the electrical conductors of a cable, and in particular to a cap which can be mounted to a cable end of the housing to surround the cable tightly in order to protect the cavity from the ingress of dust and water.

[0002] In the manufacture of electrical connectors it is common practice to provide connectors with housings having contact cavities for the accommodation of electrical contacts and with the corresponding contacts for making connection with the electrical conductors of a cable. Additionally, it is also known to provide the connector with caps that are fitted to the cable end of the housing that fit tightly around the trailing cable in order to protect the cavity from the ingress of dust and water. The employment of such caps in the motor vehicle industry is particularly beneficial. In addition to the protective function the cap can also fulfil a guiding function for the electrical conductors of the cable, and furthermore provide a strain-relief for the cable. An electrical connector with such a cap is, for instance, disclosed in US 5,762,520 (& EP-A-805 522).

[0003] It is also generally known that the electrical contacts in the contact cavities of the housing should be secured. Such securing keeps the contact safely in the contact cavity even if there is a pull on the cable. Brazilian Patent Application PI 9501343-1A discloses an electrical connector which is provided with a contact securing device at the cable end. The contact securing device snaps into the housing and fits into the contact accommodating cavity around the electric conductor and behind the contacts, possibly behind a single wire seal, thus securing the contacts in the cavity. The contact securing device does not, however, protect from the ingress of dust and water into the housing.

[0004] From US 4,372,634 a connector is known having a housing with contact cavities for electrical contacts attached to electrical conductors of a cable, and a cap that can be mounted on the housing at a cable end of the housing. The cap includes an integrated contact securing device for securing the contacts in the cavities and consists of two parts which can be joined together perpendicular to the plugging direction.

[0005] Starting from this prior art, the objective of this invention is to provide a connector with a protection from the ingress of dust and water as well as a structure for securing the contacts therein, that is surely mounted when the cap is mounted.

[0006] The objective is achieved by an arrangement with the features of claim 1, whereby the special design of the cap ensures that when the cap is mounted to the housing the integrated contact securing device is also brought into its final position. This is achieved by joining the two parts of the cap to the housing by a positive guiding arrangement which operates in the plugging direction when moving the contact securing device into its

final position. This positively guided arrangement is achieved by sliding slots incorporated in the cap parts and sliding blocks in the housing. Advantageous developments are stated in the respective dependent claims.

[0007] It is particularly advantageous that in addition to the housing only one other part is required, a cap, in order to both secure the contacts in their cavities and to protect the housing against the ingress of dust and water.

[0008] It is particularly advantageous that the cap comprises two parts interconnected in a flexible manner, which ensures that the two parts can be handled as one part and not as separate entities.

[0009] It is of further particular advantage that the cap is provided with a mechanical strain-relief for the cable.

[0010] It is of further particular advantage that the ingress of dust and water is made more difficult. This is achieved by providing a dust protection lip which fits tightly around the cable.

[0011] Referring to the figures, an embodiment of this invention will now be explained by way of example.

Figure 1 is an isometric view of the claimed connector housing showing a housing and a cap in a position in which sliding blocks of the housing can be inserted into the corresponding sliding slots of the cap;

Figure 2 is an isometric view corresponding to figure 1 taken from a different viewpoint of a side wall and the cable end;

Figure 3 is also an isometric view corresponding to figure 1 taken essentially from the cable end of the connector housing;

Figure 4 is a cross-sectional view through the connector housing shown in figure 1 to 3 with the electrical contacts being schematically indicated;

Figure 5 is a cross-sectional view through figure 4 along the section line A-A;

Figure 6 is an isometric view of the connector housing, essentially from its side with the sliding blocks at the housing already in the sliding slots of the cap; Figure 7 is a corresponding isometric view from the cable end;

Figure 8 is an isometric view essentially from one side wall onto the claimed connector housing with fully mounted cap;

Figure 9 is a corresponding isometric view of a housing with a fully mounted section of a cap;

Figure 10 is a cross-sectional view through the housing with the cap fully mounted and the contacts indicated schematically; and

Figure 11 is a cross-sectional view along the section line B-B of figure 10.

[0012] Referring to figures 1 to 5, the general construction of the connector will now be explained. The claimed electrical connector includes a connector housing 1 which, in turn, consists of two parts: a housing 2

and a cap 3. The housing 2 comprises two parallel rows of four contact cavities 4. The contact cavities 4 accommodate electrical contacts 5, indicated schematically in figures 4 and 5.

[0013] The cap 3 is pushed onto the housing 2 from cable end 7. The cap 3 comprises two parts 12 and 13. The two parts 12, 13 are split shells provided with a semi-circular cable end 14. In when the split shells 12, 13 are in their closed position, the two semi-circular parts 14 form a circular end which will tightly surround a cable (not shown). Within the semi-circular end 14, a sealing lip 15 is formed to provide a seal around the cable, thus affording protection from dust and water. At the same time, the cable end 14 with its dust protection lip 15 can function as a mechanical strain-relief.

[0014] The two parts 12 and 13 are not fully independent from each other but linked by plastic bands 16. The plastic bands 16 are flexible, thereby allowing the parts to be moved in relation to each other.

[0015] Within each of the split shell parts 12, 13, a contact securing device 17 is included. The contact securing device 17 takes the form of a comb-shaped rib configured to embrace a number of conductors of the cable when the cap 3 is joined together. The contact securing device 17 is provided with semi-circular apertures 18 to accommodate respective electrical conductors. In addition, the contact securing device 17 is provided with a rib 19 that engages in a cavity 4 when the cap is shifted in a longitudinal direction away from the cable end.

[0016] To lock the two parts 12, 13 of the cap 3 together, each part 12, 13 is provided with a corresponding latching arrangement 20, 21. On facing sides of one part 12 of the cap 3 is provided with at least one latching lug 21 whereas the other part 13 on the corresponding facing side is provided with a latching arm 20 having a latch opening 22. Latching arms with latching openings are also provided at the housing end of the cap 3. These latching elements 23 interact with the corresponding latching lugs 11 at the housing 3.

[0017] In addition to the elements discussed, the housing 2 is provided with a pair of sliding blocks 24 at opposite sides near the cable end 7. In each part 12, 13 of the cap 3, a corresponding sliding slot 25 is located on facing sides. When the cap 3 is mounted to the cable end 7 of the housing 2, the sliding blocks 24 in the sliding slots 25 are inserted first. If now an attempt is made to join the parts 12, 13 by exerting some compressive pressure onto the parts 12, 13, perpendicular to the plugging direction, the cap 3 will shift on the housing 2 in the plugging direction. The two halves 12, 13 then will move closer together (see figures 6 and 7). With this movement, the ribs 19 of the contact securing device 17 enter into the cavities 4. When the end position is reached, the two parts 12, 13 of the cap are matched and the complementary latch elements 20, 21 engage each other. At the same time, the cap 3 has been pushed towards the housing 2 in the plugging direction so that the latching elements 23 also are latched with the complemen-

tary latching elements 11. The ribs 19 engage into the cavities 4 thus securing the contacts in the cavities 4. This arrangement is illustrated in figures 8 to 11.

[0018] Figures 1, 4 and 9 show clearly that adjacent to the sealing lip 15 the circular end 14 is provided with a further semi-circular rib 26. This rib can, for example, be employed as strain-relief.

10 Claims

1. An electrical connector comprising a housing (2) with contact cavities (4) for electrical contacts attached to electrical conductors of a cable, and a cap (3) that can be mounted on the housing at a cable end of the housing, the cap (3) including an integrated contact securing device (17) for securing the contacts (5) in the cavities (4) and consisting of two parts (12, 13) which can be joined together perpendicular to the plugging direction **characterised in that** the cap (3) fits tightly around the cable to protect the housing (2) from the ingress of dust and water, **in that** the cap (3) is positively guided on the housing (2) in such a way that on joining the parts (12, 13) perpendicular to the plugging direction (S) the cap is shifted in the plugging direction thus moving the contact securing device (17) into its end position and **in that** the parts (12, 13) of the cap (3) are provided with sliding slots (25) and the housing (2) with sliding blocks (24) to be guided into the sliding slots (25) when the cap (3) is mounted on the housing (2), whereby the shift in the plugging direction is obtained.
2. The electrical connector according to claim 1, **characterised in that** the contact securing device (17) is provided with individual ribs (19) which engage from the cable end into the cavities (4) in order to secure the contacts (5).
3. The connector according to claim 1, **characterised in that** the cap (3) is provided with latching elements (23) and the housing (2) with complementary latching elements (11) which fasten the cap (3) securely to the housing (2) in an end position.
4. The connector according to claim 1, **characterised in that** the parts (12, 13) are provided with complementary latching arrangements (20, 21) for latching them together.
5. The connector according to claim 1, **characterised in that** the parts (12, 13) are interconnected in a flexible manner, which ensures that the two parts can be handled as one part and not as separate entities.

Patentansprüche

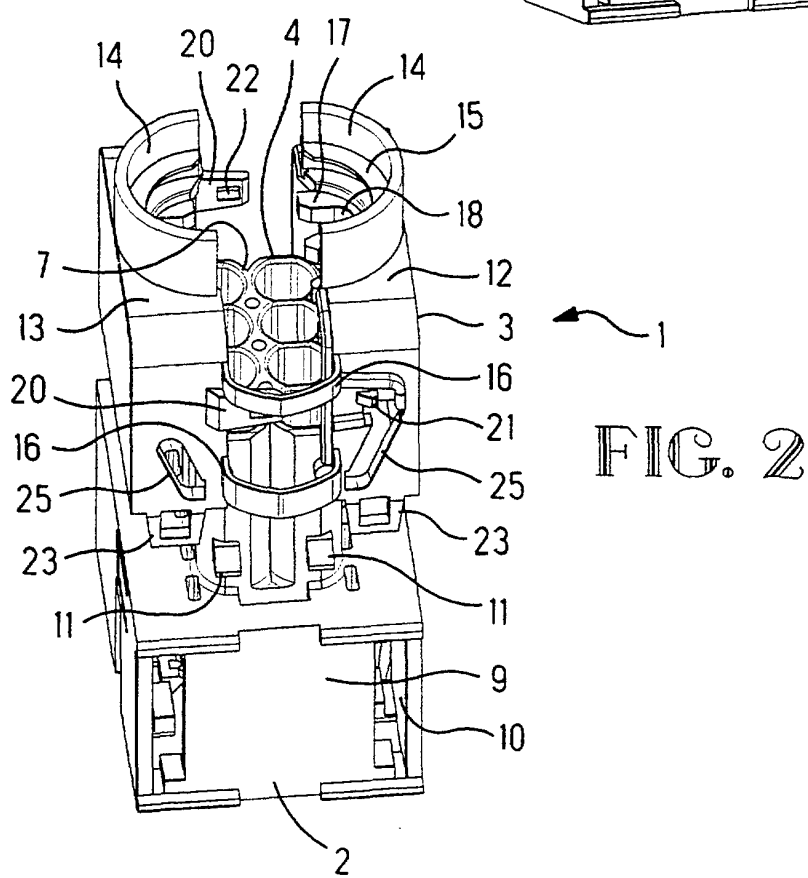
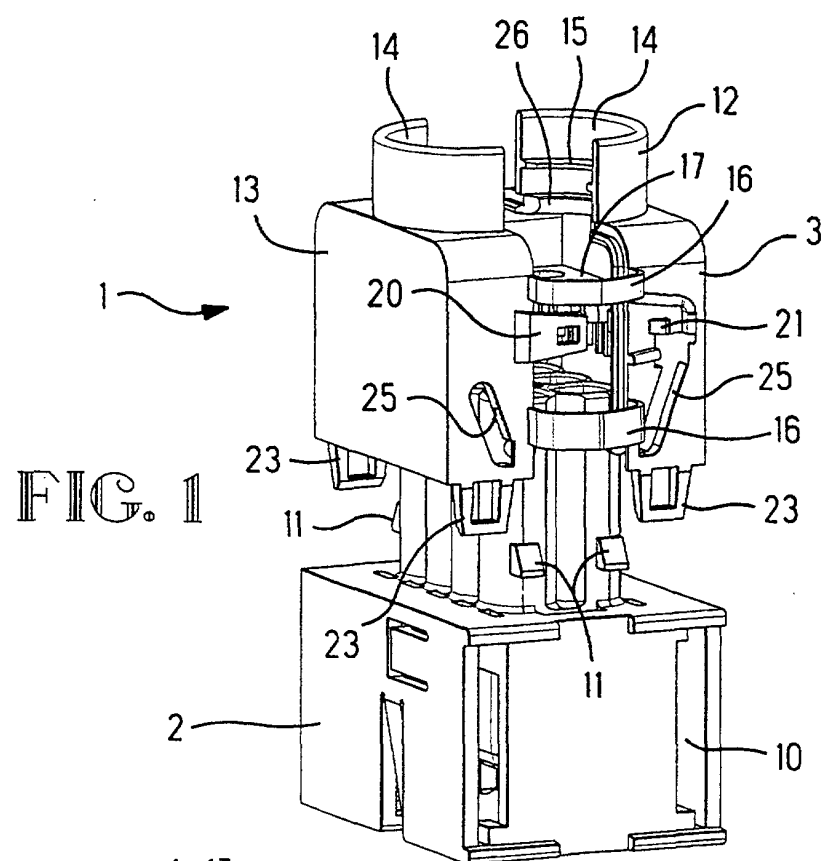
1. Elektrischer Verbinder, der aufweist: ein Gehäuse (2) mit Kontakthohlräumen (4) für elektrische Kontakte, die an elektrischen Leitern eines Kabels befestigt sind; und eine Kappe (3), die am Gehäuse an einem Kabelende des Gehäuses montiert werden kann, wobei die Kappe (3) eine integrierte Kontaktsicherungsvorrichtung (17) für das Sichern der Kontakte (5) in den Hohlräumen (4) umfaßt und aus zwei Teilen (12, 13) besteht, die miteinander senkrecht zur Steckrichtung verbunden werden können, **dadurch gekennzeichnet, daß** die Kappe (3) dicht anliegend um das Kabel herum paßt, um das Gehäuse (2) vor einem Eindringen von Staub und Wasser zu bewahren; daß die Kappe (3) zwangsläufig am Gehäuse (2) so geführt wird, daß beim Verbinden der Teile (12, 13) senkrecht zur Steckrichtung (S) die Kappe in der Steckrichtung verschoben wird, wodurch die Kontaktsicherungsvorrichtung (17) in ihre Endposition bewegt wird; und daß die Teile (12, 13) der Kappe (3) mit Schiebeschlitten (25) versehen sind und das Gehäuse (2) mit Gleitblöcken (24), damit sie in den Schiebeschlitten (25) geführt werden, wenn die Kappe (3) am Gehäuse (2) montiert wird, wobei die Verschiebung in der Steckrichtung erhalten wird.
2. Elektrischer Verbinder nach Anspruch 1, **dadurch gekennzeichnet, daß** die Kontaktsicherungsvorrichtung (17) mit einzelnen Rippen (19) versehen ist, die vom Kabelende aus in die Hohlräume (4) eingreifen, um die Kontakte (5) zu sichern.
3. Verbinder nach Anspruch 1, **dadurch gekennzeichnet, daß** die Kappe (3) mit Einklinkelementen (23) versehen ist und das Gehäuse (2) mit komplementären Einklinkelementen (11), die die Kappe (3) sicher am Gehäuse (2) in einer Endposition befestigen.
4. Verbinder nach Anspruch 1, **dadurch gekennzeichnet, daß** die Teile (12, 13) mit komplementären Einklinkanordnungen (20, 21) für deren gemeinsames Einklinken vorhanden sind.
5. Verbinder nach Anspruch 1, **dadurch gekennzeichnet, daß** die Teile (12, 13) in einer elastischen Weise miteinander verbunden werden, was sichert, daß die zwei Teile als ein Teil und nicht als separate Einheiten gehandhabt werden können.

ques d'un câble, et un capuchon (3) pouvant être monté sur le boîtier au niveau d'une extrémité du câble du boîtier, le capuchon (3) englobant un dispositif de fixation des contacts solidaire (17) destiné à fixer les contacts (5) dans les cavités (4) et composé de deux parties (12, 13) pouvant être assemblées perpendiculairement à la direction d'enfichage, **caractérisé en ce que** le capuchon (3) est fixé fermement autour du câble pour protéger le boîtier (2) contre la pénétration de poussières et d'eau, **en ce que** le capuchon (3) est guidé de manière positive sur le boîtier (2), de sorte que lors de l'assemblage des parties (12, 13) perpendiculairement à la direction d'enfichage (S), le capuchon est déplacé dans la direction d'enfichage, déplaçant ainsi le dispositif de fixation des contacts (17) dans sa position d'extrémité, et **en ce que** les parties (12, 13) du capuchon (3) comportent des fentes coulissantes (25), le boîtier (2) comportant des blocs coulissants (24) destinés à être guidés dans les fentes coulissantes (25) lorsque le capuchon (3) est monté sur le boîtier (2), assurant ainsi le déplacement dans la direction d'enfichage.

2. Connecteur électrique selon la revendication 1, **caractérisé en ce que** le dispositif de fixation des contacts (17) comporte des nervures individuelles (19) s'engageant à partir de l'extrémité du câble dans les cavités (4) pour fixer les contacts (5).
3. Connecteur selon la revendication 1, **caractérisé en ce que** le capuchon (3) comporte des éléments de verrouillage (23), le boîtier (2) comportant des éléments de verrouillage complémentaires (11), fixant fermement le capuchon (3) sur le boîtier (2) dans une position d'extrémité.
4. Connecteur selon la revendication 1, **caractérisé en ce que** les parties (12, 13) comportent des agencements de verrouillage complémentaires (20, 21) en vue de leur assemblage par verrouillage.
5. Connecteur selon la revendication 1, **caractérisé en ce que** les parties (12, 13) sont assemblées de manière flexible, les deux parties pouvant ainsi être manipulées comme une seule pièce et non pas comme des pièces séparées.

Revendications

1. Connecteur électrique comprenant un boîtier (2) comportant des cavités de contact (4) pour des contacts électriques fixés sur des conducteurs électri-



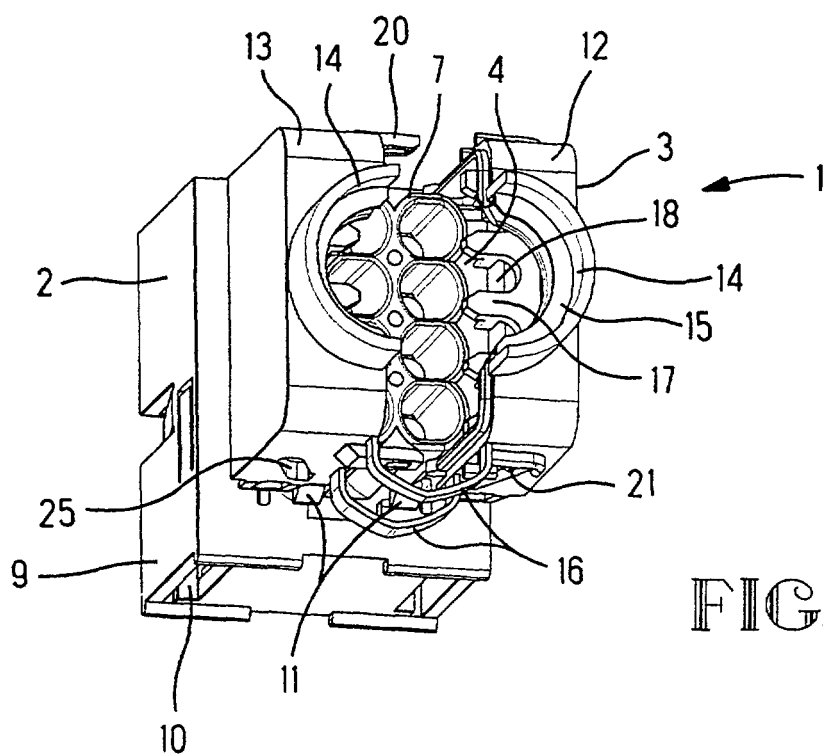


FIG. 3

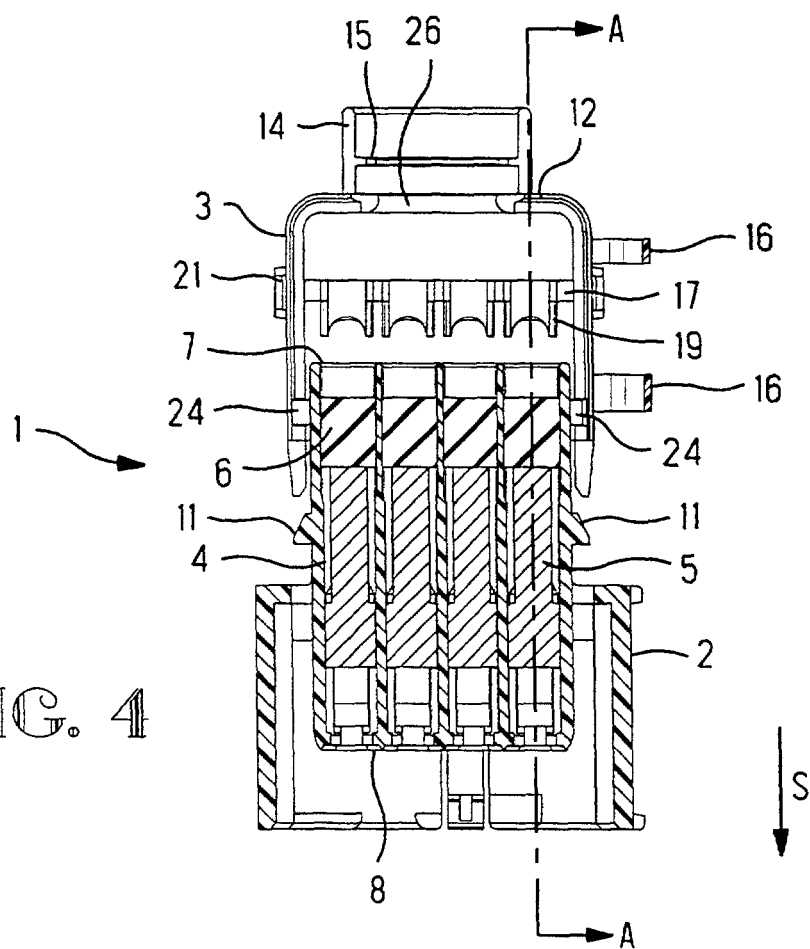


FIG. 4

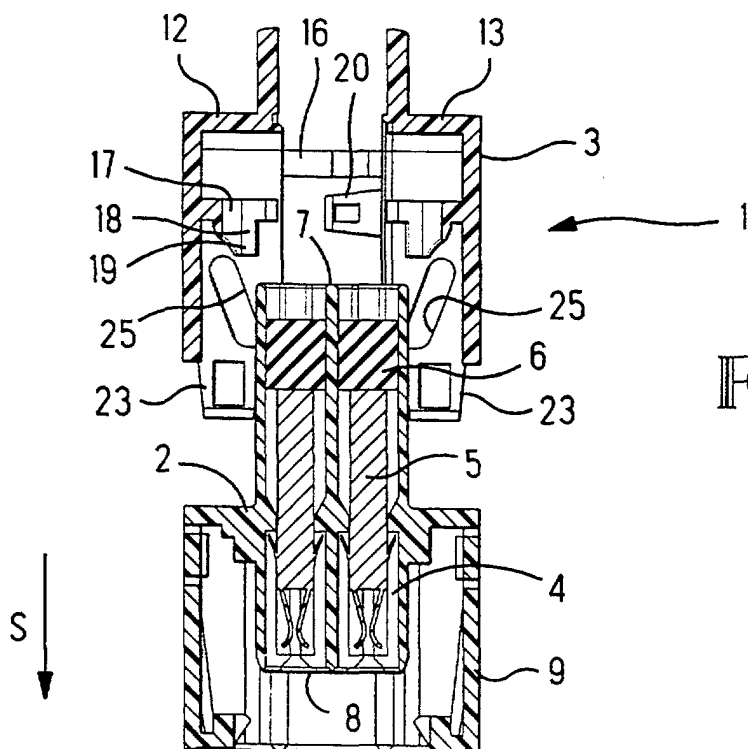


FIG. 5
A-A

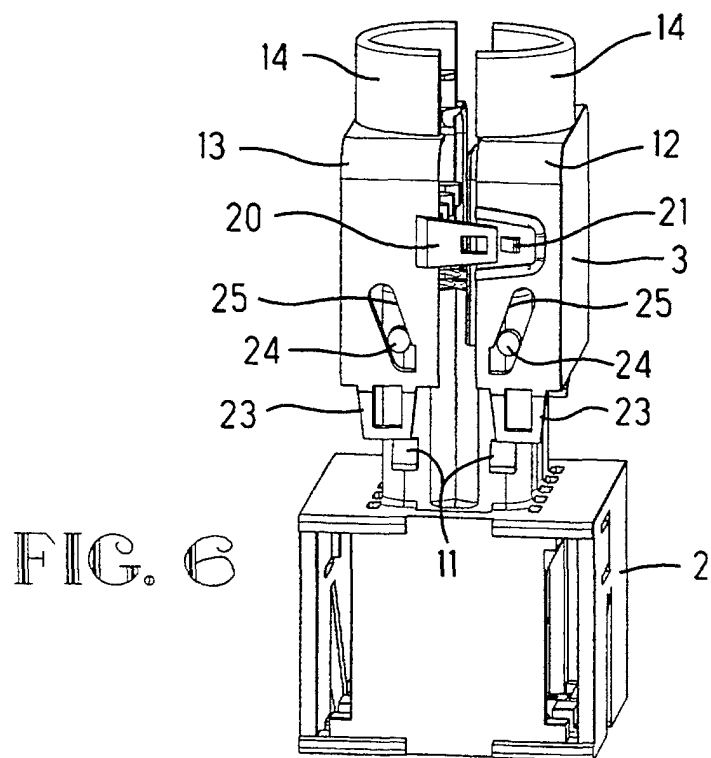


FIG. 6

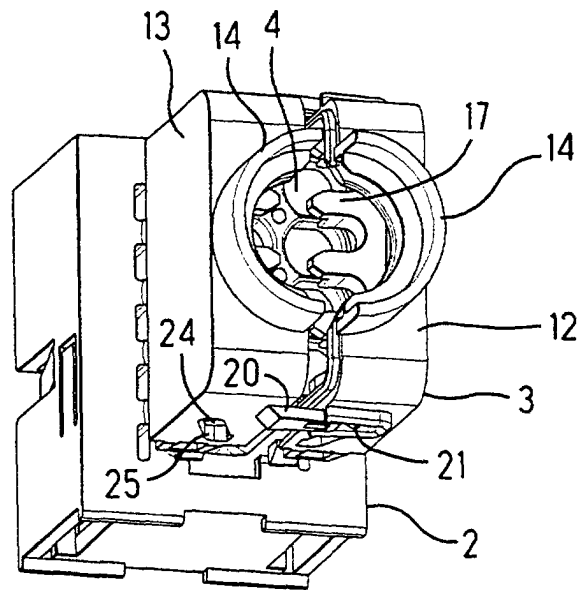


FIG. 7

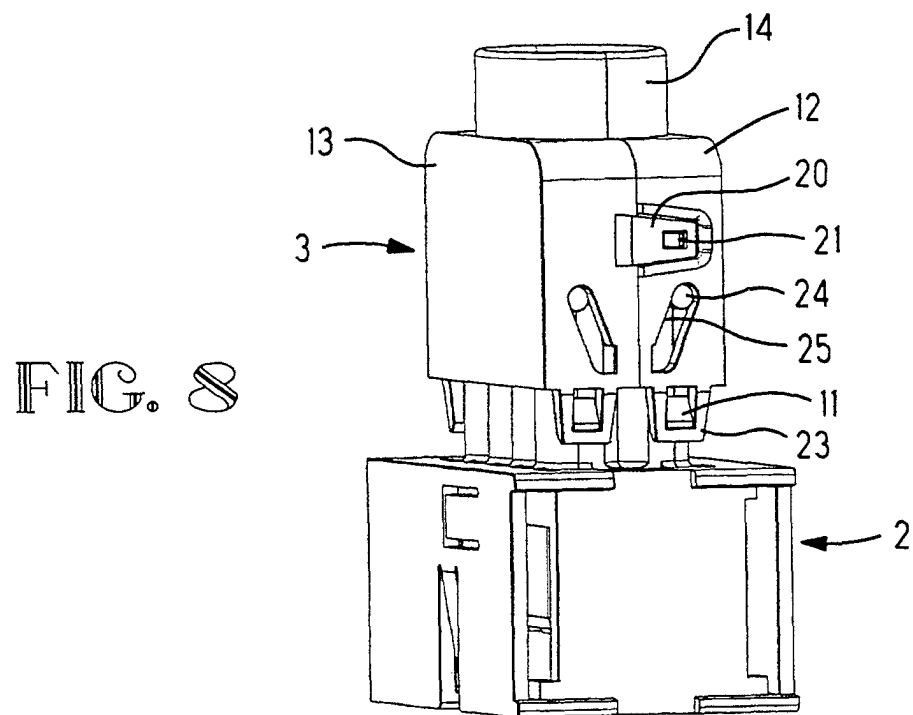


FIG. 8

FIG. 9

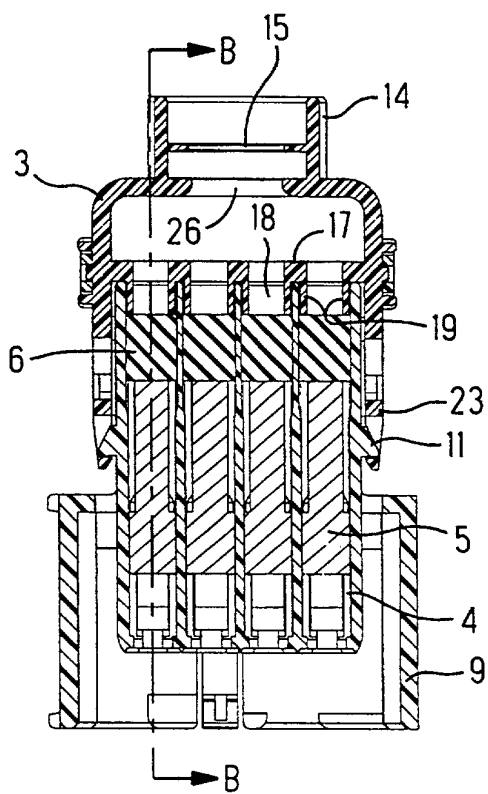
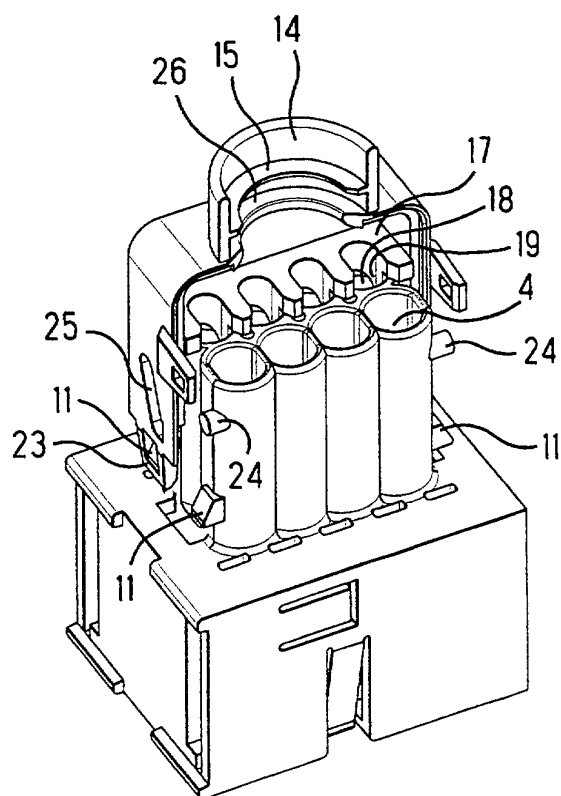
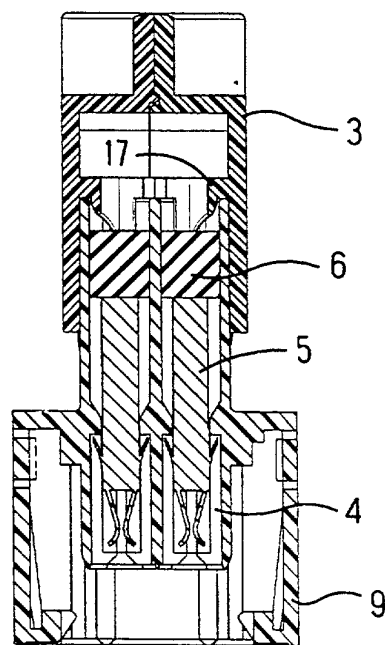


FIG. 10



B-B
FIG. 11