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(54) **Contact housing and process for manufacturing**

(57) A connector housing and a process for making same, in which the connector housing comprises a base part and a pivoting part, attached to the base part and made in one piece with the base part. The pivoting part has at least one surface delimiting an insertion opening in the connector housing through which a pin contact may be inserted into a socket contact in the connector housing. The connector housing being injection mould-

ed, with the pivoting part located in an open position, providing sufficient space for the moulds for shaping a latching hook. After the mould has been removed, the pivoting part is moved into a closed position in which the delimiting surface of the pivoting part is moved towards the insertion opening. The connector housing cures with the pivoting part in the closed position. The socket contact is held in a contact chamber by a latching hook.

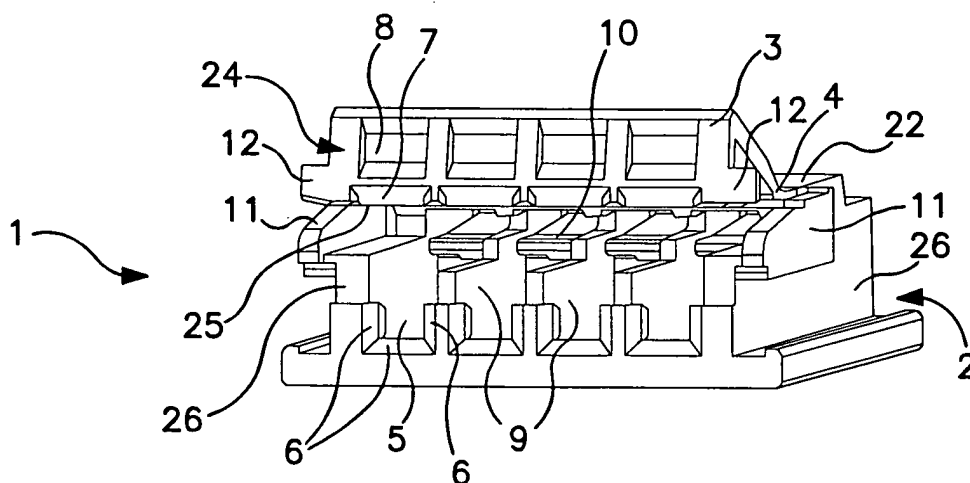


FIG. 1

Description

[0001] The invention relates to connector housings in accordance with Claims 1 and 2 and processes for making a connector housing in accordance with Claims 8 and 9.

[0002] Connector housings are used to hold a socket contact into which a pin contact may be pushed. To improve introduction of the pin contact into an introduction opening, the connector housing has, arranged around the introduction opening, delimiting surfaces which are inclined in the direction of the centre of the introduction opening. The socket contact is secured by a latching hook to prevent its being withdrawn from the connector housing.

[0003] DE 196 00 236 A1 discloses a housing element of an electrical connector. The housing element has a body with passages provided to receive a contact member. Further provided is a locking key which is provided with protuberances for engagement in slots which open into the passages. The protuberances have a width corresponding to the dimension of the apertures, which extend over the entire width of the passages. The protuberances are lengthened to form bosses. The contact member is made in the form of a socket contact whereof the plug receiving region has associated with it a plug opening in the housing. The plug opening is surrounded by delimiting surfaces. In the region of the plug opening, the housing body is made in one piece. To hold the socket contact, a lug is provided as a latching hook which latches into a corresponding latching slot in the socket contact when the socket contact is pushed into the housing.

[0004] In many cases, the housings are made from synthetic material by an injection moulding process. When the housing is made, it is necessary for the latching hook to be shaped in the housing using a mould. It is moreover necessary to form between the latching hook and the housing wall a receiving space into which the latching hook can spring back when a contact is pushed in. To remove the mould once the shaping procedure is complete a sufficiently large opening has to be made in the housing. In the case of small housings, it may be that there is no surface available large enough for the opening to be provided.

[0005] To solve this problem, French patent application FR 2 706 687 A1 proposes a two-part housing in which some of the delimiting surfaces for the plug opening of the housing are formed by a separate plug receiving part. In this way, it becomes possible to make the housing separately from the plug receiving part. This allows a large opening for the mould to be provided, and this opening is at least partly closed by the plug receiving part in the mounted condition. Thus, the housing, together with the latching hook, can be removed from the mould without problems. The plug receiving part is then pushed into the corresponding opening in the housing. The plug openings each have four delimiting surfaces

which taper conically inwards. Three of the delimiting surfaces are formed by the housing. The fourth delimiting surface is formed by the plug receiving part. The plug receiving part moreover has a blocking element which is pushed into a free space between the movable latching hook and the housing. This means that the latching hook is held in a latched position. The process described for making a connector housing is relatively complicated.

[0006] The object of the present invention is to provide a connector housing and a process for making a connector housing by means of which a latching hook can be shaped even if the connector housing is small and has little surface available for providing the mould.

[0007] The object of the invention is achieved by the connector housings according to Claims 1 and 2 and the processes for making a connector housing according to Claims 8 and 9.

[0008] One advantage of the connector housing of the present invention consists in the fact that the contact housing has a base part and a pivoting part which each form part of the delimiting surface of the opening to the contact chamber, with the delimiting surfaces of the pivoting part and the housing abutting against one another by way of abutment surfaces, and with the housing and the pivoting part being made in one piece. In this way it becomes possible to make the contact housing by an injection moulding process, with the pivoting part located in an open position during manufacture. In the open position, sufficient space is available between the pivoting part and the housing for the mould in order to shape the latching hook. After removal from the mould, the pivoting part is moved into the closed position and an insertion opening to the contact chamber is made, with four delimiting surfaces. The insertion opening can be made relatively small because of the manufacturing process.

[0009] In a further embodiment of the invention, the mould opening for receiving the mould is made outside the opening to the contact chamber, so that there is greater flexibility in the design of the contact housing. The contact housings and the manufacturing processes described make it possible to shape contact housings with a latching hook even though the contact housing has no surface available sufficient for an opening for providing the mould.

[0010] Other advantageous embodiments of the invention are specified in the dependent claims.

[0011] In an exemplary preferred embodiment, the pivoting part is connected to the housing by way of a connection wall extending preferably transversely over the entire width of the contact housing. The connection wall has less thickness than the wall of the housing or the wall of the pivoting part. The lesser thickness provides an aid to attaching the pivoting part to the base part in pivotal manner.

[0012] In another exemplary preferred embodiment, the pivoting part has a respective delimiting surface for

a plurality of insertion openings. Moreover, the delimiting surfaces of the pivoting part are preferably arranged next to one another. In this way, it becomes possible to make a pivoting part having delimiting surfaces for a plurality of insertion openings in the connector housing at low cost.

[0013] In another exemplary preferred embodiment, the contact housing is made from a fibre-reinforced synthetic material. The fibre-reinforced synthetic material provides the possibility of moving the pivoting part from the open position into the closed position while it is in the as yet uncured condition after the injection moulding process. Once the synthetic material has cured, the latter has the required rigidity to hold the pivoting part. The rigidity of the mould material is particularly advantageous if the pivoting part has a delimiting surface that serves to guide a contact pin.

[0014] In another preferred embodiment, the pivoting part is held in the closed position against the housing by way of a latch-type holding. The latch-type holding secures the position of the pivoting part and provides an aid to the holding function as a result of the rigidity of the mould material. Depending on the embodiment of the connection wall and the rigidity of the mould material, the latch-type holding may be required to fix the pivoting part.

[0015] In a further exemplary preferred embodiment the pivoting part has a front panel which forms part of the front side of the connector housing. A plurality of openings are provided on the front side, and these are delimited by delimiting surfaces. Some of the delimiting surfaces of the openings are formed by the front panel and the others are formed by the base part.

[0016] The invention will be explained below in more detail with reference to the figures, in which:

Figure 1 shows a perspective illustration of a connector housing with a pivoting part in an open position;

Figure 2 is a front view of the connector housing of Figure 1 with the pivoting part open;

Figure 3 is a sectional view of the connector housing of Figure 1 with the pivoting part open;

Figure 4 is a perspective view of the connector housing of Figure 1 with the pivoting part closed; and

Figure 5 is a sectional view through the connector housing of Figure 1 with the pivoting part closed and a contact locked in the housing.

[0017] The connector housing 1 is substantially made from an insulating material and is preferably made from synthetic material by an injection moulding process. The connector housing 1 has a base part 2 and a pivoting part 3 connected to the base part 2. The base part 2 includes a base plate 20 having a plurality of walls 9 which are arranged perpendicular to the base plate 20, a respective contact chamber 15 being formed between

each two walls 9. Constructed on a front side 21 of the base part 2 are U-shaped delimiting surfaces 6, each having three delimiting surface portions. In each case, two delimiting surface portions are arranged parallel to one another and in front of a respective wall 9. A third delimiting surface portion connects the two parallel delimiting surface portions. The delimiting surface 6 delimits on three sides an opening which, in the example illustrated, is constructed as an insertion opening 5.

[0018] Arranged between two walls 9, above a contact chamber 15, is a respective latching hook 10 which is connected to a housing top 22 (Figure 3). The parallel delimiting surface portions are provided up to a fixed height of the walls 9. The pivoting part 3 is attached to the base part 2 by way of a connection wall 4. The connection wall 4 provides a connection between a cover plate 23 of the pivoting part 3 and the housing top 22 of the base part 2. The cover plate 23 is arranged inclined at an upward angle with respect to the housing top 22.

The cover plate 23 merges into a front panel 24 which is arranged substantially perpendicular with respect to the cover plate 23. The front panel 24 extends over the entire width of the front side 21 of the base part 2. Provided on the front panel 24 are four openings 8 arranged next to one another in the upper region of the front panel 24. Below the openings 8, the front panel 24 has a continuous edge on which upper delimiting surfaces 7 are arranged next to one another. The upper delimiting surfaces 7 are preferably constructed such that they are downwardly inclined in the direction of the contact chamber 15. The front panel 24 has on the underside an abutment edge 25 which is arranged substantially parallel to the base plate 20. Constructed between the abutment edge 25 and the front side of the base part 2 is a mould opening 37 which serves to receive a mould. The front panel 24 has, on opposite side edges, latching arms 12 which emerge laterally from the front panel 24.

[0019] The base plate 20 is connected to the housing top 22 by way of outside walls 26. The outside walls 26 have on their outside latching lugs 11 which are arranged laterally with respect to the front side 21 in the upper region of the outside walls 26. Between an outside wall 26 and the nearest wall 9, a contact chamber 15 is constructed.

[0020] Figure 2 shows the connector housing 1 in front view. The upper delimiting surfaces 7 of the front panel 24 are arranged symmetrically with respect to the central delimiting surface portion of the delimiting surfaces 6 in the base part 2. Moreover, the latching arms 12 are arranged above the latching lugs 11. Between each two upper delimiting surfaces 7, a bearing surface 27 is constructed on the abutment edge 25. Between each two adjacent delimiting surface portions of two insertion openings 5 there is constructed a second bearing surface 28 on the front side 21 of the base part 2.

[0021] Figure 3 shows a cross-section through the connector housing 1 and the contact chamber 15. A mould opening 37, which is constructed to receive a

mould during moulding of the connector housing, is provided. Once the mould has been removed, the pivoting part 3 is pivoted and the mould opening 37 is thereby at least made smaller or indeed completely closed off. As a result of the construction of the mould opening 37, the latching hook 10 can be shaped in a simple way even though the front side of the connector housing has in the final (or closed) condition, as illustrated in Figure 4, only openings 8 and insertion openings 5 which would not be sufficient to accommodate a mould.

[0022] The pivoting part 3 is constructed in the form of a hinged flap. In the closed position of the pivoting part 3, the bearing surfaces 27 of the pivoting part 3 lie on the second bearing surfaces 28 of the base part 2. During pivoting of the pivoting part 3, the latching arms 12 come over the latching lugs 11 and latch into corresponding latching recesses 13 below the latching lugs 11. This means that the pivoting part 3 is held in the closed position by way of a latch-type holding, as illustrated in Figure 4. In the closed position of the pivoting part 3, the insertion openings 5 are surrounded all round by delimiting surfaces 6, 7. The delimiting surfaces 6, 7 are constructed to taper conically inwards in order to make it easier to introduce a contact pin.

[0023] The base part 2 has, opposite the insertion openings 5, socket contact introduction openings 16 for the feeding in of socket contacts 17 (Figure 5). The latching hook 10 is constructed above the contact chamber 15. The latching hook 10 has an inclined sliding surface 29 which merges at an acute angle into a blocking surface 30 arranged perpendicular to the base plate 20. Constructed between the housing top 22 and the latching hook 10 is a receiving space 14. The housing top 22 extends from the socket contact introduction opening 16 into the end region of the latching hook 10 and then merges by way of a section of less thickness D into the cover plate 23 of the pivoting part 3. The section of less thickness D provides a connection wall 4 by means of which the pivoting part 3 is attached to the base part 2.

[0024] In the embodiment illustrated, the connector housing 1 is made from synthetic material with glass fibres. The glass fibres are provided to increase the rigidity of the connector housing 1. As a result of using the glass fibres, the synthetic material may be bent in the region of the connection wall 4 predominantly just after removal of the connector housing 1 from the moulds of the injection moulding process, that is to say when it is in the not yet fully cured condition. After curing, the connection wall 4 is no longer sufficiently resilient because of the combination of synthetic material and glass fibres selected, and if the pivoting part 3 were pivoted into the closed position or out of the closed position the connection wall 4 would break.

[0025] Instead of this embodiment, however, it is also possible to use a synthetic material without any glass fibre content, which is flexible in the uncured condition after the moulding procedure and makes it possible to pivot the pivoting part 3 into the closed position and

keeps the pivoting part 3 in the closed position in the cured condition. Depending on the desired function, it is also possible to use a mould material which remains flexible even in the cured condition in the region of the connection wall 4 because of a correspondingly low thickness D of the connection wall.

[0026] Depending on the embodiment, the latching lugs 11 and latching arms 12 may also be dispensed with. This is for example the case if, because of the mould material used, the pivoting part 3 is only capable of pivoting in the uncured condition of the mould material. As a result of using synthetic material having a high glass fibre content, the connection wall 4 is for example only flexible in the uncured condition. If, in the uncured condition of the connection wall 4, the pivoting part 3 is moved from the open position into the closed position and held in the closed position until the connector housing 1 has cured, then the pivoting part 3 remains in the closed position once the synthetic material has cured without any latch-type holding being required.

[0027] Figure 5 illustrates a cross-section through the connector housing 1 with a socket contact 17 therein. The socket contact 17 has a second blocking surface 31 which is associated with the first blocking surface 30 of the latching hook 10. The blocking surface 30 and the second blocking surface 31 prevent the contact socket 17 from being pushed out of the socket contact introduction opening 16. On the side with the introduction opening 16, the socket contact 17 can either have a plug contact inserted therein, or be connected to an electrical cable.

[0028] The socket contact 17 has a contact region which is opened in the direction of the insertion opening 5. A pin contact can be pushed into the contact region 32 through the insertion opening 5. Instead of the socket contact 17, a plug contact may alternatively be arranged in the contact chamber as a contact and held by the latching hook 10.

[0029] The opening 8 may be used for example to reach under the latching hook 10 with an appropriately shaped tool and to raise it up. Thus, the blocking surface 30 of the latching hook 10 releases the second blocking surface 31 of the socket contact 17 so that the socket contact can be withdrawn from the socket contact introduction opening 16.

[0030] Depending on the geometry of the connector housing 1 that is used, bearing surfaces 27, 28 may also be constructed in other regions, outside the insertion opening 5. For example, the bearing surfaces 27, 28 may also be constructed in the cover plate 23 between the front panel 24 and the latching hooks 10, with the pivoting part 3 taking the form of a cover. However, other geometries of the pivoting part 3 are also possible. Thus, the position of the mould opening 37 may also be selected as a function of the structure of the connector housing.

Claims

1. A connector housing (1) having a pivoting part (3) and a base part (2), the connector housing having a contact chamber (15) for receiving a contact (17) with an insertion opening (5) into the contact chamber (15), there being constructed in the contact chamber (15) a latching hook (10) which is provided for latching the contact (17) inside the contact chamber (15), the connector housing (1) being made together with the latching hook (10) by a moulding procedure, the insertion opening (5) being surrounded by a delimiting surface (6, 7), one portion of the delimiting surface (7) being formed by the pivoting part (3) and another portion of the delimiting surface (6) being formed by the base part (2), in the region of the delimiting surface (6, 7) the pivoting part (3) and the base part (2) abutting against one another by way of abutment surfaces (27, 28), **characterised in that** the pivoting part (3) and the base part (2) are made in one piece, **in that** during the moulding procedure the pivoting part (3) is located in an open position in which the abutment surfaces (27, 28) of the base part (2) and the pivoting part (3) are at a spacing, **in that** after the moulding procedure the mould is removed, **in that** while the mould material is still in a not yet fully cured condition the pivoting part (3) is moved into a closed position in which the abutment surfaces (27, 28) of the base part (2) and the pivoting part (3) approach one another, and **in that** in the closed position the mould material cures so that the pivoting part (3) is held in the closed position.
2. A connector housing (1) having a pivoting part (3) and a base part (2), the connector housing having a contact chamber (15) for receiving a contact (17) with an insertion opening (5) into the contact chamber (15), there being constructed in the contact chamber (15) a latching hook (10) which is provided for latching the contact (17) inside the contact chamber (15), the connector housing (1) being made together with the latching hook (10) by a moulding procedure, **characterised in that** the pivoting part (3) and the base part (2) are made in one piece, **in that** during the moulding procedure the pivoting part (3) is located in an open position and a mould opening (37) is constructed between the base part and the pivoting part, **in that** after the moulding procedure the mould is removed, **in that** while the mould material is still in a not yet fully cured condition the pivoting part (3) is moved into a closed position in which the mould opening (37) is made smaller, and **in that** in the closed position the mould material cures so that the pivoting part (3) is held in the closed position.
3. A connector housing according to Claim 1 or 2, **characterised in that** the pivoting part (3) is connected to the base part (2) by way of a connection wall (4), with the connection wall (4) having less thickness (D) than the base part (2) and the pivoting part (3).
4. A connector housing according to Claim 1, **characterised in that** the pivoting part (3) has a front panel (24) which forms part of the front side (21) of the connector housing (1), **in that** a plurality of openings (5) are arranged next to one another on the front side (21), **in that** each opening (5) is delimited by delimiting surfaces (7), **in that** the abutment surface (27) of the pivoting part (3) is constructed on the front panel (24), and **in that** some of the delimiting surfaces (7) of the openings (5) are formed by the front panel (24).
5. A connector housing according to one of Claims 1 to 4, **characterised in that** the connector housing (1) is moulded from a fibre-reinforced synthetic material.
6. A connector housing according to one of Claims 1 to 5, **characterised in that** the pivoting part (3) is held in the closed position against the base part (2) by way of a latch-type holding arrangement (11, 12, 13).
7. A connector housing according to one of Claims 1 to 6, **characterised in that** there is provided in a front panel (24) of the pivoting part (3) an opening (8) in communication with a receiving space (14), the receiving space (14) being arranged adjacent to the latching hook (10) to receive the latching hook (10) when the latching hook (10) is displaced by the contact (17), the opening allowing the introduction of a tool for releasing the latching hook (10) from the contact (17).
8. A process for making a connector housing (1) having a base part (2) and a pivoting part (3), the connector housing defining a contact chamber (15) for receiving a contact (17), the connector housing having an insertion opening (5) into the contact chamber (15), the insertion opening (5) being surrounded by delimiting surfaces (6, 7), at least one part (7) of the delimiting surface being formed by the pivoting part (3) and the other part of the delimiting surface (6) being formed by the base part (2), there being constructed in the contact chamber (15) a latching hook (10), the process comprising the steps of:

moulding the base part (2) the pivoting part (3), and a latching hook (10) in one piece with the pivoting part (3) being located in an open position in which a mould opening (37) is constructed between the pivoting part (3) and the base

part (2) for the mould, the mould being arranged in the mould opening (37) during the moulding procedure; and

after the mould has been removed, with the mould material still in a not yet fully cured condition, moving the pivoting part (3) into a closed position in which the mould opening (37) is made smaller, such that the pivoting part (3) forms one part (7) of the delimiting surfaces of the opening (5). 5 10

9. A process for making a connector housing (1) having a base part (2) and a pivoting part (3), the connector housing (1) defining a contact chamber (15) for receiving a contact (17), and having an insertion opening (5) into the contact chamber (15), a latching hook (10) being constructed inside the contact chamber (15) and being provided for latching the contact (17), the process comprising the steps of: 15 20

moulding the base part (2), the pivoting part (3) and the latching hook (17) in one piece by a moulding procedure with the pivoting part (3) being located in an open position in which a mould opening (37) is constructed between the pivoting part (3) and the base part (2) for the mould, a mould being arranged in the mould opening (37) during the moulding procedure; 25 30

after the mould has been removed, with the mould material still in a not yet fully cured condition, moving the pivoting part (3) into a closed position in which the mould opening (37) is made smaller; 35

and in the closed position allowing the mould material to cure, such that, as a result of the change in rigidity in the mould material, the pivoting part (3) is held in the closed position.

10. A process according to either of Claims 8 or 9, **characterised in that** fibre-reinforced synthetic material is used as the mould material and cures after the moulding procedure. 40 45 50 55

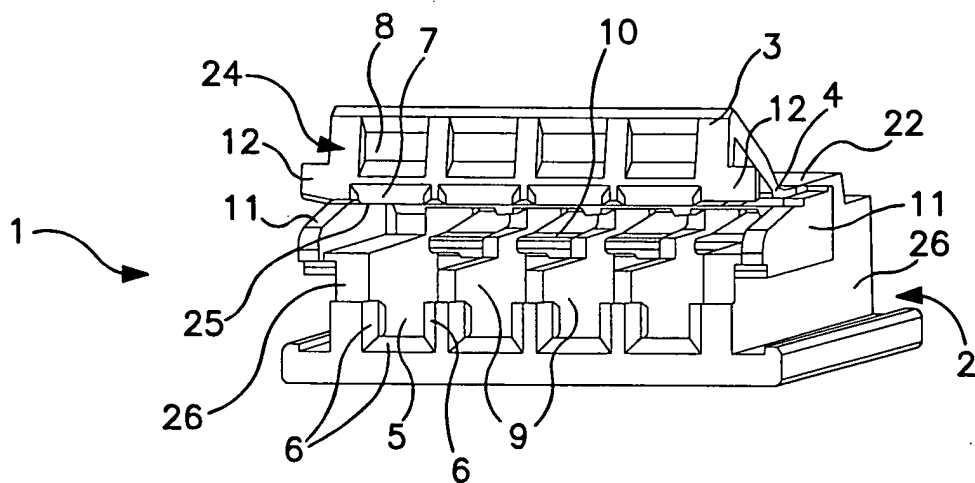


FIG. 1

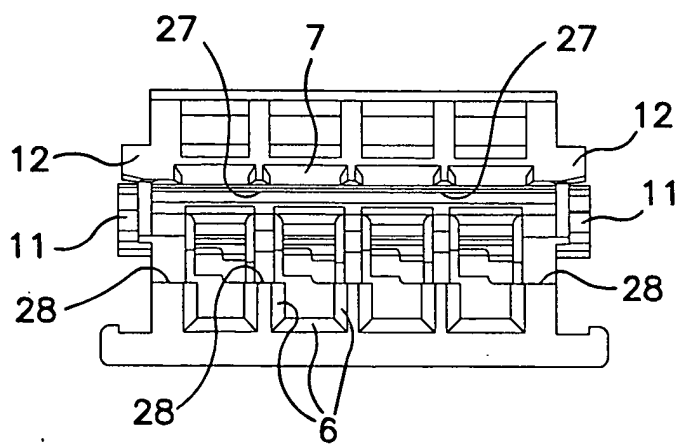


FIG. 2

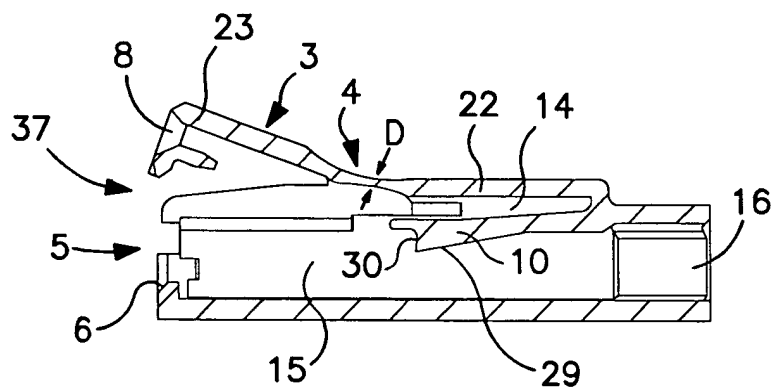


FIG. 3

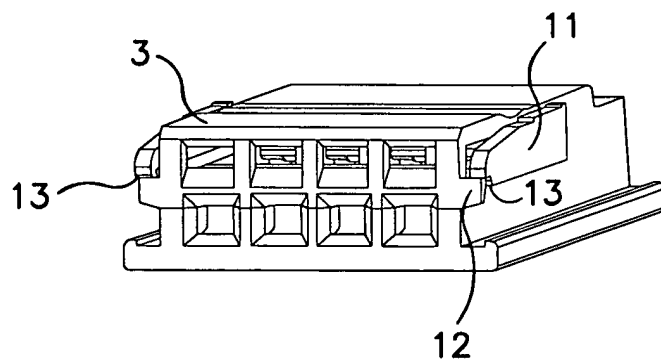


FIG. 4

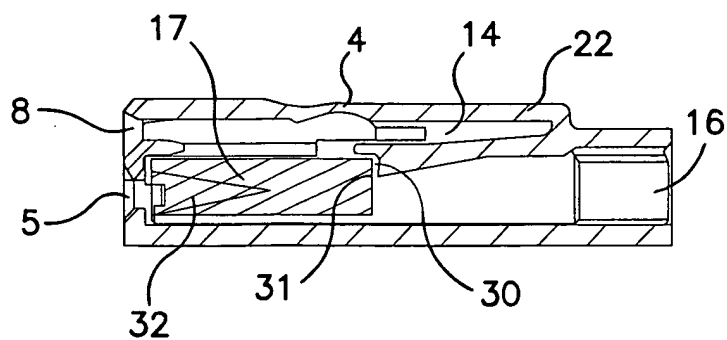


FIG. 5



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EUROPEAN SEARCH REPORT

Application Number
EP 04 02 4467

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 19 November 2004	Examiner Bertin, M
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 04 02 4467

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