

(19) **DANMARK**

(10) **DK/EP 1742299 T3**



(12) Oversættelse af
europæisk patentskrift

Patent- og
Varemærkestyrelsen

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- (51) Int.Cl.: **H 01 R 4/50 (2006.01)**
- (45) Oversættelsen bekendtgjort den: **2014-03-10**
- (80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2013-12-11**
- (86) Europæisk ansøgning nr.: **06013296.6**
- (86) Europæisk indleveringsdag: **2006-06-28**
- (87) Den europæiske ansøgnings publiceringsdag: **2007-01-10**
- (30) Prioritet: **2005-07-05 DE 102005031281**
- (84) Designerede stater: **AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR**
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- (54) Benævnelse: **Forbindelsesindretning for litzeledninger**
- (56) Fremdragne publikationer:
WO-A1-2005/020375
DE-A1- 10 143 008
DE-A1- 19 851 529
DE-C2- 10 145 324

The invention relates to a connecting device for electrical stranded conductors in a plug housing according to the preamble of claim 1.

A connecting device of this type is specifically required in electrical conductors configured as stranded conductors.

5 Document DE 101 43 008 A1 shows a connecting device for electrical stranded conductors in an electric plug housing comprising pin and/or socket contacts which are arranged in rows and columns in separate chambers. The contacting of the stranded conductors is here realized via a so-called contact bar.

Document DE 101 45 324 C1 discloses an electric connecting element for
10 contacting stranded conductors, the connecting end of which has a saw tooth-like structure, onto which a resilient sleeve widened by means of a wedge can be pushed.

In this case, the number of individual components required for the functioning which was significantly reduced with the proposed invention proved disadvantageous.

Consequently, the invention is based on the object of realizing a connecting device
15 of the type initially mentioned in such a way that the connection of stranded conductors can be realized with a few and simple components and without tools, wherein the broadest range possible of wire cross sections to be contacted is covered.

This object is achieved by the characterizing features of claim 1.

Advantageous embodiments of the invention are specified in claims 2 to 7.

20 The advantages reached by the invention consist in particular in that using this plug housing, a connecting system without tools for stranded conductors is provided, in which the stranded conductors can be fixed on the connecting portions of the electric plug contacts in the form of pins and sockets by means of a resilient sleeve.

In this respect, it is intended to cover a cross-sectional range between 0.35 and
25 1.5 mm² for the stranded conductors using a clamping device that is easy to install. An unproblematic exchange is possible due to an identical modular dimension with similar plug housings which however have different connection types such as screw-type connections.

For this purpose, a plurality of chambers is arranged in rows and columns in the
30 plug housing, a clamping device for a stranded conductor being provided in each chamber.

The clamping device is formed as a connecting device for electrical stranded conductors from an axially displaceable slide member which along with a clamping sleeve can be slipped onto the connecting portion of an electric contact element configured as a pin or a socket. One prerequisite, specifically with respect to stranded
5 conductors, is that the feeding thereof into a contacting portion is to be realized without applying any force so as to prevent, if possible, individual copper cores from twisting or bending before a striking point is reached.

This means that during the "mounting state", the stranded conductors always need to be fed to the connecting portion having the contact element in a continuously
10 accessible fashion namely until the stopping point of the strands on the contact element is reached.

During mounting, the stripped section of a stranded conductor is guided into a bore that extends through the slide member and a clamping sleeve fixed to the slide.

The slide member is then displaced axially into the plug housing in the plug-in
15 direction of the stranded conductor.

In this case, it is advantageous that beads are provided which are molded integrally with both outwardly pointing corner portions of the slide members in the direction of displacement, these beads preventing a slide member from unintentionally sliding off in the direction of a contact element due to the fact that they have a certain
20 oversize with respect to the chamber in which they are accommodated.

As the slide member approaches its end position, the clamping sleeve configured in a resilient manner is slipped onto the preferably conically shaped contacting or connecting portion of the pin or socket contacts with the surrounding stranded conductor.

25 Furthermore, the connecting portion can be configured to be pyramidal up to polygonal and arrow-shaped and to have at least one clamping shoulder.

The clamping sleeve which is advantageously provided with a meander-shaped continuous longitudinal slit ensures a constricting force which is always adapted to the number and size of the strands and is exerted upon a clamping shoulder on the
30 connecting portion of the pin or socket contacts formed by the base of the cone.

Any slide member can be levered out of the respective chamber by inserting a narrow and flat object such as a screwdriver in a bevel provided for this purpose on

the outside of each chamber and extending into a recess in the slide member, as a result of which the stranded conductor is also released.

One example embodiment of the invention is illustrated in the drawing and described in greater detail below. The figures show:

5 Fig. 1 a plug half with a housing for pin contacts in a sectional representation with a view on the plug-in portion;

 Fig. 2 a plug half with a housing for pin contacts in a sectional representation with a view on the connecting portion;

 Fig. 3 a plug half with a housing for socket contacts in a sectional
10 representation;

 Fig. 4 a clamping sleeve;

 Fig. 5 a pin contact;

 Fig. 6 a socket contact;

 Fig. 7 a perspective representation of a slide member, and

15 Fig. 8 the mode of operation of the connecting device with stranded conductors,

 Fig. 9 a connection variant for a pin contact,

 Fig. 10 a connection variant for a socket contact, and

 Fig. 11 a variant of the clamping sleeve.

 Fig. 1 shows a perspective sectional representation of a plug half 1 that consists of
20 a housing 10 with pin contacts 50 arranged therein.

In this case, the housing 10 has a collar-shaped plug-in portion 4, into which the pin contacts 50 protrude with their plug-in side 51, and a connecting portion 5 that is provided for the connection of stranded conductors.

 The connecting portion 5 has a plurality of individual chambers 11, in which axially
25 displaceable slide members 20 are arranged adjacent to one another in rows and columns.

 The pin contacts 50 are positioned in the housing 10 in the same configuration.

For this purpose, the pin contacts 50 respectively present a collar 57 by means of which they are inserted into a correspondingly shaped holding portion 13 approximately in the center of the housing 10 below the chambers 11 and are locked therein by locking elements 15.

- 5 The pin-shaped plug-in side 51 of the pin contacts protrudes into the plug-in portion 4 through openings 12 below the holding portion 13, whereas the connecting portion 52 which is realized with a cone point 53 and a clamping shoulder 54 extends into the chamber 11.

- 10 An axially displaceable slide member 20 is arranged in each chamber 11, wherein the slide member is illustrated here in a "mounting position," in which it partially protrudes out of the housing 10.

The slide member basically presents a round body 22 having four integrally molded corner portions 23 so as to form a square shape outside, wherein two of these corner portions that are adjacent to one another merge into a slide guide 21.

- 15 On this side, the two outer corner portions 23 are in sections provided with an integrally molded bead 33 in the shifting direction which due to a slight oversize with respect to the chamber 11 in which it is accommodated prevents the slide member 20 from unintentionally lowering when no stranded conductors are mounted.

- 20 The slide guide 21 is additionally provided with a stop 29 that abuts on the stop 16 of the outer locking element 15 provided for arresting the pin contact 50 when the slide member is displaced.

The slide member 20 is prevented from falling out of one of the chambers 11 of the housing by means of mutually engaging locking edges 18, 28 on the outwardly directed side of the slide guide 21 and the corresponding side of the chambers 11.

- 25 For this purpose, a raised narrow guide rail 32 is integrally molded with the outwardly directed slide guide 21 and engages into a groove 19 on the housing wall.

A through hole 24 having an outlet 25 that narrows in a funnel-shaped fashion is provided in the center of the slide member 20.

- 30 A clamping sleeve 40 is arranged below the funnel-shaped outlet 25, more specifically such that the clamping sleeve can be inserted into a fork-shaped holding means 26 adapted to its diameter and simultaneously fixed in a slit 27 of the slide

member provided above the holding means by means of a holding ring 42 perpendicularly beveled from the clamping sleeve.

The actual connecting device therefore is formed by the slide member 20, the clamping sleeve 40 and the connecting portion 52 conical here of the pin contact 50.

5 To mount this connecting device, the pin contact 50 must first be inserted into the holding portion 13 of the housing 10 and fixed by means of the locking elements 15. The clamping sleeve 40 must then be connected to the slide member 20 and inserted into one of the chambers 11 together therewith until the locking edges 18 and 28 of the housing and the slide member contact one another.

10 This position - in which the slide member 20 still protrudes from the housing 10 - constitutes the "fitting position" in which a stripped stranded conductor 8 can be slipped into the through hole 24 formed in the center of the slide member 20 up to the clamping sleeve 40 arranged thereunder, and onto the conical connecting portion 52 up to the collar 57 of the pin contact 50.

15 The section of the slide member that is still visible above the housing in this case presents a laterally inclined V-shaped recess 30 into which a correspondingly flat tool such as, e.g., a screwdriver can be inserted in order to lever out an inserted slide member. A bevel 17 is provided for the use of the tool in each chamber on the inner side of the housing wall surface.

20 In other respects, a groove 31 is provided on the surface of the slide member 20, into which a tool for pressing the slide member 20 into the housing 10 can be inserted.

When the slide member 20 is pressed into its end position such that the stop 29 abuts on the stop 16 of the locking element 15 at the end of the slide guide 21, the clamping sleeve 40 is slipped onto the conical connecting portion 52 such that the
25 strands inserted therein are fixed between the inner wall of the clamping sleeve and the clamping shoulder 54 formed by the cone base.

Fig. 2 shows the plug half 1 in a perspective sectional representation with a view on the connecting portion 5.

In this case, the left or front row of slide members is shown already inserted into
30 the housing 10 while the right or rear row of slide members still protrudes out of the housing.

The left front slide member 20 is further illustrated in a sectional representation such that it is clearly visible that for threading a stranded conductor, the narrowing funnel outlet 25 of the slide member has a smaller diameter than the clamping sleeve 40 arranged therebelow. This prevents individual wires of a stranded conductor from possibly getting stuck in the portion of the beveled holding means 42 of the clamping sleeve.

The contact between the stop 29 of the slide guide 21 and the locking element 15 can be seen in the slide member 20 illustrated here in the already lowered position. If stranded conductors are inserted, the slide member remains in this position because the clamping sleeve is held on the clamping shoulder 54 due to the widening of its diameter and the strands lying therebetween.

In contrast thereto, if no stranded conductors are inserted, the beads 33 integrally molded with the corner portions 23 of the slide member 20 prevent an unintentional sliding off in the direction of the pin contact.

Fig. 3 shows the plug half 2 with a plug housing 10' and at least one socket contact 60 arranged therein in a sectional representation.

It is clearly visible in the illustration shown here that though the plug housing is basically designed similar to the housing that accommodates the pin contact, it requires a slightly modified construction for accommodating the socket contacts.

In this case, the socket contact 60 is inserted into the tubular holding portion 13 with the partially slotted plug-in side 61 until the limit stop 14 is reached and locked in position by means of the locking elements 15.

This figure, in which the clamping sleeve 40 is also illustrated in a sectional representation, also shows the connecting portion 62 which consists of the conical point 63 on the connecting pin 66 that is adjoined by the stopping face 65 of the socket-shaped plug-in side 61.

In this case, the conical point 63 already protrudes into the clamping sleeve 40 in the "fitting position", whereas the clamping shoulder 64 is still situated outside the clamping sleeve.

The lower end of the clamping sleeve 40 comprises an outwardly directed, funnel-shaped widening 44 that exerts a holding force upon the stranded conductors

arranged between the clamping sleeve and the clamping shoulder with its inner wall during the lowering of the clamping sleeve.

In addition, this figure clearly shows that a circular ring of sufficient size for inserting the strands of an electrical conductor is available between the clamping sleeve and the point such that the strands can at maximum hit on the stop 65 below the clamping shoulder 64.

In this case, the inside diameter of the sleeve is chosen slightly larger than the diameter of the clamping shoulder on the cone end of the connecting portion of a pin or socket contact - however, at least so large that the smallest stranded conductor provided can already be reliably held.

The clamping sleeve 40 shown in Fig. 4 is realized in the form of a rolled, resilient clamping sleeve that presents a meander-shaped slit 41 along the sleeve wall in order to ensure a spring effect when the sleeve is radially widened.

One of the end faces is provided with an outwardly beveled holding ring 42 that is interrupted several times by separating slits 43, whereas the opposite side has a funnel-shaped widening 44.

The pin contact 50 shown in Fig. 5 is realized in the form of a turned part and comprises a pin-shaped plug-in side 51 and a connecting portion 52 having a conical point 53.

A cylindrical collar 57 the annular surface of which that is directed toward the cone point is defined as a stopping face 5 is integrally molded between the plug-in side 51 and the connecting portion 52. The conical point is integrally connected to the collar 57 by means of a connecting pin 56.

The edges of the cone base form a clamping shoulder 54, onto which the resilient clamping sleeve 40 is slipped during the connection of a stranded conductor such that it exerts a force that acts radially inward.

The socket contact 60 shown in Fig. 6 has a plug-in side 61 and a connecting portion 62 analogous to the pin contact 50 already described. The plug-in side is realized in the form of a partially slotted socket while the connecting portion 62 is provided with a conical point 63 on the cone base of which a clamping shoulder 64 is provided for arresting the strands by means of the clamping sleeve 40 slipped onto the connecting portion 62.

Fig. 7 shows the slide member 20 individually in a perspective representation. The round body 22 with the through hole 24 and the integrally molded corner portions 23 and the also integrally molded slide guide 21 can be seen here.

5 A wedge-shaped guide rail 32 with the locking edge 28 protrudes from the outer surface of the slide guide, wherein the guide rail slides in the plug-in direction in a correspondingly designed guide groove 19 in the chamber 11 of the plug housing 10, 10', the locking edge 28 abutting on the locking edge 18 in the chamber and thus preventing the slide member 20 from falling out.

10 The V-shaped recess 30 is provided so as to interrupt the guide rail and for inserting a simple tool so that a slide member lowered into the chamber 11 can be levered out again.

A groove 31 is provided above the recess 30 in the connecting portion 5, into which the same tool as the one above can be inserted for lowering the slide member into the chamber.

15 In order to prevent an unused slide member from sliding off into its chamber, beads 33 are integrally molded with the corner portions 23 over a certain length on the side that points to the recess 30, these beads protruding beyond the surface of the respective corner portion and thus being pressed against the inner wall of the chamber 11.

20 Figs. 8a, 8b show the interaction of the connecting device formed by the slide member 20, the clamping sleeve 40 and the connecting portion of a pin contact 50 with a stranded conductor 7 inserted therein in a section view through a housing 10 for pin contacts.

25 To this end, the individual wires 8 of the stranded conductor 7 are first stripped over a predetermined length that should be slightly longer than the length of the clamping sleeve 40.

The stranded conductor 7 is then inserted into the through hole 24 of the slide member 20 such that its coating approximately protrudes as far as the funnel outlet 25, the individual wires 8 protruding for their part at least over the clamping shoulder 54
30 below the clamping sleeve 40.

The slide member 20 is then pressed into the housing 10, the individual conductors being displaced over the cone point 53 by the travel of the slide and being reliably

positioned on the clamping shoulder of the connecting portion where they are fixed by the widening, but resilient clamping sleeve 40 depending on the number and thickness of the strands.

Fig. 9 shows a pyramidal connecting portion 52 having four clamping shoulders 54 for a pin contact 50 in the present case, whereas Fig. 10 illustrates a socket contact having an arrow-shaped connecting portion 62 and two clamping shoulders 64. A clamping sleeve 40' which is provided for one of these variants and which has here a square configuration and a simplified meander-shaped longitudinal slit 41 is shown in Fig. 11.

Furthermore, a polygonal shape for the volume body forming the connecting portion is also conceivable, which requires an appropriately modified clamping sleeve.

PATENTKRAV

1. Tilslutningsindretning for elektriske litzeledninger i et elektrisk stikhus (10, 10') med i separate kamre (11) i rækker og spalter anbragte stift- og/eller bøsnings-kontakter (50, 60), som omfatter et af et geometrisk volumenlegeme med en spids (53, 5 63) dannet tilslutningsområde (52, 62), idet der ved tilslutningsområdet modsat spidsen er udformet i det mindste én klemskulder (54, 64),

at der i hvert af kamrene (11) er anbragt et forskydeligt slædeelement (20) med en gennemgangsboring (24) til indføring af litzeledningen,

at der på slædeelementet (20) er positionsfikseret en klembøsning (40) orienteret 10 aksialt i forhold til gennemgangsboringen (24), og at klembøsningen (40) sammen med slædeelementet (20) kan skydes ind på tilslutningsområdet (52, 62) på stift- eller bøsningskontakten (50, 60) og også atter kan trækkes tilbage derfra, idet der på den imellem klembøsningen (40) og klemskulderen (54, 64) indføjede litzeledning virker en radial, fikserende kraft fra klembøsningen (40),

15 **kendetegnet ved, at**

klembøsningen (40) har en meanderformet langsgående slids (41) samt en afskrået, flere gange opslidset holdering (42) og en tragtformet udvidelse (44).

2. Tilslutningsindretning ifølge krav 1, **kendetegnet ved, at** der 20 på slædeelementet (20) er tilvejebragt en gaffelformet holder (26) til optagelse af klembøsningen (40).

3. Tilslutningsindretning ifølge ethvert af de foregående krav, **kendetegnet ved, at**

det forskydelige slædeelement ved hjælp af et i en udsparring (30) indgribende værktøj kan vippes et bestemt stykke ud af stikhuset (10).

25 4. Tilslutningsindretning ifølge ethvert af de foregående krav, **kendetegnet ved, at**

slædeelementet (20) på den imod tilslutningsområdet (5) vendende side har et rundt legeme (22) med vinklet udformede hjørneområder (23), idet der ved de to mod udsparringen (30) vendende hjørneområder (23) er udformet en vulst (33).

5. Tilslutningsindretning ifølge ethvert af de foregående krav, **kendetegnet ved, at**

slædeelementet (20) ved hjælp af en føringsskinne (32) er aksialt ført i en føringsnot (19) i huset (10, 10').

5 6. Tilslutningsindretning ifølge ethvert af de foregående krav, **kendetegnet ved, at**

indbyrdes tilstødende låsekanter (18, 28) er udformede på huset (10, 10') og på slædeelementet (20).

7. Tilslutningsindretning ifølge krav 1, **kendetegnet ved, at**

10 volumenlegemet for tilslutningsområdet (52, 62) er udformet kegleformet, pyramideformet, som polygon eller pileformet.

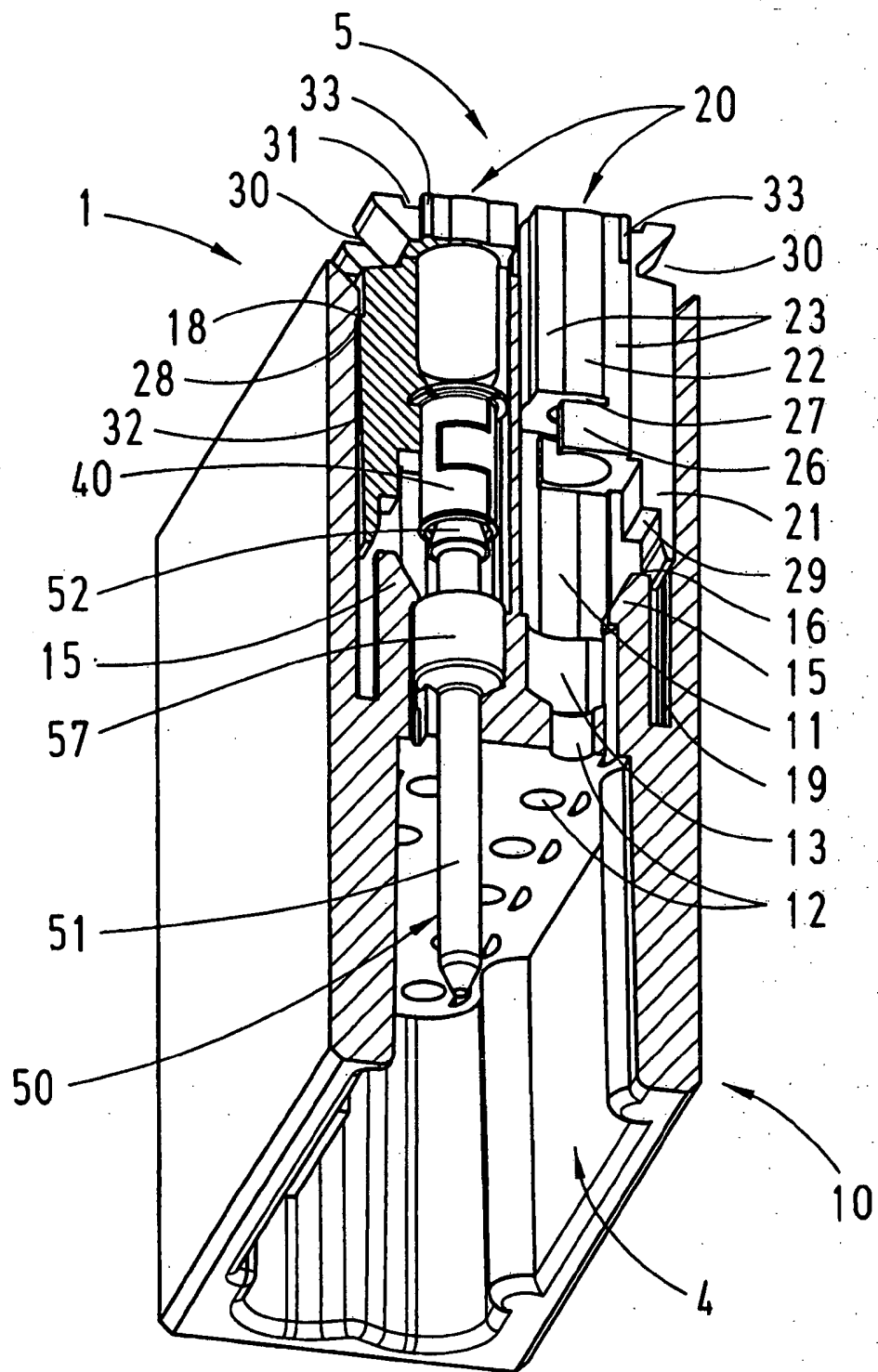


Fig.1

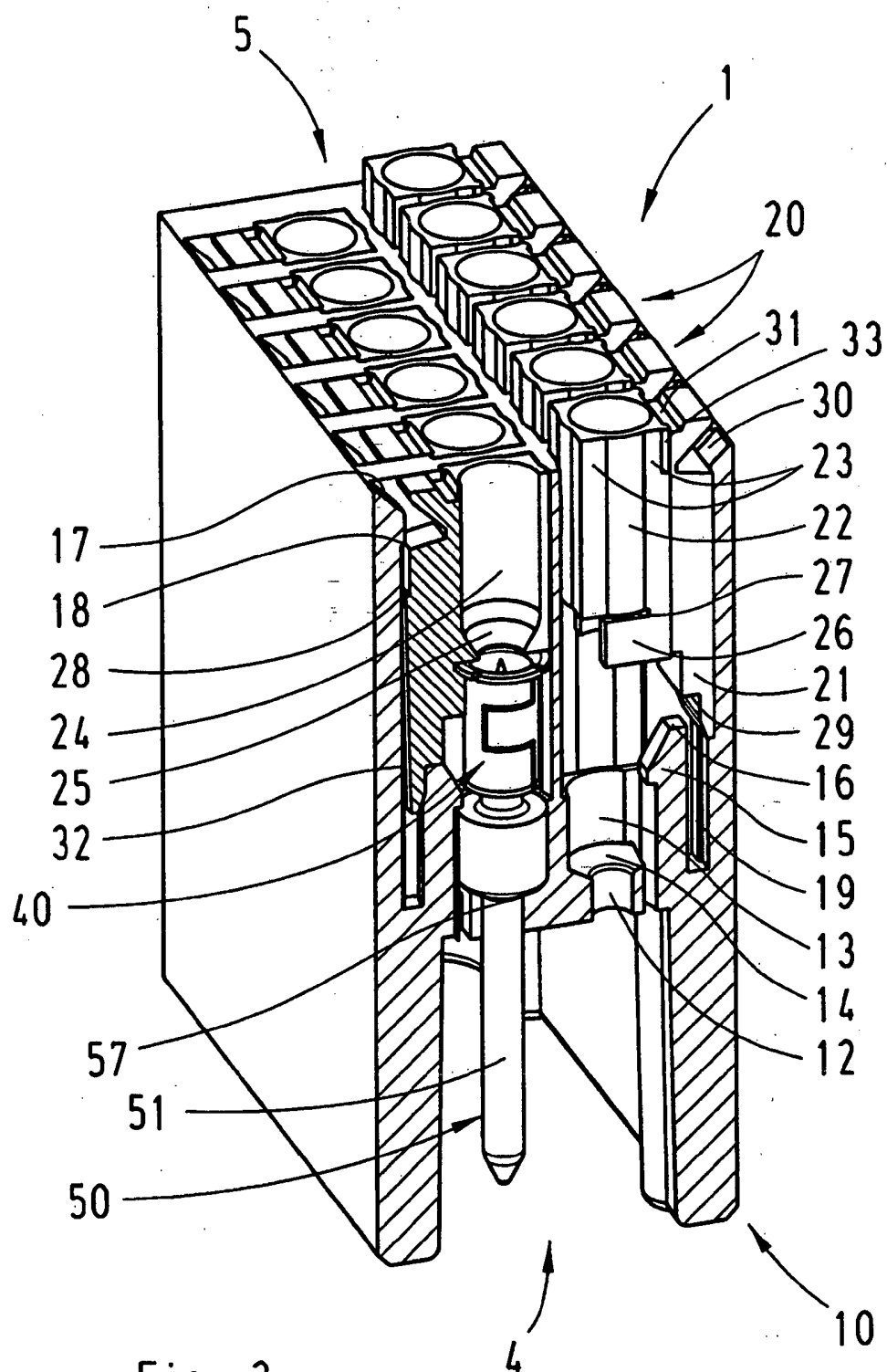


Fig. 2

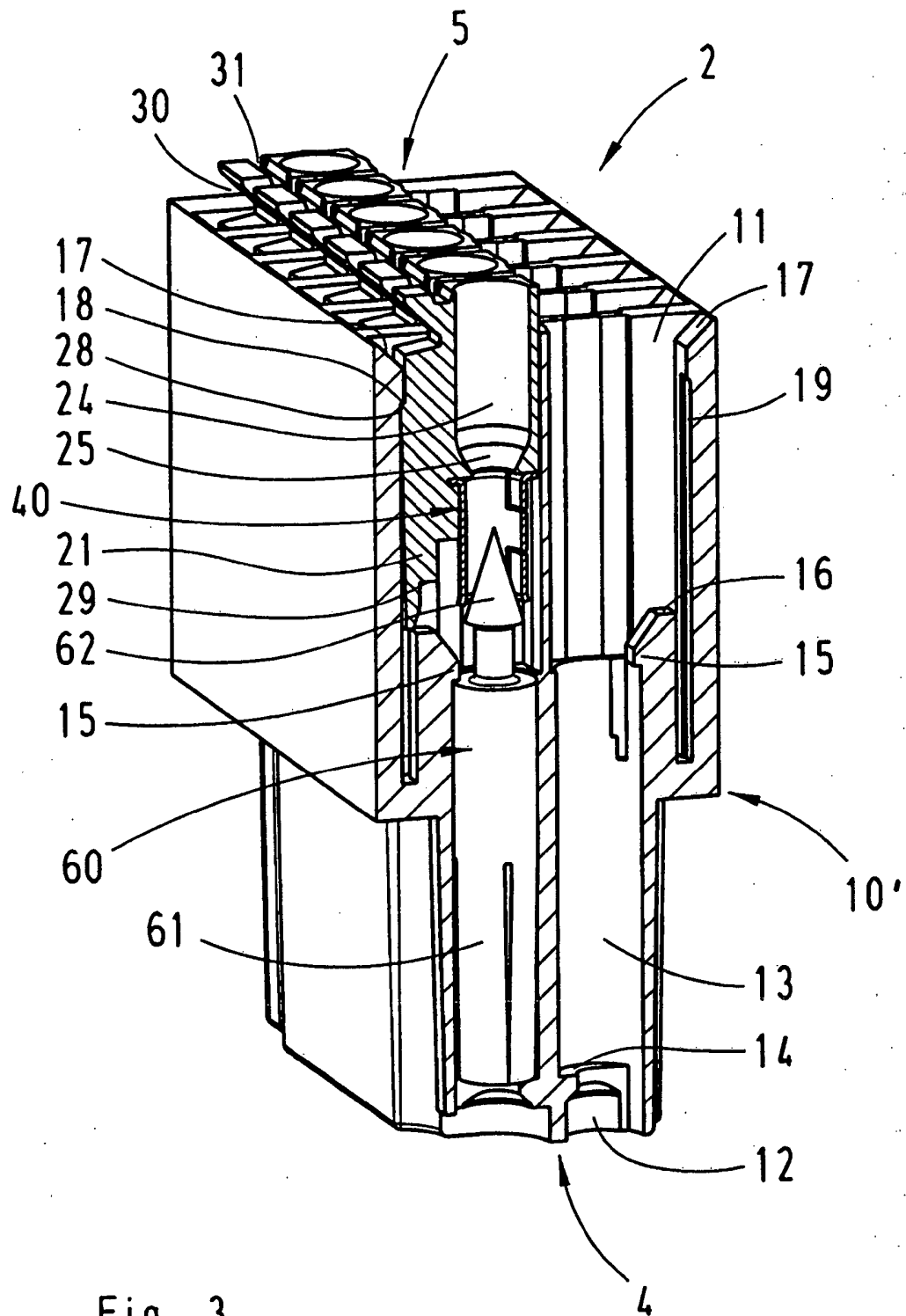


Fig. 3

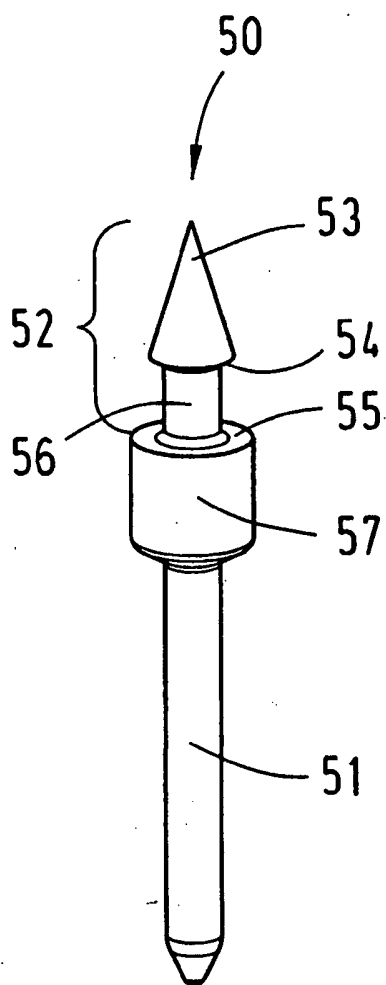


Fig. 5

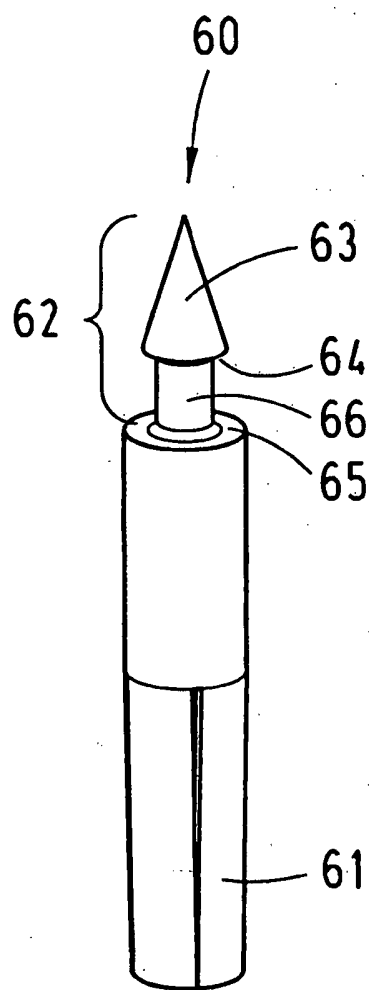


Fig. 6

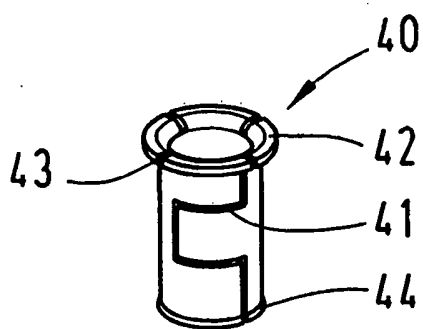


Fig. 4

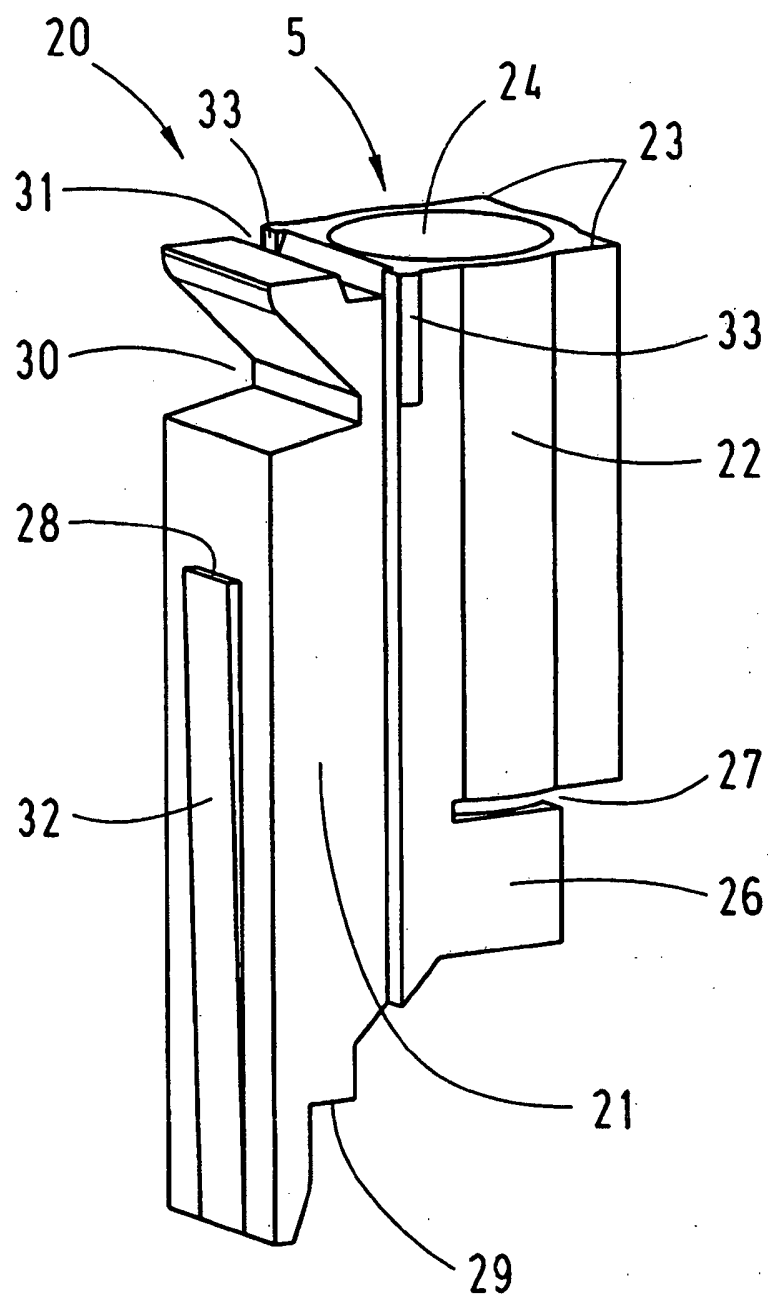


Fig. 7

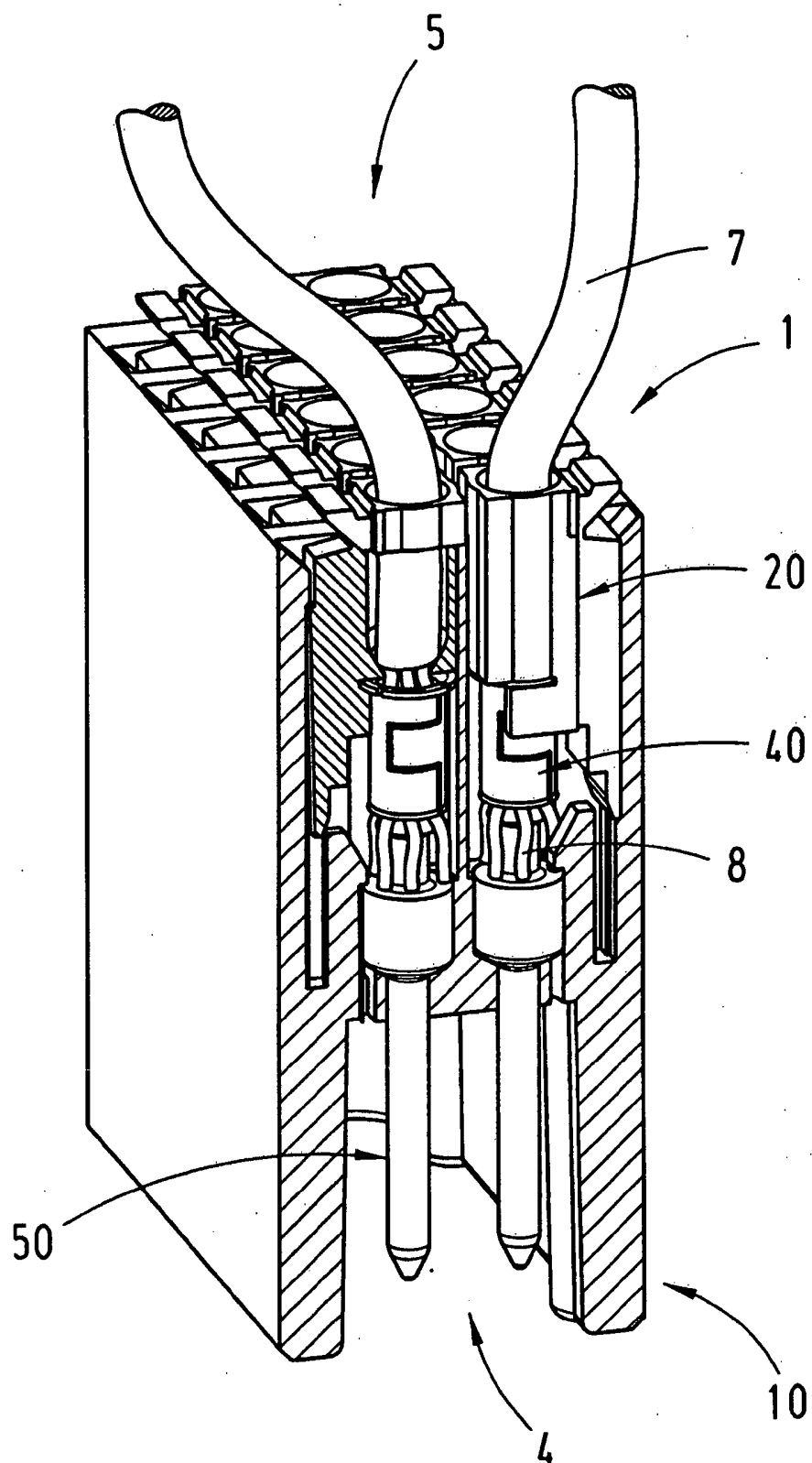


Fig. 8a

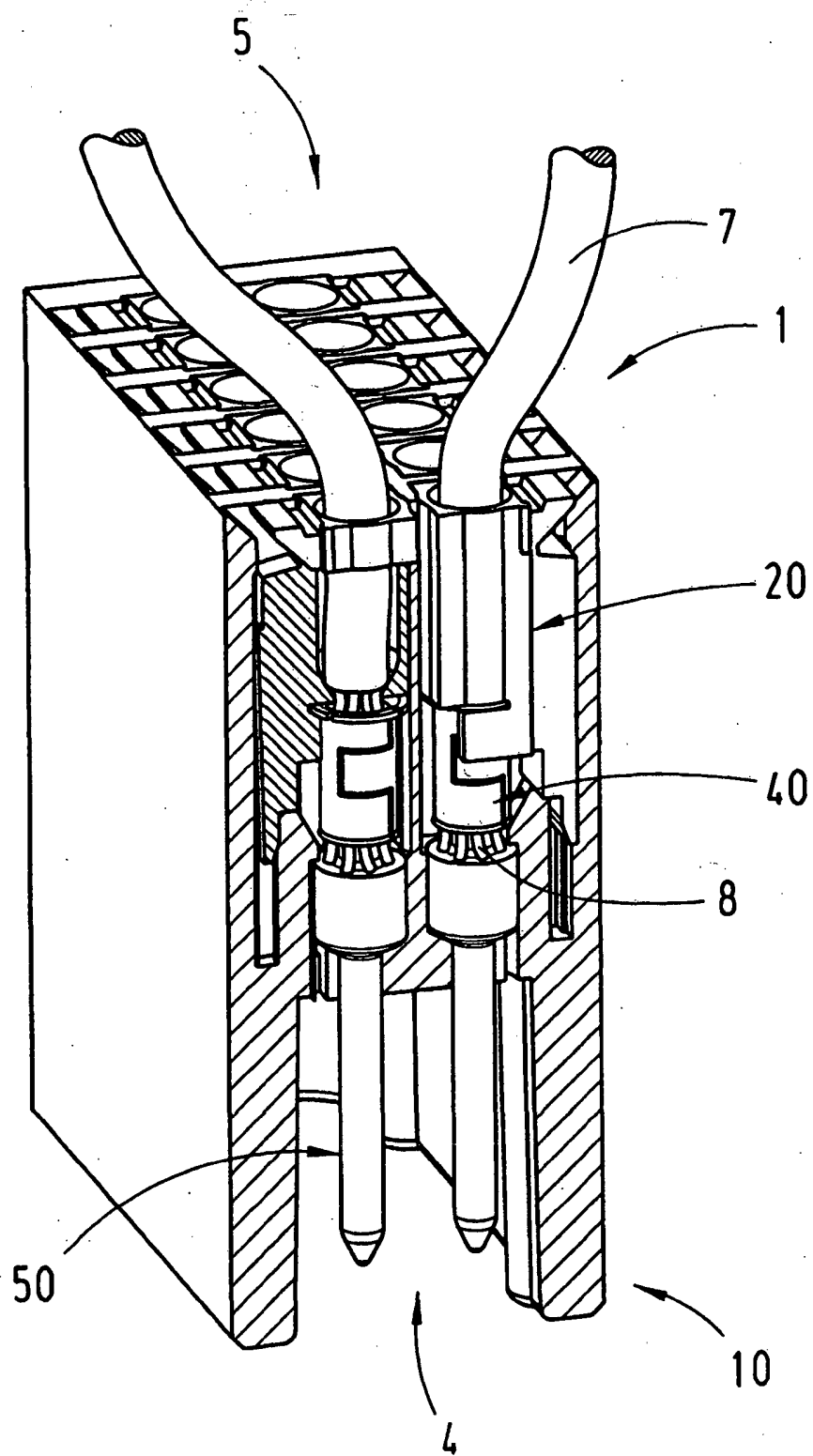


Fig. 8b

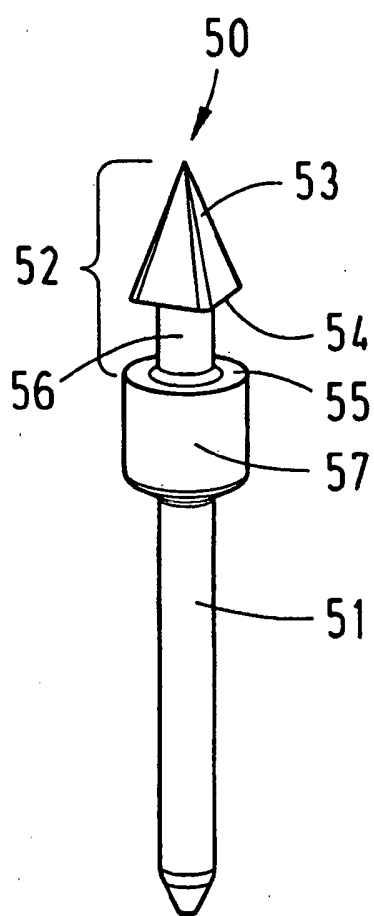


Fig. 9

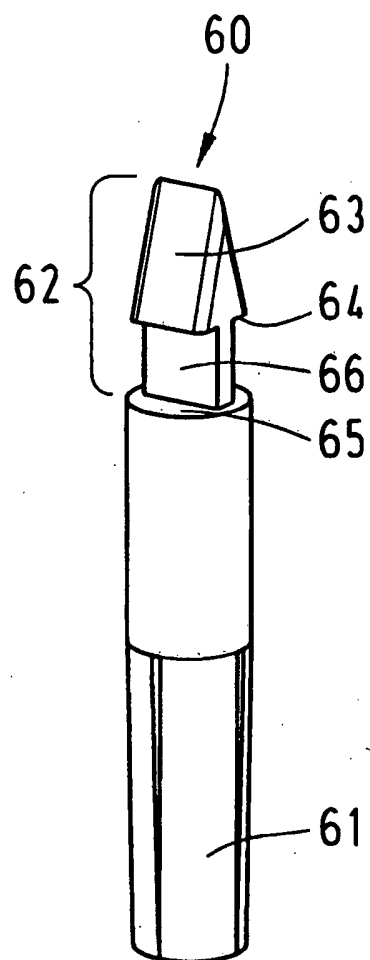


Fig. 10

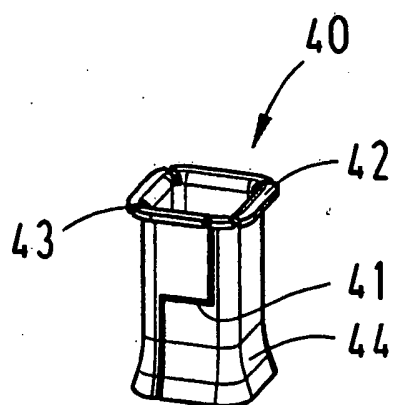


Fig. 11