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(54) Benævnelse: **AFSKÆRMET STIKKONTAKT MED SYMMETRISK ANBRAGTE KONTAKTSTIK**

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TITLE: AFSKÆRMET STIKKONTAKT MED SYMMETRISK ANBRAGTE KONTAKTSTIK

DESCRIPTION

SHIELDED ROUND PLUG CONNECTION UNIT WITH SYMMETRICAL ARRANGED CONTACT PLUGS

The invention relates to a round plug connector unit for shielded electrical cables, with an insulating body, around which a shielding sleeve engages and in which a plurality of electrical socket- and/or pin-like plug contacts are arranged in receiving chambers, wherein the shielding sleeve latches to the insulating body and is latchable to part of a plug connector receiving housing, wherein the plug-side end of the shielding sleeve has an even number of axially extending sleeve segments, separated by longitudinal slots, and wherein the sleeve segments, which follow one another in the circumferential direction of the shielding sleeve, each have a uniform radial offset in an alternating direction to one another, and wherein the sleeve segments of two identically designed shielding sleeves are pluggable into one another in the event of a rotational offset in the circumferential direction of the shielding sleeves, wherein the rotational offset arises from 360° divided by the number of sleeve segments

A plurality of round plug connectors are known in the most varying embodiments in the prior art. Known round plug connectors have a connector body configured as an insulating body with contact elements secured thereon for the connection of wire lines, which have a cable connection side and a plug side. By using shielded cables for signal transmission, the insulating body is often engaged, in particular in non-metallic plug connector housings, inside a shielding sleeve, with which the cable shielding mesh can be connected to an antagonist connector for the transfer of the shielding potential. A similar round plug connector unit consisting of the insulating body and the shielding sleeve may be arranged, for example, in a round plug connector provided only for the connection of signal lines or in one for the connection of power and signal lines.

It is further known to manufacture plug connectors such as straight or right-angle plug connectors, to which an antagonist plug connector is associated respectively having equally arranged antagonist plug contacts and an antagonist shielding sleeve. For the plug connector and the antagonist plug connector, different insulating bodies and dif-

ferent shielding sleeves are generally used, making manufacturing more expensive and raising the storage cost for these components.

With respect to the state of the art reference is made to documents EP 1 274 154 A2 and DE 10 2011 056798 A1.

Document EP 1 274 154 A2 discloses a shielded plug connector by means of a shielding sleeve, which presents a part of a male connector with a male plug contact and a part of a female connector with a female plug contact, which are associated with each other, wherein the plug-side end of the shielding sleeve comprises two and therefore an even number of axially extending sleeve segments, separated by longitudinal slots. One of the two sleeve segments is frontally connected to the body of the shielding sleeve without a radial offset, while the other sleeve segment has a radial offset with respect to the latter and to the body of the shielding sleeve. The two parts of the plug connector can be plugged into one another on the plug side in the case of a rotational offset of 180 degrees, wherein the sleeve element with the radial offset overlaps the sleeve segment without radial offset on its outer circumference. In this regard, the shielding sleeves of the two connector parts are arranged relative to each other such that their central axes are laterally offset with respect to each other, when the two shielding sleeves are configured identically and are plugged one in the other with a rotational offset. To compensate for this offset, at least the plug areas of the male and/or female plug contact are arranged eccentrically in the insulating bodies concentrically accommodated in the shielding sleeves.

Document DE 10 2011 056798 A1 shows an electrical connector plug, with a insulating housing, into which a free end of a cable is inserted, with a first electrically conductive spring element, which is arranged in a first peeled area of the free cable end on the shielding surrounding the cable conductors, with several contact elements, which are connected to the cable conductors, and with a shielding sleeve, which surrounds the first spring element, wherein the shielding sleeve is attached onto the cable sheath in front of and behind the first spring element. In the area of the free end, the shielding sleeve, which is configured on the plug-side end with a number of axially extending sleeve segments, separated by longitudinal slots, has retaining means for attaching the plug connector to a wall, which are provided in the form of various re-

taining hooks configured in a ring shape on the front surface of the shielding sleeve. The plug connector can be connected by making contact with an antagonist connector arranged on a wall, which is preferably arranged on a printed circuit board, wherein the retaining means latch behind the wall for attaching the plug connector to the antagonist connector. The plug connector and the antagonist connector are configured differently at least with respect to the shielding sleeve. The retaining means configured in the sleeve segments of the shielding sleeve of the plug connector prevent the same shielding sleeve from being also used for the antagonist connector.

To this end, the object of the invention is to propose an insulating body and a shielding sleeve to reduce the cost of storage, which can be assembled to form a round plug connector unit that can be used equally for the plug connector as well as for the antagonist plug connector, such that these two embodiments can thus be manufactured in an economic way.

This object is achieved according to the invention by means of a round plug connector unit with the characteristics of claim 1. Other advantageous configurations can be deduced from the said claims.

In the round plug connector unit according to the invention, in the case of insulating body accommodated in the shielding sleeve, the central axis of the insulating body coincides respectively with the central axis of the shielding sleeve and they form a longitudinal axis of the round plug connector unit, wherein the central axes of the shielding sleeves and the insulating bodies form a longitudinal axis of the round plug connector units assembled in the case of shielding sleeves that are plugged into one another, and according to the invention, the even number of the axially extending sleeve segments, separated by longitudinal slots is at least four, so that in the case of shielding sleeves that are plugged into one another due to the uniform radial offset of the sleeve segments, the longitudinal axes of the two round plug connector units are not radially offset with respect to each other. In this respect, the sleeve segments can extend absolutely in parallel or slightly angled relative to the shielding sleeve end on the connection side. Slightly angled means in this respect an envisaged inclination angle of typically less than 5 degrees, which is advantageous in particular in elastically configured sleeve segments. Therefore the shielding sleeve can be safely and relia-

bly electrically connected to the antagonist shielding sleeve. In this respect, radial offset of the sleeve segments, which follow one another in the circumferential direction of the shielding sleeve, may be inwardly and/or outwardly radially oriented with respect to the non-segmented part of the shielding sleeve. Therefore the distance of respectively two successive sleeve segments directly in the circumferential direction of the shielding sleeve with respect to the central axis of the shielding sleeve differs in the same value. This means that every first, third, and eventually fifth, etc. sleeve segment counted in the circumferential direction of the shielding sleeve is arranged, for example, along an inner orbit and every second, fourth, and eventually sixth, etc. sleeve segment along an outer orbit, which extends concentrically with respect to the central axis of the shielding sleeve, or vice versa. The distance between these two orbits corresponds with the radial offset of the sleeve segments.

In this respect, the width, measured in the circumferential direction of the shielding sleeve, of the sleeve segments as well as of the longitudinal slots can be selected at will in themselves. However, embodiments of invention are preferred, in which all the sleeve segments and/or longitudinal slots have a concordant width, wherein each of the sleeve segments is symmetrically arranged with respect to the central axis of the shielding sleeve and with respect to each of the other sleeve segments. The sleeve segments are thus arranged uniformly distributed in the circumferential direction of the shielding sleeve on the plug-side front-end of the shielding sleeve.

In a preferred embodiment of the invention, the sleeve segments have a right-angled bend directed radially inwards and/or outwards, which causes the offset. The right-angled sleeve segments extend essentially axially with an angle of inclination with respect to the central axis of the shielding sleeve of a maximum of 5 degrees at least after the right-angled bend point. In this regard, in one embodiment of the invention, the shielding segments located closer to the central axis of the shielding sleeve are bent inwards, while the shielding segments located further away from the central axis extend rectilinearlly or are bent outwards. Alternatively, the sleeve segments located closer to the central axis may also not have a right-angle bend, and the sleeve segments further away from the central axis may be bent outwards.

Preferably the offset of the sleeve segments corresponds at least with the wall thickness of the shielding sleeve. For the case where the sleeve segments are configured preferably elastically, the offset of the inner and outer sleeve segments may be somewhat greater than the wall thickness of the shielding sleeve. In the case of sleeve segments non-elastically configured, the radial offset of the sleeve segments corresponds with the wall thickness of the shielding sleeve.

In a favoured embodiment, the shielding sleeve has axially directed short and long sleeve segments, which are arranged successively in an alternating manner in the circumferential direction of the shielding sleeve. The short sleeve segments are produced, for example, by means of the right-angled bend of each second sleeve segment, when before the bend all the sleeve segments are axially configured with an equal length.

Thanks to the measures described above, the sleeve segments of the two identically configured shielding sleeves can be plugged one into the other with a determined rotational offset in the circumferential direction, which arises from 360 degrees divided by the number of the sleeve segments. So, for example, two identical shielding sockets, having four sleeve segments can be plugged one into another on the plug side, when one of the shielding sleeves is rotated by 90 degrees around the central axis of the shielding sleeve with respect to the another shielding sleeve. During the assembly, the respective outer sleeve segments of a rotated shielding sleeve overlap the inner sleeve segments of the other shielding sleeve and the outer sleeve segments of the other shielding sleeve overlap the sleeve segments of the inner rotated shielding sleeve, each time rotated outwardly. In this respect, the sleeve segments are supported against each other and are safely put into electrical contact. Therefore, this type of configured shielding sleeve can be used both for a connector part and for an antagonist connector part, when the latter is respectively mounted appropriately with a corresponding rotational angular offset. Therefore a plug without problems related to the shielding sleeves on the plug side is possible. The proposed shielding sleeve is preferably manufactured as a rolled-up folded and pointed piece and therefore in an economic manner.

The round plug connector unit according to the invention has an insulating body, accommodated in the shielding sleeve, that is backwardly offset near the plug-side end

of the shielding sleeve and latches to the shielding sleeve. The central axis of the insulating body is consistent with the central axis of the shielding sleeve in the case of an insulating body accommodated in the shielding sleeve and forms a longitudinal axis of the round plug connector unit. The retaining position of the insulating body and shielding sleeve is selected in this respect so that the insulating bodies of two round plug connector units according to the invention, which are determined for a connector part and an antagonist connector part, are not in the path when the shielding sleeve segments of the shielding sleeves plug into each other.

In a preferred embodiment of the round plug connector unit according to the invention, the insulating body has receiving chambers for the plug contacts, which are arranged around a central axis of the insulating body with an angular offset, arising from 360 degrees divided by the number of the sleeve segments. The angular offset of the receiving chambers of the insulating body corresponds to the rotational angular offset of the sleeve segments of the shielding sleeve oriented to the longitudinal axis of the round plug connector unit. The symmetrical arrangement of the insulating body plug contacts corresponds with the symmetrical arrangement of the sleeve segments in the shielding sleeve. According to the orientation of two round plug connector units according to the invention, in order that the shielding sleeves can be plugged one into the other with their end on the plug side, the receiving chambers of the two insulating bodies, of which respectively one is arranged on each shielding sleeve, they extend oriented exactly aligned with each other in the axial direction. The plug contacts incorporated in the receiving chambers, which are respectively opposite each other as electrical contacts, in the form of pin and socket, configured correspondingly, of the plug connector and the antagonist plug connector, can therefore be plugged into each other without difficulty. In this respect, the sleeve segments further act as encoding elements of the round plug connector, which reliably prevent a change of polarity. Instead of a single receiving chamber associated with each sleeve segment, each sleeve segment can also be associated with several receiving chambers forming a chamber group, which are arranged with rotational symmetry oriented to the central axis of the insulating body, as is the case in the individual receiving chambers.

Preferably the receiving chambers of the insulating bodies are configured so that they can receive plug contacts both in the form of a pin and also in the form of a socket.

The same insulating body can therefore be used for the connector part as well as for the antagonist connector part. In this respect, the insulating body can be made in one piece or in several pieces, wherein it can be inserted from the connection side of the cable into the shielding sleeve with plug contacts arranged in the receiving chambers, attached on the cable wires from the connection side of the cable on the insulating body. In the case of insulating bodies configured in a single piece, the plug contacts can be inserted in the axial direction from behind in the insulating body. In the case of insulating bodies configured in several pieces, these are most usually inserted in the radial direction in a part of the insulating body that then meets at least another part of the insulating body. In this respect, only plug contacts in the form of pins can be incorporated in the insulating body for use as a connector part and only plug contacts in the form of sockets, for use as an antagonist contact part or in the case of appropriate arrangement, also plug contacts in the form of pins and sockets in mixed equipment. The shielding connection can be implemented in a simple and well-known way with elastic elements that are integrated into the connector housing. A round plug connector unit can be installed in a round plug connector having a power and/or signal line and preferably latch to the receiving housing part of this plug connector.

The invention is explained in greater detail below by means of an example embodiment with reference to the drawing. Other characteristics of the invention are derived from the following description of the example embodiment of the invention in connection with the claims and attached figures. The individual characteristics of the invention can be materialised alone or in combination in different embodiments of the invention. The figures show:

Figure 1 a hybrid plug connection with a connector part and an antagonist connector part respectively having a round plug connector unit;

Figure 2 one of the round plug connector units according to the invention of Figure 1 as an exploded representation;

Figure 3 the two round plug connector units assembled of Figure 1 in a side view, assembled (Figure 3a) and not assembled (Figure 3b); and

Figure 4 the round plug connector units assembled of Figure 1 in a longitudinal section representation.

Figure 1 shows a hybrid plug connection 1 with a plug connector 2 and an antagonist plug connector 3 in the assembled state, in a partial longitudinal section representation. The plug connector 2 is configured as a straight round plug connector and the antagonist plug connector 3 is configured as a right-angled round plug connector. Both plug connectors have a metal plug connector housing 4, in which the not shown plug connector contacts that transmit power and represented plug contacts 5, 5' that transmit the signal are arranged. The plug contacts 5, 5' which transmit the signal are arranged in round plug connector units 6, 6', wherein the round plug connector unit 6, which is associated with the plug connector 2, has plug contacts in the form of a socket 5 and the round plug connector unit 6', which is associated with the antagonist plug connector 3, has plug contacts in the form of a pin 5'. The round plug connector units 6, 6' respectively comprise a shielding sleeve 7 and an insulating body 8 which are latched to each other.

Figure 2 shows one of the round plug connector units 6, 6 ' according to the invention of Figure 1 as an exploded representation. The round plug connector unit 6' represented has an insulating body 8 in two parts with an insulating body sleeve 9 in pot form and an insulating contact support 10 which can be inserted from the connection side of the cable into the insulating body sleeve 9. In the contact support 10, the plug contacts 5' can be radially inserted in the form of a pin with not represented attached wires of a shielded cable. The contact support 10 can then be inserted into the insulating body sleeve 9 and latch thereto. The insulating body 8 thus formed can be axially inserted from behind into the shielding sleeve 7, which is preferably manufactured as a rolled-up folded and pointed piece. The cable shielding of the shielded electrical cable not shown in the drawing can be connected to the shielding sleeve 7 via a shielding contact sleeve 11. The round plug connector unit 6 is correspondingly similar, wherein the difference lies only in the plug contacts 5 inserted in the form of a socket.

Figures 3a, 3b show the round plug connector units 6, 6 ' according to the invention assembled (Figure 3a) and not assembled (Figure 3b). Especially Figure 3b clearly shows that the end 12 of the shielding sleeve 7 on the plug side has an even number,

in this case four axially extending sleeve segments 14, separated by longitudinal slots 13. The sleeve segments 14 comprise in each case two short sleeve segments 14' and two long sleeve segments 14', which are arranged successively in the circumferential direction of the shielding sleeve 7. A long sleeve segment 14' is followed by a short sleeve segment 14', then again a long sleeve segment 14'' to which again a short sleeve segment 14' connects. The sleeve segments 14 are arranged in a circular shape around a central axis 17 of the shielding sleeve 7, wherein the short sleeve segments 14 respectively have a uniform radial offset 18 inwardly with respect to the long sleeve segments 14''. The offset 18 extends in an alternating direction oriented to the sleeve segments 14' and 14''. In the case of these sleeve segments 14 is alternately oriented inwards and outwards.

In the represented example embodiment of the round plug connector units 6 or 6' according to the invention, the short sleeve segments 14' have a right-angel bend 19 radially directed inwards, which causes the offset 18 between the long sleeve segments 14'' and the short sleeve segments 14'. The offset 18 of the successive sleeve segments 14 approximately corresponds with the wall thickness of the shielding sleeve 7, wherein the short sleeve segments 14' are configured preferably in an elastic way by means of the right-angle bend. Received respectively in the shielding sleeves 7 are the insulating bodies 8, whose ends 15 on the plug side are arranged at the short end of the short sleeve segments 14'. Plug-in contacts in the form of a pin 5 ' protrude from the insulating body 8 of the round plug connector unit 6' of the antagonist plug connector 3. Plug contacts in the form of a socket 5 received in insulating body 8 of the plug connector unit 6 of the plug connector 2 cannot be seen in Figure 3b.

The round plug connector units 6, 6' are arranged rotational to each other at 90 degrees around the longitudinal axis 20 of round plug connector units 6, 6'. The short sleeve segments 14' of the shielding sleeve 7 of the round plug connector units 6, 6' are each time directly respectively opposite to the long sleeve segment 14' of the respective other shielding sleeve 7 and vice versa. In this respect, the sleeve segments 14', 14'' with the adjacent longitudinal slots 13 respectively have a uniform width in the circumferential direction of the shielding sleeve 7. Therefore, the two shielding sleeves 7 can be plugged into each other, as shown in Figure 3a, until the insulating bodies 8 are placed against each other. In this state the plug contacts in the form of a pin 5' engage

in the plug contacts in the form of a socket 5, as shown in Figure 1. In the assembled state of the two round plug connector units 6, 6', the long sleeve segments 14" respectively overlap the short sleeve segments 14' and are electrically in contact therewith.

This can also be deduced from Figure 4, which shows the round plug connector units 6, 6' assembled in a longitudinal section representation. In addition, this figure again clearly shows the contact support 10 arranged on the insulating body sleeve 9 of the insulating body 8. The contact support 10 has receiving chambers 16, which are configured so that they can receive plug contacts 5, 5' both in the form of pins and sockets. The receiving chambers 16 are arranged symmetrically in rotation oriented to the central axis 17, 17' of the insulating body 8 and therefore around a longitudinal axis 20 of the round plug connector units 6, 6', so that the pole diagram is also preserved during the 90° rotation of one of the round plug connector units 6, 6', which is consistent with the number of the sleeve segments 14 configured in the example embodiment as 360 degrees divided by 4. Plug contacts 5, 5' on the central axis 17, 17' can obviously also be arranged.

PATENTKRAV

1. Et rundstik (6, 6 ') til afskærmede elektriske kabler med et isolerende legeme (8) rundt med en afskærmningsmuffe (7) der er i kobles sammen med en flerhed af stikkontakter og / eller stift stikkontakter (5, 5 ') er anbragt i modtage kamre (16), hvor afskærmningsmuffen (7) låses til isoleringslegemet (8) og kan låse til en modtage del af et stikkontakthus (4,4'), hvor stikket har et ensartet antal aksialt forløbende muffesegmenter (14,14'14 ") af to identisk udformede afskærmningsmuffer (7), der kan kobles ind i hinanden i tilfælde af en rotationsforskydning i omkredsretningen af afskærmningsmufferne (7), hvor rotationsforskydningen stammer fra 360 ° divideret med antallet af muffesegmenter (14,14'14 "), kendetegnet ved, at, når isoleringslegemet (8) er anbragt i afskærmningsmuffen (7), sammensættes isolationslegemets (8) midterakse i hvert tilfælde sammen med skærmens hylster (8) 's centerakse (17, 17') og danner en akse i længderetning (20) af den runde stikforbindelsesenhed (6, 6 '), idet det ensartede antal af .muffesegmenterne (14, 14, 14' ') er på mindst fire, og at når afskærmningshylderne (8) er sat ind i hinanden , de langsgående akser (20) af de to runde stikforbindelsesenheder (6,6 ') ikke er forskudt radialt i forhold til hinanden på grund af den ensartede radiale forskydning af bøsningssegmenterne (14, 14'14 ").

2. Rundstikket ifølge krav 1, er kendetegnet ved, at muffesegmenterne (14,14'14 ") har en retvinklet bøjning (19), som er rettet radialt indad og / eller udad og har en forskydning (18).

3. Rundstikket er ifølge krav 2, kendetegnet ved, at forskydningen (18) af hylstresegmenterne (14, 14, 14 ") svarer til mindst vægtykkelsen af afskærmningsmuffen (7) 0,4.

4. Rundstikket er ifølge et af de foregående krav, kendetegnet ved, at muffesegmenterne (14, 14, 14 ") i det mindste er af delvist elastisk design.

5. Rundstikket er ifølge et af de foregående krav, kendetegnet ved, at afskærmningshylsteret (7) har hylstre segmenter (14), der er korte (14 ') og lange (14' ') i aksialretningen og er arrangeret efter hinanden på en vekslende måde i omkredsretningen af afskærmningsmuffen (7)

6. Rundstikket er ifølge et af de foregående krav, kendetegnet ved, at isoleringslegemet (8) har modtage kamre (16) til stikkontakterne (5, 5 '), idet de modtagende kamre er anbragt omkring en midterakse (17) ') af isoleringslegemet (8) med en vinkelforskydning, der opstår fra 360° der er divideret med antallet af muffesegmenter (14).

7. Rundstikket er ifølge et af de foregående krav, kendetegnet ved, at modtage kamrene (16) er udformet på en sådan måde, at de kan modtage både stiftelignende og stikkontaktkontakter (5,5 ') .

8. Rundstikket ifølge et af de foregående krav, kendetegnet ved, at den runde stikforbindelsesenhed (6, 6 ') er monteret eller monterbar i en rund stikkontakt (2,3) med strømledninger og / eller signallinjer

AFSKÆRMET STIKKONTAKT MED SYMMETRISK ANBRAGTE KONTAKTSTIK

1. Et rundstik (6, 6 ') til afskærmede elektriske kabler med et isolerende legeme (8) rundt med en afskærmningsmuffe (7) der er i kobles sammen med en flerhed af stikkontakter og / eller stift stikkontakter (5, 5 ') er anbragt i modtage kamre (16), hvor afskærmningsmuffen (7) låses til isoleringslegemet (8) og kan låse til en modtage del af et stikkontakthus (4,4'), hvor stikket har et ensartet antal aksialt forløbende muffesegmenter (14,14'14 ") af to identisk udformede afskærmningsmuffer (7), der kan kobles ind i hinanden i tilfælde af en rotationsforskydning i omkredsretningen af afskærmningsmufferne (7), hvor rotationsforskydningen stammer fra 360 ° divideret med antallet af muffesegmenter (14,14'14 "), kendetegnet ved, at, når isoleringslegemet (8) er anbragt i afskærmningsmuffen (7), sammensættes isolationslegemets (8) midterakse i hvert tilfælde sammen med skærmens hylster (8) 's centerakse (17, 17') og danner en akse i længderetning (20) af den runde stikforbindelsesenhed (6, 6 '), idet det ensartede antal af .muffesegmenterne (14, 14, 14' ') er på mindst fire, og at når afskærmningshylderne (8) er sat ind i hinanden , de langsgående akser (20) af de to runde stikforbindelsesenheder (6,6 ') ikke er forskudt radialt i forhold til hinanden på grund af den ensartede radiale forskydning af bøsningssegmenterne (14, 14'14 ").

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6. Rundstikket er ifølge et af de foregående krav, kendetegnet ved, at isoleringslegemet (8) har modtage kamre (16) til stikkontakterne (5, 5 '), idet de modtagende kamre er anbragt omkring en midterakse (17) ') af isoleringslegemet (8) med en vinkelforskydning, der opstår fra 360° der er divideret med antallet af muffesegmenter (14).

7. Rundstikket er ifølge et af de foregående krav, kendetegnet ved, at modtage kamrene (16) er udformet på en sådan måde, at de kan modtage både stiftelignende og stikkontaktkontakter (5,5 ') .

8. Rundstikket ifølge et af de foregående krav, kendetegnet ved, at den runde stikforbindelsesenhed (6, 6 ') er monteret eller monterbar i en rund stikkontakt (2,3) med strømledninger og / eller signallinjer

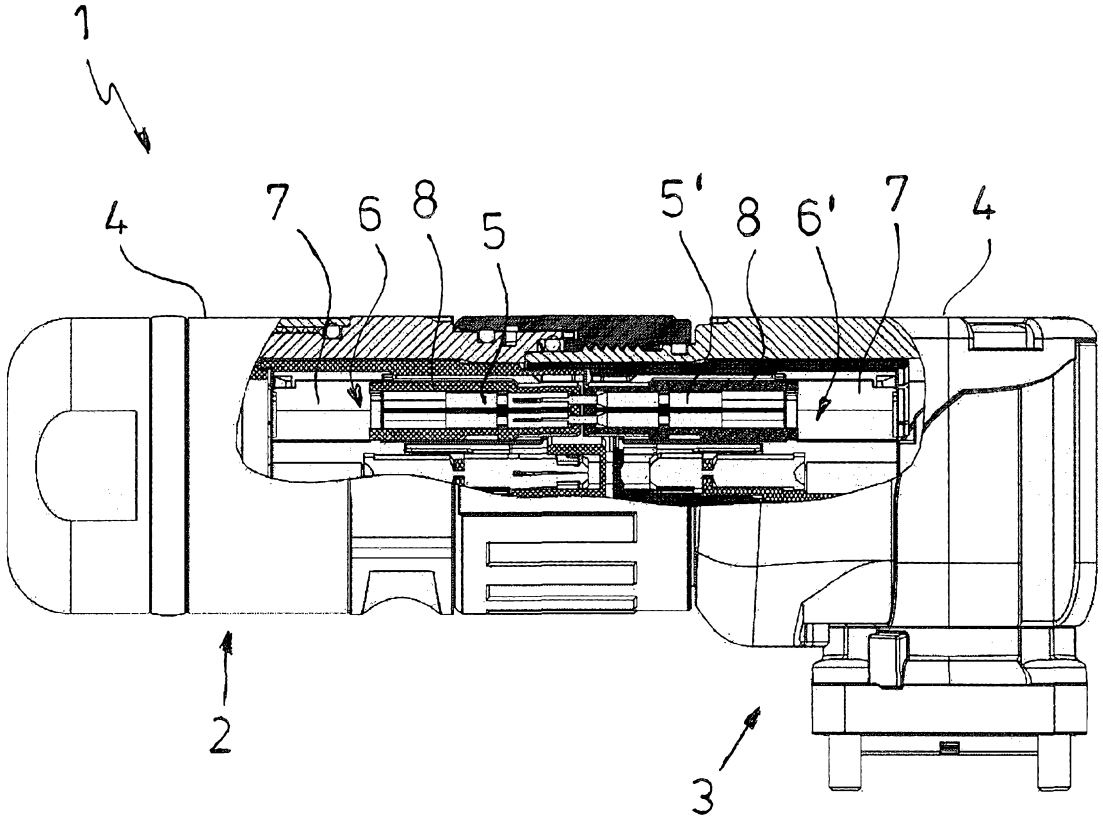

Fig. 1

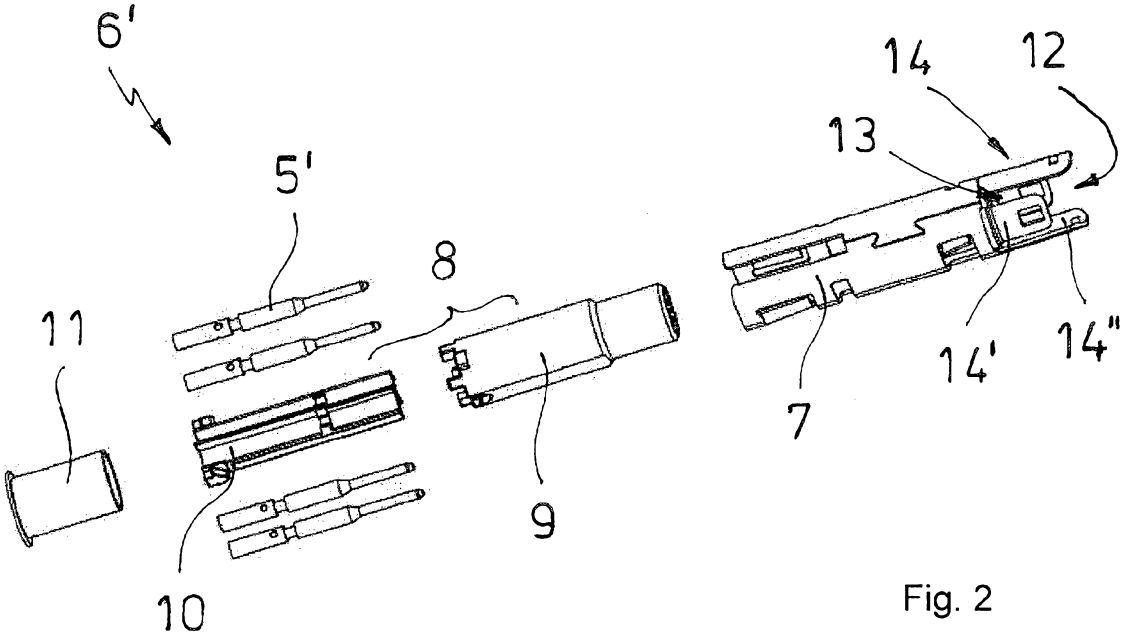

Fig. 2

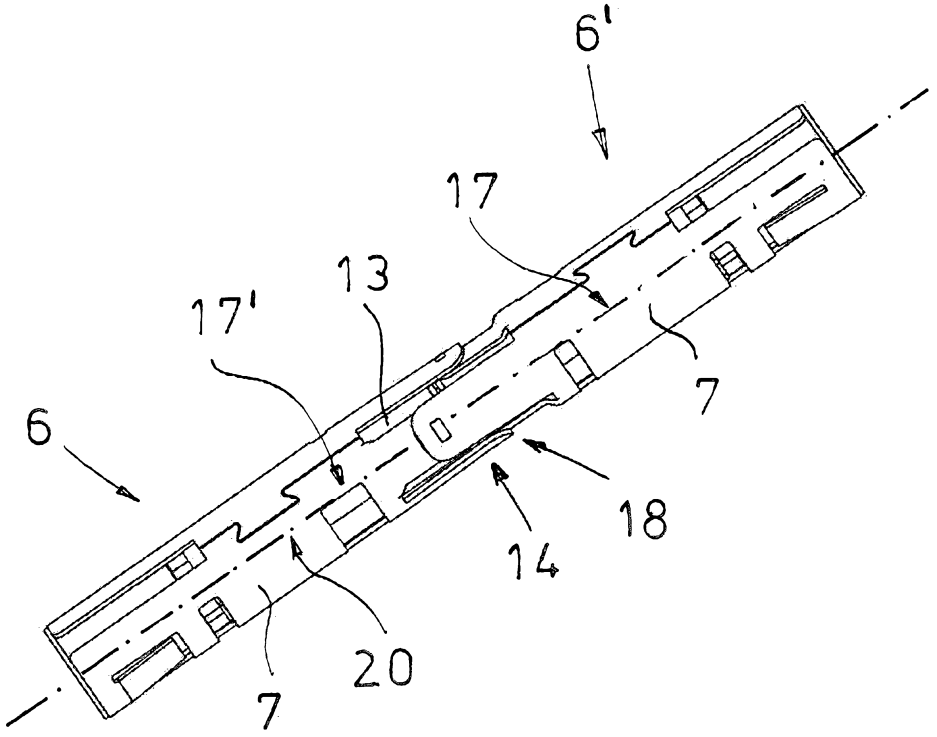

Fig. 3a

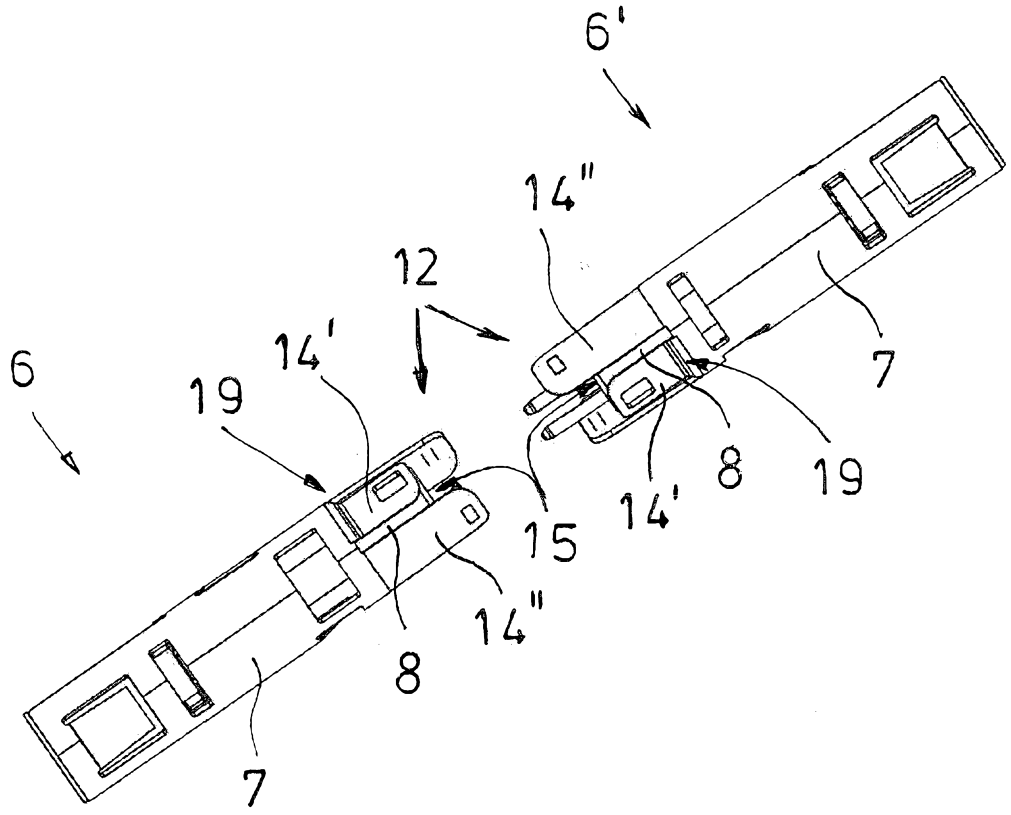

Fig. 3b

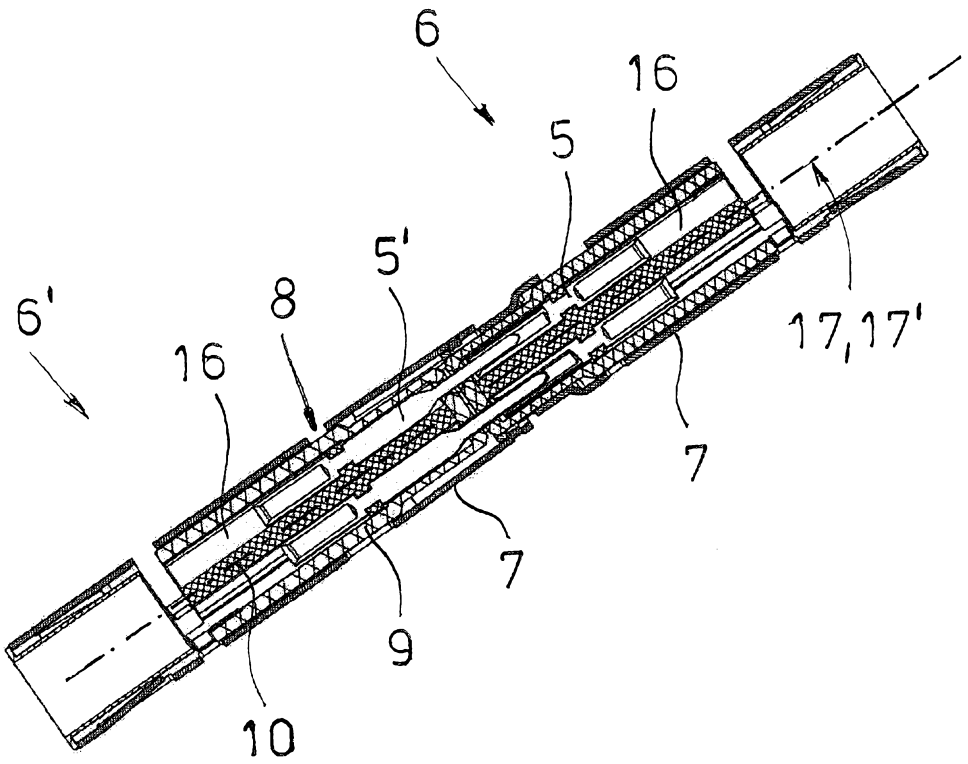

Fig. 4