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(54) **ELECTRICAL CONNECTOR SYSTEM WITH SHIELDING SLEEVE**

(57) The present invention relates to an electrical connector system, wherein the electrical connector system comprises at least a connector housing 100 having a shield cavity 130 formed therein; at least one shielding sleeve 200, adapted to be installed at least partially within the shield cavity 130, wherein the shielding sleeve 200 comprises at least one contact lance 210 provided with a spring portion 212 and a contact portion 211, wherein

in an uninstalled state the spring portion 212 extends radially outward from the shielding sleeve 200, and the contact portion 211 extends radially inward into the shielding sleeve 200; and wherein the connector system comprises further at least one wedge element 300, adapted to surround at least parts of the shielding sleeve 200 and to bend the at least one contact lance 210 inwardly when the wedge element 300 is installed.

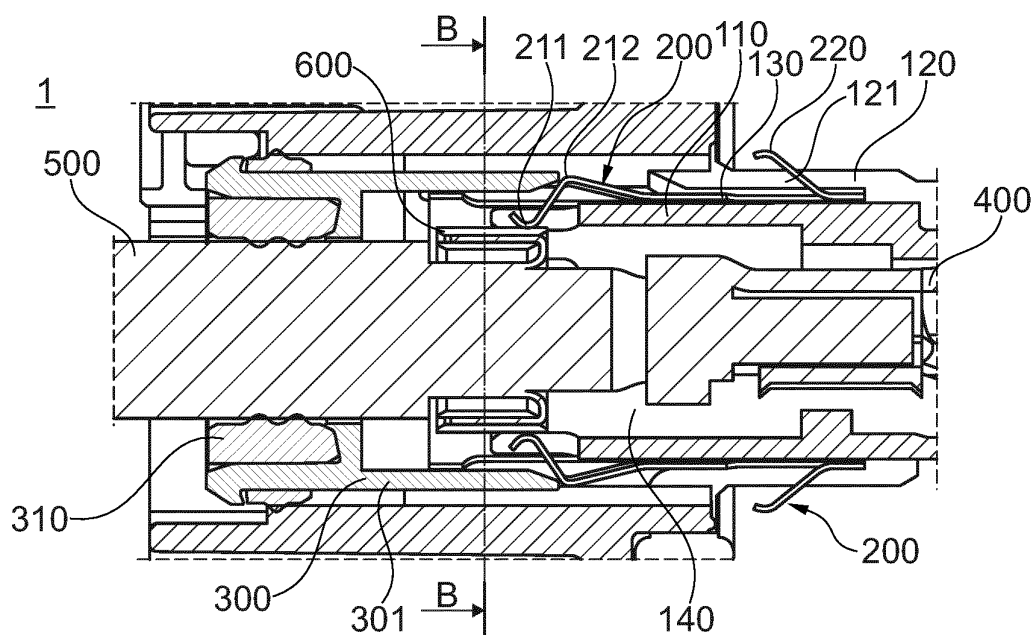


Fig. 8A

EP 3 107 155 A1

Description

Field of the invention

[0001] The present invention relates to an electrical connector system and a method to assemble the same, wherein the electrical connector system comprises a shielding sleeve for the continuous shielding of a conducting element, as e.g. a cable.

Technical background

[0002] In many fields of applications, electrical cables and connections need to be electromagnetically shielded. Shielding of the connectors and cables is an essential need to avoid possible interferences or damage caused by voltages which can be induced by electromagnetic energy. Often it is of importance to electrically connect the electromagnetic shielding of, for example, a power or signal cable to the electromagnetic shielding of a housing to establish shielding continuity. Due to the large demand for electrical components, e.g. in the field of automotive applications, such components have to be efficiently and inexpensively producible; however, they still have to fulfil high quality standards. Therefore, it is of great advantage if complicated parts can be saved, e.g. by incorporating their function into parts which are unavoidable, or by allowing a pre-assembly of certain components, in order to facilitate the final manufacturing step. Preferably, no tools are needed to finally assemble the connector system. An example of a typical prior art shielding connection is given in the US patent document no. 4,547,623. Here, the shielding of a cable is electrically connected to a metallic housing to achieve a shielding continuity in a connector arrangement where the cable shielding is removed. To establish the connection, the cable insulation is partially removed and an assembly of different metal rings is arranged around the dismantled portion of the cable and in electrical contact with the cable shielding. This ring assembly is in electrical contact with the inner surface of the conductive housing, thereby providing shielding continuity over the connector.

[0003] In order to provide a more flexible solution, US document no. 5,237,129 proposes to use contact elements in form of toroidal spring elements to establish electrical contact between the shielding of a cable and the shielding of a connector housing the cable is mounted to. These spring elements are positioned inside of a metallic housing at a dismantled portion of the cable in electrical contact with the cable shielding. Upon assembly the springs are compressed in axial direction such that they expand in the radial direction thereby pressing against the cable shielding on one side and the inner wall of the metallic housing on the other side. Thus an electric connection between the cable shielding and the metallic housing is established.

[0004] The development of such connection elements culminated in sophisticated spring elements as e.g. pre-

sented in the European publication EP 2 109 201 A2. This document discloses a new kind of spring element which can be mounted inside of a metallic housing establishing an electrical connection to the shielding of a cable within a dismantled portion of the cable. This new spring element is constructed in a very sophisticated way offering a large range of possible diameters for the cable as well as a large range of possible inner diameters of the housing.

[0005] The above described parts are examples of common solutions providing an electrical connection between the shielding of a power cable to an outer connecting element as e.g. the shielding of a connector housing. The solution proposed in document US 4,547,623 constitutes a complicated assembly consisting of many parts. The connecting parts are inflexible metallic rings which have to be fabricated within small tolerances and are therefore only applicable within a special designated assembly. Documents US 5,237,129 and EP 2 109 201 A2 propose to establish the required connection by using spring elements which are more flexible. However, such elements are complicated in fabrication and expensive. Further, all prior solutions require at least one extra part to electrically connect the cable shielding to an outer shielding element. These solutions are therefore relatively complicated in assembly and error-prone. For these reasons, the above described solutions are in particular not optimal for the use in mass production.

[0006] Further, US application US 2013/084 741 A1 describes an electromagnetic shielding device for electromagnetic shielding of a power transmitting arrangement adapted to house an electromagnetically shielded conducting element. The electromagnetic shielding device has essentially the form of a sleeve and further includes a weakened portion, which is adapted to be contracted for establishing an electrical connection between the device and the shielding of the conducting element. However, such a shielding device needs to be contracted in general by using specific tools, such as crimping tools.

[0007] Further, the weakened portions are not secured within the housing so that during the use of the connector, i.e. due to vibrations or the like, the contractive portions might be loosened and the electrical contact between the shielding device and the further shielding components might be opened, so that the shielding continuity would be interrupted.

[0008] Subject matter of the present invention is to provide a new electrical connector system with an electromagnetic shielding sleeve which minimizes or eliminates the problems described above. It is a further object of the invention to provide an electromagnetic shielding sleeve with increased contact force between the shielding sleeve and the electromagnetic shielding of the inserted shielded cable. Further, the new shielding sleeve shall be secured within the housing of an electrical connector system, so that unintentional displacement of the shielding sleeve during the insertion of further components, such as terminals or the like is prevented. Still further, it

is an object of the invention to achieve all the advantages with an inexpensive product, which can preferably be made out of a single piece of sheet metal.

Detailed description of the invention

[0009] These and other objects, which become apparent upon reading the following description, are solved by an electrical connector system according to claim 1 and a method to assemble an electrical connector system according to claim 15.

[0010] In particular, these and other objects are solved by an electrical connector system comprising a connector housing having a shield cavity formed therein; at least one shielding sleeve, adapted to be installed at least partially within the shield cavity, wherein the shielding sleeve comprises at least one contact lance provided with a spring portion and a contact portion, wherein in an uninstalled state, the spring portion extends radially outward from the shielding sleeve and the contact portion extends radially inward into the shielding sleeve; and at least one wedge element, adapted to surround at least parts of the shielding sleeve and to bend the at least one contact lance inwardly when the wedge element is installed.

[0011] Commonly, such electromagnetic shielding sleeves are needed particularly to allow for continuously shielding of complex assemblies. For example, in the case that cables need to be connected to signal or power contacts, the cables have to be dismantled to allow for an electrical connection. The dismantled cable core and usually the power and/or signal contact are not electromagnetically shielded and thus, a shielding "bridge" is required. The new electromagnetic shielding sleeve is particularly adapted to continue the shielding of the cables in such a case where the cables are mounted in a connector assembly or the like.

[0012] The shielding sleeve is further preferably formed from a single metal sheet by stamping, embossing, punching or the like. The therein formed contact lances having spring portions that extends radially outward from the shielding sleeve and contact portions that extend radially inward into the shielding sleeve, allow to contact a shield of an e.g. electrical cable inside the shielding sleeve. Further, the spring portions can be bent inwardly so that the contact portions are pressed against the possible shield of a cable. This pressing will increase the contact force between the shielding sleeve and the electromagnetic shielding of an e.g. shielded cable significantly. The wedge element is therefore arranged so that it bends at least one contact lance inwardly. The wedge element preferably comprises a rigid material, such as a rigid plastic that is dimensionally stable, when surrounding at least parts of the shielding sleeve and bending the contact lance inwardly. Further, the wedge element is preferably able to withstand temperatures of up to 130°C, preferably up to 200°C, more preferably up to 250°C. An example material is polyamide which is preferably reinforced with glass fibers.

[0013] Providing the shielding sleeve within a shield cavity allows securing the shielding sleeve within the connector housing, so that a possible displacement is prevented at least in axial direction, wherein the axial direction is the direction of the cable provided within the connector housing. Further preferably, the electrical connector system comprises a shielded cable, wherein the shielded cable is preferably provided with a ferrule, electrically conductive connected with the shield of the shielded cable, wherein the shielded cable is at least partially arranged within the connector housing and wherein the at least one contact lance is bent inwardly so that the contact portion of the contact lance is pressed against the shield of the shielded cable and/or the ferrule, if the at least one wedge element is installed.

[0014] The wedge element is installed, when it at least partly surrounds the shielding sleeve and bends the at least one contact lance inwardly. Preferably, the wedge element is therefore at least partially arranged within the housing. By pressing the contact portion of the contact lance against the shield and/or a ferrule, the contact force between the contact portion and the shield and/or the ferrule can be increased significantly.

[0015] Preferably, the contact force between the shield of the shielded cable and/or the ferrule and the contact portion of the contact lance is increased by pressing the contact portion against the shield of the shielded cable and/or the ferrule, so that the electrical conductive contact between the ferrule and the contact portion can be preserved up to a vibration level of at least 40 g sinus, preferably of up to at least 50 g sinus and most preferably up to at least 60 g sinus. These vibration levels allow a safe contacting between the elements (i.e. the shield of the shielded cable and/or the ferrule on the one hand and the contact portion of the contact lance on the other hand) even under rough environmental conditions. The vibration level can be determined according to PSA class V3 according to B217051, according RSA-Nissan 40g sinus power train whip profile acc 36-05-019, according to AK vibration profile severity 3 (LV214) and/or according to Volvo truck class 6 (12.4g RMS).

[0016] Thus, in particular in the field of vehicles, the shielding sleeve provides a secure shielding continuity even under harsh environments. Preferably, prior to the installed state of the wedge element, the at least one wedge element is arranged slidably on the shielded cable, wherein in the installed state, the at least one wedge element is preferably fixedly arranged, at least partially, within the connector housing.

[0017] Providing the wedge element slidably on the shielded cable allows to pre-assemble the cable and the wedge element in advance. This is a typical requirement for the use in vehicles, since typically cable trees are pre-assembled, so that the plugging, mating or connecting of the electrical connector systems that correspond to the cable tree can be performed rapidly, and preferably manually without using specific tools. Thus, by arranging the wedge element slidably at least on the shielded cable,

the wedged element can be moved from an uninstalled state in the installed state by simply sliding it along the longitudinal axis of the shielded cable so that the wedge element is guided in the installed position. Typically, the housing provides a cavity, for receiving further connector system components, such as terminals, cables, seals and/or the like. Preferably, the at least one wedge element is at least partially arranged within that cavity of the connector housing in the installed state.

[0018] Preferably, the wedge element comprises at least one actuating means, wherein the at least one actuating means is adapted to contact the spring portion of the at least one contact lance and to bend the at least one contact lance inwardly when the wedge element is installed. To allow a secure and continuous shielding, the contact lance has to be bent inwardly. This is preferably achieved by the actuating means. Typically, one actuating means is sufficient to bend the at least one contact lance inwardly. However, due to space requirements of the connector, it might be advantageous to provide several actuating means that can be dimensioned smaller than one actuating means that has to interact with all contact lances provided.

[0019] Preferably, the actuating means of the wedge element is tubular. Providing a tubular actuating means is advantageous, since the contact lances can be arranged in any suitable form around the shielding sleeve. Thus, the actuating or bending of the contact lances can be performed with one single wedge element, so that different shielding sleeve can be assembled with one standardized wedge element. Further, by bending the contact lances inwardly, different cable diameters can be continuously shielded with one shielding sleeve. Since the at least one contact portion of the contact lance contacts the shield and/or the ferrule of the cable to be shielded, and the at least one spring portion of the shielding sleeve is flexible, the shielding sleeve can be adapted to different cable diameters. Thus cables having different diameters can be shielded. Still further, using bendable contact lances, allows greater tolerances, so that manufacturing costs can be reduced.

[0020] Preferably, the shielding sleeve comprises at least two contact lances, preferably at least four contact lances and most preferably at least six contact lances, wherein the wedge element comprises preferably a corresponding number of actuating means. Providing several contact lances is advantageous, since the contact force is applied at different points, e.g. spread circumferential around the shielding and/or the ferrule of the cable. Further, a redundant contact can be achieved. By applying the contact lances circumferential around the shielding sleeve, the cable can be centered within the shielding sleeve, due to the contact lances. Having a corresponding number of actuating means allows each contact lance to be actuated individually. However, it is also possible to actuate two or more contact lances with one actuating means.

[0021] Preferably, the shielding sleeve further com-

prises at least one locking lance that preferably extends radially outward from the shielding sleeve and wherein the connector housing comprises at least one corresponding locking means, wherein the locking lance is adapted to engage with the locking means when the shielding sleeve is arranged within the shield cavity. Said engaging between the locking means and the locking lance of the shielding sleeve secures the shielding sleeve in the connector housing axially and/or radially. Thus, when further assembling the electrical connector system, the shielding sleeve is less prone to unintentional displacement. Further, the locking lances can protrude through the corresponding locking means and are preferably used to contact, for example, a housing, so that the shielding "bridge" is closed to provide a continuous shielding.

[0022] Preferably, the connector housing comprises a terminal cavity, designed to receive at least one electrical terminal, and wherein the contact portion of the contact lance does not extend into the terminal cavity, before the at least one wedge element is installed to surround at least part of the shielding sleeve and to bend the at least one contact lance inwardly. The terminal allows the electrical connection of the connector system to a corresponding counter connector. A contact lance that does not extend into the terminal cavity reduces the risk of displacing the shielding sleeve during the insertion of the terminal. Thus, the error rate during the assembly of the electrical connector system can be reduced.

[0023] Preferably, the electrical connector housing further comprises at least one first guiding means for guiding the electrical terminal within the terminal cavity and preferably further comprises at least a second guiding means for guiding the shield of the shielded cable and/or the ferrule within the terminal cavity and even more preferably further comprises at least a third guiding means for guiding the wedge element within the connector housing. Typically, these guiding means are formed as ribs that are orientated along the axial direction, wherein the axial direction is also the longitudinal direction of the terminal cavity. These guiding ribs help to guide the single components of the electrical connector system, i.e. the terminal, the shield of the cable and/or the ferrule and the wedge element to their final position in the installed state. Thus, the assembly of the connector system is facilitated. Alternatively, the guiding means are formed as recesses that correspond to contours of the components of the electrical connector system.

[0024] Preferably, the electrical connector system further comprises at least one cable stop, preferably comprising a strain relieve, wherein the cable stop is arranged adjacent to the at least one wedge element in longitudinal direction of the cable, to secure the at least one wedge element in longitudinal direction of the cable. Since the cable is arranged slidably on the cable, it has to be secured in that axial direction in order to remain at that installed position. In this position, the wedge element bends the contact lances inwardly, to establish high con-

tact forces between the shield and/or the ferrule and the contact portion of the contact lance. Securing the wedge element by means of a cable stop is advantageous, since different functions can be integrated in one part. Since cable stops and/or strain relieves are typically required, the number of parts can be reduced by integrating the securing functionality within the cable stop.

[0025] Preferably, the wedge element is provided with a sealing member, which sealing member is preferably over-molded and arranged on the wedge element, preferably comprising at least two sealing lips, and wherein the sealing member seals the wedge element against the cable and against the connector housing so that the terminal cavity is sealed. Typically, a sealed terminal cavity is a requirement for the electrical connector system to be used in vehicles or the like. Thus, the connector system is protected from environmental influences, such as moisture, dust and other contaminants. Providing a sealing member that is over-molded or arranged on the wedge element is advantageous, since multiple functions can be integrated into one part. Thus, the number of parts to be assembled can be reduced and the assembly of the connector system can be facilitated.

[0026] The objects are further solved by a method to assemble an electrical connector system, wherein the method comprises: providing a connector housing, wherein the connector housing has a shield cavity formed therein, providing at least one shielding sleeve, and installing the at least one shielding sleeve at least partially within the shield cavity, wherein the shielding sleeve comprises at least one contact lance provided with a spring portion and a contact portion, wherein in the uninstalled state the spring portion extends radially outward from the shielding sleeve and the contact portion extends radially inward into the shielding sleeve and providing at least one wedge element and installing the at least one wedge element, preferably at least partially within the connector housing so that the at least one wedge element surrounds at least parts of the shielding sleeve and bends at least one contact lance inwardly. Bending the at least one contact lance inwardly by means of the wedge element is advantageous, since the contact force of the contact between the shielding sleeve and the shield of the shielded cable or a ferrule can be increased. Further, the risk of displacing the shielding sleeve during the assembly of the connector system can be reduced.

[0027] Preferably, the method to assemble an electrical connector system further comprises: providing a shielded cable, and preferably providing a ferrule on the shielded cable so that the ferrule is electrically conductive connected with the shield of the shielded cable and arranging the shielded cable at least partially within the connector housing, wherein the at least one contact lance is bent inwardly so that the contact portion of the contact lance is pressed against the shield of the shielded cable and/or the ferrule if the at least one wedge element is installed. The contact between the contact portion of the contact lance and the shield of the cable and/or the ferrule

allows shielding continuity of the electrical connector. Further, the ferrule is typically crimped onto the shield of the shielded cable, so that a defined surface is generated that can be contacted by the contact portion. This is in particular advantageous, if the shielded cable has a shield that comprises a mesh wire.

[0028] Preferably, the method further comprises providing at least one cable stop and arranging the cable stop adjacent to the at least one wedge element in longitudinal direction of the cable, to secure the at least one wedge element in longitudinal direction of the cable; and preferably guiding the electrical terminal within the terminal cavity, using first guiding means provided within the connector housing so that the electrical terminal will not contact the shielding sleeve when it is arranged within the terminal cavity of the connector housing, before the at least one wedge element is installed to surround at least parts of the shielding sleeve and to bend the at least one contact lance inwardly. Avoiding a contact between the terminal and the contact lances is advantageous, since the shielding sleeve is less prone for unintentional displacement. Further, possible damages can be avoided. Therefore, the assembly method can be facilitated and is less error prone.

Detailed description of the figures

[0029] In the following, the invention is described with reference to the enclosed figures. Thus, preferred embodiments are described. In particular shows

- Fig. 1 a schematic view of an electrical connector system in assembled state;
- Fig. 2 a schematic view of a pre-assembled cable with a ferrule, a wedge element and a cable stop;
- Fig. 3 a schematic exploded view of the connector housing and the shielding sleeve;
- Fig. 4 a schematic three-dimensional view of a shielding sleeve;
- Fig. 5 a schematic cut view of a shielding sleeve being arranged within a shielding cavity of the connector housing;
- Fig. 6A a schematic cut view of the assembly shown in Fig. 5, with a terminal being inserted;
- Fig. 6B a schematic cut view along line A-A, shown in Fig. 6A;
- Fig. 7 a schematic cut view of the connector housing, the shielding sleeve and the terminal in an installed state;

- Fig. 8A a schematic cut view of the electrical connector system with the wedge element in an un-installed state;
- Fig. 8B a schematic cut view of the connector system shown in Fig. 8A in a cut view along line B-B; and
- Fig. 9 a schematic cut view of the connector system in an installed state.

[0030] In the following the figures are described in detail, wherein same reference numbers relate to the same features.

[0031] Fig. 1 shows an electrical connector system 1 in an installed state. The cable 500 is received by the electrical connector housing 100. Preferably, three cables 500 are provided that can be received in different cavities of the housing 100. The cable stop 700 is provided with a strain relieve 710 and is affixed to the connector housing 100.

[0032] Fig. 2 shows the shielded cable 500 in a pre-assembled condition. The shielded cable 500 is at least partially unstrapped so that the core of the shielded cable 500 is connected with the terminal 400. The shield of the shielded cable 500 is over-crimped by a ferrule 600. Further, a wedge element 300 comprising a sealing member 310 is arranged slidably on the shielding cable 500. Further, the cable stop 700 and the strain relieve 710 are arranged slidably on the shielding cable 500.

[0033] Fig. 3 shows an exploded view of the connector housing 100 and the shielding sleeve 200. In particular, the connector housing 100 comprises three terminal cavities 140. The shielding sleeves 200 can be provided within a terminal cavity and preferably within a shield cavity. Preferably, each cavity receives one shielding sleeve.

[0034] Fig. 4 shows a detailed view of the shielding sleeve 200. The shielding sleeve 200 is preferably formed from a single sheet of metal. After punching or embossing or the like, the shield sleeve is formed cylindrically, in order to form a shielding sleeve. The shielding sleeve comprises an outer surface 201 and an inner surface 202. Further, the shielding sleeve comprises contact lances 210, wherein the shielding sleeve 200 preferably comprises four contact lances. Each contact lance has a spring portion 212 extending radially outward of the shielding sleeve 200 and a contact portion 211 extending radially inward into the shielding sleeve 200. Further, the shielding sleeve comprises locking lances 220, wherein the locking lances 220 extend radially outward of the shielding sleeve.

[0035] Figures 5 to 9 show an assembly of the connector system. In particular, Fig. 5 shows the shielding sleeve 200 in a pre-installed state within the connector housing 100. The shielding sleeve 200 is at least partially arranged within a shield cavity 130. The connector housing 100 has a terminal cavity 140, formed therein. The spring portions 212 extend radially outward of the shielding

sleeve 200, wherein the contact portions 211 extend radially inward into the shielding sleeve 200. However, the contact portions 211 do not protrude yet into the terminal cavity 140. Thus, upon inserting a terminal into the terminal cavity 140, the contact lances 210 preferably will not be contacted by the terminal and thus, a possible damage of the terminal and/or the contact lance and an unintentional displacement of the shielding sleeve can be avoided. As one can take from Fig. 5, the contact lances 210 have a generally s-shape configuration and the spring portion 212 is arranged at one bend of the s-shape and the contact portion 211 is arranged at the other bend of the s-shape.

[0036] Further, the shielding sleeve 200 comprises locking lances 220 that protrude radially outward from the shielding sleeve 200. The locking lances 220 engage with the corresponding locking means 121 of the connector housing 100. Preferably, the locking means 121 are an aperture arranged within an outer wall 120 of the connector housing 100. Thus, the locking lances can be utilized to contact a further shielding element, such as a metallic housing or the like. This allows a continuity shielding of the electrical cable.

[0037] Fig. 6A shows the shielding sleeve and the connector housing 100 as disclosed in Fig. 5 and a terminal 400 and a shielded cable 500. The cable 500 comprises a shield 510 that is over-crimped with a ferrule 600. Further, in the embodiment shown, the terminal 400 does not contact the contact lances 210, and in particular not the contact portions 211 of the contact lances 210 of the shielding sleeve 200.

[0038] Fig. 6B shows a cut view along the line A-A of fig. 6A. The terminal 400 is guided by a corresponding guiding means that is preferably formed as a corresponding recess 151 in the terminal cavity 140. Further, the contact lances 210 comprising contact portions 211 do not contact the terminal, since the terminal is guided and centered within the terminal cavity 140.

[0039] Fig. 7 shows the electrical connector system of fig. 6A, with the terminal 400 in the installed state. Thus, the terminal 400 is inserted completely into the terminal cavity 140. In the installed state, the ferrule and/or the shield 510 of the cable 500 are arranged opposite to the contact portions 211 or the contact lance 210 of the shielding sleeve 200.

[0040] As shown in Fig. 8A, the wedge element 300 having an actuating means 301 can be arranged within the connector housing 100. Figure 8A shows the wedge element 300 in a pre-installed state. The wedge element 300 comprises a sealing member 310 that is preferably over-molded over the wedge element 300. The sealing member seals the terminal cavity of the housing 100, since it seals the cable against the wedge element and the wedge element 300 against the housing 100. Thus, the terminal cavity 140 of the housing 100 is sealed. Further, as one can see from Fig. 8B, the ferrule 600 is crimped on the shield 510 of the shielded cable 500 and does not yet contact the contact portions 211 of the con-

tact lances 210 in the pre-installed state of the wedge element 300. Thus, upon insertion of the terminal 400, the ferrule 600 and/or the shield 510 of the shielded cable 500, the contact lances 210 cannot be damaged. Further, the wedge element 300 is guided by guiding means 153 within the connector housing 100. The guiding means 153 are formed as guiding ribs that extend along the longitudinal direction of the cable 500.

[0041] Fig. 9 shows the electrical connector system 1 in the fully (final) installed state. In the final installed state, the wedge element 300 surrounds at least parts of the shielding sleeve 200 and bends the at least one contact lance 210 inwardly. Since the contact lance, and in particular the spring portion 212 of the contact lance 210 is bend in inwardly, the contact portion 211 is pressed tightly against the ferrule 600 or alternatively against the shield 510 of the shielded cable. The spring portion 212 thereby applies an increased contact force on the ferrule 600 and/or the shield 510 of the shielded cable 500. Further, a cable stop 700 is arranged axially adjacent to the wedge element 300 in the longitudinal direction of the cable 500, so that the wedge element 300 is secured at least axially. The cable stop 700 further comprises a strain relieve 710 to protect the cable 500.

List of reference signs

[0042]

1	electrical connector system
100	connector housing
110	inner wall
120	outer wall
121	corresponding locking means
130	shield cavity
140	terminal cavity
151	first guiding means
153	third guiding means
200	shielding sleeve
201	outer surface
202	inner surface
210	contact lance
211	contact portion
212	spring portion
220	locking lance
300	wedge element
301	actuating means
310	sealing member
400	terminal
500	shielded cable
510	shield of the shielded cable
600	ferrule
700	cable stop
710	strain relieve

Claims

1. An electrical connector system (1), comprising:

5 a connector housing (100) having a shield cavity (130) formed therein;
at least one shielding sleeve (200), adapted to be installed at least partially within the shield cavity (130), wherein the shielding sleeve (200) comprises at least one contact lance (210) provided with a spring portion (212) and a contact portion (211), wherein in an uninstalled state the spring portion (212) extends radially outward from the shielding sleeve (200), and the contact portion (211) extends radially inward into the shielding sleeve (200); and
at least one wedge element (300), adapted to surround at least parts of the shielding sleeve (200) and to bend the at least one contact lance (210) inwardly when the wedge element (300) is installed.

2. The electrical connector system (1) of claim 1, wherein the at least one contact lance (210) has a generally s-shape configuration.

3. The electrical connector system (1) of claim 2, wherein the spring portion (212) is arranged at one bend of the s-shape and the contact portion (211) is arranged at the other bend of the s-shape.

4. The electrical connector system (1) of any preceding claim, further comprising a shielded cable (500), wherein the shielded cable (500) is preferably provided with a ferrule (600), electrically conductive connected with the shield (510) of the shielded cable (500), wherein the shielded cable (500) is at least partially arranged within the connector housing (100) and wherein the at least one contact lance (210) is bended inwardly, so that the contact portion (211) of the contact lance (210) is pressed against the shield (510) of the shielded cable (500) and/or the ferrule (600), if the at least one wedge element (300) is installed.

5. The electrical connector system (1) of claim 4, wherein the contact force between the shield (510) of the shielded cable (500) and/or the ferrule (600) and the contact portion (211) of the contact lance (210) is increased by pressing the contact portion (211) against the shield (510) of the shielded cable (500) and/or the ferrule (600), so that the electrical conductive contact between the ferrule (600) and the contact portion (211) can be preserved up to a vibration level of at least 40g sinus, preferably up to at least 50g sinus and most preferably up to at least 60g sinus.

6. The electrical connector system (1) of any preceding claim, wherein prior to the installed state of the wedge element (300), the at least one wedge element (300) is arranged slidably on the shielded cable (500), and wherein in the installed state of the wedge element (300), the at least one wedge element (300) is preferably fixedly arranged at least partially within the connector housing.
7. The electrical connector system (1) of any preceding claim, wherein the wedge element (300) comprises at least one actuating means (301), wherein the at least one actuating means (301) is adapted to contact the spring portion (212) of the at least one contact lance (210) and to bend the at least one contact lance (210) inwardly when the wedge element (300) is installed.
8. The electrical connector system (1) of claim 7, wherein the actuating means (301) of the wedge element (300) is tubular.
9. The electrical connector system (1) of any preceding claim, wherein the shielding sleeve (200) comprises at least two contact lances (210), preferably at least four contact lances (210) and most preferably at least six contact lances (210), and wherein the wedge element (300) comprises preferably a corresponding number of actuating means (301).
10. The electrical connector system (1) of any preceding claim, wherein the shielding sleeve (200) further comprises at least one locking lance (220) that preferably extends radially outward from the shielding sleeve (200), and wherein the connector housing comprises at least one corresponding locking means (121), wherein the locking lance (220) is adapted to engage with the locking means (121), when the shielding sleeve (200) is arranged within the shield cavity (130).
11. The electrical connector system (1) of any preceding claim, wherein the connector housing (100) comprises a terminal cavity (140) designed to receive at least one electrical terminal (400), and wherein the contact portion (211) of the contact lance (210) does not extend into the terminal cavity (140), before the at least one wedge element (300) is installed to surround at least parts of the shielding sleeve (200) and to bend the at least one contact lance (210) inwardly.
12. The electrical connector system (1) of any preceding claim, wherein the connector housing (100) further comprises:
- at least one first guiding means (151) for guiding the electrical terminal (400) within the terminal cavity (140), and preferably further comprises at least one second guiding means (152) for guiding the shield (510) of the shielded cable (500) and/or the ferrule (600) within the terminal cavity (140), and even more preferably further comprises at least one third guiding means (153) for guiding the wedge element (300) within the connector housing (100).
13. The electrical connector system (1) of any preceding claim, further comprising:
- at least one cable stop (700) preferably comprising a strain relieve (710), wherein the cable stop (700) is arranged adjacent to the at least one wedge element (300) in longitudinal direction of the cable, to secure the at least one wedge element (300) in longitudinal direction of the cable.
14. The electrical connector system (1) of any preceding claim, wherein the wedge element (300) is provided with a sealing member (310), which sealing member (310) is preferably overmolded and arranged on the wedge element (300), preferably comprising at least two sealing lips, and wherein the sealing member (310) seals the wedge element against the cable (500) and against the connector housing (100) so that the terminal cavity (140) is sealed.
15. A method to assemble an electrical connector system (1), wherein the method comprises:
- providing a connector housing (100), wherein the connector housing (100) has a shield cavity (130) formed therein;
- providing at least one shielding sleeve (200), and installing the at least one shielding sleeve (200) at least partially within the shield cavity (130), wherein the shielding sleeve (200) comprises at least one contact lance (210) provided with a spring portion (212) and a contact portion (211), wherein in the uninstalled state the spring portion (212) extends radially outward from the shielding sleeve (200), and the contact portion (211) extends radially inward into the shielding sleeve (200); and
- providing at least one wedge element (300) and installing the at least one wedge element (300), preferably at least partially within the connector housing (100) so that the at least one wedge element (300) surrounds at least parts of the shielding sleeve (200) and bends the at least one contact lance (210) inwardly.
16. The method to assemble an electrical connector sys-

tem (1) of claim 15, the method further comprising:

providing a shielded cable (500); and preferably
 providing a ferrule (600) on the shielded cable
 (500) so that the ferrule (600) is electrically con- 5
 ductive connected with the shield (510) of the
 shielded cable (500); and
 arranging the shielded cable (500) at least par-
 tially within the connector housing (100), where- 10
 in the at least one contact lance (210) is bended
 inwardly, so that the contact portion (211) of the
 contact lance (210) is pressed against the shield
 (510) of the shielded cable (500) and/or the fer-
 rule (600), if the at least one wedge element 15
 (300) is installed.

17. The method to assemble an electrical connector sys-
 tem (1) of any one of claims 15 or 16 the method
 further comprising:

providing at least one cable stop (700);
 arranging the cable stop (700) adjacent to the
 at least one wedge element (300) in longitudinal
 direction of the cable (500), to secure the at least 25
 one wedge element (300) in longitudinal direc-
 tion of the cable (500); and preferably
 guiding the electrical terminal (400) within the
 terminal cavity (140) using first guiding means
 (151) provided within the connector housing
 (100), so that the electrical terminal (400) will 30
 not contact the shielding sleeve (200) when it is
 arranged within the terminal cavity (140) of the
 connector housing (110), before the at least one
 wedge element (300) is installed to surround at 35
 least parts of the shielding sleeve (200) and to
 bend the at least one contact lance (210) inward-
 ly.

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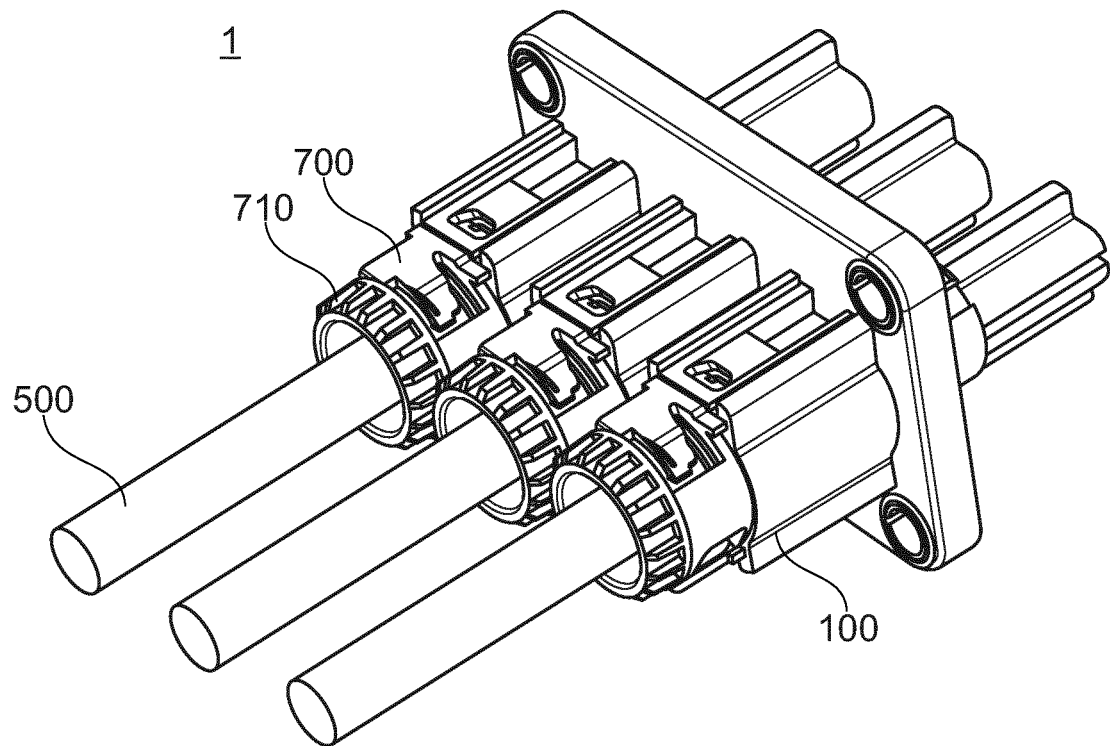


Fig. 1

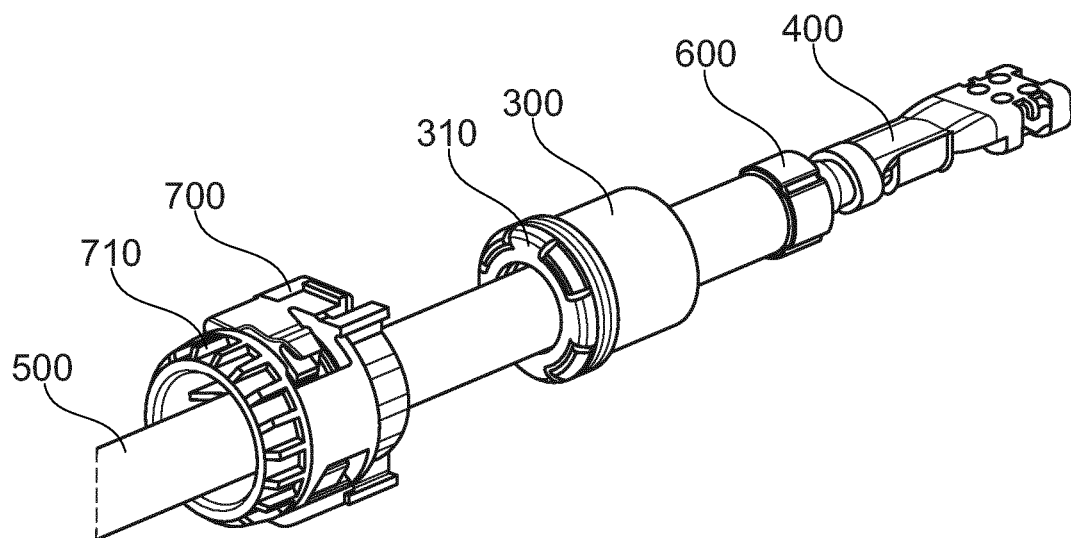


Fig. 2

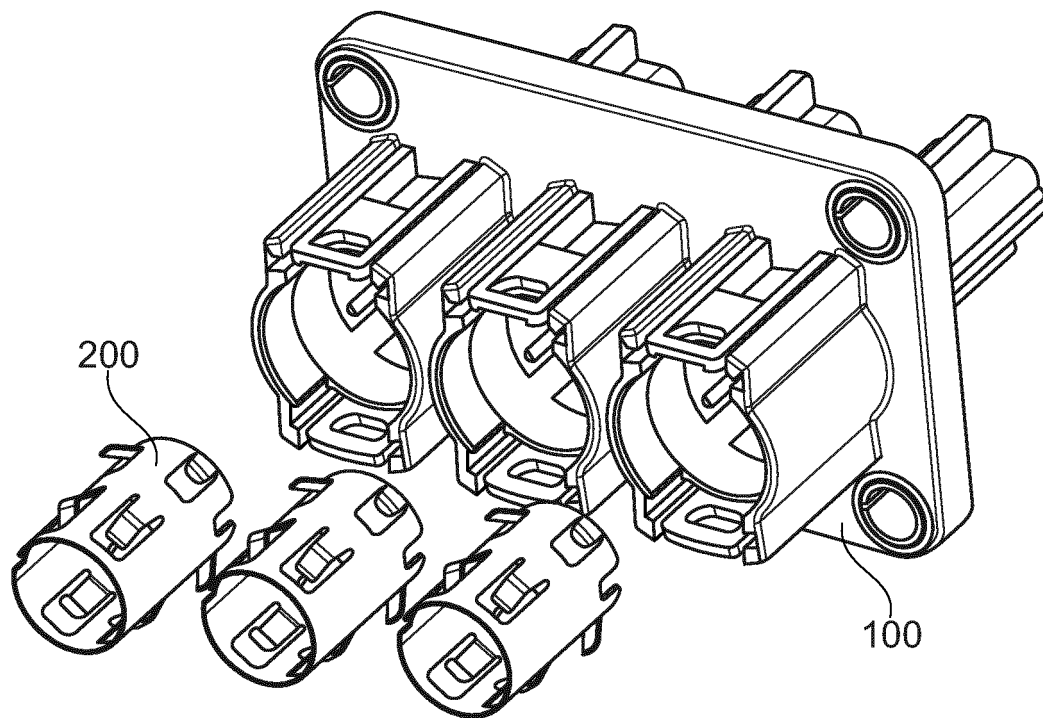


Fig. 3

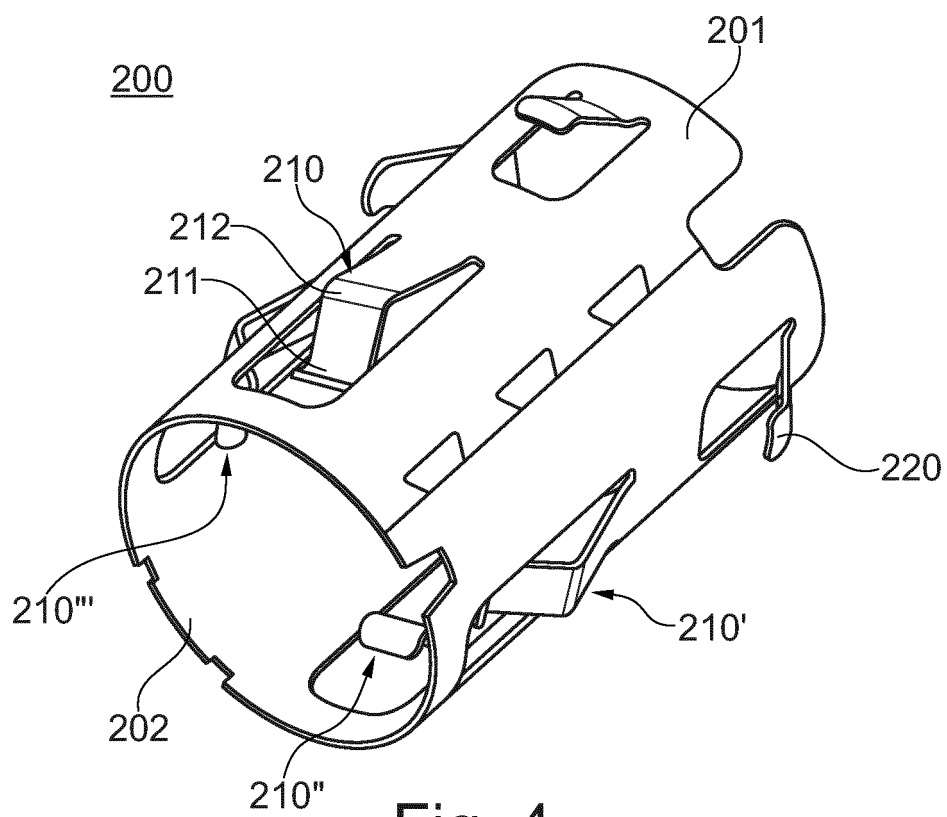


Fig. 4

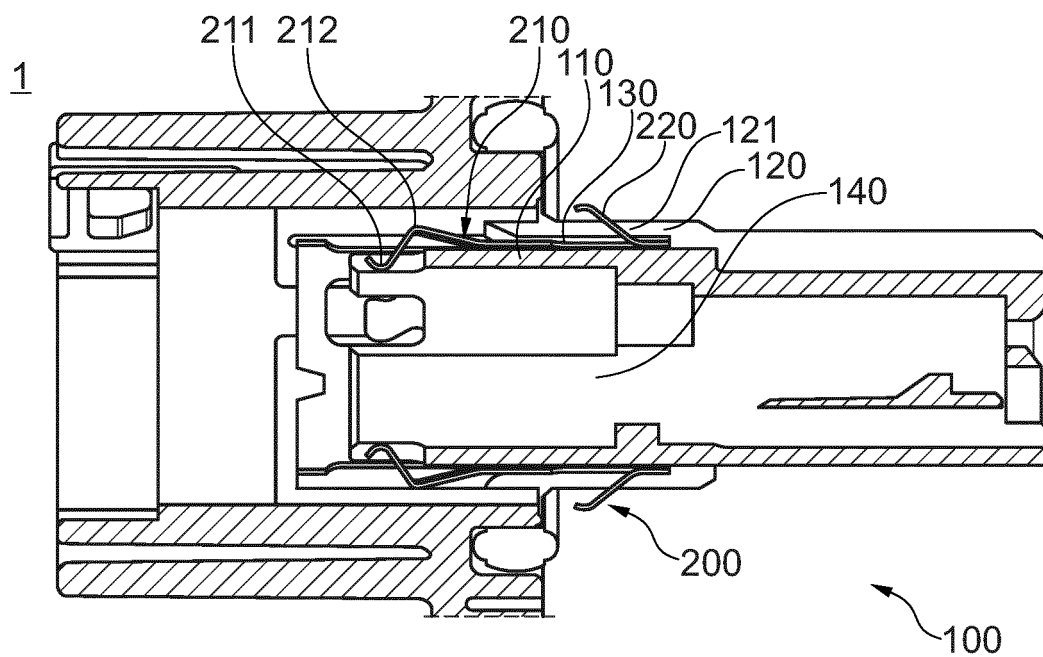


Fig. 5

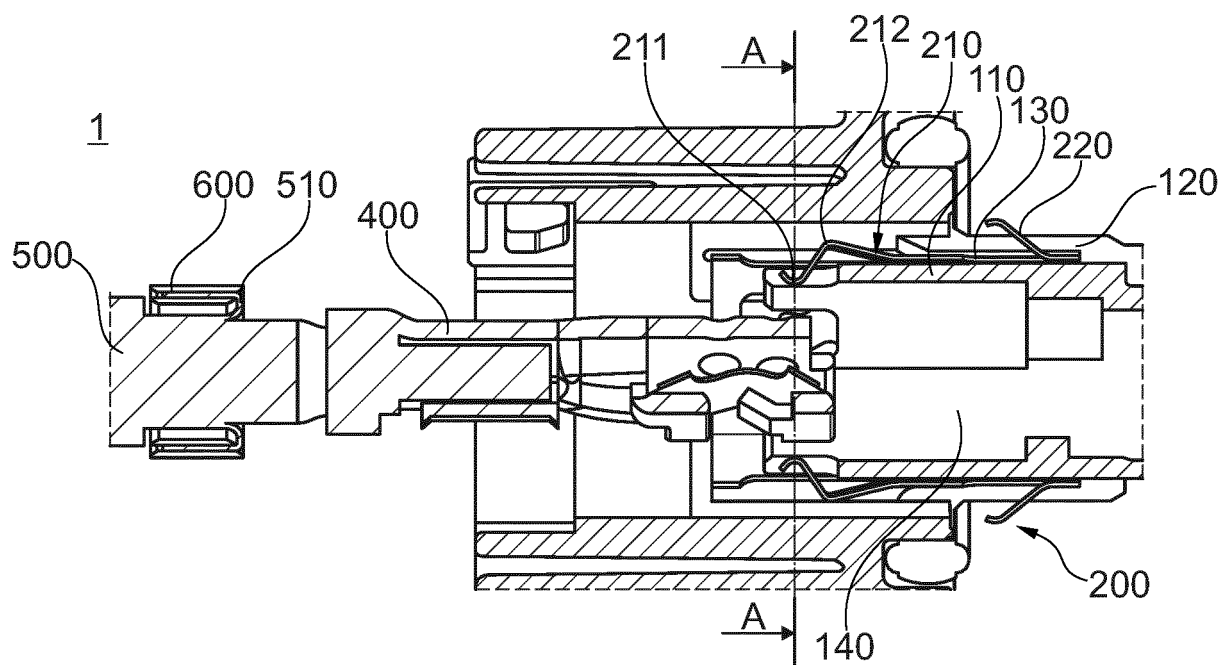


Fig. 6A

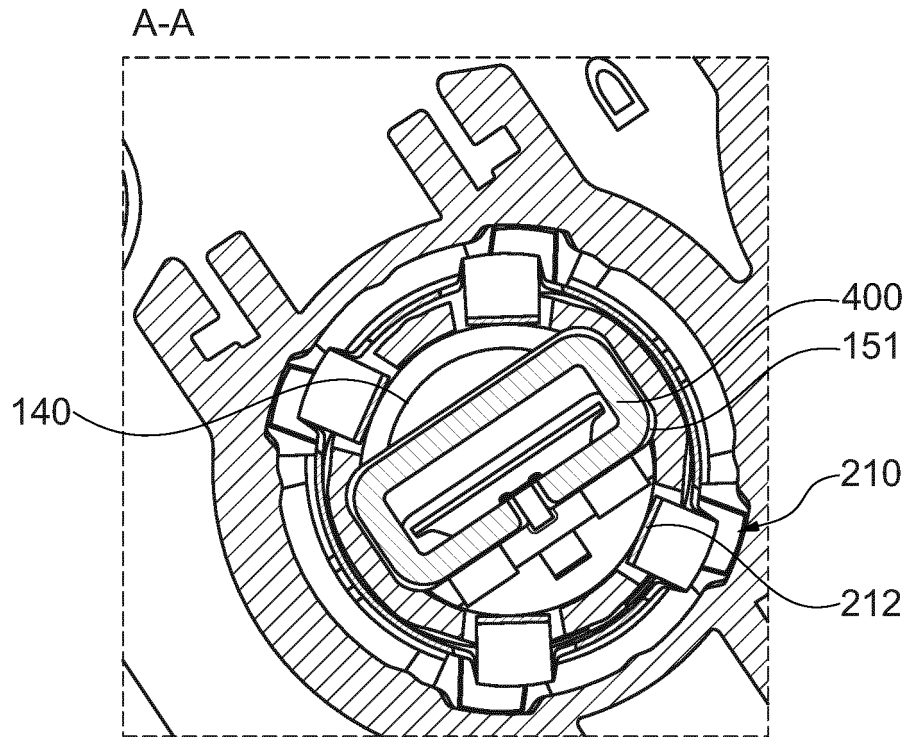


Fig. 6B

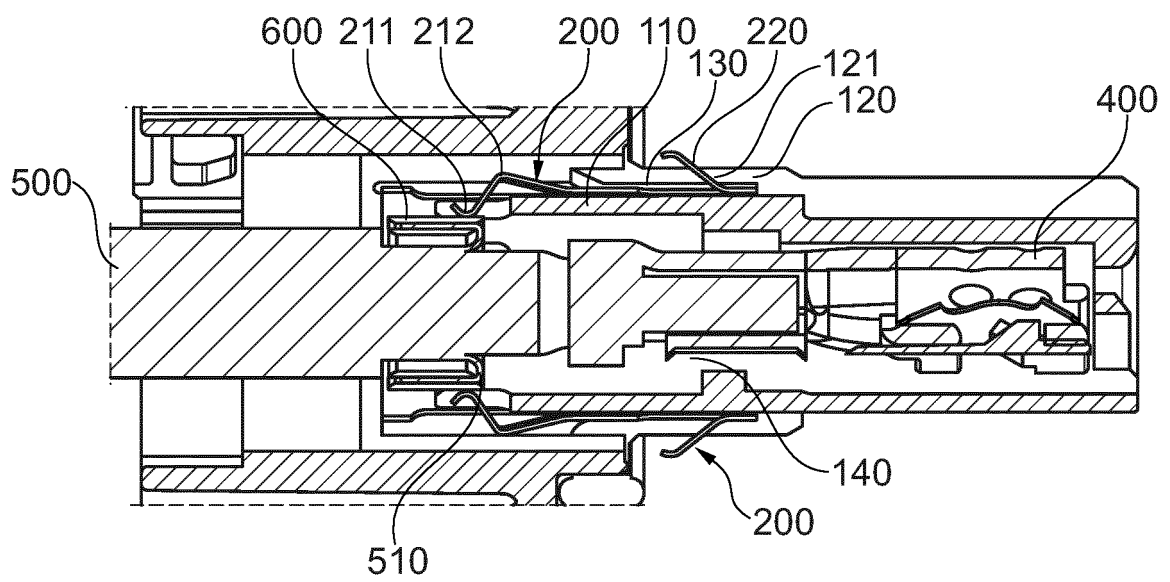


Fig. 7

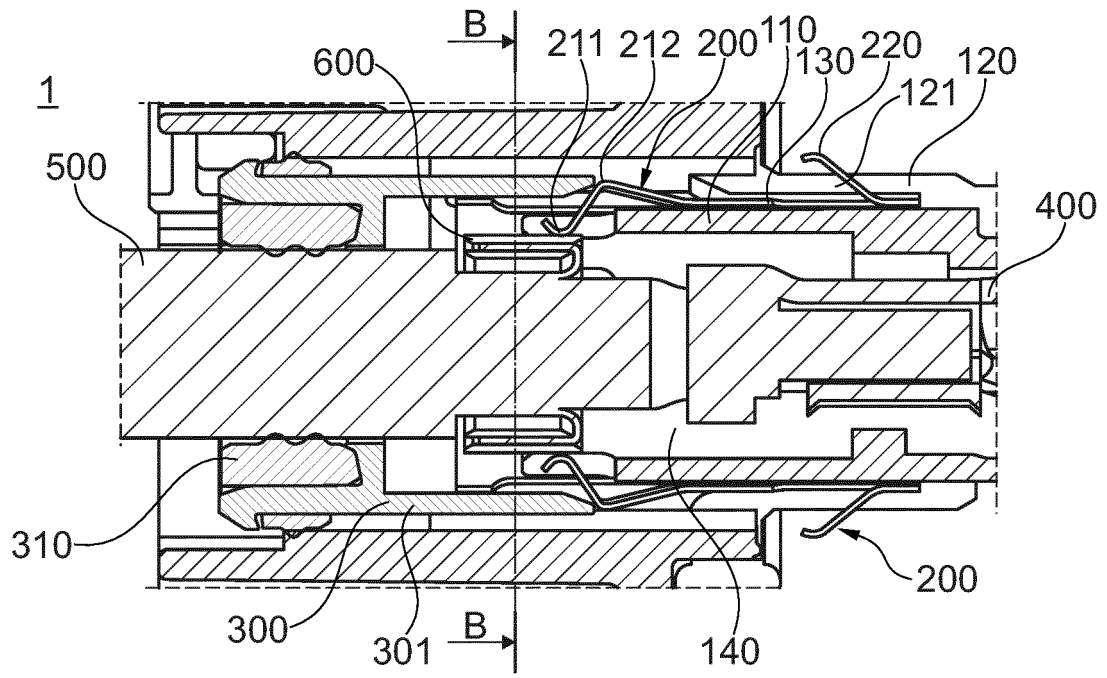


Fig. 8A

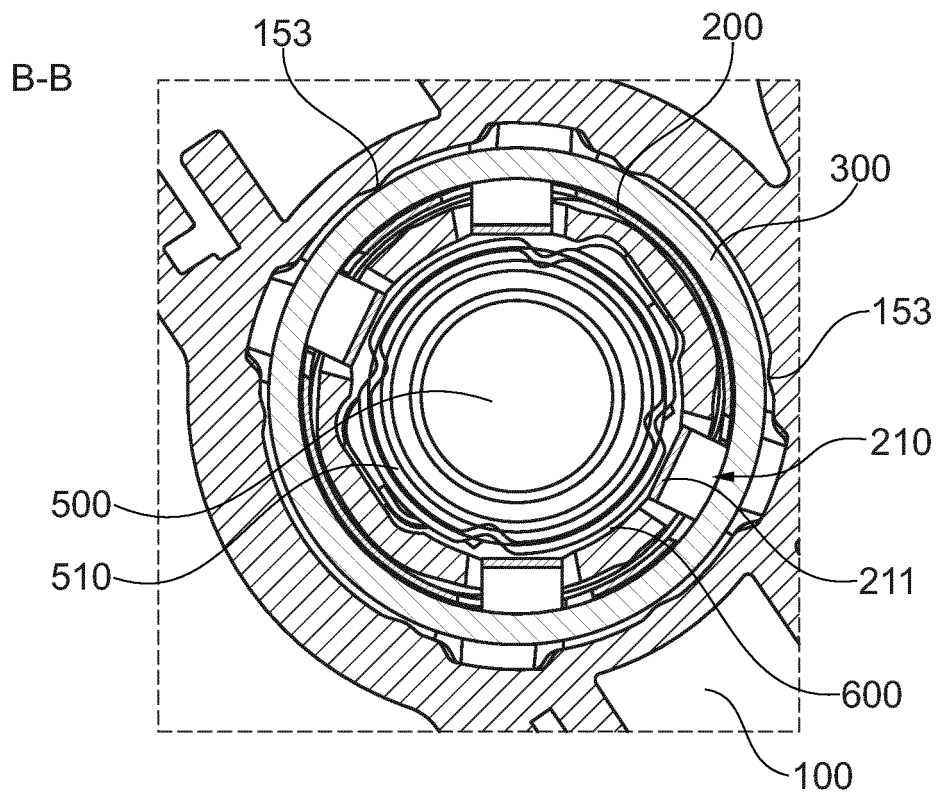


Fig. 8B

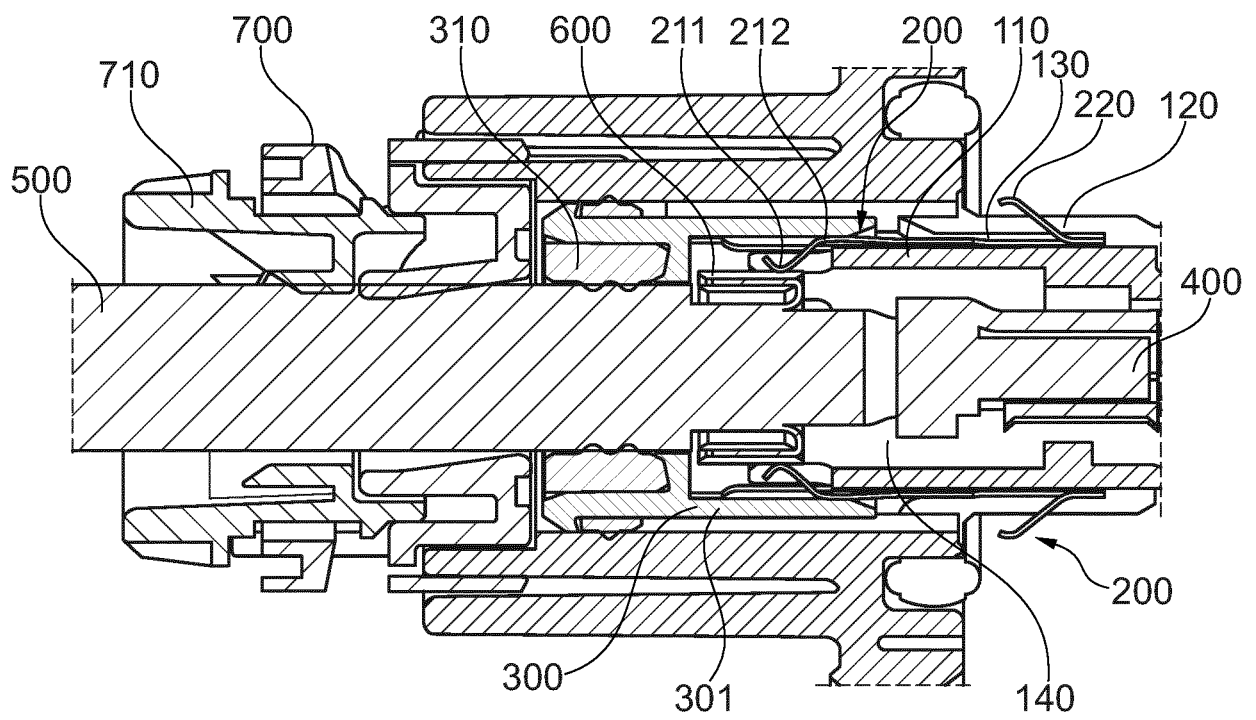


Fig. 9



EUROPEAN SEARCH REPORT

Application Number
EP 15 17 2407

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X	EP 2 579 396 A1 (TYCO ELECTRONICS NEDERLAND BV [NL]) 10 April 2013 (2013-04-10) * the whole document *	1-17	INV. H01R13/6583 H01R13/6592 H01R13/58
A	US 2005/221673 A1 (MYER JOHN M [US] ET AL) 6 October 2005 (2005-10-06) * paragraph [0033] * * figures 10-12 *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			H01R
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 16 November 2015	Examiner Henrich, Jean-Pascal
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 15 17 2407

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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16-11-2015

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