(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 745 737 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.12.2020 Bulletin 2020/49

(21) Application number: **20176643.3**

(22) Date of filing: **26.05.2020**

(51) Int Cl.:
H04R 3/00 *(2006.01)* ***H01R 13/631*** *(2006.01)*
H04R 27/00 *(2006.01)* *H04R 1/08* *(2006.01)*
H01R 13/74 *(2006.01)* *H01R 24/60* *(2011.01)*
H01R 31/06 *(2006.01)*

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **27.05.2019 BE 201905345**

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(54) CONNECTOR UNIT FOR MOBILE APPARATUS INCLUDING NECK

(57) Connector unit (100) for connecting a mobile apparatus (102) including neck (105) in a conference unit (101), comprising:
- a housing (200) adapted for placing the neck (105) in the conference unit (101);
- an electric connector component (201) forming a first element (208) of a connector pair (208, 220), and adapted for connecting to a second element (220) of the connector pair (208, 220) within the neck (105), wherein the connector pair (208, 220) is adapted for high-speed digital data transmission;
- a positioning component (202) adapted for positioning the electric connector component (201) within the housing (200);
- a linking component (203) adapted for electrically linking the electric connector component (201) to a processing unit (1000) within the conference unit (101).

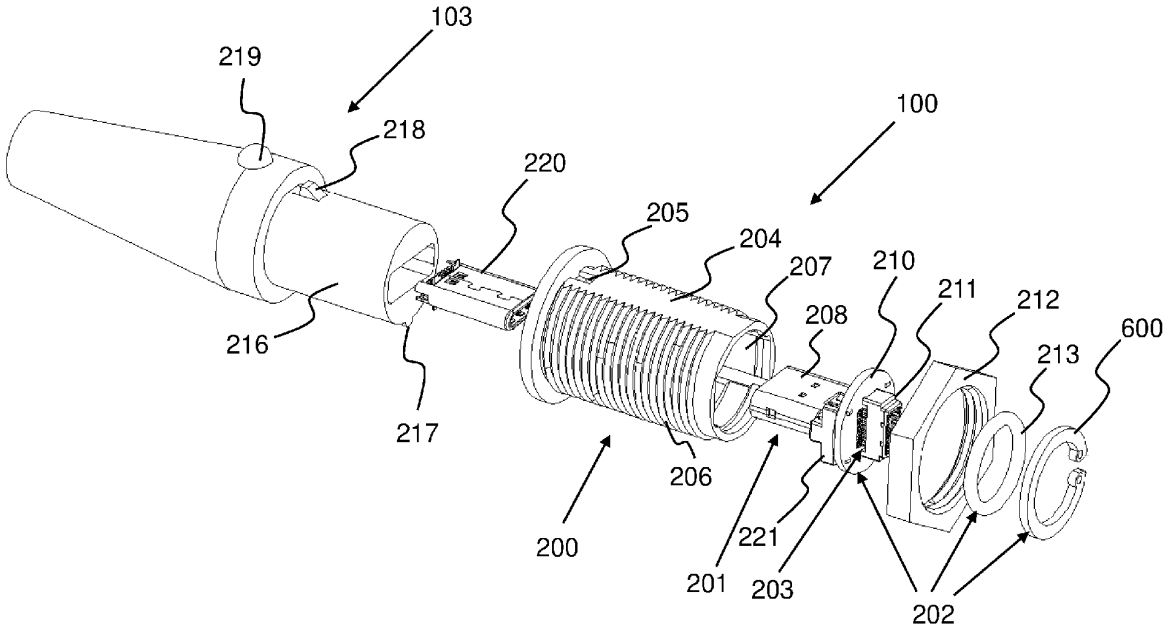

Fig. 2

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Description

Technical Domain

[0001] The present invention generally relates to a connector unit for connecting a mobile apparatus including neck in a conference unit. The invention in particular provides a connector unit permitting high-speed data transmission, that is sufficiently robust, and that is practical in terms of replacing the electric connector and placing the apparatus including neck.

Background of the Invention

[0002] Meeting rooms and conference rooms are often equipped with a system in which each participant can have their own microphone at their disposal. A conference unit in which the microphone part can be placed is then positioned on each table. Typically, the microphone part is detachable, i.e. can be removed from the conference unit when the conference unit and related microphone have to be stored away, for instance when the meeting room is rented out without conference material. Conversely, prior to use the microphones need to be placed again in the various conference units. The microphone part typically has a neck on which the actual microphone is mounted. Optionally, said neck has a flexible part to permit the microphone to be bent towards or away from the participant, as is the case with a 'gooseneck microphone'. The conference unit typically comprises the electronics to process the audio signal and for instance controlling a light on the microphone.

[0003] Placing the neck of the microphone part in a conference unit takes place by means of a connector. It contains an electric connector allowing signals from the microphone cartridge to be transmitted to the electronics in the conference unit. Typically, use is made of an XLR connector having 3 or 5 pins, which guarantee the transmission of analogue audio, and for instance also the controlling of the light on the microphone. In addition to the electric connector, the connector typically also comprises an anchoring for mechanically linking the microphone part to the conference unit when connecting. A threaded system is often made use of in such cases. When placing the microphone part in the conference unit, first the male and female part of the XLR connector are connected, and subsequently the mechanical anchoring is tightened.

[0004] Whereas currently such apparatuses are typically deployed as analogue microphones, manufacturers are in the process of developing more sophisticated functionality. For instance, apart from the microphone a digital camera can also be provided in the apparatus, or active microphones are developed in which sophisticated signal processing takes place. Manufacturers are faced with the problem that such sophisticated functionality requires a digital data transmission at high-speed. However, the traditionally used 3-pin or 5-pin XLR connector does not permit this. As a consequence, a larger number of pins is required, and all this within a footprint permitting the connector to be integrated within the existing layout of apparatus and conference unit.

[0005] Electric connectors are known that are typically used in digital applications and permit a rapid data transmission, such as for instance USB (Universal Serial Bus). The most recent USB-C connector has 24 pins and supports various USB specifications, such as USB2.0 ('high-speed', 480 Mb/s), USB3.0 ('super speed', 5 Gb/s), USB3.1 ('super speed+', 10 Gb/s), and future USB specifications. Within a USB-C connector, the 24 pins, placed in 2 rows of 12 pins each, are positioned on a small surface area, because of which they are more fragile than the 3 or 5 copper pins used in an XLR connector. In applications such as a USB microphone that has to be connected to a PC, inserting a cable with USB-C connector in the corresponding port will suffice. However, in the context of an apparatus including neck placed in a conference unit, the connector is subject to mechanical loads as a result of for instance the bending of the microphone neck, impacts on the apparatus, and the frequent removal and placing back again of the microphone part. Such loads on a USB-C connector will cause mechanical tensions resulting in the connector wearing out rapidly and also in the quality of the data transmission being adversely affected. As a consequence, a USB connector is insufficiently robust per se to ensure a reliable and durable connection in this context.

[0006] The traditionally used XLR connector does offer the required robustness, but does not allow the desired high-speed data transmission. In addition, the traditionally used XLR connector also involves a number of practical drawbacks. Often use is made of a threaded system for the mechanical anchoring of the microphone part in the conference unit. The fact that each microphone needs to be tightened causes the placement of a large number of microphones to make a meeting room conference-ready, time consuming and not ergonomic. In addition, the output of the XLR connector within the conference unit is soldered with wires to the board on which the signal processing takes place. However, the connector is subject to wear, and may get damaged due to vandalism. To replace the XLR connector, the wires to the board have to be cut through and then be re-soldered. This does not allow for a quick replacement of a damaged XLR connector.

[0007] In US5988585 a shock mount for a gooseneck microphone is disclosed, where the latter comprises a 3-pins XLR connector. The shock mount isolates the microphone from vibrations and shocks when installed on a podium or table. The shock mount prevents that such vibrations are transferred via the table or podium to the microphone, thereby introducing vibrational noises. The shock mount comprises an inner and outer housing, separated by a substantial gap, and two dampeners placed in that gap. A shock caused at an external position next to the microphone is absorbed by the elastic material of the dampeners. Due to the dampeners being placed in

the gap between both housings, a horizontal shifting of the electrical connector is possible, thereby reducing the horizontal stability of the connector. The latter hampers an easy connection of both parts of the electrical connector, and causes mechanical loads to be exerted onto the electrical connector. As a classical 3-pins connector offers sufficient robustness, presence of such loads is acceptable. However, the classical 3-pins connector does not allow the desired high-speed data transmission.

[0008] It is an object of the present invention to describe a connector unit for connecting a mobile apparatus including neck in a conference unit, overcoming one or several of the drawbacks of solutions from the state of the art. More specifically, it is an object of the present invention to describe a connector unit that can be integrated within the existing layout of apparatus and conference unit, that permits high-speed data transmission, that is sufficiently robust, and that is practical in terms of replacing the electric connector and placing the apparatus including neck.

Summary of the invention

[0009] According to a first aspect of the invention the object identified above is realized by a connector unit for connecting a mobile apparatus including neck in a conference unit, as defined by claim 1, comprising:

- a housing adapted for placing the neck in the conference unit;
- an electric connector component forming a first element of a connector pair, and adapted for connecting to a second element of the connector pair within the neck, wherein the connector pair is adapted for high-speed digital data transmission;
- a positioning component adapted for positioning the electric connector component within the housing;
- a linking component adapted for electrically linking the electric connector component to a processing unit within said conference unit,
  wherein
- the electric connector component has sides adapted to slide along inner surfaces of the housing when positioning the electric connector component within the housing, and
- the positioning component is adapted to bear the electric connector component, thereby allowing clearance in the position of the electric connector component relative to the housing.

[0010] In other words: the invention relates to a connector unit for connecting a mobile apparatus including neck in a conference unit. A conference unit is a unit that is typically placed on a tabletop or is integrated in the table. The conference unit contains the electronics, for instance in the form of a printed circuit board or PCB, to process the audio signal and for instance control a light on the microphone. An apparatus including neck comprises a neck on which at least one unit receiving media is mounted. A unit receiving media is for instance is a microphone head or a microphone array receiving audio, or a camera receiving footage. A microphone head may for instance contain a microphone cartridge, intended for converting audio into electrical signals, optionally supplemented by an electronic filtering. A neck is a part to which on the one side, typically the upper side, the unit for receiving media is mounted, and on the other side, typically the bottom side, an outer end is provided with which the apparatus can be placed in the conference unit. Typically, the neck is an elongated, rod-shaped part. However, embodiments wherein the neck is not elongated are also possible. In a possible embodiment, the neck comprises a part that is bendable, as is the case in a gooseneck apparatus. The neck, for instance, comprises a bendable part at the bottom, i.e. on the side where the neck is placed in the conference unit, and a solid part at the top. In a possible embodiment, an apparatus for instance comprises a light or LED ring, indicating whether the apparatus is switched on or off.

[0011] The apparatus including neck is mobile, which means that it is anticipated that it can frequently be removed from the conference unit and be placed back in it again. The connector unit is intended to be part of the conference unit. i.e. when assembling the conference unit the connector unit is mounted within the conference unit. The neck of the apparatus comprises a corresponding connector part intended for placing the apparatus in the connector unit prior to use, and for easily being removed from it again.

[0012] The connector unit comprises a housing adapted for placing the neck in the conference unit. The housing is a mechanical part that is adapted for accommodating the neck, particularly via the outer end of the neck that does not comprise the unit for media reception. For instance, the housing has a hollow shape, wherein an outer end of the neck of the apparatus fits in the cavity of the housing. The housing is intended for upon assembly of the conference unit being fixedly mounted within the conference unit.

[0013] The connector unit further comprises an electric connector component forming a first element of a connector pair. For example, in a possible embodiment, this is the female element of a connector pair. The electric connector component is adapted for connecting to a second element of the connector pair, which for instance is the male element of the connector pair. The second element is located within the neck of the apparatus. When placing the apparatus in the conference unit, both elements of the connector pair are connected to each other, such that transmission of electrical signals becomes possible. Electrical signals for instance come from the cartridge of an analogue microphone or from a digital camera, which is electrically connected within the apparatus to the second element of the connector pair, for instance by making use of a printed circuit board. Conversely, when connecting the connector pair, electrical signals

from the conference unit can be transmitted to the apparatus, for instance to switch the microphone or camera on or off via a button on the conference unit, or to control the light or the LED ring on the apparatus.

[0014] The connector pair is adapted for high-speed digital data transmission. The connector pair for instance consists of the male and female element of a USB connector. In a possible embodiment, the connector pair consists of the male and female element of a USB connector of the C type, in short called USB-C connector. High-speed digital data transmission is defined as digital data transmission that at least permits a transfer rate as defined by the USB 2.0 standard, being 480 Mb/s. In other words: embodiments are possible wherein the connector pair permits a digital transmission at 480 Mb/s, and embodiments are possible wherein the connector pair permits a more rapid data transmission, for instance 5 Gb/s in accordance with the USB 3.0 standard, 10 Gb/s in accordance with the USB 3.1 standard, or even higher rates defined by other existing or future standards.

[0015] The connector pair is adapted for high-speed digital data transmission, meaning that the requisite pins are available to allow data transmission at the above-mentioned minimum transfer rate. However, it is not necessary that the available pins of the connector unit are also effectively connected or used, i.e. connected to a processing unit within the conference unit. An embodiment is for instance possible wherein only a limited number of pins of the connector unit is connected, intended to transmit analogue audio signals from the apparatus to a processing unit within the conference unit. In another embodiment pins are connected intended for digital data transmission from the apparatus to a processing unit within the conference unit. In yet another embodiment, all pins are connected for enabling both analogue and digital signal transmission from the apparatus to a processing unit within the conference unit.

[0016] The advantage of providing a connector pair adapted for high-speed digital data transmission is that in addition to the use of a conference unit in combination with an analogue microphone, more sophisticated functionality becomes possible as well. It will for instance become possible to provide other units for media reception within an apparatus, such as digital cameras or active microphones in which sophisticated signal processing takes place. In possible embodiments the connector pair may also be adapted for electrically feeding active components in the apparatus including neck.

[0017] The connector unit comprises a positioning component adapted for positioning the electric connector component within the housing. This means that once the connector unit has been assembled, the electric connector component is located within the housing. This ensures that when placing an apparatus in the conference unit on the one hand an outer end of the neck of the apparatus slides into the housing, and on the other hand the two elements of the connector pair connect to each other. The positioning component is intended for positioning the electric connector component within the housing, which means that once the connector unit has been assembled, the electric connector component is retained in position relative to the housing, however without this position needing to be completely fixed. In other words: upon assembly the electric connector component is not rigidly fixated to or relative to the housing, but the positioning component ensures that a certain freedom of movement of the electric connector component relative to the housing is still possible.

[0018] Furthermore, the electric connector component has sides adapted to slide along inner surfaces of the housing when positioning the electric connector component within the housing. This implies that in assembled condition, some side parts of the electric connector component are in contact with the inner surface of the housing. As a consequence, in assembled condition, a shifting of the electric connector component in horizontal direction is made impossible. This guarantees a horizontal stability of the electric connector component when connecting an apparatus to the connector unit. As such, connecting e.g. a microphone can be done in an easy and stable way, even when the housing of the connector unit prevents to manually hold the electric connector component during connecting.

[0019] Moreover, the positioning component is adapted to bear the electric connector component, thereby allowing clearance in the position of the electric connector component relative to the housing. For instance, in one embodiment, the positioning component may comprise several mechanical parts, wherein for instance one part is fixed to the bottom of the electric connector component, and one or several of such parts, when being assembled, are mounted underneath that fixed part, such that some clearance exists in the position of the electric connector component relative to the housing. This means that a certain freedom of movement is provided for the electric connector component relative to the housing. Typically, the clearance provided and corresponding movement is in the order of tenths of a millimeter. In an embodiment, the clearance may be due to the dimensions of the parts comprised in the positioning component, where those dimensions are chosen such that a small vertical movement is possible relative to the housing. In another embodiment, the clearance may be due to one or more parts of the positioning component being elastic or resilient. In that case, a compression of the elastic or resilient part(s) results in a vertical movement of the electric connector component relative to the housing. Providing clearance permits that when the electric connector component is mechanically loaded, for instance when the neck of a connected apparatus is bent or loaded, a little movement of the electric connector component occurs. In particular, a small tilting movement of the electric connector component may occur. In this way, the electrical connector component remains better aligned with the corresponding second element of the connector pair in the apparatus. The advantage is that when mechanically loading

the apparatus, due to conditions of use such as bending or loading the neck or placing and removing the apparatus, a lower mechanical tension on the electric connector component occurs than when the latter would have been firmly fixated relative to the housing. This contributes to the robustness of the connector unit. In that way a connector unit is provided making use of a large number of electrical pins on a small surface area, and nonetheless permits reliable and durable high-speed data transmission.

[0020] The connector unit further comprises a linking component adapted for electrically linking the electric connector component to a processing unit within the conference unit. A processing unit for instance comprises a component ensuring digital signal processing before transmitting the audio signal to a loudspeaker. A processing unit may for instance also comprise an analogue-to-digital convertor. Typically, a processing unit is implemented by means of a PCB, printed circuit board or electronic board. In connected condition, the electric connector component receives electrical signals via the corresponding second element of the connector pair. The linking component is intended for transmitting those electrical signals to the processing unit. The linking component makes it possible that the electric connector component does not have to be mounted directly onto the board of the processing unit. The direct fixation of the electric connector component onto the board of the processing unit is disadvantageous as the board is typically fixated relative to the conference unit, and a mechanical load on the electric connector component or the housing would entail the risk of the electric connector component breaking off. The use of a linking component has the advantage of the electric connector unit not needing to fully absorb the mechanical load itself, but that it can be set off via the one or more parts in-between of the linking component. This contributes to the robustness of the connector unit, and to realizing a reliable and durable high-speed digital data transmission within the context of an apparatus including conference unit.

[0021] Optionally, as defined by claim 2, the high-speed digital data transmission permits a transfer rate of at least 480 Mb/s. A transfer rate of at least 480 Mb/s means that the connector pair at least permits a digital data transmission at a transfer rate as defined by the USB 2.0 standard. That means embodiments are possible wherein the connector pair permits a digital transmission of 480 Mb/s, and embodiments are possible wherein the connector pair permits a more rapid data transmission, for instance 5 Gb/s in accordance with the USB 3.0 standard, 10 Gb/s in accordance with the USB 3.1 standard, or even higher rates defined by other existing or future standards.

[0022] Optionally, according to claim 3, the connector pair is further adapted for transmission of analogue audio signals. This means that the connector pair permits both high-speed digital data transmission and transmission of analogue audio signals. For instance, within the connector unit a number of pins are used for transmission of analogue signals, and a number of other pins are used for transmission of digital signals. The advantage of this is that the same connector unit can be used within various applications, for instance an application with an analogue microphone, or an application with a digital camera. For a specific application, only the wanted pins of the connector unit need to be connected to the processing unit. Analogous thereto, within the apparatus the wanted pins of the connector element need to be connected to the microphone or camera. Another advantage is that the connector unit permits an application requiring simultaneous analogue and digital data transmission.

[0023] Optionally, according to claim 4, the positioning component comprises an annular element, adapted to bear the electric connector component, thereby allowing clearance in the position of the electric connector component relative to the housing. An annular element on the one hand permits the electric connector component, which is for instance fixedly mounted to a disk-shaped plate, to be borne. For example, it is mounted underneath the electric connector component. On the other hand, the annular element permits that, by connecting the linking component, a link can be made with the processing unit through the opening of the ring. The advantage of the annular element is that in this way the disk-shaped plate including electric connector component can be positioned within the housing, which for instance is a hollow cylindrical part. The disk-shaped plate including electric connector component can then support on the annular element, without being anchored thereto. This permits a certain relative movement of the electric connector component relative to the housing, e.g. due to dimensions leaving such a clearance, or e.g. due to the annular element being elastic or resilient. The advantage of this is that the electric connector component can always assume a position that is better aligned relative to the second connector element in the apparatus, and thus mechanical tensions within the electric connector component are reduced.

[0024] Optionally, as defined by claim 5, the annular element is an O-ring. An O-ring is typically a loop of elastomer with a round cross-section. In other applications, it is generally used for creating a seal at the interface between two parts. Using an O-ring within the positioning component has the advantage that when the electric connector component is loaded, the elastic compression of the O-ring will allow for a small movement of the electric connector component, thereby avoiding mechanical tension within the electric connector. Moreover, small intolerances in the dimensions of housing and parts of the positioning component are compensated by some elastic deformation of the O-ring.

[0025] Optionally, as defined by claim 6, the linking component comprises a bendable component such that the mechanical link between the electric connector component and the processing unit is not rigid. For instance, the linking component comprises a cable or flexible PCB.

Providing a mechanical link between the electric connector component and the processing unit that is not rigid has the advantage that when mechanically loading the electric connector component or the housing, the electric connector component is able to slightly move along in the direction of the load without being subjected to a high mechanical tension. This prevents the electric connector component from breaking off and contributes to the robustness of the connector unit.

[0026] Optionally, according to claim 7, the electric connector component is detachable relative to the processing unit. This means that in the link between the electric connector component and the processing unit a point is provided where the mechanical and electrical link can easily be broken off and after replacing the electric connector component can be easily be hooked up again. In one embodiment, use is for instance made of a board-to-board connector.

[0027] Optionally, as defined by claim 8, the housing comprises a key unit adapted for orienting the neck relative to the housing. A key unit for instance is a protuberance or indentation arranged in the housing at the location where the housing will contact the neck of the apparatus when placing the apparatus in the conference unit. The outer end of the neck may for instance comprise a corresponding indentation or protuberance, respectively, so that the apparatus can only be placed in the housing in one possible orientation. The advantage of this is that when a mechanically symmetric connector is being made use of for the electric connector component, for instance a USB-C connector consisting of two symmetric rows of pins, each pin can be allocated a unique function as a result of which the connector becomes electrically asymmetric. If no unique orientation is guaranteed, then it is required that each function is fulfilled by a pin in the one row as well as by a pin in the other row. Providing a unique function for each pin has the advantage that more pins are available for different forms of data transmission, for instance a simultaneously analogue and digital data transmission.

[0028] Optionally, according to claim 9, the housing comprises a locking component adapted for mechanically fixating the neck relative to the housing, the locking component being part of a snap system. The housing is adapted for accommodating the outer end of the neck of the apparatus. Providing a locking component on the housing allows that after the apparatus has been placed it can be mechanically anchored relative to the housing. In that way a relative movement of the neck relative to the housing or relative to the conference unit is not possible. This has the advantage that when using a connected apparatus the mechanical load on this apparatus is set off by the housing, and is not transferred to the electric connector pair. This also has the advantage that the neck cannot rotate relative to the housing, as a result of which once more mechanically loading the connected connector pair is prevented. This contributes to the robustness of the connector unit.

[0029] The locking component is part of a snap system. A snap system is a system for fixating two parts relative to each other, by snapping the one part fixedly into the other. A snap system for instance comprises a pin or clip on the one hand and an opening or recess on the other hand, such that upon snapping fixed, the pin or clip ends up in the opening or recess and a movement relative to each other is thus prevented. In a possible embodiment the neck of the apparatus comprises a pin or clip, and the housing comprises a corresponding opening. The neck for instance comprises an unlocking button with which the pin or clip can be pushed in for in that way enabling the neck outer end to be slid into and out of the housing of the conference unit. Providing a snap system for locking apparatus and conference unit has the advantage that this permits a rapid and ergonomic placement and removal of the apparatuses, contrary to a threaded system.

[0030] Optionally, according to claim 10, the electric connector component forms the female element of the connector pair. This means that the second connector element of the connector pair present in the apparatus is the male element of the connector pair. Typically, a male element comprises pins, which can be touched more easily than the corresponding holes provided in a female connector. Providing the female element in the conference unit has the advantage that it is difficult for a user to touch the contacts, which contributes to the user's safety.

[0031] Optionally, as defined by claim 11, the electric connector component comprises connector pins and has a surface area measured perpendicular to the connector pins that does not exceed the corresponding surface area of a standard XLR connector. A connector of the XLR type is a circular multi-pole connector having 3 to 7 contacts and a nominal outer shell diameter of 19 mm. An XLR connector is traditionally used in the state of the art as electric connector for connecting apparatuses including neck in a conference unit. Providing an electric connector component having a surface area, measured perpendicular to the connector pins, not exceeding the surface area of a standard XLR connector, has the advantage that the electric connector component can easily be integrated within the layout of an existing apparatus including neck and conference unit. The cross-section of the neck for instance should not be made larger than is the case in apparatuses including neck known in the state of the art.

[0032] Optionally, according to claim 12, the connector pair comprises a USB-C connector. A USB-C connector, formally known as USB Type C, is a twofold rotational-symmetric connector having 24 pins placed in 2 rows of 12 pins each. A USB-C port has standard dimensions of 8.4 mm by 2.6 mm. A connector pair comprising a USB-C connector, means that the hardware of the connector pair comprises a USB-C connector, i.e. makes use of a connector having the standard layout of a USB-C connector. Use of the pins or allocating functions to the var-

ious pins does not necessarily have to follow the standard USB-C specifications. Providing a USB-C connector allows high-speed digital data transmission, at a transfer rate of at least 480 Mb/s.

[0033] According to a second aspect of the invention, as defined by claim 13, an apparatus is provided, the apparatus comprising a neck, the neck comprising a neck connector adapted for connecting to a connector unit according to the first aspect of the invention. The apparatus comprises a neck on which a unit receiving media is mounted. A unit receiving media is for instance a microphone head or a microphone array receiving audio, or a camera receiving footage. A neck is a part to which on the one side, typically the upper side, the unit for receiving media is mounted, and on the other side, typically the bottom side, a neck connector is provided with which the apparatus can be placed in the conference unit. Typically, the neck is an elongated, rod-shaped part. However, embodiments wherein the neck is not elongated are also possible. In a possible embodiment the neck comprises a part that is bendable, as is the case in a gooseneck apparatus. The neck, for instance, comprises a bendable part at the bottom, i.e. on the side where the neck is placed in the conference unit, and a solid part at the top. In a possible embodiment an apparatus for instance comprises a light or LED ring, indicating whether the apparatus is switched on or off.

[0034] Optionally, according to claim 14, the neck connector comprises:

- a neck outer end adapted to fit within the housing of the connector unit, and
- a neck housing adapted to remain outside the housing after connecting the neck connector to the connector unit,

  and wherein the neck connector comprises elastic material placed around the neck housing such that after connecting the neck connector to the connector unit at least part of the elastic material is in contact with the housing. Thus, the neck connector comprises a neck outer end and a neck housing. In connected condition, the neck outer end is placed inside the housing of the connector unit, while the neck housing remains outside the housing of the connector unit. An elastic material may be any kind of material that may easily be deformed in an elastic way, and returning to their initial shape after removal of forces. In an embodiment, the elastic material is provided as a ring of elastic material, e.g. rubber, placed around the neck housing. In connected condition, the elastic material is in contact with the housing of the connector unit. Therefore, due to the elastic deformation of the elastic material, any intolerances in the dimensions are compensated and the neck housing may tightly fit with the housing of the connector unit. As a result, the neck connector is tensioned, meaning that it will not e.g. wiggle after placing in the connector unit. At the same time, the elastic material allows for an easy removal of the neck connector when disconnecting from the connector unit. Furthermore, in connected condition, a mechanical load, e.g. due to pulling the neck of the apparatus, will result in compression of the elastic material, thereby reducing mechanical tensions within the electric connector component. The latter contributes to a better protection of the fragile pins of a high-speed electrical connector.

[0035] Optionally, according to claim 15, the neck connector comprises:

- an unlocking button adapted for moving a locking clip when pushing the unlocking button, and
- a resilient element,

wherein a resilient force is generated by the resilient element when pushing the unlocking button, thereby pushing back the unlocking button.

A locking clip typically is part of a snap system, wherein the clip clicks into an opening of the housing of the connector unit when connecting. For disconnecting, pushing an unlocking button allows to move the locking clip, thereby opening the click. For this purpose, some link material is provided between the unlocking button and the locking clip, this material being elastically deformed during unlocking. When a cheap material is used for this, the link material may gradually deform and lose its elasticity. A resilient element is an element that, when pushing it, generates a resilient force, the latter tending to bring the element back in its original shape. For example, it may be a part in an elastic material, e.g. silicone, rubber, any kind of spring, etc. The resilient element is placed in the neck connector such that a resilient force is generated when pushing the unlocking button, thereby pushing back the unlocking button. This has the advantage that even when a cheap link material is used, the unlocking button is always pushed back to its unloaded position, thereby guaranteeing a good functioning of the snap system and a tight connection between the neck connector and the connector unit. Such a tight connection contributes to reducing loads being exerted on the electrical connector, e.g. when pulling the neck of a gooseneck microphone.

Brief Description of the Drawings

[0036]

Figure 1 shows a 3D representation of an embodiment of an apparatus including neck connected in a conference unit.

Figure 2 and Figure 3 each show an exploded view of an embodiment of the connector unit and of a neck connector fitting in the connector unit.

Figure 4 and Figure 5 each show a 3D representation of an embodiment of an assembled connector unit and of a neck connector fitting in the connector unit.

Figure 6 shows a cross-section of an embodiment of the connector unit.

Figure 7 shows a 3D representation of another embodiment of an assembled connector unit.

Figure 8 and Figure 9 show an exploded view of another embodiment of a neck connector.

Figure 10 and Figure 11 show a 3D representation of an embodiment of an assembled neck connector

Figure 12 and Figure 13 show a cross section of an embodiment of an assembled neck connector, in disconnected respectively connected condition.

Figure 14a and Figure 14b each show an embodiment of an electric connector component.

Figure 15 shows a schematic representation of various embodiments of the data transmission within a connector unit.

Detailed Description of the Embodiments

[0037] Figure 1 shows a 3D representation of an embodiment of an apparatus 102 connected in a conference unit 101. In the embodiment shown the apparatus 102 comprises a microphone head 104, a LED ring 108 and a neck 105. The microphone head 104 is for instance screened off by means of a wind screen. Internally in the microphone head 104 for instance a microphone cartridge and an electronic filtering are present. In the embodiment of Figure 1, the neck 105 comprises a solid part 106 and a flexible part 107, intended for bending the neck 105 towards or away from a speaking person. The apparatus 102 shown in Figure 1 is typically called a gooseneck microphone. Other embodiments of an apparatus 102 are possible however, for instance wherein the apparatus 102 comprises a microphone array or a camera. Different embodiments are also possible for the neck 105, for instance wherein there is no flexible part 107, or a neck having a different shape than the elongated or rod-shaped embodiment as suggested in Figure 1. Typically, a connector unit and apparatus including neck should be able to go through about 1500 connection cycles without deterioration occurring.

[0038] A neck is a part to which on the one side, typically the upper side, the unit for receiving media is mounted, and on the other side, typically the bottom side, an outer end is provided with which the apparatus can be placed in the conference unit. Typically, the neck is an elongated, rod-shaped part. However, embodiments wherein the neck is not elongated are also possible.

[0039] The conference unit 101 contains the electronics, for instance in the form of a printed circuit board, PCB or electronic board, to process the audio signal and for instance switch the microphone on and off and control the LED ring 107. The embodiment as shown in Figure 1 is typically placed on a tabletop or mounted in the tabletop. Other embodiments, having a different position or mounting of the conference unit 101 are possible, however.

[0040] The neck 105 of the apparatus 102 comprises two outer ends. In the embodiment of Figure 1 one neck outer end is situated on the side of the microphone head 104, whereas the other neck outer end, comprising a neck connector 103, is adapted for being placed in the conference unit 101. The conference unit 101 comprises the connector unit 100, which is fixedly mounted in the conference unit 101. The apparatus 102 is mobile, which means that it is adapted for, by uncoupling the neck connector 103 from the connector unit 100, being easily removed from the conference unit 101 and being placed back into it afterward.

[0041] Figure 2 and Figure 3 show an exploded view of an embodiment of the connector unit 100 and a neck connector 103. Figure 4 and Figure 5 show a 3D representation of this embodiment in assembled condition. Figure 6 shows a cross-section of this embodiment of the connector unit 100. The connector unit 100 comprises a housing 200, an electric connector component 201, a positioning component 202, and a linking component 203.

[0042] In the embodiment shown, the housing 200 is cylindrical and hollow. Typically, the housing 200 has an inner surface that is smooth and durable. The outer surface of the cylindrical housing 200 comprises a threaded part 206, and a flat part 204. The figures also show a hexagonal nut 212, permitting the connector unit 100 to be mounted within a conference unit 101.

[0043] The neck 105 comprises a neck outer end 216 typically having a smooth and durable outer surface. The housing 200 is adapted for accommodating the neck outer end 216, when placing the neck 105 in the connector unit 100. The neck outer end 216 comprises a locking clip 218. The housing 200 comprising a locking component in the form of the locking opening 205. The locking clip 218 and the locking opening 205 together form a snap system. When placing the neck 105 in the housing 200 the locking clip 218 snaps into the corresponding locking opening 205. The neck 105 comprises an unlocking button 219, which is adapted for pushing in the locking clip 218, and thus enabling the neck outer end 216 to be slid out of the housing 200. The housing 200 further comprises a key unit in the form of an indentation 300, adapted for correctly orienting the neck 105 upon connecting. For that purpose, the neck outer end 216 comprises a corresponding protuberance 217.

[0044] The connector unit 100 comprises an electric connector component 201, which in the embodiment shown is the female element 208 of a connector pair.

The male element 220 of this connector pair is fixedly mounted within the neck outer end 216. In the embodiment shown the connector pair is formed by the male element 220 and the female element 208 of a USB-C connector. When placing the neck 105 in the conference unit 101 the neck outer end 216 slides into the cavity of the housing 200, and the pins of the male element 220 slide into the corresponding contacts of the female element 208. The indentation 300 and the protuberance 217 ensure that the female element 208 and the male element 220 of the symmetric USB-C connector are capable of connecting with each other in one way only.

[0045] In the embodiment shown in Figures 2, 3, 4, 5 and 6, the positioning component 202 comprises several parts, namely a disk-shaped PCB 210, an annular element or O-ring 213, and a C-Clip 600. As shown in the figures, all parts of the positioning component 202 are placed underneath the electric connector component 201 in assembled condition. The electric connector component 201 is fixedly mounted to the disk-shaped PCB 210. The disk-shaped PCB 210 simultaneously functions as a mechanical part that is adapted for bearing the bottom side of the electric connector component 208, and as a part that is adapted for electrically linking the contacts of the electric connector component 208 to other components, in this case via a board-to-board connector 211. When assembling the connector unit 100, the electric connector component 201 is positioned in the housing 200. The disk-shaped PCB on which the electric connector component 201 is mounted, is then slid into the cavity of the housing 200. The electric connector component 201 is placed such that its sides 221 slide along the surfaces 207 on the inner surface of the housing 200. This ensures a correct orientation of the PCB 210 in the housing 200. The length of the surfaces 207, measured according to the axis of the cylindrical housing 200, defines the position of the disk-shaped PCB 210 after assembly, and therefore also the relative position of the electric connector component 208 relative to the housing 200. As shown in the figures, in assembled condition, the sides 221 of the electric connector component 201, and the parts comprised in the positioning component 202 are in contact with the housing 200. The positioning component 202 further comprises an O-ring 213. In the embodiment of Figures 2, 3, 4, 5, and 6, the disk-shaped PCB 210 is retained in position by an O-ring 213 which is pushed against the disk-shaped PCB 210 by a C-clip 600. In its turn, the basis of the electric connector component 208 is pushed against an annular protuberance 602 of the inner wall of the housing 200. Providing the O-ring 213 permits some clearance, for instance in the order of tenths of millimeters, to be allowed in the position of the electric connector components relative to the housing 200. When the neck 105 is loaded in the connected condition, or during connecting the neck, the electric connector component 208 and the disk-shaped PCB 210 are able to slightly move along in the direction of the load, due to elastic compression of the O-ring. This tilting movement causes the female element 208 to remain better aligned relative to the male element 220, thereby avoiding or reducing mechanical tensions in the connected connector pair 208, 200.

[0046] After assembling the connector unit 100, the C-clip 600 is located within the cavity of the cylindrical housing 200. This has the advantage that the hexagonal nut 212, intended for mounting the connector unit 100 within the conference unit 101, can be placed and tightened once the conference unit 100, i.e. the housing 200 including its internally positioned components, has been assembled. Conversely, the connector unit 100 in assembled form of the conference unit 101 can be detached by unscrewing the hexagonal nut 212. The advantage of this is that it allows for easy mounting of the connector unit 100 in the conference unit 101, as well as easy removal of the connector unit 100 from the connector unit 101.

[0047] In another embodiment of the connector unit 100, as shown in Figure 7, there is no C-clip 600. In this embodiment the disk-shaped PCB 210 is retained in position by an O-ring 213, which is pushed against the disk-shaped PCB 210 by tightening a round nut 214.

[0048] In the embodiments shown in Figures 2, 3, 4, 5, 6 and Figure 7, respectively, the linking component 203 comprises a board-to-board connector 211, 603. A first part 211 is mounted on the disk-shaped PCB 210, on the other side than the one bearing the electric connector component 208. The second part 603 of the board-to-board connector 211, 603 is attached to the flexible PCB 601. The first part of the board-to-board connector 211 is adapted to fit in the inside opening of the O-ring 213 and the C-clip 600, as can be seen in the embodiment of Figures 2, 3, 4, 5, 6, and is adapted to fit in the inside opening of the O-ring 213 and the round nut 214, as can be seen in the embodiment of Figure 7. The linking component 203 further comprises a flexible PCB 601, which is attached to the second part of the board-to-board connector 603, as can be seen in Figure 6. The board-to-board connector 211, 603 and the flexible PCB 601 are adapted for electrically linking the electric connector component 208, over the disk-shaped PCB 210, to a processing unit 1000. The processing unit 1000, not depicted in Figures 2, 3, 4, 5, 6 and 7, is typically implemented by means of a PCB, printed circuit board or electronic board. A processing unit 1000 for instance comprises a component ensuring digital signal processing before transmitting an audio signal to the loudspeaker. A processing unit 1000 may for instance also comprise an analogue-to-digital convertor.

[0049] The flexible PCB 601 forms a bendable component, such that the mechanical link between the electric connector component 208 and the processing unit 1000 is not rigid. In that way, in case of mechanically loading the electric connector component 208 or the housing 200, the electric connector component 208 is able to slightly move along in the direction of the load without being subject to high mechanical tension. In that

way the electric connector component 208 is prevented from breaking off.

[0050] The board-to-board connector 211, 603 further permits easy detachment of the flexible PCB 601 from the disk-shaped PCB 210 including electric connector component 208, by pulling the two parts 211, 603 of the board-to-board connector loose. In that way the electric connector component 208 can easily be detached from the processing unit 1000. This allows for easy replacement of the electric connector component 208, without the connecting wires to the processing unit 1000 having to be cut through and re-soldered.

[0051] Figure 8 to 13 illustrate another embodiment of a neck connector 8000. Referring to Figure 1, the neck connector 8000 is another embodiment of neck connector 103, and allows to connect an apparatus 102 with neck 105 to a connector unit 100. The connector unit 100 as shown in Figure 13 is similar to the connector unit 100 shown in the Figures 2 to 5, and comprises a housing 200. The neck connector 8000 comprises a neck outer end 8001, being the part fitting within the housing 200 when connecting the neck connector 8000 to the connector unit 100, see Figure 13. Moreover, the neck connector 8000 comprises a neck housing 8002, being the part remaining outside the housing 200 after connecting to the connector unit 100, see Figure 13. The neck connector 8000 comprises the male element 8012 of a USB-C connector, adapted to connect with the corresponding female element of the connector unit 100.

[0052] The neck connector 8000 comprises elastic material 8003. In the embodiment shown, the elastic material 8003 is provided as a rubber ring, placed around the neck housing 8002. Figure 12 shows two different cross sections. The figure shows that the rubber ring 8003 comprises a part 8010, being placed inside a groove of the neck housing 8002, in order to hold the ring 8003 in a fixed position. Moreover, the ring 8003 comprises a part 8009, being placed at the bottom side of the neck housing 8002. After connecting the neck connector 8000 to the connector unit 100, part 8009 of the elastic ring 8003 is found in between the neck housing 8002 and the top part of the housing 200. The latter is clear from Figure 13, showing the connected condition. The elastic material 8003 allows the neck connector 8000 to tightly fit with the housing 200 of the connector unit 100, thereby tensioning the neck connector 8000. At the same time, it allows for an easy removal of the neck connector 8000 when disconnecting from the connector unit 100. Finally, in connected condition, mechanical tensions within the USB-C connector are reduced when e.g. pulling the neck 105 of the apparatus 102.

[0053] Further, the neck connector 8000 comprises an unlocking button 8004 and a locking clip 8005. The locking clip 8005 forms a snap system together with the locking opening 205 in the housing 200. When connecting the neck connector 8000 to the connector unit 100, the locking clip 8005 clicks into the opening 205, thereby removably fixing the neck connector 8000 to the connector unit 100. Pushing the unlocking button 8004 allows to open the click. Indeed, Figure 12 and Figure 13 show that some linking material 8011 is provided between the unlocking button 8004 and the locking clip 8005. Thus, pushing the button 8004 results in moving the linking material 8011 and the locking clip 8005, thereby opening the snap connection. In the embodiment shown, the pushing button 8004 is provided in the same elastic material as the elastic ring 8003.

[0054] Figure 12 and Figure 13 further show that a resilient element 8006 is placed inside the neck housing 8002. In the embodiment shown, the resilient element 8006 is a cube of silicone. As shown in Figure 8, the resilient element 8006 is hold in a fixed position by placing it into a gap 8008 of a cylindrical element 8007. The cylindrical element 8007 fits into the neck housing 8002, and also holds the male element 8012 of the USB-C connector. When pushing the unlocking button 8004, the resilient element 8006 is compressed, thereby generating a resilient force. The latter tends to push back the button 8004 to its unloaded position. Therefore, even when a cheap linking material 8011 is used, of which the elasticity may deteriorate over time, the good functioning of the snap system is guaranteed.

[0055] Figure 14a shows an embodiment of the electric connector component 201, wherein a cross-section perpendicular to the direction of connecting is shown. In the embodiment of Figure 14a the electric connector component 201 has 24 contacts, numbered 801 up to and including 824 in Figure 14a, placed in two rows of 12 contacts each. This for instance is the female element 208 of a USB-C connector. In a possible embodiment of the connector unit 100, the contacts 801 up to and including 824 are used as defined by the standard USB-C specifications. In this embodiment, the contacts are used fully symmetrically, i.e. each function fulfilled by a contact in the one row is also fulfilled by a corresponding contact in the other row.

[0056] In another embodiment of the electric connector component 201, shown in Figure 14b, the functions of the contacts 901 to 924 are not fulfilled symmetrically, i.e. not every function fulfilled by a contact in the one row is also fulfilled by a contact in the other row. An embodiment is for instance possible wherein the use of the one row of contacts follows the standard USB-C specifications, whereas the other row comprises contacts with functions such as the transmission of analogue audio signals and the controlling of a LED ring. Such an embodiment may permit both transmission of analogue audio signals and high-speed digital data transmission. This means that this connector unit can be used in combination with an analogue apparatus, a digital apparatus or a combination of an analogue and a digital apparatus.

[0057] Figure 15 shows a schematic representation of various embodiments of the data transmission within a connector unit 100. In embodiment 'a.' an electric connector component 201 receives a digital data flow 1004 by coupling to the male element 220 of the connector

pair 208, 220. The apparatus 102 for instance comprises a digital camera. The digital data flow 1004 is transmitted to a processing unit 1000 via a linking component 203. In the embodiment 'a.' of Figure 15, the processing unit 1000 comprises a unit 1002 adapted for digital signal processing, and a unit 1001 adapted for detecting the nature of the received signal 1004. In the embodiment 'a.' the nature of the received signal 1004 is digital. Such detection permits knowing how to read the contacts of the electric connector component 201. For instance, in combination with the embodiment of Figure 14b, the contacts 906, 907; 902, 903; 910, 911; and 914, 915 are used for digital data transmission.

[0058] In the embodiment 'b.' of Figure 15, an electric connector component 201 receives an analogue data flow 1005 with the male element 220 of the connector pair 208, 220. The apparatus 102 for instance comprises an analogue microphone, wherein the apparatus 102 itself does not comprise an analogue-to digital convertor. The analogue data flow 1005 is transmitted to a processing unit 1000 via a linking component 203. In the embodiment 'b.' the processing unit 1000 comprises a unit 1002 adapted for digital signal processing, a unit 1001 adapted for detecting the nature of the received signal 1004, and an analogue-to-digital convertor 1003. In the embodiment 'b.' the nature of the signal detected by unit 1001 is analogue. In combination with the embodiment of Figure 14b, the contacts 922 and 923 have to be read. The analogue audio data further is first sent to an analogue-to-digital convertor 1003 before going to the digital signal processing 1002.

[0059] In the embodiment 'c.' of Figure 15, the electric connector component 201 receives an analogue data flow 1005 and a digital data flow 1004. The apparatus 102 for instance comprises an analogue microphone and a digital camera. In the embodiment 'c.' the processing unit 1000 comprises a unit 1002 adapted for digital signal processing, a unit 1001 adapted for detecting the nature of the received signal 1004, and an analogue-to-digital convertor 1003. In the embodiment 'c.' the nature detected by unit 1001 is analogue plus digital. In combination with the embodiment of Figure 14b the contacts having a digital function, i.e. 906, 907, 902, 903, 910, 911, 914, and 915 as well as the contacts having an analogue function, i.e. 922 and 923, have to be read. The analogue audio data 1005 is first sent to an analogue-to-digital convertor 1003 before going to the digital signal processing 1002. The digital data 1004 is directly sent to the digital signal processing 1002.

[0060] Although the present invention was illustrated on the basis of specific embodiments, it will be clear to the expert that the invention is not limited to the details of the above illustrative embodiments, and that the present invention can be configured including various changes and amendments without departing from the scope of the invention. The present embodiments therefore have to be considered illustrative in all aspects and not restrictive, wherein the scope of the invention is described by the attached claims and not by the above description, and all changes that fall within the meaning and scope of the claims, will therefore be included herein. In other words: it is taken as starting point that all changes, variations or equivalents that fall within the scope of the underlying basic principles and of which the essential characteristics are claimed in this patent application, are included. Moreover, the reader of this patent application will understand that the words "comprising" or "comprises" do not preclude other elements or steps, that the word "a/an" does not preclude the plural, and that a single element, such as a computer system, a processor or another integrated unit is capable of fulfilling the functions of various tools mentioned in the claims. Any references in the claims should not be taken as a limitation of the claims in question. The terms "first", "second", "third", "a", "b", "c" and the like, when used in the description or in the claims are used to make a difference between similar elements or steps and not necessarily describe a sequence or chronological order. Likewise, the terms "upper side", "lower side", "over", "under" and the like are used for the sake of the description and they do not necessarily refer to relative positions. It should be understood that under the right circumstances, those terms are interchangeable and that embodiments of the invention are capable of functioning according to the present invention in different orders or orientations than described or illustrated above.

Claims

1. Connector unit (100) for connecting a mobile apparatus (102) including neck (105) in a conference unit (101), comprising:

- a housing (200) adapted for placing said neck (105) in said conference unit (101);
- an electric connector component (201) forming a first element (208) of a connector pair (208, 220), and adapted for connecting to a second element (220) of said connector pair (208, 220) within said neck (105), wherein said connector pair (208, 220) is adapted for high-speed digital data transmission;
- a positioning component (202) adapted for positioning said electric connector component (201) within said housing (200);
- a linking component (203) adapted for electrically linking said electric connector component (201) to a processing unit (1000) within said conference unit (101),

CHARACTERIZED IN THAT:

- said electric connector component (201) has sides (221) adapted to slide along inner surfaces (207) of said housing (200) when positioning

said electric connector component (201) within said housing, and

- said positioning component (202) is adapted to bear said electric connector component (201), thereby allowing clearance in the position of said electric connector component (201) relative to said housing (200).

2. Connector unit (100) according to claim 1, wherein said high-speed digital data transmission allows a transfer rate of at least 480 Mb/s.

3. Connector unit (100) according to any one of the preceding claims, wherein said connector pair (208, 220) is further adapted for transmission of analogue audio signals.

4. Connector unit (100) according to any one of the preceding claims, wherein said positioning component (202) comprises an annular element (213), adapted to bear said electric connector component (201), thereby allowing clearance in the position of said electric connector component (201) relative to said housing (200).

5. Connector unit (100) according to claim 4, wherein said annular element (213) is an O-ring.

6. Connector unit (100) according to any one of the preceding claims, wherein said linking component (203) comprises a bendable component (601) such that the mechanical link between said electric connector component (201) and said processing unit (1000) is not rigid.

7. Connector unit (100) according to any one of the preceding claims, wherein said electric connector component (201) is detachable relative to said processing unit (1000).

8. Connector unit (100) according to any one of the preceding claims, wherein said housing (200) comprises a key unit (300) adapted for orienting said neck (105) relative to said housing (200).

9. Connector unit (100) according to any one of the preceding claims, wherein said housing (200) comprises a locking component (205) adapted for mechanically fixating said neck (105) relative to said housing (200), said locking component (205) being part of a snap system.

10. Connector unit (100) according to any one of the preceding claims, wherein said electric connector component (201) forms the female element (208) of said connector pair (208, 220).

11. Connector unit (100) according to any one of the preceding claims, wherein said electric connector component (201) comprises connector pins and said electric connector component (201) has a surface area measured perpendicular to said connector pins that does not exceed the corresponding surface area of a standard XLR connector.

12. Connector unit (100) according to any one of the preceding claims, wherein said connector pair (208, 220) comprises a USB-C connector.

13. Apparatus (102) comprising a neck (105), said neck (105) comprising a neck connector (8000) adapted for connecting to a connector unit (100) according to one of the preceding claims.

14. Apparatus (102) according to claim 13, wherein said neck connector (8000) comprises:

- a neck outer end (8001) adapted to fit within said housing (200) of said connector unit (100), and
- a neck housing (8002) adapted to remain outside said housing (200) after connecting said neck connector (8000) to said connector unit (100),

and wherein said neck connector (8000) comprises elastic material (8003) placed around said neck housing (8002) such that after connecting said neck connector (8000) to said connector unit (100) at least part of said elastic material (8003) is in contact with said housing (200).

15. Apparatus (102) according to claim 13 or 14, wherein said neck connector (8000) comprises:

- an unlocking button (8004) adapted for moving a locking clip (8005) when pushing said unlocking button (8004), and
- a resilient element (8006),

wherein a resilient force is generated by said resilient element (8006) when pushing said unlocking button (8004), thereby pushing back said unlocking button (8004).

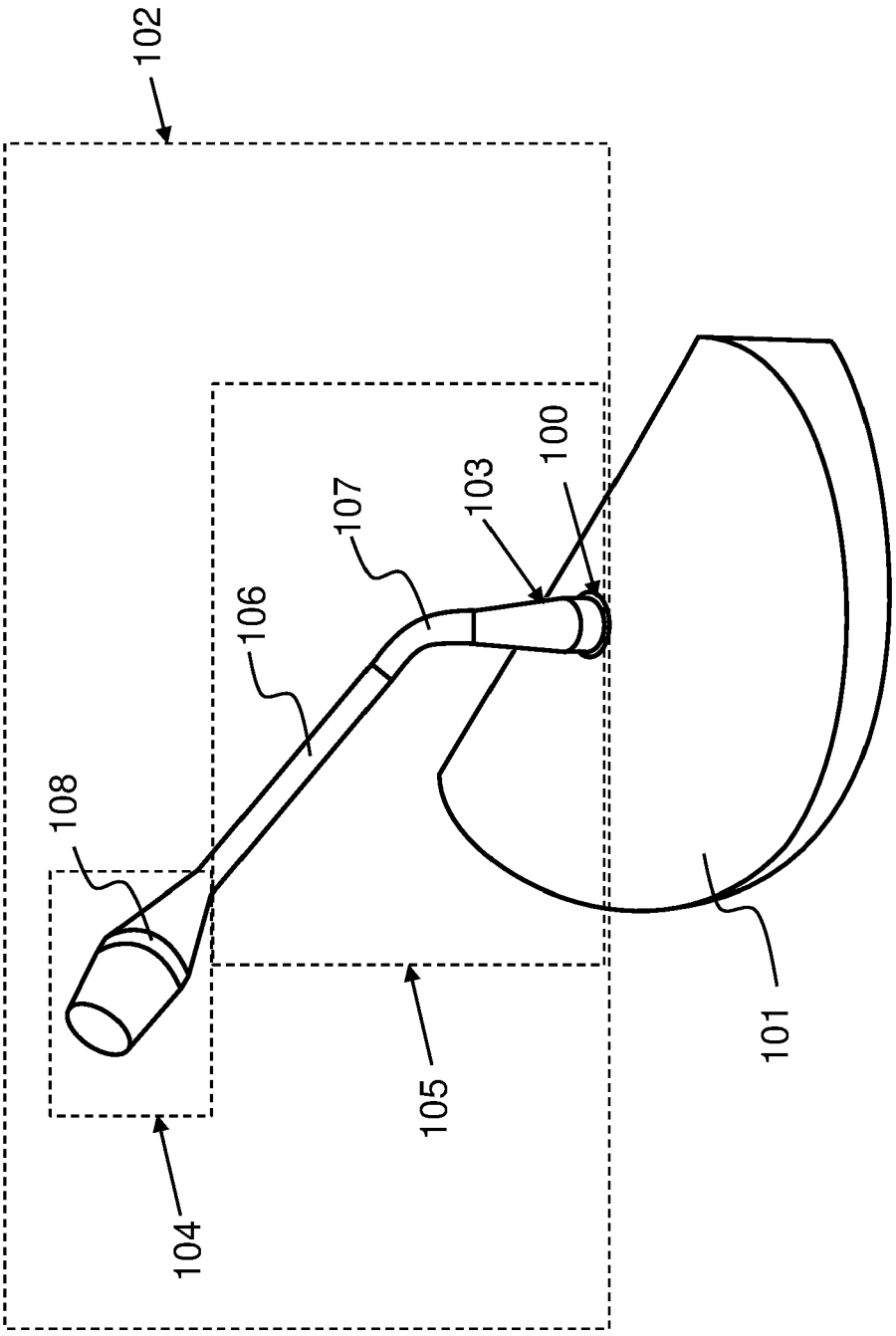
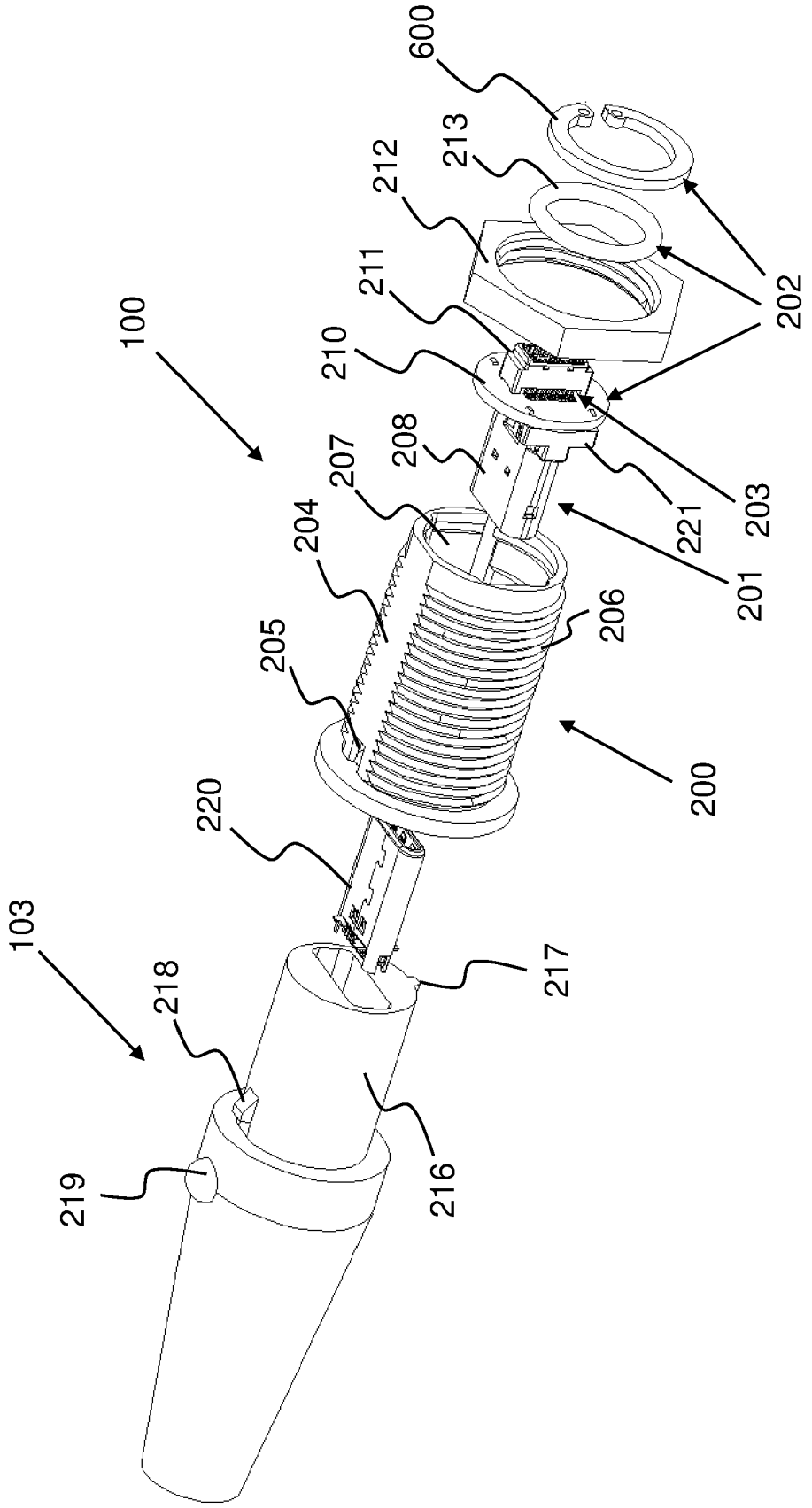


Fig. 1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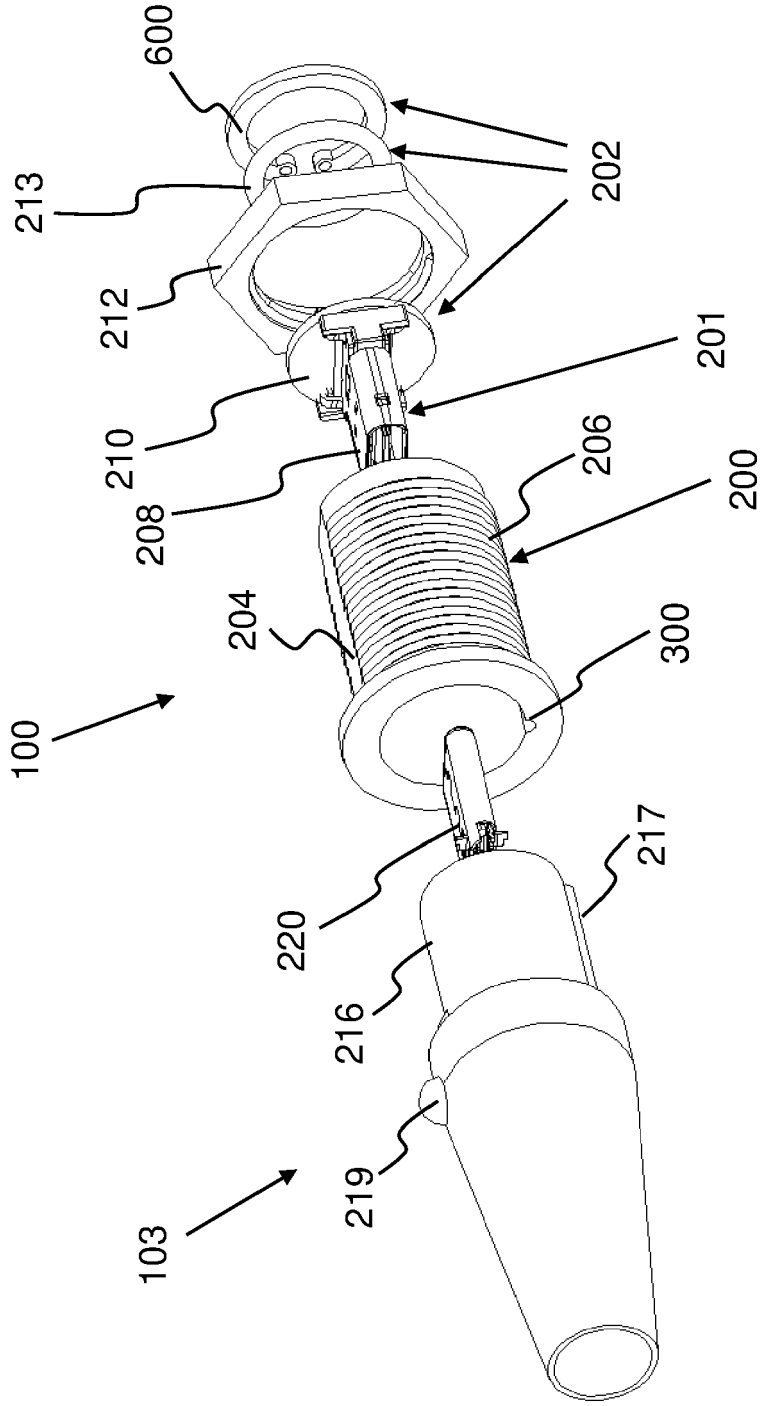
100

Fig. 2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103

Fig. 3

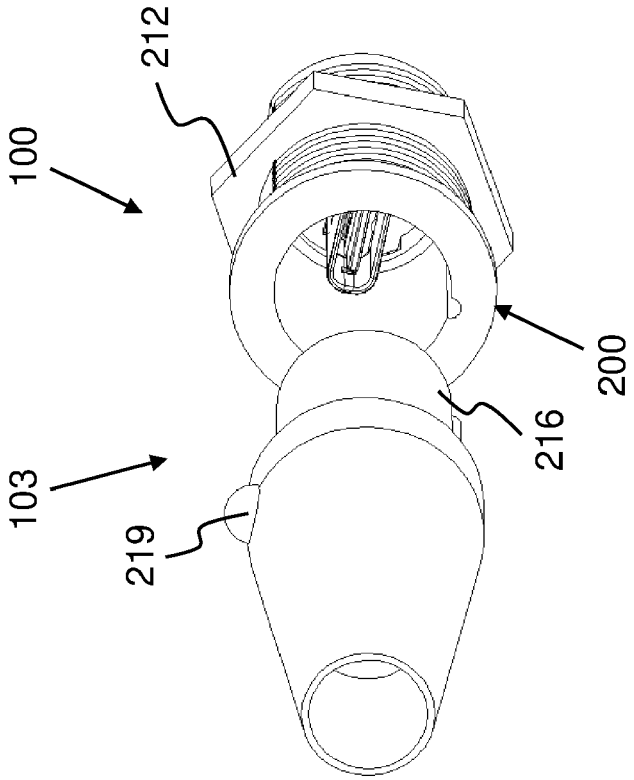


Fig. 4

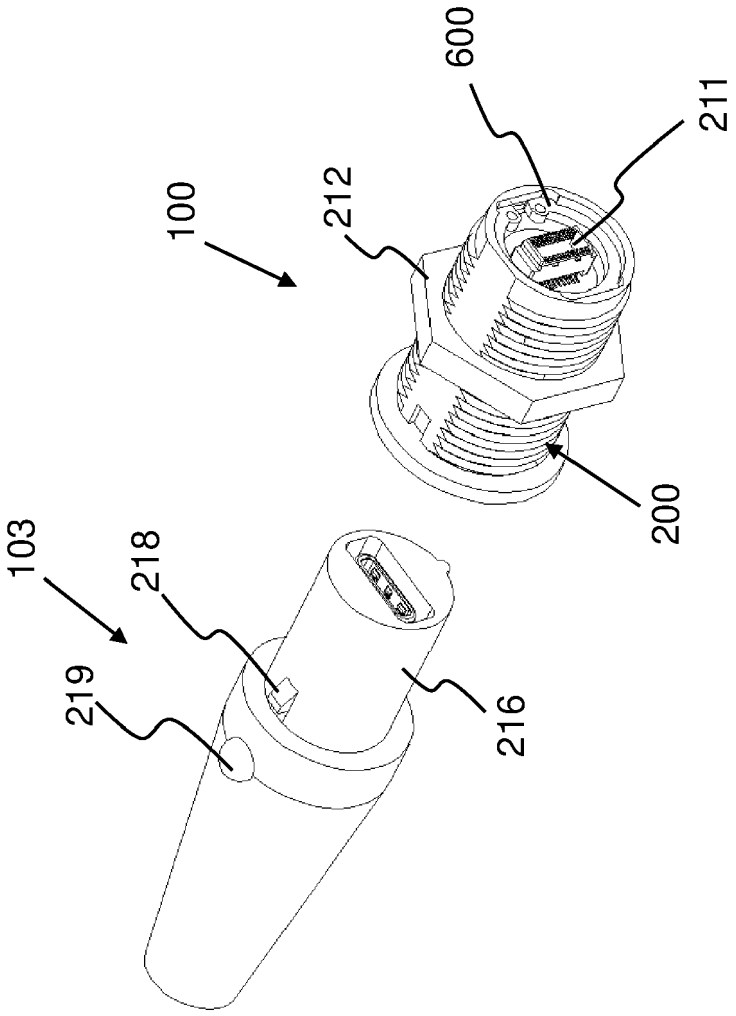


Fig. 5

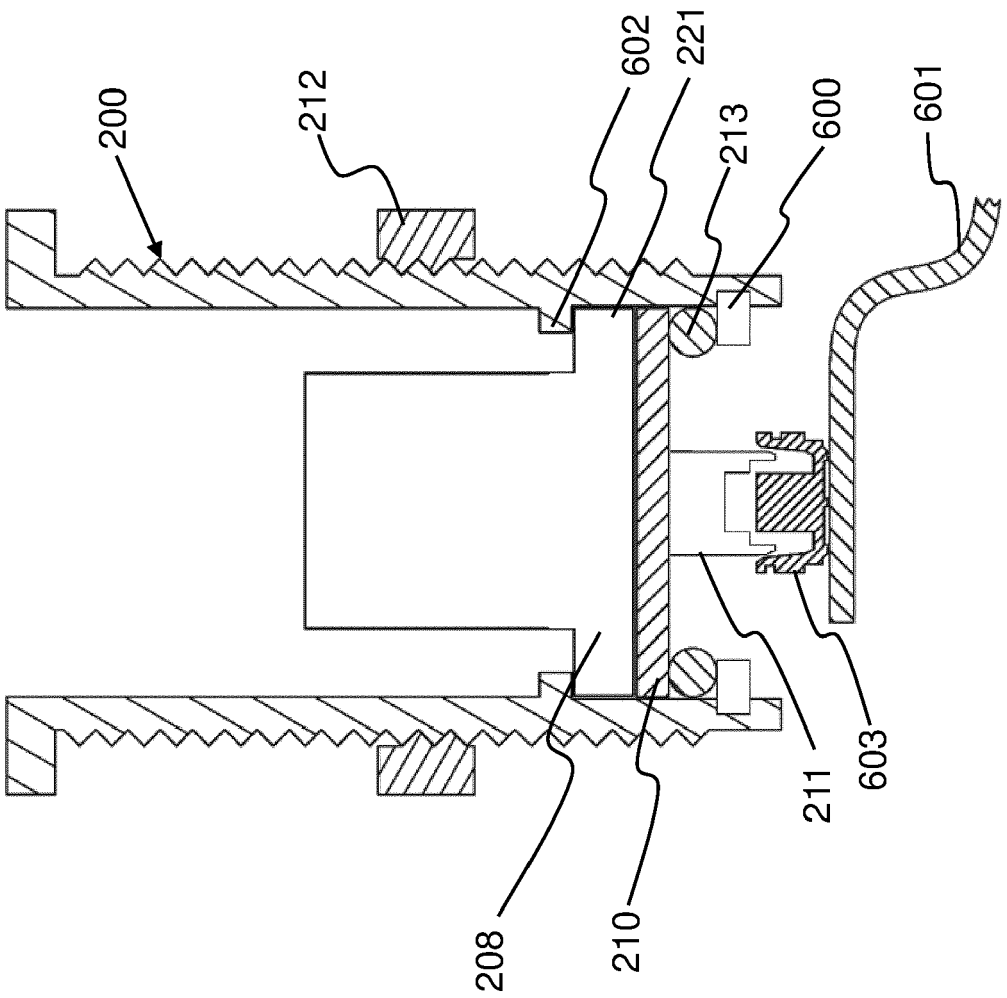


Fig. 6

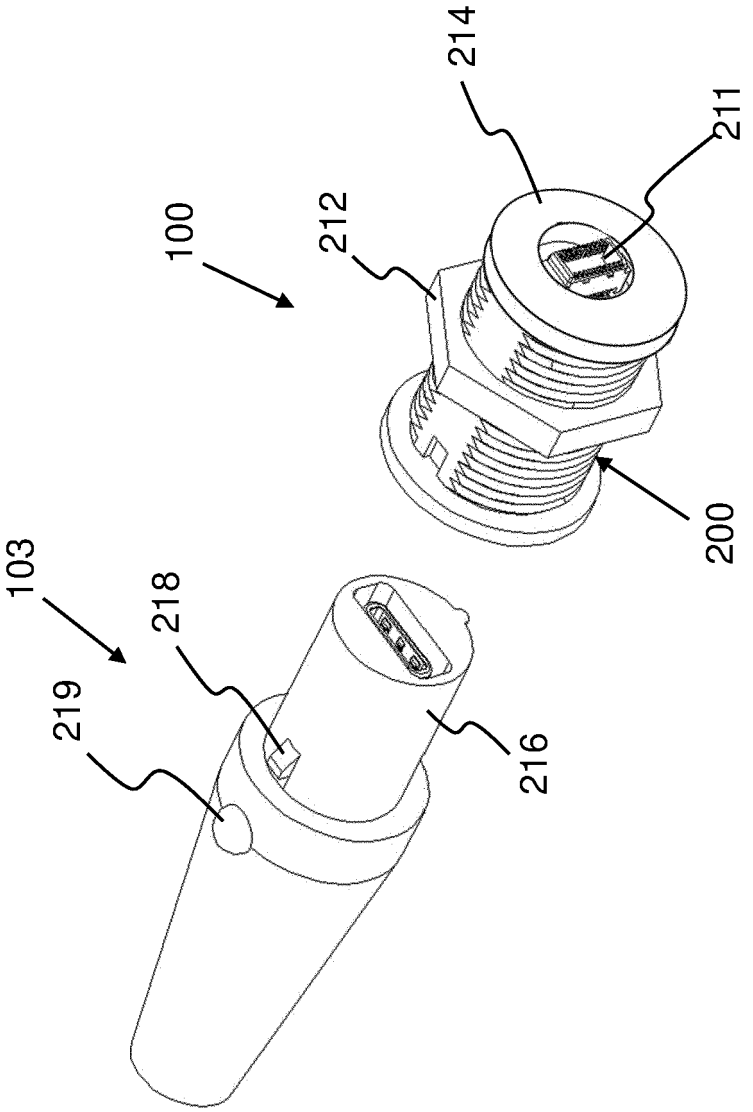


Fig. 7

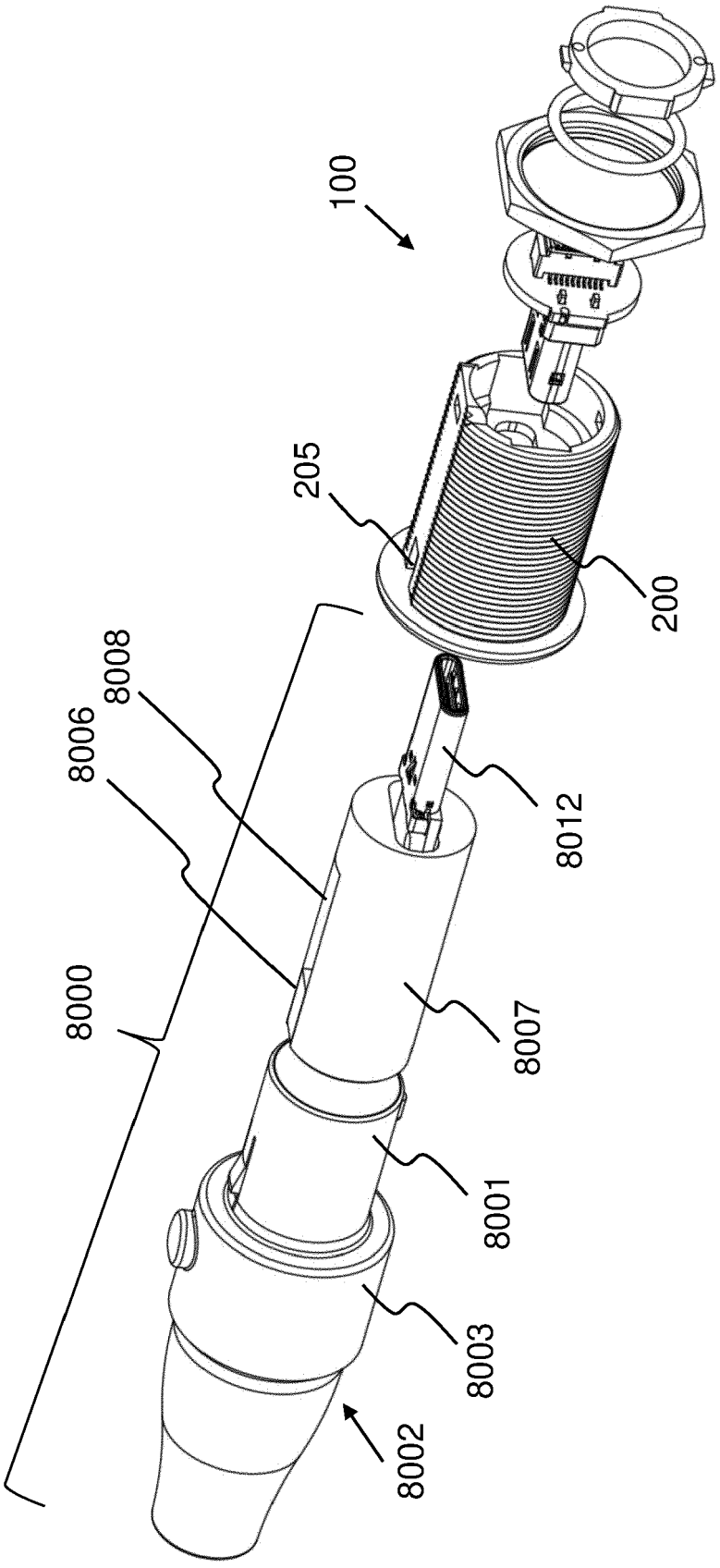


Fig. 8

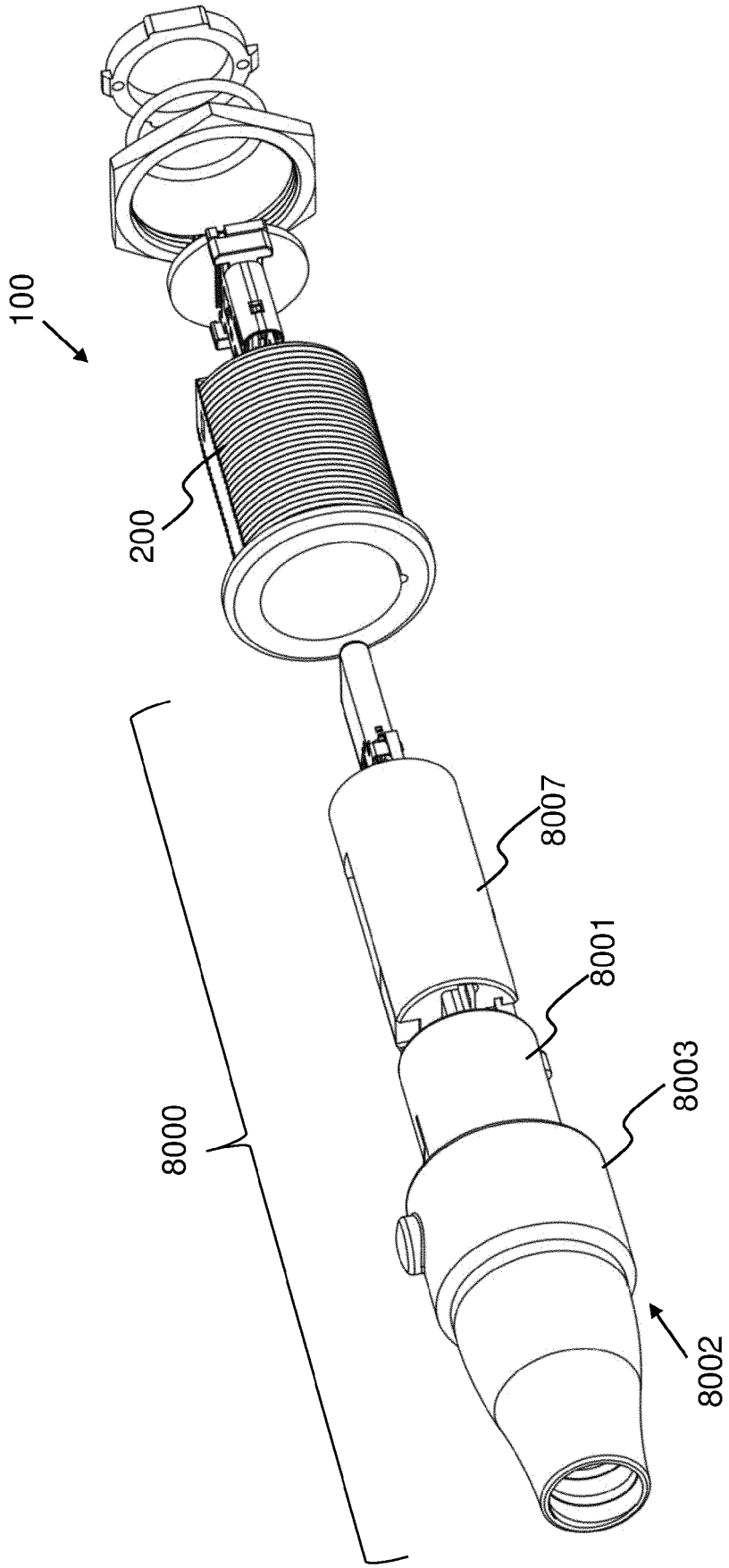


Fig. 9

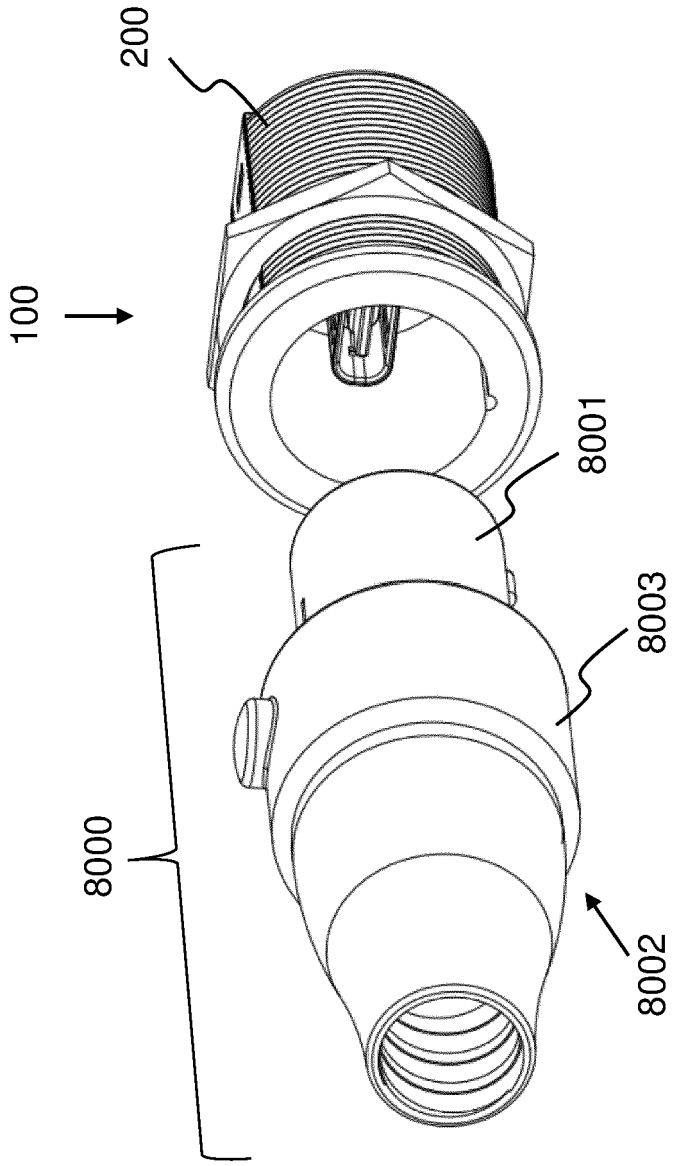


Fig. 10

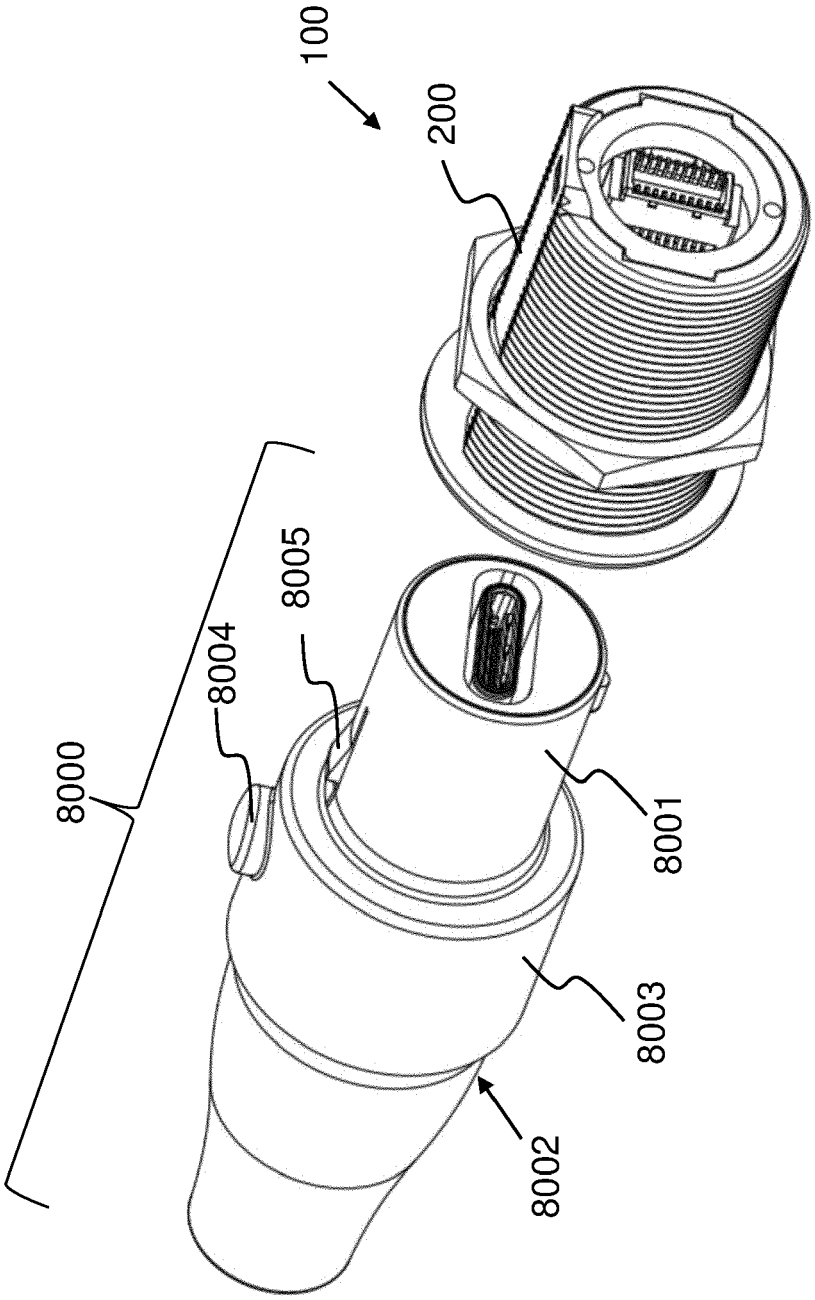
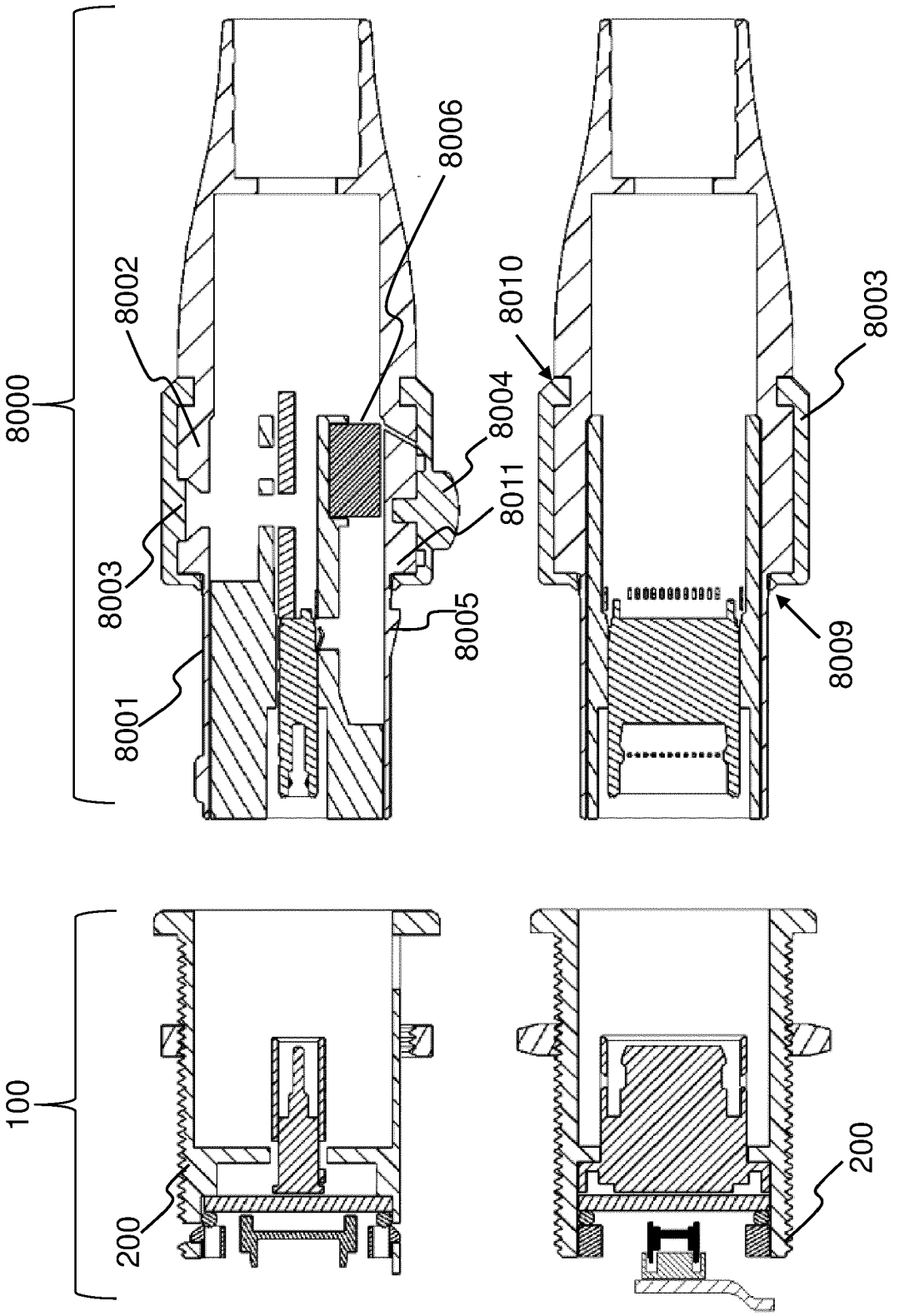


Fig. 11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200
200

Fig. 12

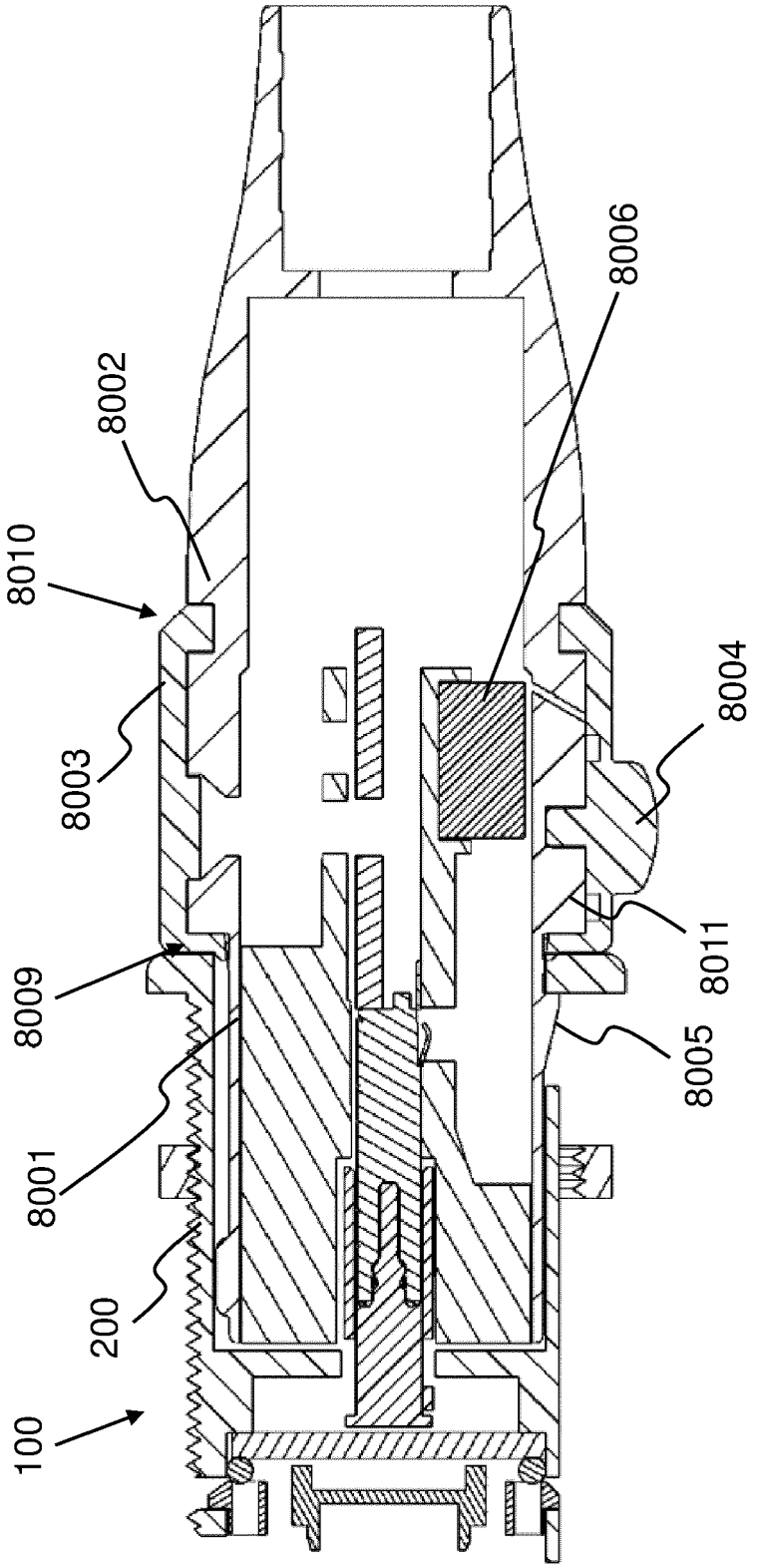


Fig. 13

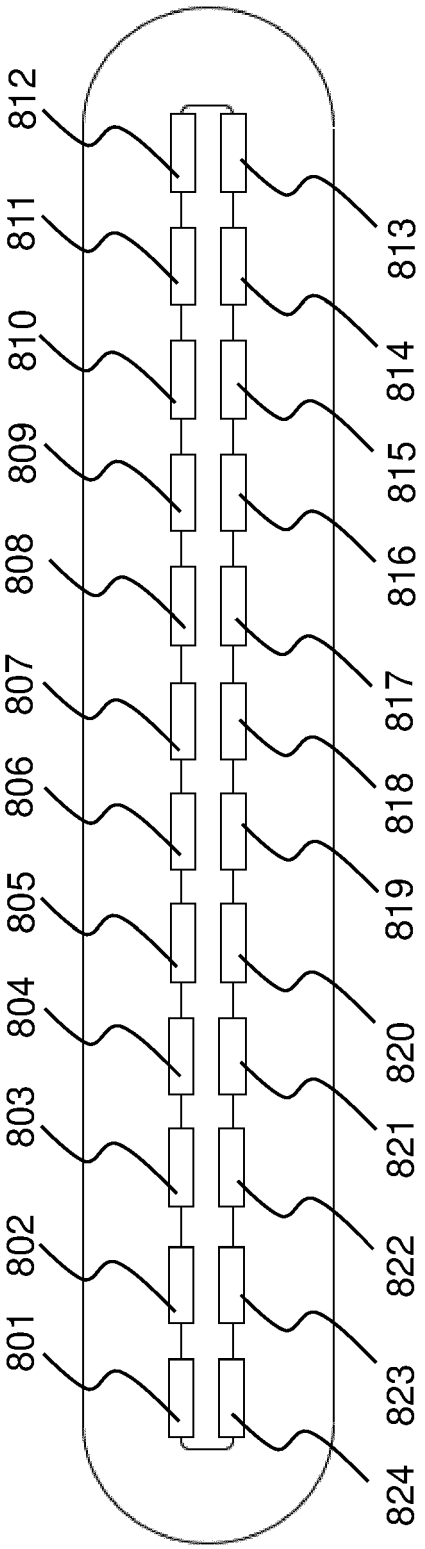


Fig. 14a

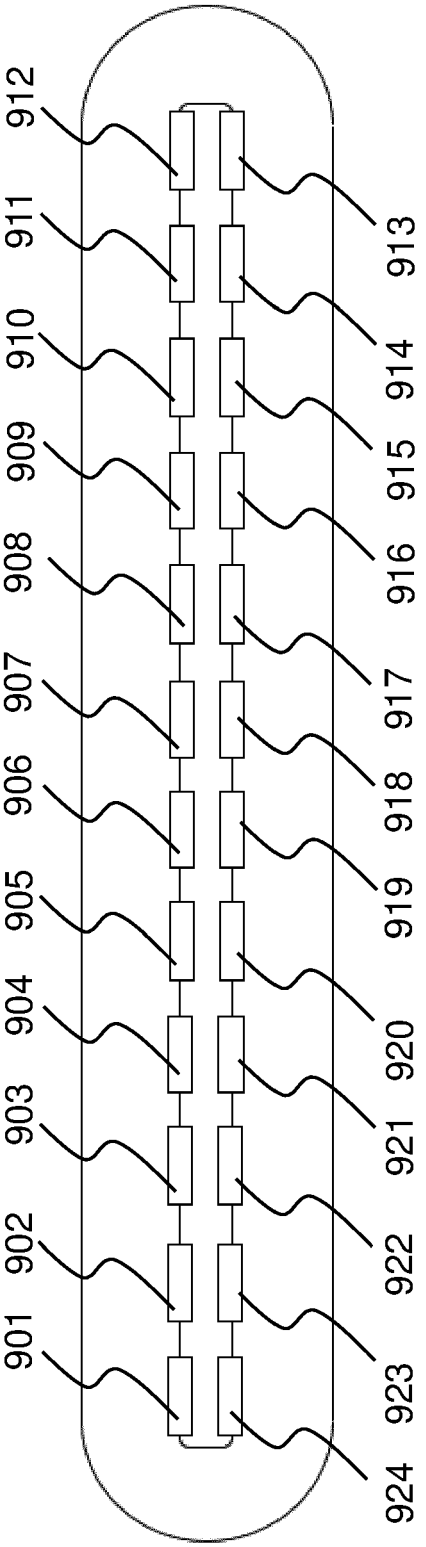
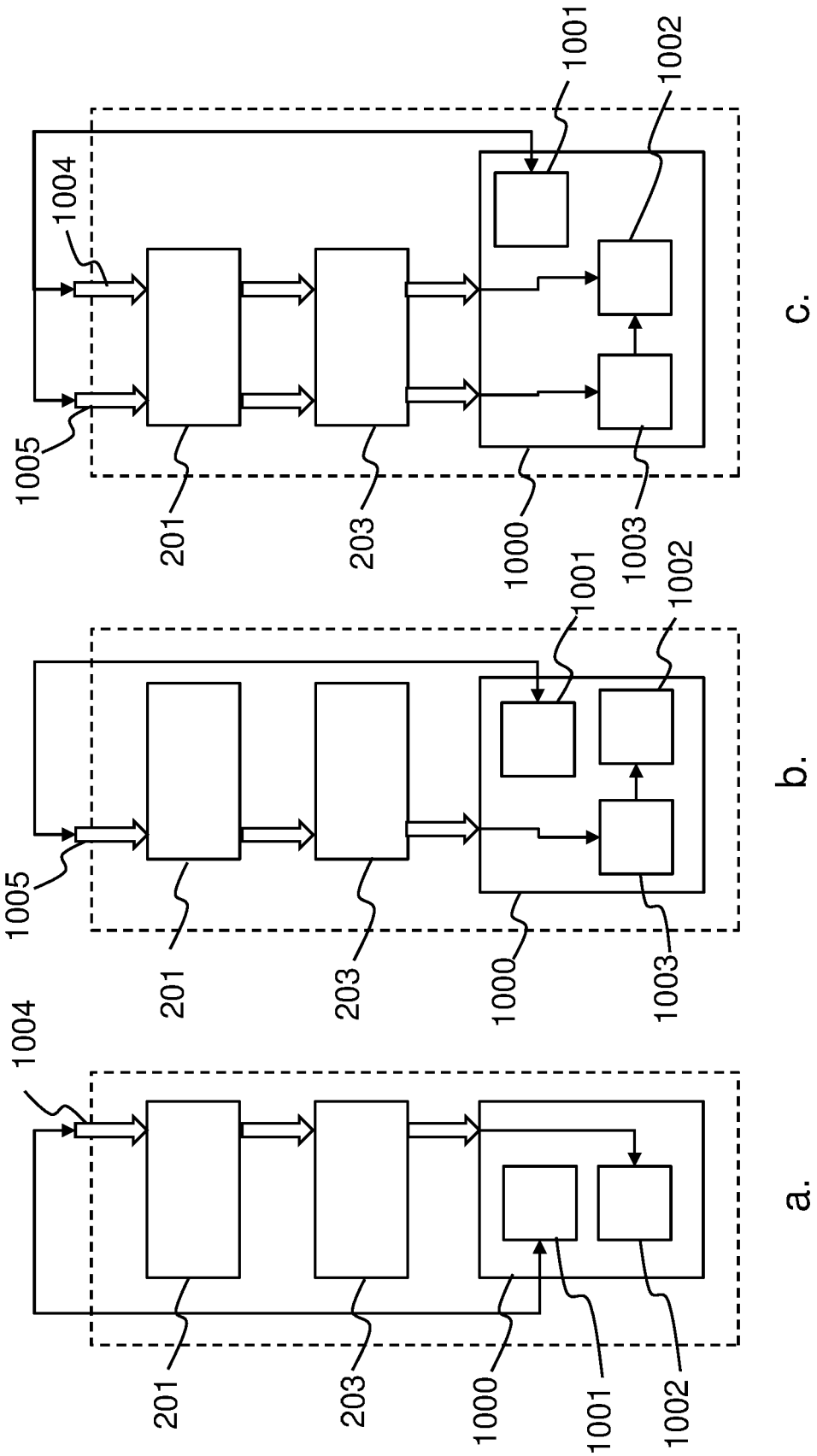


Fig. 14b


a.
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b.
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1003
c.
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201
203
1000
1003

Fig. 15

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 20 17 6643

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 5 988 585 A (EATON ROBERT L [US]) 23 November 1999 (1999-11-23) * column 2 - column 6; figures 1-4 *	1-15	INV. H04R3/00 H01R13/631
A	US 2015/172808 A1 (FURUYA HIROAKI [JP]) 18 June 2015 (2015-06-18) * paragraphs [0065] - [0078], [0007]; figures 9-11 *	1-15	ADD. H04R27/00 H04R1/08 H01R13/74 H01R24/60
A	US 2010/061559 A1 (WU YING JUI [TW]) 11 March 2010 (2010-03-11) * figure 4 *	1-15	H01R31/06
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	25 August 2020	Carrière, Olivier

CATEGORY OF CITED DOCUMENTS

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