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(54) Title: SHUTTER MECHANISM FOR A SOCKET OF A CHARGING STATION

(57) Abstract: Present disclosure discloses a shutter mechanism (101) for a socket (100) of a charging station (200), including at least one lever (103) being laterally displaceable between a first position and a second position. The mechanism includes a torque ring (104) rotatably coupled to an end of at least one lever (103), and being rotatable in a first direction and a second direction corresponding to displacement of the at least one lever (103). The mechanism also includes a plurality of flaps (105), which are configured to be selectively operated between an open configuration and a closed configuration. Further, the at least one lever (103) on displacement from the first position to the second position is configured to rotate the torque ring (104) in the first direction to operate each flap of the plurality of flaps (105) to the open configuration to expose the socket (100).

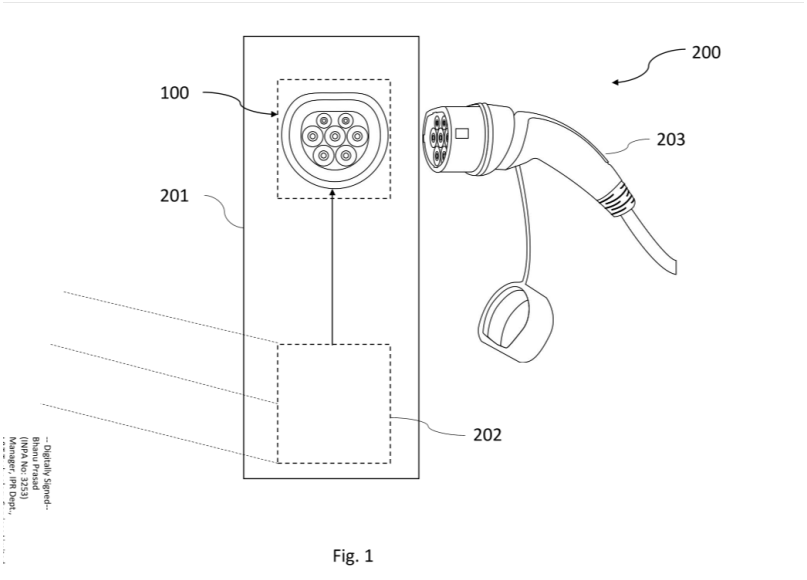

Fig. 1

FORM 2

THE PATENTS ACT 1970
(39 OF 1970)
&
The Patent Rules, 2003

Complete Specification

(See Section 10 and Rule 13)

1. TITLE OF THE INVENTION

SHUTTER MECHANISM FOR A SOCKET OF A CHARGING STATION

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3. PREAMBLE TO THE DESCRIPTION

COMPLETE

The following specification describes the invention and the manner in which it is to be performed

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DESCRIPTION

TECHNICAL FIELD

Present disclosure, in general, relates to electric charging devices. Particularly, but, not exclusively, the present disclosure relates to charging stations thereof. Further, embodiments of the present disclosure disclose a shutter mechanism for a socket of the charging station.

BACKGROUND OF THE DISCLOSURE

With rise in demand for green fuel and sustainable means for transportation, electric and hybrid vehicles have become one of the predominant options available and accessible to the public at large. Such electric and hybrid vehicles are generally operated through a rechargeable battery, which supplies electric charge to a motor that propels said vehicle. To improve range of the electric vehicles, infrastructure with a number of charging stations have been built across geographical locations for suitably charging of the rechargeable batteries in the vehicle.

To enable charging of the batteries of the vehicle, the charging station may include a charging terminal, a plug, a hose, among other components and accessories, which complementarily connect with corresponding charging terminal of the vehicle. The charging station are generally supplied with AC current for charging of the batteries of the vehicle, where such AC current may be transmitted through distant source-grid or DC current may be transmitted through solar panels at the station for fast charging. To have safety standards, generally the charging stations are equipped with a socket that enables transmission of current to the batteries of the vehicle, on plugging with the cable. Such sockets of the charging station may be prone to malfunctioning due to entry of foreign particle. To prevent such malfunctioning of the charging station at the socket, conventionally, said sockets are provisioned with a cover, that provides shelter from foreign particles including, but not limited to, dust, dirt, water, rainfall, snow, among other things. In general, the socket of the charging station may be accessible on removal of the cover from said sockets.

Conventionally, the safety concerns at the charging stations are pertaining to inadvertent placing of fingers of the operators during plugging which may cause electrical shocks. To avoid such scenarios, several plugging systems have been developed to improve safety at the charging stations. One of such has been described in WO2021032235A1 [hereinafter referred to as ‘235] which describes about an electric charging device for a motor vehicle that includes an actuating element is connected directly and/or indirectly to a locking element inside the

electrical charging device to define a path for a plug to connect with a socket of the electrical charging device. However, configuration of the electrical charging device described in '235 becomes bulky due to the actuating element and the locking elements.

The present disclosure is directed to overcome one or more limitations stated above or any other limitation associated with the prior arts.

SUMMARY OF THE DISCLOSURE

One or more shortcomings of the prior art are overcome by a method as disclosed and additional advantages are provided through the method as described in the present disclosure.

Additional features and advantages are realized through the techniques of the present disclosure. Other embodiments and aspects of the disclosure are described in detail herein and are considered a part of the claimed disclosure.

In one non-limiting embodiment of the disclosure, a shutter mechanism for a socket of a charging station is disclosed. The shutter mechanism includes at least one lever accommodated in a housing defined by the socket. The at least one lever is laterally displaceable between a first position and a second position. The shutter mechanism further includes a torque ring which is rotatably coupled to an end of at least one lever. The torque ring is rotatable in a first direction and a second direction corresponding to displacement of the at least one lever between the first position and the second position. The shutter mechanism also includes a plurality of flaps, where each configured to be selectively operated between an open configuration and a closed configuration. Further, the shutter mechanism includes a plurality of sleeves which is pivotally connectable to the torque ring at one end, and other end opposite to the one end of each of the plurality of sleeves is connectable to at least one flap of the plurality of flaps. The at least one lever on displacement from the first position to the second position is configured to rotate the torque ring in the first direction to radially displace each of the plurality of sleeves to operate each flap of the plurality of flaps to the open configuration to expose the socket.

In an embodiment, the shutter mechanism comprises a flange, which is fixed connected to and accommodated in the housing. The flange is configured to define periphery of the socket. Further, the flange is positioned between the torque ring and the plurality of flaps. Additionally, the flange includes a protrusion to engage with a slot defined in the torque ring. The protrusion

is adapted to restrict rotation of the torque ring to operate the plurality of flaps between the open configuration and the closed configuration.

In an embodiment, the shutter mechanism comprises at least one link which is positioned in the housing. The at least one link is connected to the at least one lever at one end and an other end of the at least one link is connectable to the torque ring. The at least one link is configured to rotate the torque ring between the first direction and the second direction, on lateral displacement of the at least one lever from the first position and the second position. Also, the at least one link and at least one sleeve of the plurality of sleeves are connectable to the torque ring at an off-set, to selectively rotate the torque ring and displace each of the plurality of flaps.

In an embodiment, the shutter mechanism comprises a locking mechanism to lock movement of at least one of the torque ring, the plurality of flaps and the at least one lever. The locking mechanism includes at least one detent which is displaceably positioned in the housing. The at least one detent is adapted to be introduced into the housing on displacement. The locking mechanism also includes a resilient member which is connected to the at least one detent. The resilient member is configured to bias the at least one detent to extend out from the housing. The locking mechanism further includes a locking pin is displaceably connected to the at least one detent. The locking pin is adapted to lock with at least portion of the torque ring. Displacement of the at least one detent is configured to unlock the locking pin and the torque ring, to selectively rotate the torque ring in the first direction and the second direction. Further, the at least one detent of the locking mechanism is operable by the plug before engagement with the at least one lever, to access the socket.

In an embodiment, the shutter mechanism comprises a cover connectable to the housing. The cover is operable between an open position and a closed position to selectively expose the socket.

In an embodiment, the shutter mechanism comprises a biasing element connectable between at least one of the torque ring and one of the plurality of sleeves and the housing, to selectively bias the torque ring from the open configuration to the closed configuration.

In another non-limiting embodiment of the present disclosure, a charging station is disclosed. The charging stating includes an enclosure, a power source guided through the enclosure and a socket defined in the enclosure. The socket is configured to receive a plug to electrically

connect the power source to the plug. The socket including a shutter mechanism in the housing, which is configured to selectively allow access to the socket. The shutter mechanism includes at least one lever accommodated in a housing defined by the socket. The at least one lever is laterally displaceable between a first position and a second position. The shutter mechanism further includes a torque ring which is rotatably coupled to an end of at least one lever. The torque ring is rotatable in a first direction and a second direction corresponding to displacement of the at least one lever between the first position and the second position. The shutter mechanism also includes a plurality of flaps, where each configured to be selectively operated between an open configuration and a closed configuration. Further, the shutter mechanism includes a plurality of sleeves which is pivotally connectable to the torque ring at one end, and an other end opposite to the one end of each of the plurality of sleeves is connectable to at least one flap of the plurality of flaps. The at least one lever on displacement from the first position to the second position is configured to rotate the torque ring in the first direction to radially displace each of the plurality of sleeves to operate each flap of the plurality of flaps to the open configuration to expose the socket.

The foregoing summary is illustrative only and is not intended to be in any way limiting. In addition to the illustrative aspects, embodiments, and features described above, further aspects, embodiments, and features will become apparent by reference to the drawings and the following detailed description.

BRIEF DESCRIPTION OF THE ACCOMPANYING FIGURES

The novel features and characteristics of the disclosure are set forth in the appended description. The disclosure itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying figures. One or more embodiments are now described, by way of example only, with reference to the accompanying figures wherein like reference numerals represent like elements and in which:

Fig. 1 illustrates a schematic representation of a charging station, in accordance with an embodiment of the present disclosure.

Figs. 2a and 2b illustrate a perspective view and sectional view of a socket for the charging station, with a cover of the socket in closed position, in accordance with an embodiment of the present disclosure.

Fig. 2c illustrates a perspective view of the socket with the cover in an open position, in accordance with an embodiment of the present disclosure.

Fig. 3 illustrates a front sectional view of the socket without the cover to depict a shutter mechanism, in accordance with an embodiment of the present disclosure.

Fig. 4 illustrates an exploded view of the shutter mechanism, in accordance with an embodiment of the present disclosure.

Fig. 5 illustrates a sectional view of the socket with plug being inserted, in accordance with an embodiment of the present disclosure.

Figs. 6a and 6b illustrate front sectional views of operation of the shutter mechanism, in accordance with an embodiment of the present disclosure.

Figs. 7a and 7b illustrate front view and rear view of assembled Fig. 4, in a closed configuration of the shutter mechanism, in accordance with an embodiment of the present disclosure.

Figs. 7c and 7d illustrate front view and rear view of Figs. 7a and 7b respectively, when the plug is partially inserted into a housing of the socket, in accordance with an embodiment of the present disclosure.

Figs. 7e and 7f illustrate front view and rear view of Figs. 7a and 7b respectively, when the plug is inserted into the socket, in accordance with an embodiment of the present disclosure.

Figs. 8a, 8b and 8c illustrate side sectional view, front view and magnified view of a locking mechanism, in accordance with an embodiment of the present disclosure.

Figs. 8d, 8e and 8f illustrate side sectional view, front view and magnified view of the locking mechanism in operational configuration of the shutter mechanism, in accordance with an embodiment of the present disclosure.

Fig. 9 illustrates a sectional view of the socket with plug in inserted condition, in accordance with an embodiment of the present disclosure.

The figures depict embodiments of the disclosure for purposes of illustration only. One skilled in the art will readily recognize from the following description that alternative embodiments of the methods illustrated herein may be employed without departing from the principles of the disclosure described herein.

DETAILED DESCRIPTION OF THE DISCLOSURE

The foregoing has broadly outlined the features and technical advantages of the present disclosure in order that the detailed description of the disclosure that follows may be better understood. Additional features and advantages of the disclosure will be described hereinafter which form the subject of the description of the disclosure. It should also be realized by those skilled in the art that such equivalent mechanism does not depart from the scope of the disclosure. The novel features which are believed to be characteristic of the disclosure, as to mechanism/method of operation, together with further objects and advantages will be better understood from the following description when considered in connection with the accompanying figures. It is to be expressly understood, however, that each of the figures is provided for the purpose of illustration and description only and is not intended as a definition of the limits of the present disclosure.

In the present document, the word "exemplary" is used herein to mean "serving as an example, instance, or illustration." Any embodiment or implementation of the present subject matter described herein as "exemplary" is not necessarily to be construed as preferred or advantageous over other embodiments.

While the disclosure is susceptible to various modifications and alternative forms, specific embodiment thereof has been shown by way of example in the drawings and will be described in detail below. It should be understood, however that it is not intended to limit the disclosure to the particular forms disclosed, but on the contrary, the disclosure is to cover all modifications, equivalents, and alternatives falling within the spirit and the scope of the disclosure.

The terms “comprises”, “comprising”, or any other variations thereof, are intended to cover a non-exclusive inclusion, such that a system that comprises a list of components does not

include only those components but may include other components not expressly listed or inherent to such system. In other words, one or more components in a system proceeded by "comprises… a" does not, without more constraints, preclude the existence of other acts or additional acts in the method.

Embodiments of the present disclosure discloses a shutter mechanism of a charging station which is configured to selectively allow access to a socket. The shutter mechanism includes at least one lever accommodated in a housing defined by the socket. The at least one lever is laterally displaceable between a first position and a second position. The shutter mechanism further includes a torque ring which is rotatably coupled to an end of at least one lever. The torque ring is rotatable in a first direction and a second direction corresponding to displacement of the at least one lever between the first position and the second position. The shutter mechanism also includes a plurality of flaps, where each configured to be selectively operated between an open configuration and a closed configuration. Further, the shutter mechanism includes a plurality of sleeves which is pivotally connectable to the torque ring at one end, and other end opposite to the one end of each of the plurality of sleeves is connectable to at least one flap of the plurality of flaps. The at least one lever on displacement from the first position to the second position is configured to rotate the torque ring in the first direction to radially displace each of the plurality of sleeves to operate each flap of the plurality of flaps to the open configuration to expose the socket. With such a configuration, the socket is structured to be compact and also restricts unauthorized access to the socket, thereby preventing electrical shocks.

Henceforth, the present disclosure is explained with the help of figures of the shutter mechanism for a socket of a charging station. However, such exemplary embodiments should not be construed as limitations of the present disclosure, as the mechanism may be used for various machines including, but not limited to, fuel stations, water dispensing tanks, concrete dispensers, among others where a socket and a plug are complementarily operable. A person skilled in the art can envisage various such embodiments without deviating from scope of the present disclosure.

Figure 1 is an exemplary embodiment of the present disclosure which illustrates a schematic representation of a charging station (200). The charging station (200) may include an enclosure (201) and a power source (202) which may be guided through the enclosure (201). The power source (202) may be capable of supplying at least one of AC current and DC current, where

such current may be either generated at the charging stating [e.g., in case of DC power] or may be transmitted to the charging station (200) from location of the power source (202) by means of cables [not seen in Figs.]. The power source (202) may be stationed proximal to the charging station (200), such as, but not limited to, a solar power source, while the power source (202) may also be adapted to transmit power to the charging station (200) from a distance, for example, hydropower station, thermal power station, geothermal, power station, among others. The power or current from the power source (202) may be regulated at the charging station (200) or may be transmitted after regulation, based on nature of the current being transmitted thereto. In an embodiment, the charging station (200) may be capable of converting DC current to AC current, or vice versa, based on required output from the charging station (200). In an embodiment, the charging station (200) may be at least one of a wall-mounted unit, a panel-type unit, a portable type unit, or any other configuration, and not limited to a stand-type unit as depicted in Fig. 1.

Current from the power source (202) is transmitted to an electrical member (204) housed inside the charging station (200). The charging station (200) also includes a socket (100) which is electrically coupled to the electrical member (204) of the charging station (200) for operation. The electrical member (204), as best seen in Figs. 2a and 2b, may be coupled to an end of the socket (100) that is positioned within the enclosure (201), while other end of the socket (100) may be operationally accessible by a plug (203) for deriving power from the charging station (200) via the socket (100). In an embodiment, the electrical member (204) may be integrally formed with the socket (100), and configuration depicted in Figs. should not be construed as a limitation. Also, in one embodiment of the present disclosure, the socket (100) may be retrofittable to the charging station (200) and may be coupled with the electrical member (204).

The socket (100) may include a housing (102), where at least portion of the housing (102) is encompassed within the enclosure (201) of the charging station (200) and is electrically coupled to the electrical member (204) for allowing current to pass through the socket (100) when in operation, as seen in Fig. 2b. In the illustrative embodiment, the socket (100) is accessible for insertion of the plug (203) on operation of a cover (110) included in the housing (102). The cover (110) is connectable to the hosing at one end [as seen in Figs. 2a and 2b], while other end of the cover (110) is operable relative to the housing (102) for allowing the plug (203) to electrically couple with the socket (100). The cover (110) is operable between an open position [as best seen in Fig. 2c] and a closed position [as best seen in Fig. 2a] to

selectively expose the socket (100). For such operation, the end of the cover (110) connectable to the housing (102) may be relatively operable (for example, pivotable, liftable, tiltable) for allowing the plug (203) to be inserted and electrically coupled with the socket (100). In an embodiment, the end of the cover (110) may be temporarily coupled to the housing (102). Such configuration of the cover (110), the housing (102) and in-turn the socket (100) should not be construed as a limitation, as the cover (110) may also be removably coupled to the housing (102). Figs. 2c depicts the cover (110) being pivotally coupled to the housing (102), where such pivotal connection may be by means including, but not limited to, hinge points, pivot pins, fasteners, snap fittings, and the like. Meanwhile the cover (110) may also be removably coupled to the housing (102) to resemble configuration of at least one of a cap, a lid and the like, which may be coupled by means of threading, extension wires, and the like. Based on configuration of the cover (110), the plug (203) may be insertable into the housing (102) of the socket (100) on operating the cover (110) from the open position to the closed position.

As best seen in Fig. 3, the housing (102) includes a shutter mechanism (101) for ingress protection of the socket (100) to limit electrical access to the plug (203) of the charging station (200). The shutter mechanism (101) may be adapted to selectively expose the socket (100) or at least electrical connection portion, which is on opposite side of the electrical member (204) in the charging portion, for electrically connecting with the plug (203). For such operation, the shutter mechanism (101) [hereinafter interchangeably referred to as "mechanism"] includes at least one lever (103) accommodated in the housing (102) of the socket (100). The at least one lever (103) is structured to laterally displaceable between a first position and a second position relative to the housing (102), where in the first position the at least one lever (103) may project out from the housing (102) and in the second position the at least one lever (103) may substantially retract and secure within the housing (102). The term "substantially" may be referred to as a majority proportion of the at least one level being retracted into the housing (102), while remaining portion of the at least one lever (103) provides no or minimal frictional restriction for insertion of the plug (203) into the housing (102) and in-turn to the socket (100). The shutter mechanism (101) depicted in Fig. 3 also includes a locking mechanism (109), which is described below corresponding to Figs. 8a-8f.

Referring to Figs. 4 and 5, the at least one lever (103) may be defined with a tapered surface which displaceably engages with the plug (203). The tapered surface may extend from a portion of the at least one lever (103) proximal to the housing (102) and may extend towards portion

of the at least one lever (103) projecting away from the housing (102) such that, during inserting of the plug (203) at least a portion of the plug (203) skids or slides on the tapered surface of the at least one lever (103), as best seen in Fig. 5. Such sliding of the plug (203) may be adapted to progressively push the at least one lever (103) into the housing (102), to operate said at least one lever (103) to the second position from the first position, as best seen between Fig. 6a and 6b.

Turning back to Fig. 4, the mechanism further includes a torque ring (104), a plurality of sleeves (106), a plurality of flaps (105) and a flange (107), for selectively exposing the socket (100) for electrically connecting with the plug (203). The at least one lever (103) is coupled to the torque ring (104) by at least one link (108), where one end of the at least one lever (103) is coupled to an end of the at least one link (108), while other end opposite to the one end of the at least one link (108), is displaceably connectable to the torque ring (104). Further, displacement of the at least one lever (103) from the first position to the second position may be configured to displace the at least one link (108) relative to the at least one lever (103), in a direction based on connection therebetween. In the illustrative embodiment, the at least one link (108) is angularly connected to the at least one lever (103), due to which displacement of the at least one lever (103) tends to displace and angularly displace the at least one link (108). On coupling such link (108) to the torque ring (104), the angular displacement of the at least one link (108) is configured to rotate the torque ring (104) in at least one of a first direction and a second direction, based on corresponding of displacement of the at least one lever (103) between the first position and the second position. It should be noted that rotation of the torque ring (104) may be regulated by at least one ring, however, for sake of explanation two links corresponding to two levers are depicted for rotation of the torque ring (104). Such explanation should not be construed as a limitation, as with change in dimensions of one lever (103) and one link (108), the torque ring (104) may be rotated. Operation of the torque ring (104) and the at least one link (108) is explained in detail with respect to Figs. 6a and 6b for understanding.

In the illustrative embodiment, the torque ring (104) is connectable to the flange (107), where the flange (107) is fixedly connected to and accommodated in the housing (102). The flange (107) is configured to define periphery of the socket (100), which is illustrated to resemble a ring profile in Fig. 4 while other configurations of the flange (107) such as, but not limited to, semi-circular profile, L-shaped profile, J-shaped profile and the like. Also, without limitation to structure of the flange (107), configuration of the flange (107) may define a portion of

periphery of the socket (100) so that the plug (203) may be insertable and connectable to the socket (100). The flange (107) may be rigidly positioned and connected to an inside portion [not shown] of the housing (102) for rotatably securing the torque ring (104) within the housing (102). For rotation, other side of the torque ring (104) is connectable to the plurality of flaps (105), where each flap of the plurality of flaps (105) is configured to be selectively operated between an open configuration and a closed configuration. The plurality of flaps (105) in the open configuration is configured to expose the socket (100) for connection with the plug (203), while the closed configuration is configured to substantially close the socket (100) and restrict movement and/or connection of the socket (100) with the plug (203) [best seen in Fig. 3]. Also, to render the socket (100) to be compact, the flange (107) is positioned between the torque ring (104) and the plurality of flaps (105). i.e., when the shutter mechanism (101) is viewed from a direction in which the plug (203) is insertable into the socket (100), assembly of the mechanism depicted to be the least one lever (103), the at least one link (108), the torque ring (104), the flange (107), and the plurality of flaps (105).

In the illustrative embodiment, each flap of the plurality of flaps (105) is configured to complement each of its adjacent flaps such that, on operation from the open configuration to the closed configuration, each flap selectively engages with each of the adjacent flaps to seal the socket (100). It should be noted that, for sake of explanation, only four flaps (105) are depicted, while operation of the shutter mechanism (101) may also be performed with two or more flaps (105), where number of flaps (105) should not be considered as a limitation. Further, each flap of the plurality of flaps (105) is connectable to the torque ring (104) at one end, while other end of each of the plurality of flaps (105) is connectable to the flange (107).

In the illustrative embodiment, the shutter mechanism (101) includes a plurality of sleeves (106) that is pivotally connectable to the torque ring (104) at one end, and other end opposite to the one end of each of the plurality of sleeves (106) is connectable to at least one flap of the plurality of flaps (105), as best seen in Fig. 7a and 7b. In an embodiment, one sleeve of the plurality of sleeves (106) is connected to one flap of the plurality of flaps (105), about peripheral portion. Such configuration should not be considered as a limitation are more than one of such sleeve of the plurality of sleeves (106) may be coupled to each flap of the plurality of flaps (105) based on design and requirements. Further, as best seen in Fig 4, each of the plurality of sleeves (106) is convexly structured to resemble profile of at least one of the torque ring (104), the plurality of flaps (105) or the flange (107). Also, the at least one link (108) and

at least one sleeve (106) of the plurality of sleeves (106) are connectable to the torque ring (104) at an off-set position, to selectively rotate the torque ring (104) and displace each of the plurality of flaps (105). Further, the end of each of the plurality of sleeves (106) connected to the torque ring (104) is pivotal, while the end of each of the plurality of sleeves (106) connected to corresponding flap of the plurality of flaps (105) is comparatively rigid. Due to such configuration, rotation of the torque ring (104) is configured to radially displace the plurality of sleeves (106), which in-turn operates each flap of the plurality of flaps (105).

Referring now to Figs. 6a, 6b, 7a and 7b, the at least one lever (103) is displaceable from the first position to the second position on engaging by the plug (203) to expose the socket (100) for electrical connection. i.e., the at least one lever (103) is displaced from a central portion (also referred to as the first position in Figs. 6a and 7a) into the housing (102) (also referred to as the second position in Figs. 6b and 7b). Due to displacement of the at least one lever (103) to the second position, the at least one link (108) connected thereto is displaced further into the housing (102), as seen in Figs. 7c and 7d. Such displace of the at least one link (108) is configured to rotate (i.e., by application of pulling force) on the torque ring (104), which rotates in the first direction. In the illustrative embodiment, rotational direction of the torque ring (104) in Figs. 7c and 7e are depicted to be in clockwise direction as viewed from the direction of insertion of the plug (203), while rotational direction of the torque ring (104) in Figs. 7d and 7f are depicted to be in an anti-clockwise direction as viewed from the direction of the electrical component or enclosure (201) of the charging station (200). Such rotational direction of the torque ring (104) may be regulated based on the connection portion of the at least one link (108) relative to position of the at least one lever (103), and thereby is interchangeable based on requirement, which should not be considered as limitations of Figs. 7a-7f. Additionally, rotation of the torque ring (104) in the first direction is configured to radially displace each of the plurality of sleeves (106). For instance, due to such rotation, the end of each of the plurality of sleeves (106) being coupled to the torque ring (104) is configured to displace with the torque ring (104). Whereas the end of each sleeve of the plurality of sleeve being coupled to the plurality of flaps (105), on experiencing rotation of the torque ring (104), is configured to pivot and radially displace away from the torque ring (104). i.e., each of the plurality of sleeves (106) is configured to intrude into the housing (102) on rotation of the torque ring (104) in the first direction, as best seen in Figs. 7c and 7d. Such displacement of the plurality of sleeves (106) is configured to correspondingly displace each flap of the plurality of flaps (105), where each of the plurality of flaps (105) are configured to be retracted into the housing (102) by the

plurality of sleeves (106). In addition, it is to be understood that extent of displacement of at least one of the torque ring (104), the plurality of sleeves (106), and the plurality of flaps (105) are operated in tandem with extent of insertion of the plug (203) into the housing (102) and inherently displacing the at least one lever (103). When the at least one lever (103) is substantially displaced by the plug (203) and substantial portion of said at least one lever (103) is accommodated in the housing (102), the torque ring (104) is operable to a maximum extend in the first direction, and correspondingly the plurality of sleeves (106) is radially displaced from lifting each flap of the plurality of flaps (105), thereby operating in the open configuration to expose the socket (100), as best seen in Figs. 7e and 7f.

In the illustrative embodiment, to regulate maximum rotation of the torque ring (104) due to lateral displacement of the at least one lever (103) into the housing (102), the flange (107) includes a protrusion (107a) which structurally engages with a slot (112) defined in the torque ring (104) on assembling. The protrusion (107a) is adapted to restrict rotation of the torque ring (104) to operate the plurality of flaps (105) between the open configuration and the closed configuration. In some embodiment, extent of displacement of at least one of the torque ring (104), the plurality of sleeves (106), and the plurality of flaps (105) may be relatively calibrated based on extent of insertion of the plug (203) by incorporating calibration means. Said calibration means may be such as, but not limited to, gears, cams, spring, linkage, among others which facilitate in regulating movement of the plurality of flaps (105) corresponding to that of the plug (203).

Referring back to Fig. 3, the mechanism also includes a biasing element (111) which is connectable between at least one of the torque ring (104) and one of the plurality of sleeves (106) and the housing (102). The biasing element (111) is configured to selectively bias the torque ring (104) to rotate in the second direction on removal of the plug (203) from the housing (102), and in-turn the socket (100). Such biasing of the torque ring (104) may be configured to operate the plurality of flaps (105) from the open configuration to the closed configuration, which inherently closes the socket (100). In an embodiment, the biasing element (111) may be a coil spring, however the same should not be construed as a limitation, as the biasing element (111) may be including, but not limited to, torsional spring, cantilever spring, and the like.

Turning now to Figs. 8a and 8b which illustrates the locking mechanism (109) to lock movement of at least one of the torque ring (104), the plurality of flaps (105) and the at least one lever (103). The locking mechanism (109) includes at least one detent (109a), a resilient

member (109b) and a locking pin (109c). The at least one detent (109a) is displaceably positioned in the housing (102), where location of the at least one detent (109a) is either in-line with or away from the plurality of flaps (105), when viewed from a side view of the socket (100). Such positioning of the at least one detent (109a) in the housing (102) enables in restricting unauthorized or unmonitored exposure of the socket (100). For instance, forcibly operating the at least one lever (103) by hand or tool to expose the socket (100) may be avoided. The locking mechanism (109) ensures that the socket (100) is exposed on insertion of the plug (203) and mitigates displacement of the at least one lever (103) independently.

The at least one detent (109a) is positioned in the housing (102) and on displacement by the plug (203) during insertion, the at least one detent (109a) may displace into the housing (102). The at least one detent (109a) may be structured similar to the at least one lever (103), where portion of the at least one detent (109a) may be defined with a tapered profile for progressively engaging with the plug (203). Such engagement between the plug (203) and the at least one detent (109a) may be configured to progressively displace the at least one detent (109a) into the housing (102). Further, the locking pin (109c) is connected to the at least one detent (109a), where the locking pin (109c) is configured to displace with the at least one detent (109a), during insertion of the plug (203). To restrict exposure of the socket (100), the locking pin (109c) is adapted to lock with at least portion of the torque ring (104), as best seen in Figs. 8a and 8c. The locking pin (109c) is configured to engage with at least a portion of the torque ring (104) which is depicted to be defined with a groove, where the locking pin (109c) is accommodated in the groove of the torque ring (104) to arrest from movement. In such scenario, when lateral displacement of the at least one lever (103) is attempted without unlocking the locking pin (109c), then exposure of the socket (100) is prevented due to restriction for rotation of the torque ring (104). Additionally, when the at least one detent (109a) is displaced, and in-turn the locking pin (109c), then such displacement of the at least one detent (109a) is configured to unlock the locking pin (109c) and the torque ring (104), to selectively rotate the torque ring (104) in either of the first direction and the second direction, as best seen in Figs. 8d and 8f. Based on such tandem operation of the at least one detent (109a) and the at least one lever (103), the plug (203) is securely positioned, locked and electrically coupled with the socket (100), as best seen in Fig. 9. In addition, the resilient member (109b) of the locking mechanism (109) is configured to bias the at least one detent (109a) to extend out from the housing (102), on removal of the plug (203) from the socket (100). Such displacement of the at least one detent (109a) enables in locking of the torque ring (104) by the locking pin (109c).

In an embodiment, the plug (203) may be provided with a locking means (not shown in Figs.) such as, but not limited to, a cantilever spring, which may be capable of removably engaging with the at least one detent (109a) of the socket (100). Such locking means may prevent inadvertent disconnection between the plug (203) and the socket (100), while the same may be disconnected based on manual operation of the locking means to disengage from the at least one detent (109a).

In an embodiment, the socket (100) is structured to be compact in view of assembly of the components and includes rotational movement than linear movement for exposing electrical connections.

In an embodiment, the socket (100) is configured to avoid unauthorized access to the socket (100), which can avoid electrical shocks for inadvertent plug-ins.

In an embodiment, the shutter mechanism (101) is easy to assembly and requires no electronically regulated components such as motor or sensors, thereby significantly reducing the costs.

In an embodiment, the socket (100) and the shutter mechanism (101) may be installed for various industrial applications and shall not be limited to electrical connection of components. The socket (100) may also be installed in vehicles which complementarily receives the plug (203) for charging batteries of the vehicle from the charging station (200).

EQUIVALENTS

With respect to the use of substantially any plural and/or singular terms herein, those having skill in the art can translate from the plural to the singular and/or from the singular to the plural as is appropriate to the context and/or application. The various singular/plural permutations may be expressly set forth herein for sake of clarity.

It will be understood by those within the art that, in general, terms used herein, and especially in the appended claims (e.g., bodies of the appended claims) are generally intended as "open" terms (e.g., the term "including" should be interpreted as "including but not limited to," the term "having" should be interpreted as "having at least," the term "includes" should be interpreted as "includes but is not limited to," etc.). It will be further understood by those within the art that if a specific number of an introduced claim recitation is intended, such an

intent will be explicitly recited in the claim, and in the absence of such recitation no such intent is present. For example, as an aid to understanding, the following appended claims may contain usage of the introductory phrases "at least one" and "one or more" to introduce claim recitations. However, the use of such phrases should not be construed to imply that the introduction of a claim recitation by the indefinite articles "a" or "an" limits any particular claim containing such introduced claim recitation to inventions containing only one such recitation, even when the same claim includes the introductory phrases "one or more" or "at least one" and indefinite articles such as "a" or "an" (e.g., "a" and/or "an" should typically be interpreted to mean "at least one" or "one or more"); the same holds true for the use of definite articles used to introduce claim recitations. In addition, even if a specific number of an introduced claim recitation *is* explicitly recited, those skilled in the art will recognize that such recitation should typically be interpreted to mean *at least* the recited number (e.g., the bare recitation of "two recitations," without other modifiers, typically means *at least* two recitations, or *two or more* recitations). Furthermore, in those instances where a convention analogous to "at least one of A, B, and C, etc." is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (e.g., "a system having at least one of A, B, and C" would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.). In those instances where a convention analogous to "at least one of A, B, or C, etc." is used, in general such a construction is intended in the sense one having skill in the art would understand the convention (e.g., "a system having at least one of A, B, or C" would include but not be limited to systems that have A alone, B alone, C alone, A and B together, A and C together, B and C together, and/or A, B, and C together, etc.). It will be further understood by those within the art that virtually any disjunctive word and/or phrase presenting two or more alternative terms, whether in the description, claims, or drawings, should be understood to contemplate the possibilities of including one of the terms, either of the terms, or both terms. For example, the phrase "A or B" will be understood to include the possibilities of "A" or "B" or "A and B."

In addition, where features or aspects of the disclosure are described in terms of Markush groups, those skilled in the art will recognize that the disclosure is also thereby described in terms of any individual member or subgroup of members of the Markush group.

While various aspects and embodiments have been disclosed herein, other aspects and embodiments will be apparent to those skilled in the art. The various aspects and embodiments disclosed herein are for purposes of illustration and are not intended to be limiting, with the true scope and spirit being indicated by the following claims.

Referral Numerals:

Particulars	Numeral
Charging station	200
Socket	100
Shutter mechanism	101
Housing	102
Lever	103
Torque ring	104
Flaps	105
Sleeves	106
Flange	107
Protrusion	107a
Link	108
Locking mechanism	109
Detent	109a
Resilient member	109b
Locking pin	109c
Cover	110
Biasing element	111
Slot	112
Enclosure	201
Power source	202
Plug	203
Electrical member	204

WE CLAIM:

1. A shutter mechanism (101) for a socket (100) of a charging station (200), the shutter mechanism (101) comprising:

at least one lever (103) accommodated in a housing (102) defined by the socket (100), the at least one lever (103) being laterally displaceable between a first position and a second position;

a torque ring (104) rotatably coupled to an end of at least one lever (103), the torque ring (104) being rotatable in a first direction and a second direction corresponding to displacement of the at least one lever (103) between the first position and the second position;

a plurality of flaps (105), each configured to be selectively operated between an open configuration and a closed configuration; and

a plurality of sleeves (106) pivotally connectable to the torque ring (104) at one end, and an other end opposite to the one end of each of the plurality of sleeves (106) is connectable to at least one flap of the plurality of flaps (105),

wherein, the at least one lever (103) on displacement from the first position to the second position is configured to rotate the torque ring (104) in the first direction to radially displace each of the plurality of sleeves (106) to operate each flap of the plurality of flaps (105) to the open configuration to expose the socket (100).

2. The shutter mechanism (101) accordingly to claim 1 comprises a flange (107), fixed connected to and accommodated in the housing (102), wherein the flange (107) being configured to define periphery of the socket (100).

3. The shutter mechanism (101) according to any of preceding claims, wherein the flange (107) is positioned between the torque ring (104) and the plurality of flaps (105).

4. The shutter mechanism (101) accordingly to any of preceding claims, wherein the flange (107) includes a protrusion (107a) to engage with a slot (112) defined in the torque ring (104), and wherein the protrusion (107a) is adapted to restrict rotation of the torque ring (104) to operate the plurality of flaps (105) between the open configuration and the closed configuration.

5. The shutter mechanism (101) accordingly to claim 1, comprises at least one link (108) positioned in the housing (102), the at least one link (108) connected to the at least one lever (103) at one end and an other end of the at least one link (108) is connectable to the torque ring (104).

6. The shutter mechanism (101) accordingly to claim 5, wherein the at least one link (108) is configured to rotate the torque ring (104) between the first direction and the second direction, on lateral displacement of the at least one lever (103) from the first position and the second position.

7. The shutter mechanism (101) accordingly to any of the preceding claims, wherein the at least one link (108) and at least one sleeve (106) of the plurality of sleeves (106) are connectable to the torque ring (104) at an off-set, to selectively rotate the torque ring (104) and displace each of the plurality of flaps (105).

8. The shutter mechanism (101) accordingly to claim 1, comprises a locking mechanism (109) to lock movement of at least one of the torque ring (104), the plurality of flaps (105) and the at least one lever (103).

9. The shutter mechanism (101) accordingly to claim 8, wherein the locking mechanism (109) comprises:

at least one detent (109a) displaceably positioned in the housing (102), the at least one detent (109a) is adapted to be introduced into the housing (102) on displacement;

a resilient member (109b) connected to the at least one detent (109a), the resilient member (109b) configured to bias the at least one detent (109a) to extend out from the housing (102); and

a locking pin (109c) displaceably connected to the at least one detent (109a), the locking pin (109c) is adapted to lock with at least portion of the torque ring (104), wherein displacement of the at least one detent (109a) is configured to unlock the locking pin (109c) and the torque ring (104), to selectively rotate the torque ring (104) in the first direction and the second direction.

10. The shutter mechanism (101) accordingly to claim 9, wherein the at least one detent (109a) of the locking mechanism (109) is operable by the plug (203) before engagement with the at least one lever (103), to access the socket (100).

11. The shutter mechanism (101) according to any of preceding claims, comprises a cover (110) connectable to the housing (102), wherein the cover (110) is operable between an open position and a closed position to selectively expose the socket (100).

12. The shutter mechanism (101) according to any of preceding claims, comprises a biasing element (111) connectable between at least one of the torque ring (104) and one of the plurality of sleeves (106) and the housing (102), to selectively bias the torque ring (104) from the open configuration to the closed configuration.

13. A charging station (200), comprising:

an enclosure (201);

a power source (202) guided through the enclosure (201);

a socket (100) defined in the enclosure (201), the socket (100) being configured to receive a plug (203) to electrically connect the power source (202) to the plug (203);

a shutter mechanism (101) included a housing (102) of the socket (100), the shutter mechanism (101) configured to selectively allow access to the socket (100), the shutter mechanism (101) comprising:

at least one lever (103) accommodated in the housing (102), the at least one lever (103) being laterally displaceable between a first position and a second position;

a torque ring (104) rotatably coupled to an end of at least one lever (103), the torque ring (104) being rotatable in a first direction and a second direction corresponding to displacement of the at least one lever (103) between the first position and the second position;

a plurality of flaps (105), each configured to be selectively operated between an open configuration and a closed configuration; and

a plurality of sleeves (106) pivotally connectable to the torque ring (104) at one end, and an other end opposite to the one end of each of the plurality of sleeves (106) is connectable to at least one flap of the plurality of flaps (105),

wherein, the at least one lever (103) on displacement from the first position to the second position is configured to rotate the torque ring (104) in the first direction to

radially displace each of the plurality of sleeves (106) to operate each flap of the plurality of flaps (105) to the open configuration to expose the socket (100).

14. The charging station (200) according to claim 14, wherein the shutter mechanism (101) comprises a locking mechanism (109) to lock movement of at least one of the torque ring (104), the plurality of flaps (105) and the at least one lever (103), wherein the locking mechanism (109) comprises:

at least one detent (109a) displaceably positioned in the housing (102), the at least one detent (109a) is adapted to be introduced into the housing (102) on displacement;

a resilient member (109b) connected to the at least one detent (109a), the resilient member (109b) configured to bias the at least one detent (109a) to extend out from the housing (102); and

a locking pin (109c) displaceably connected to the at least one detent (109a), the locking pin (109c) is adapted to lock with at least portion of the torque ring (104), wherein displacement of the at least one detent (109a) is configured to unlock the locking pin (109c) and the torque ring (104), to selectively rotate the torque ring (104) in the first direction and the second direction.

15. The charging station (200) according to claim 14, wherein the at least one detent (109a) of the locking mechanism (109) is operable by the plug (203) before engagement with the at least one lever (103), to access the socket (100).

Dated this 8th day of September 2022

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ABSTRACT

"**SHUTTER MECHANISM FOR A SOCKET OF A CHARGING STATION**"

Present disclosure discloses a shutter mechanism (101) for a socket (100) of a charging station (200), including at least one lever (103) being laterally displaceable between a first position and a second position. The mechanism includes a torque ring (104) rotatably coupled to an end of at least one lever (103), and being rotatable in a first direction and a second direction corresponding to displacement of the at least one lever (103). The mechanism also includes a plurality of flaps (105), which are configured to be selectively operated between an open configuration and a closed configuration. Further, the at least one lever (103) on displacement from the first position to the second position is configured to rotate the torque ring (104) in the first direction to operate each flap of the plurality of flaps (105) to the open configuration to expose the socket (100).

[Figs. 7a-7f]

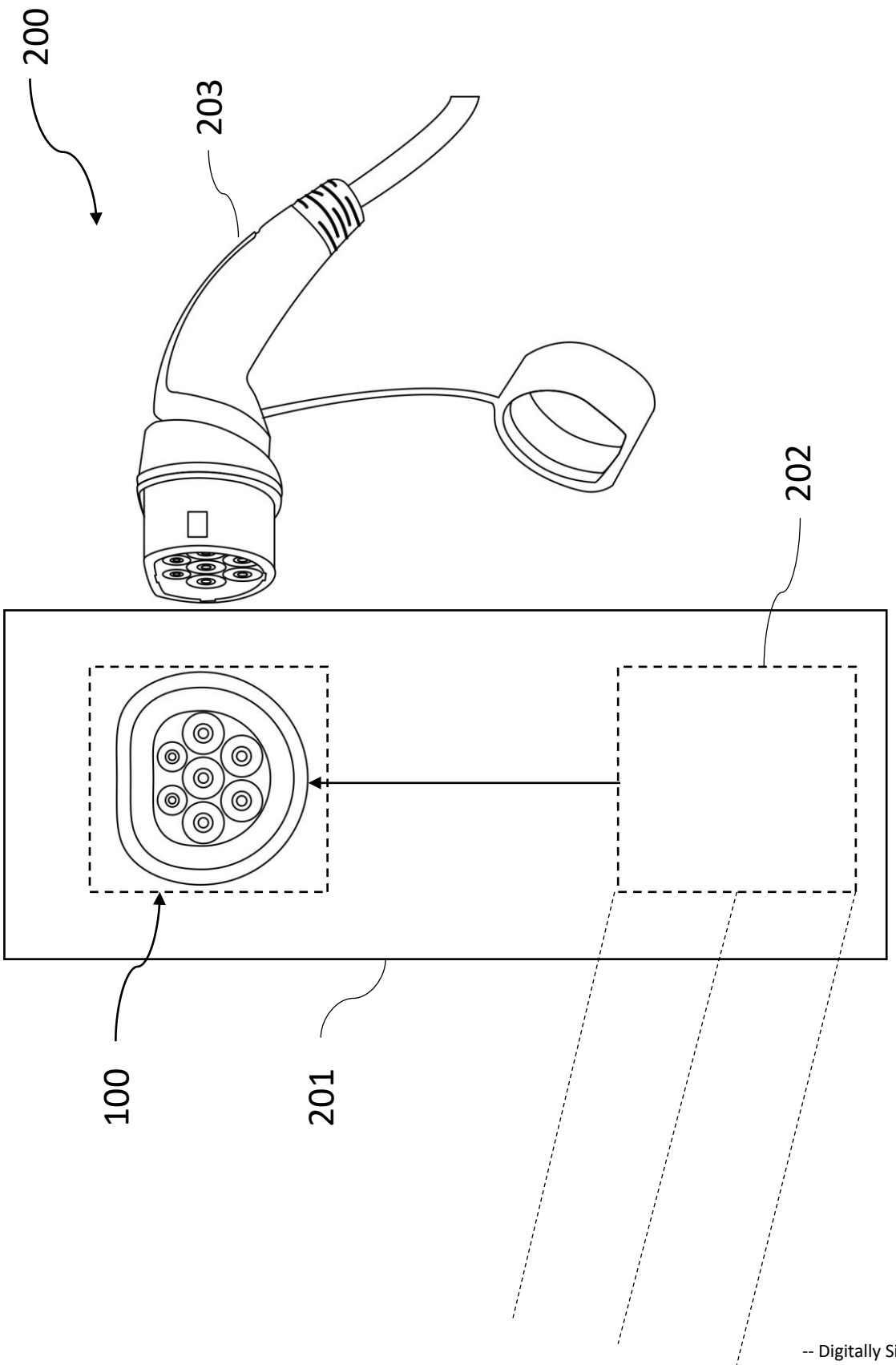

Fig. 1

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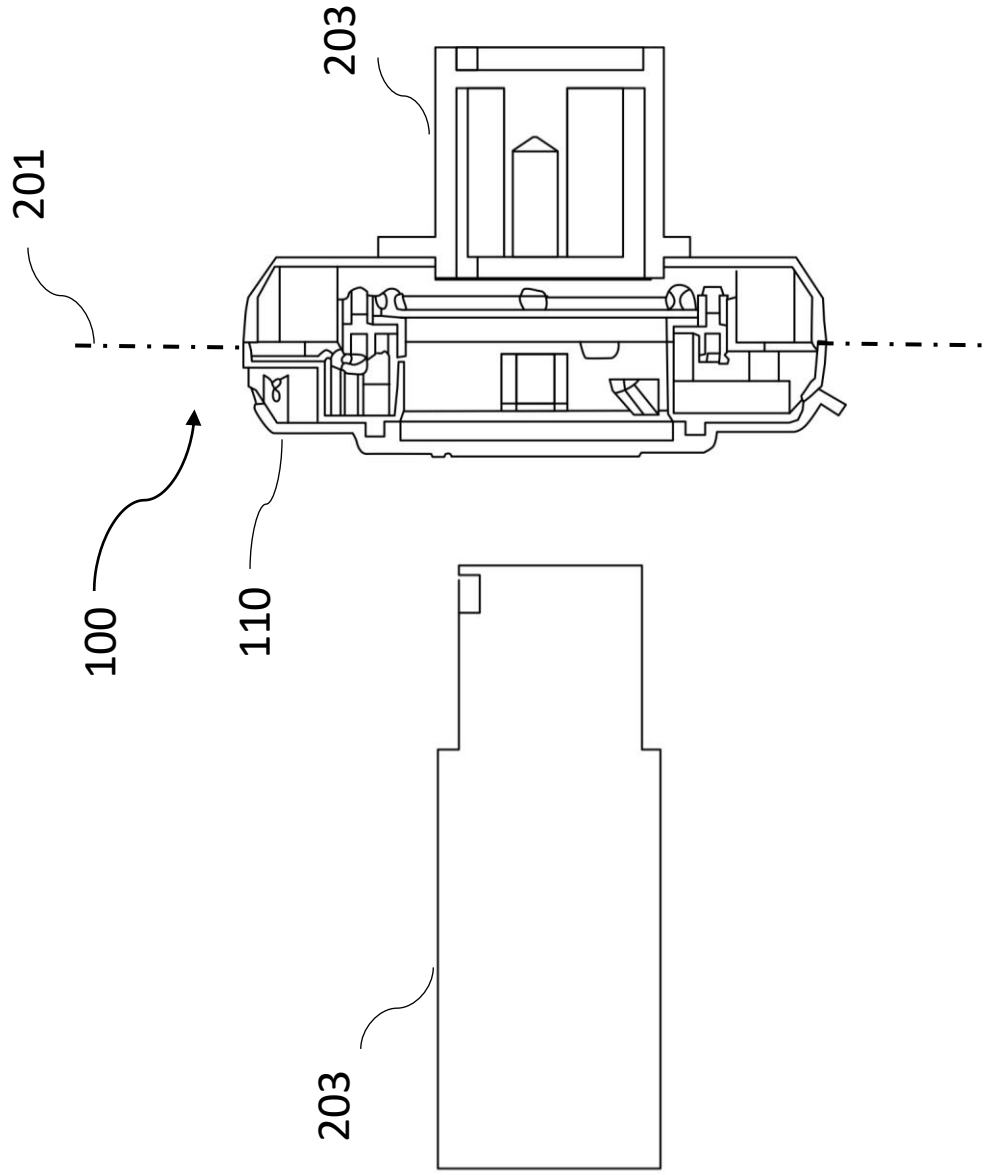

Fig. 2b

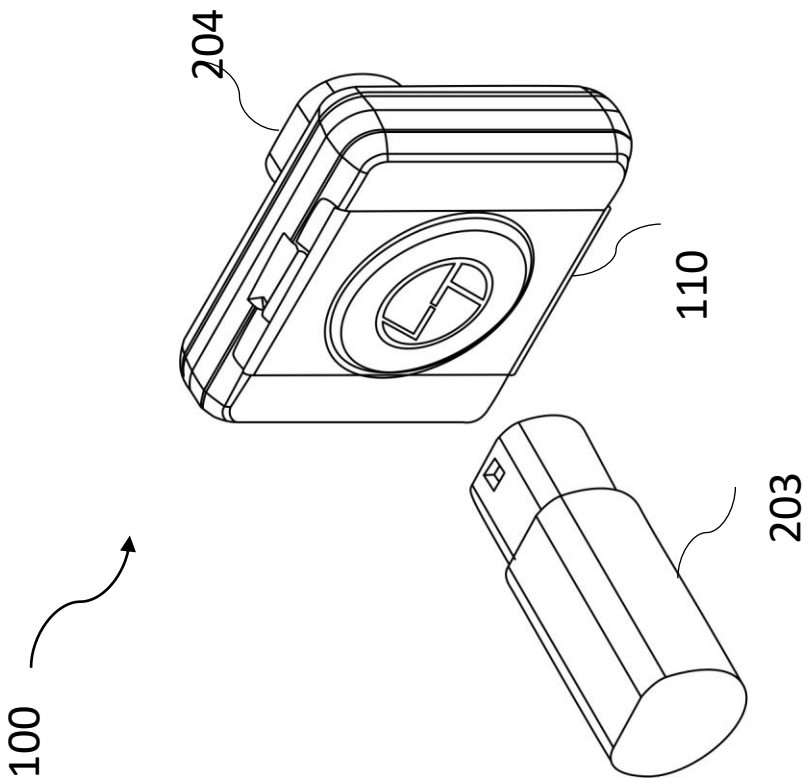

Fig. 2a

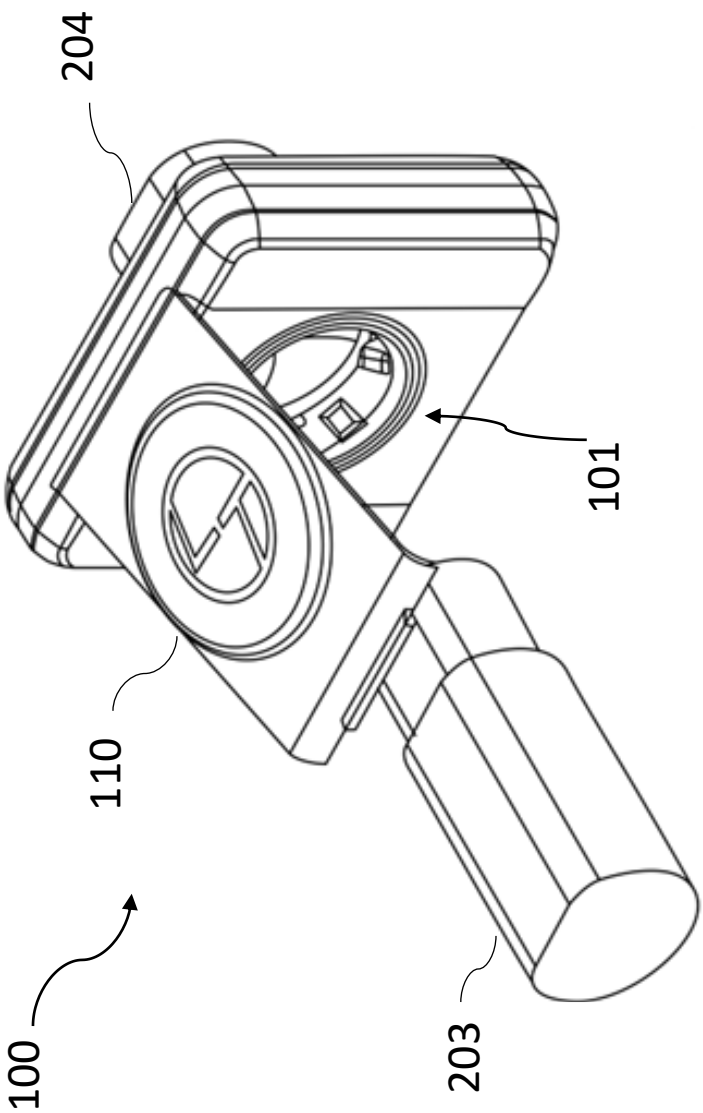

Fig. 2c

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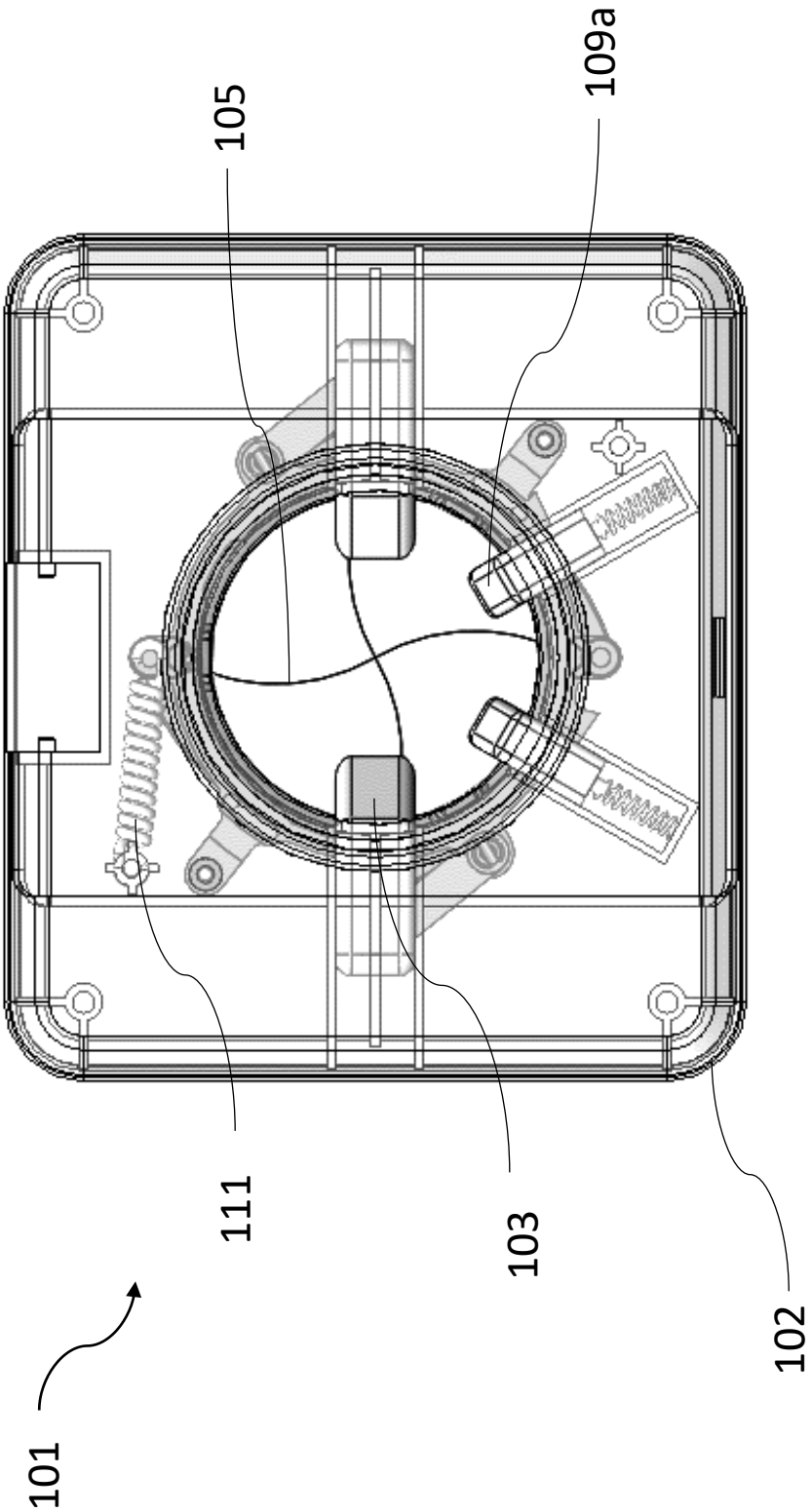

Fig. 3

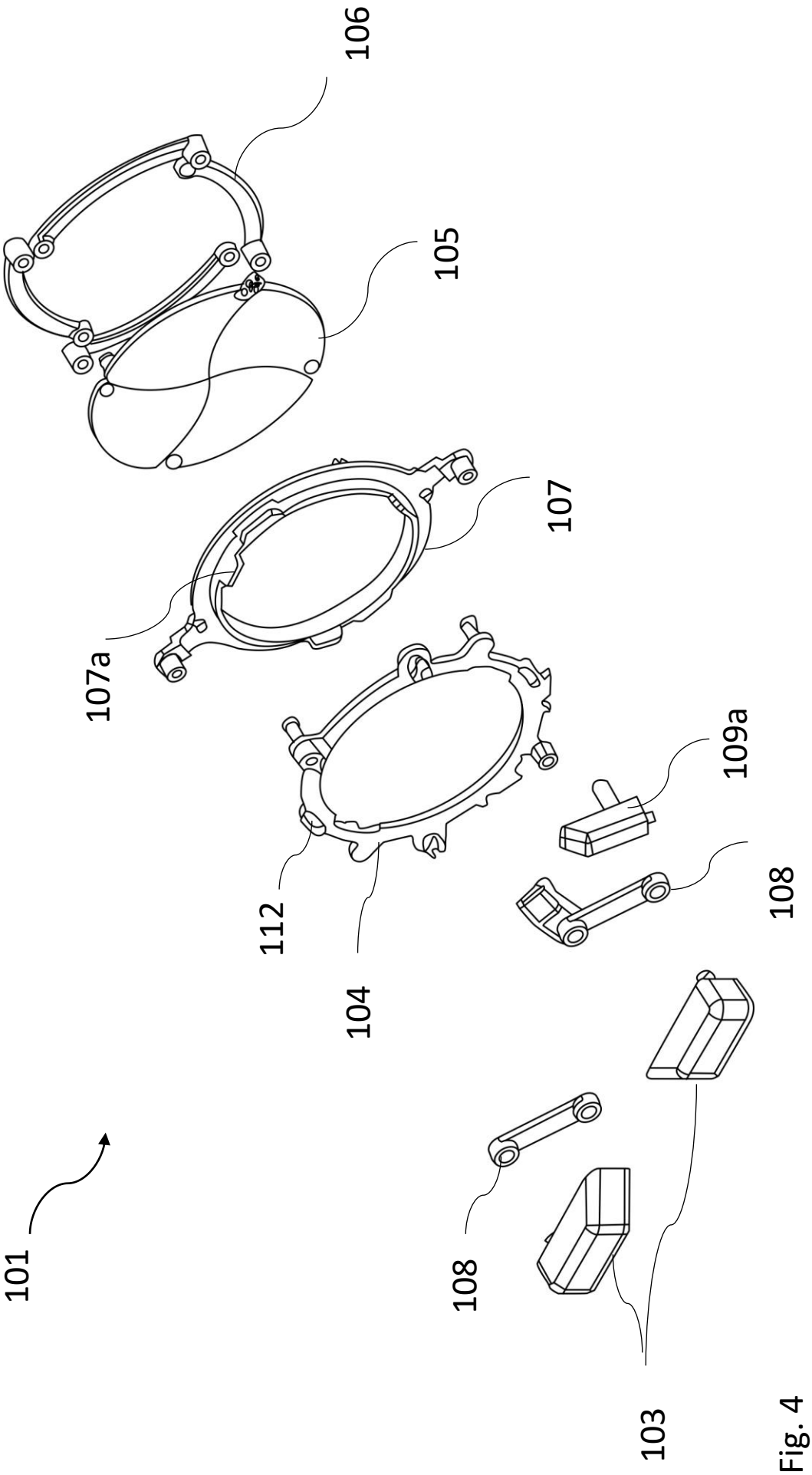

Fig. 4

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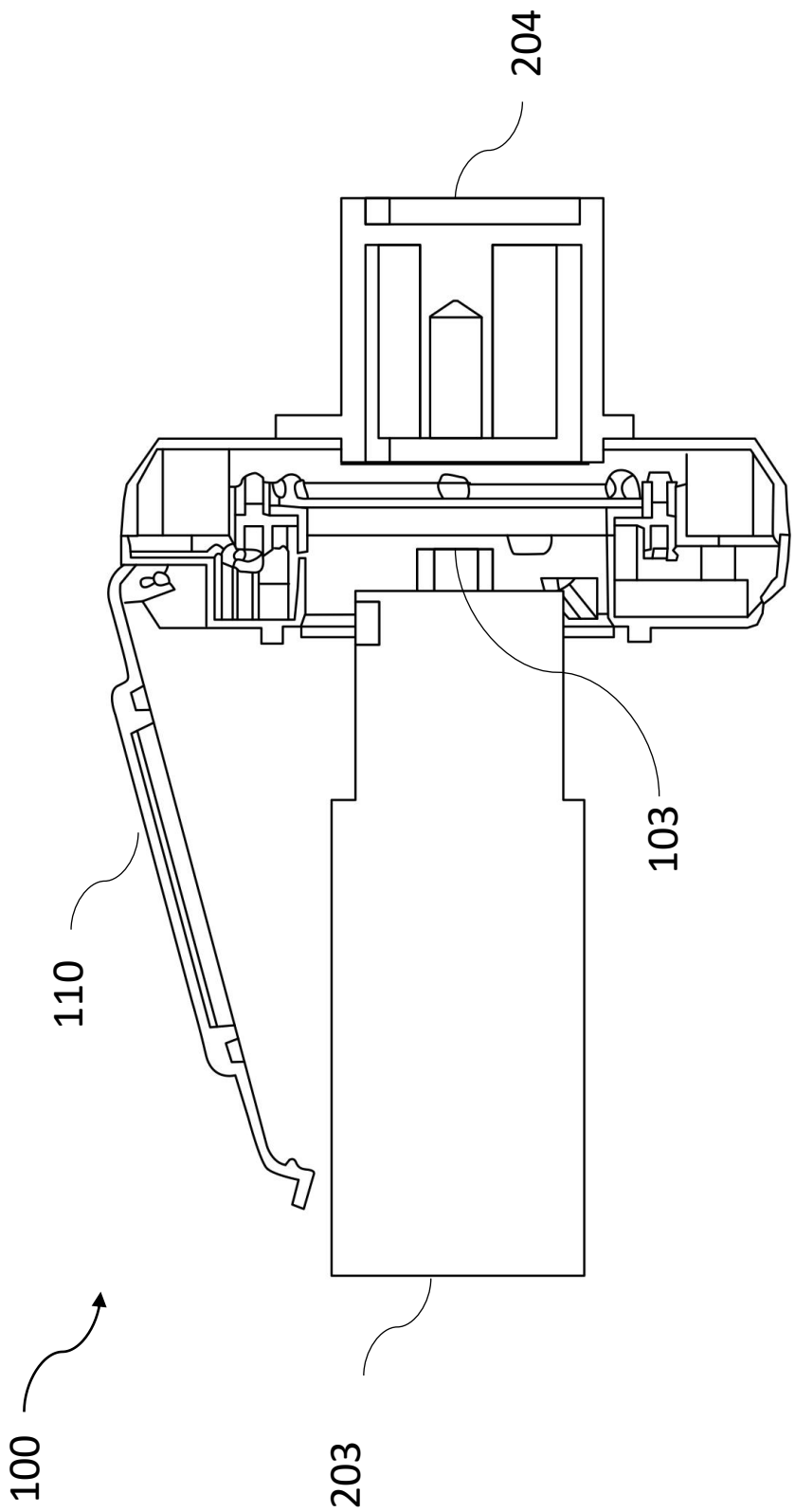

Fig. 5

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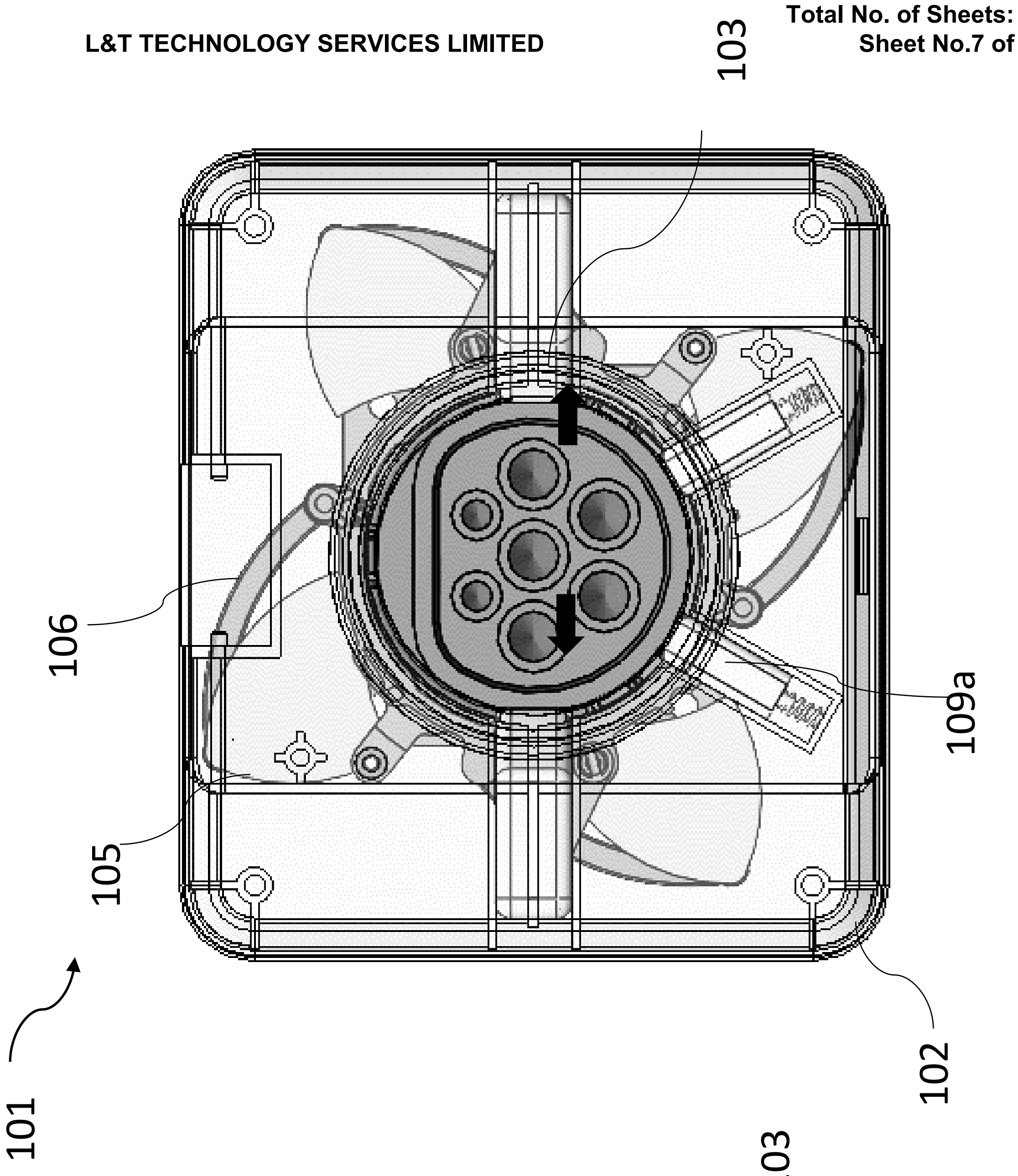

Fig. 6b

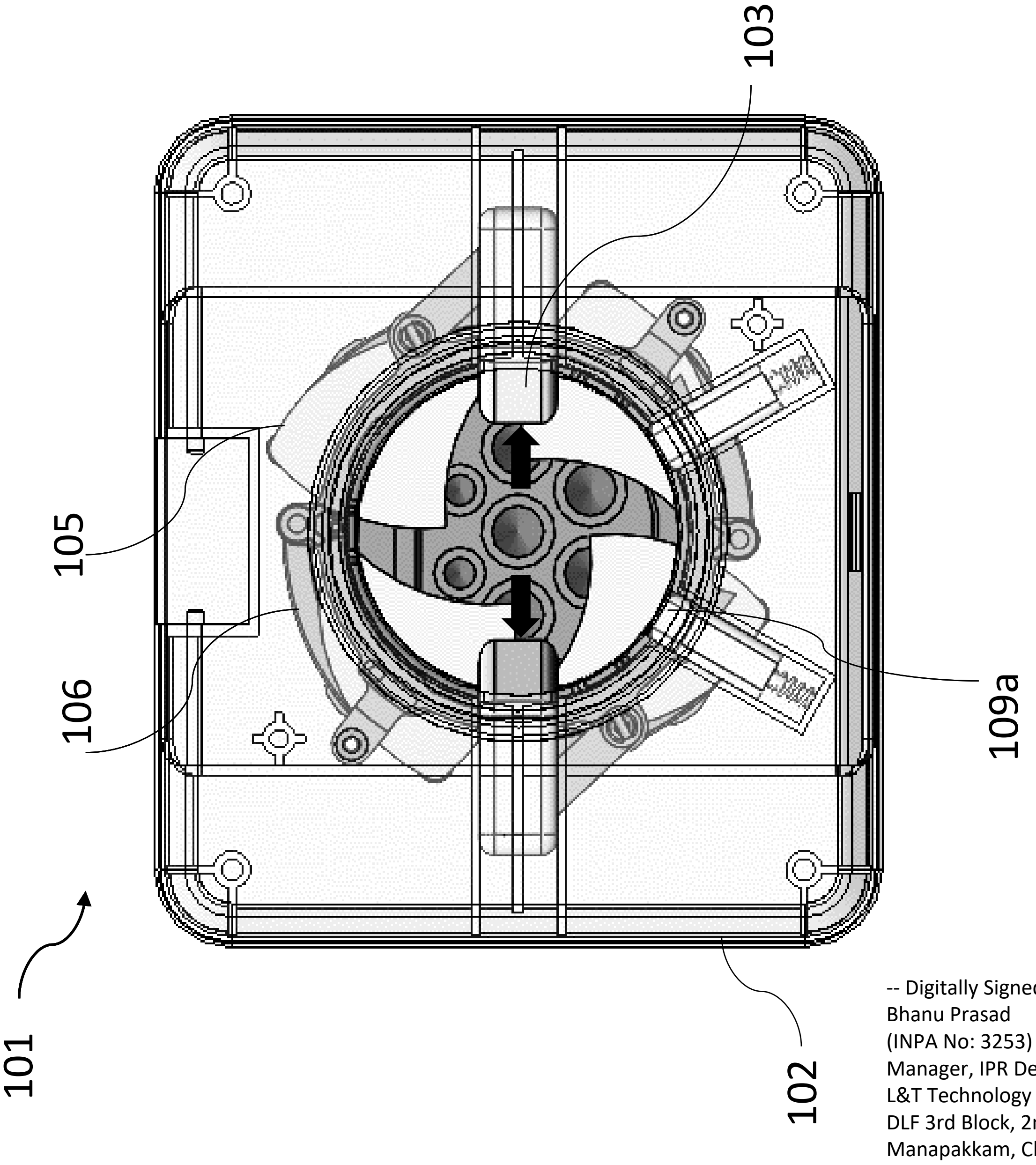

Fig. 6a

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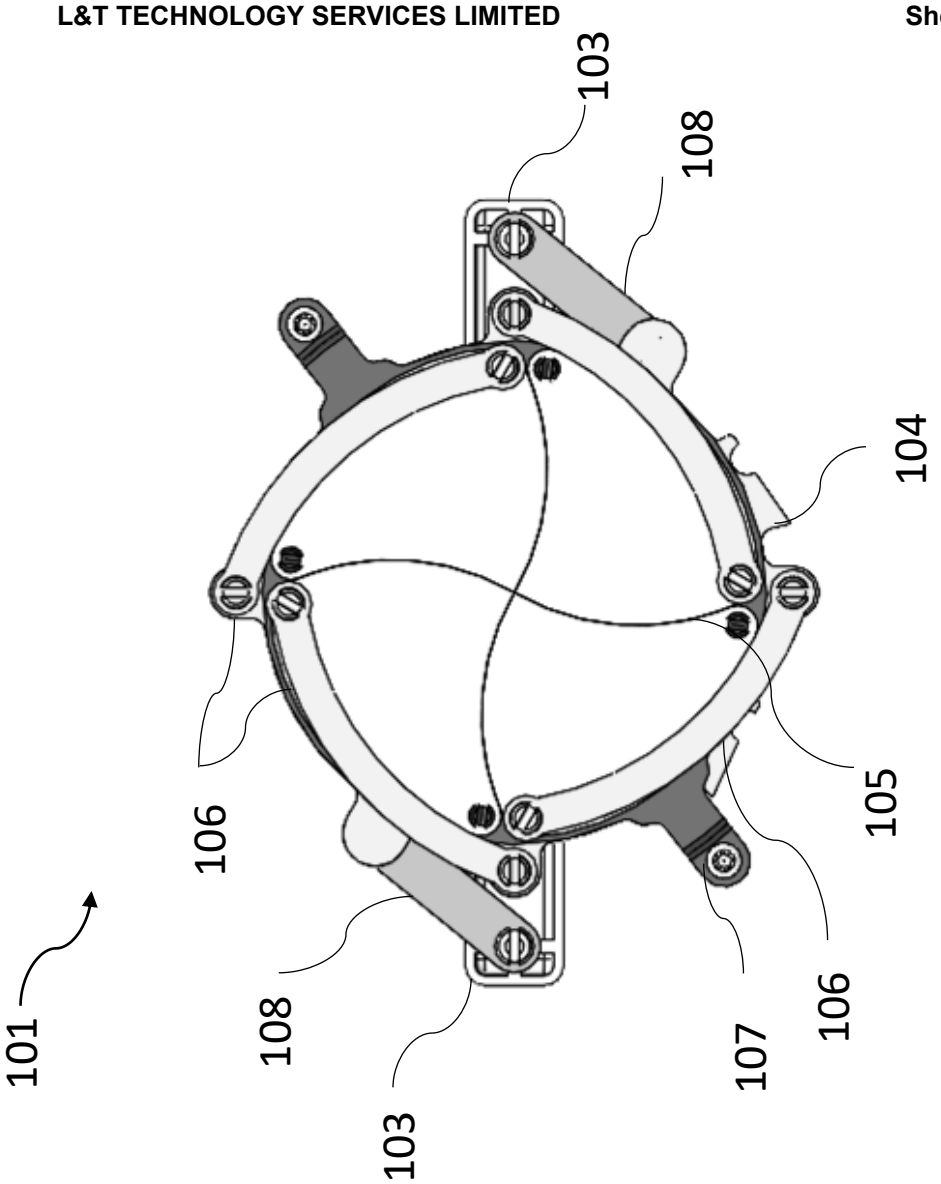

Fig. 7b

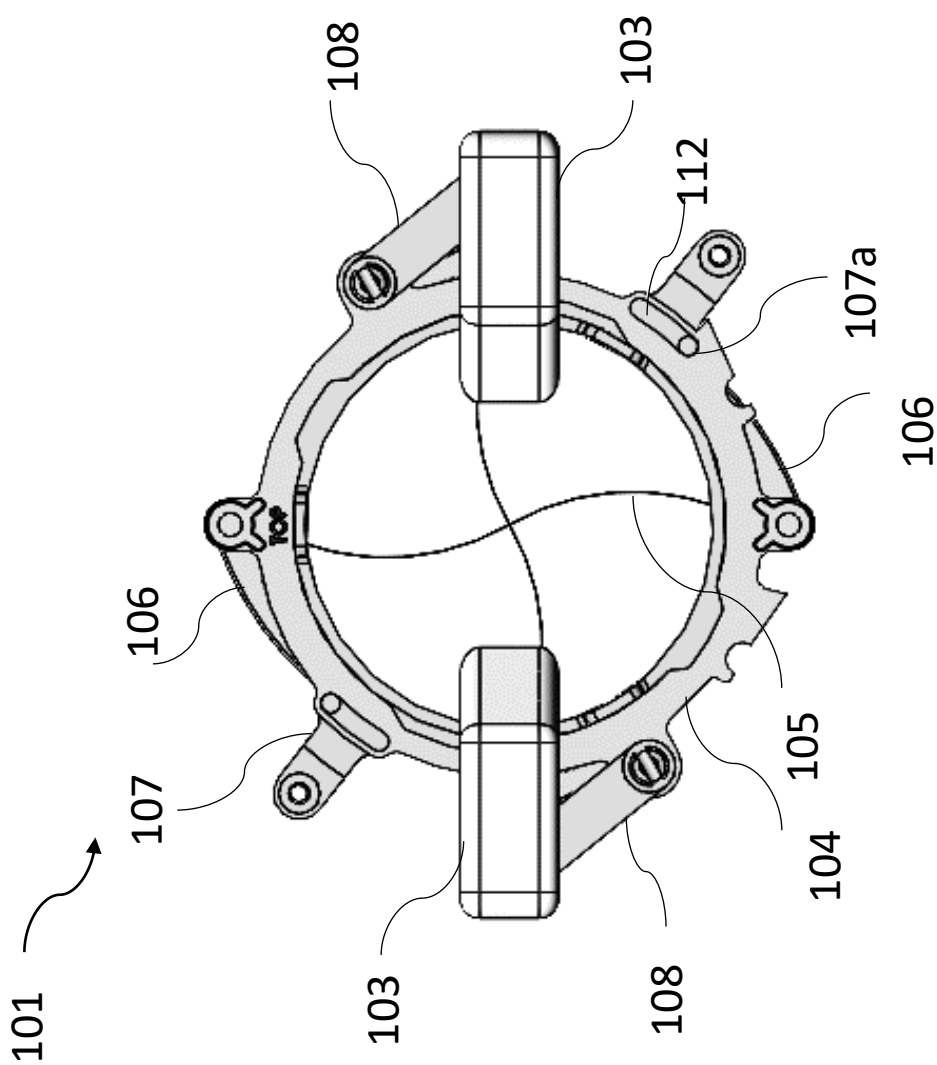

Fig. 7a

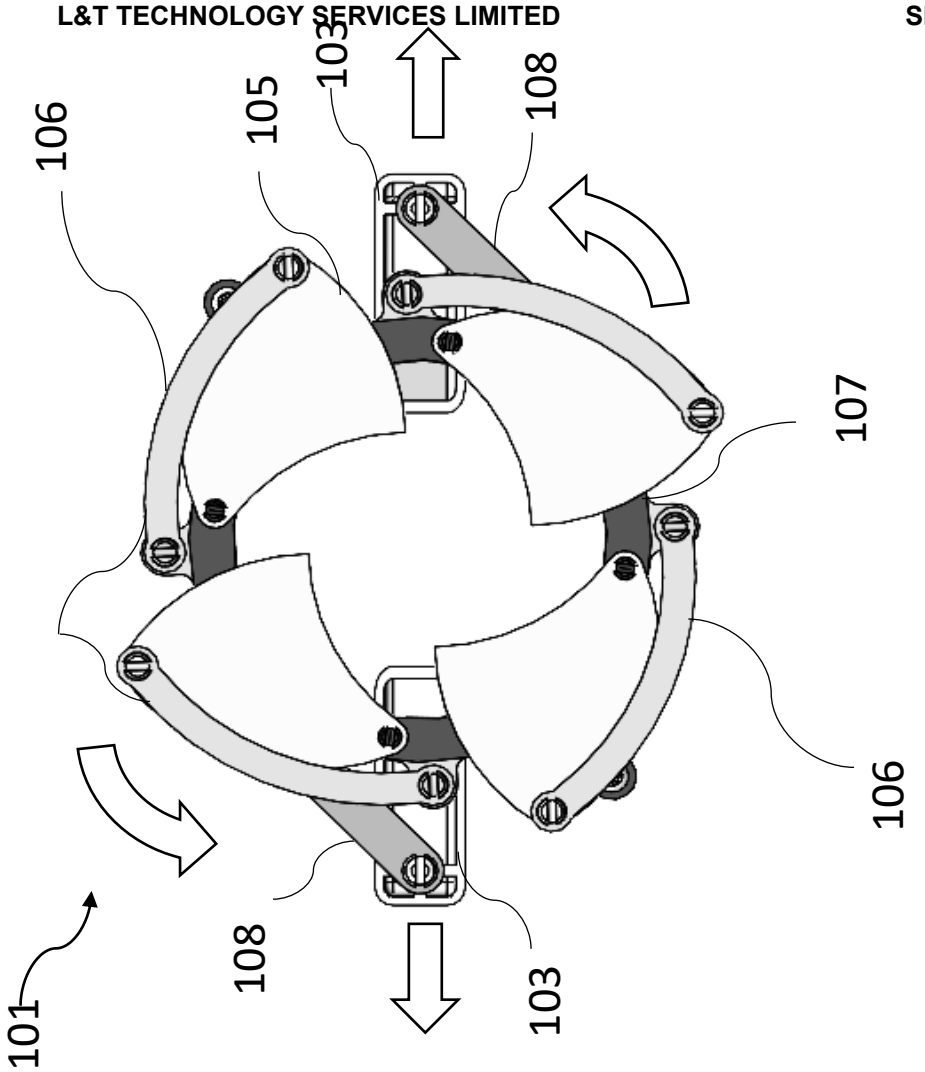

Fig. 7d

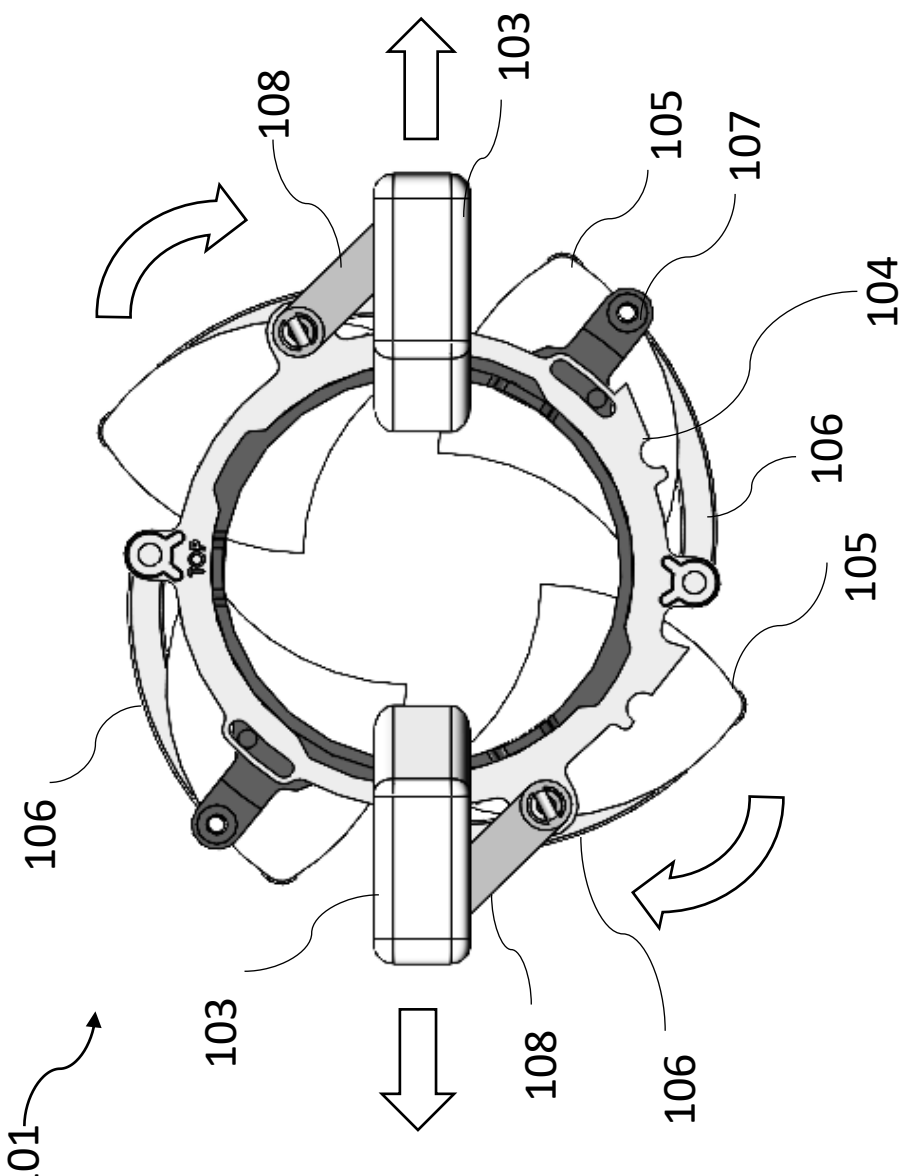

Fig. 7c

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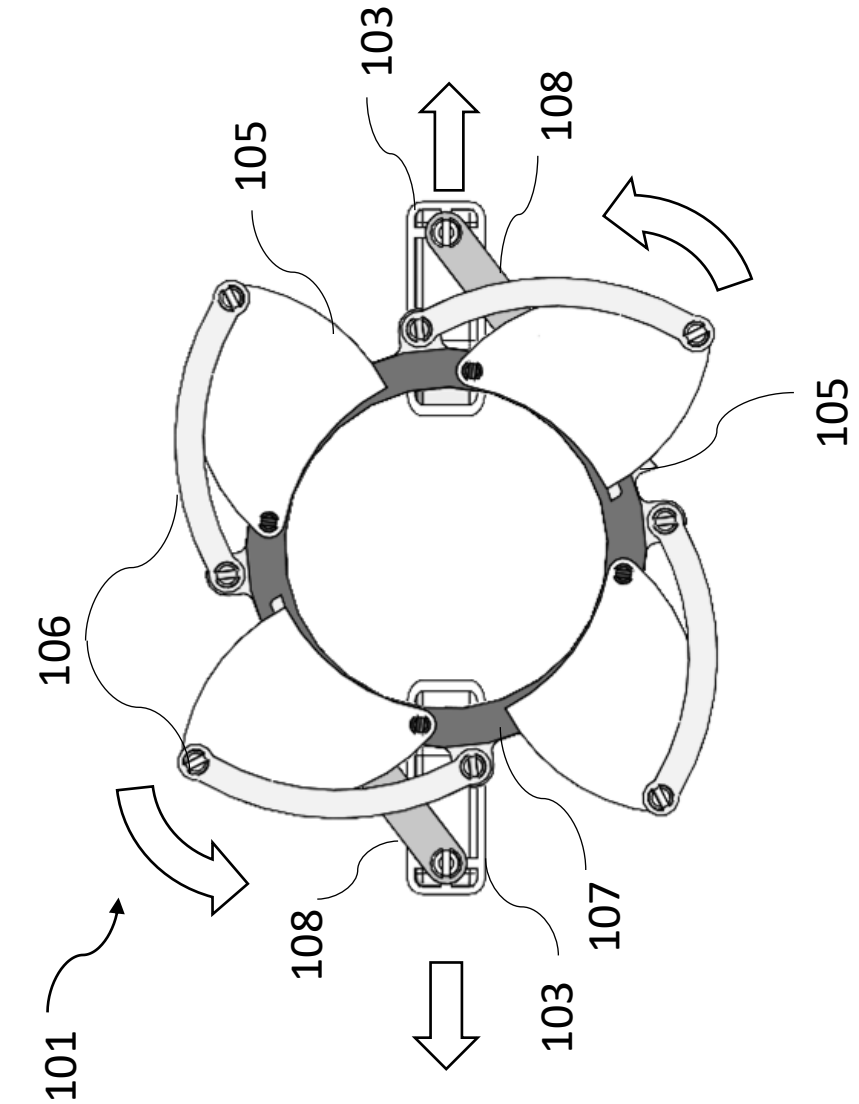

Fig. 7f

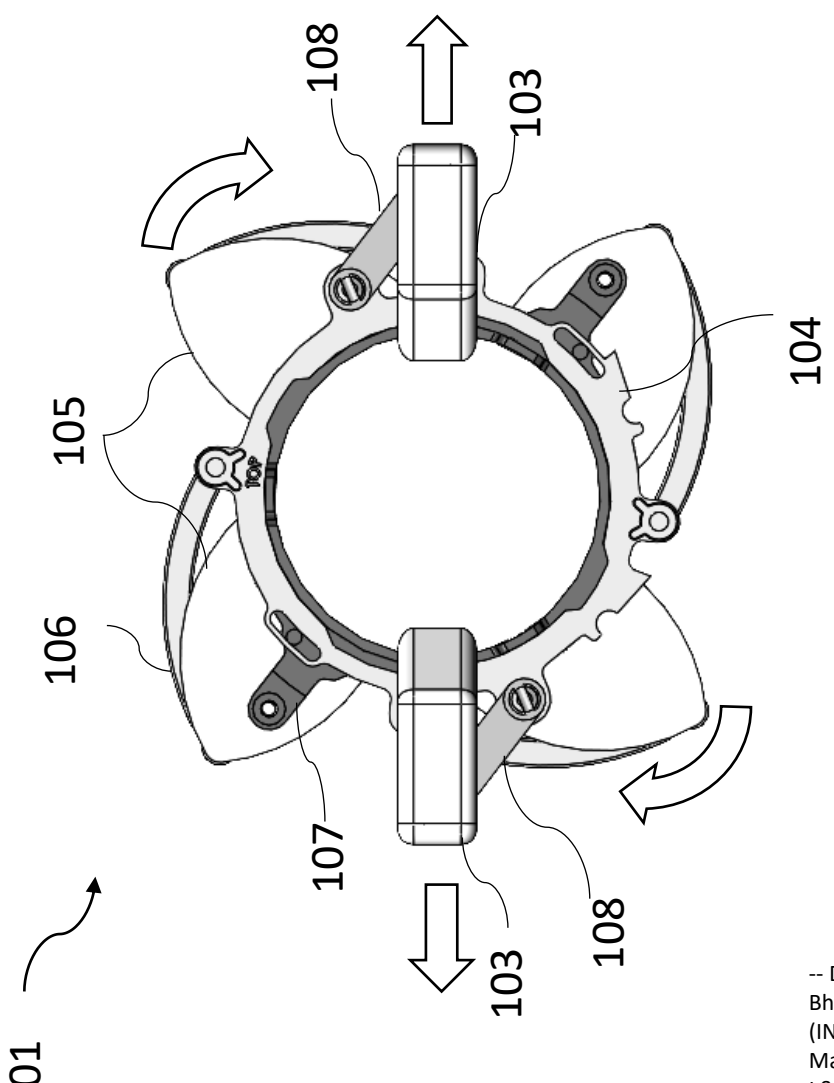

Fig. 7e

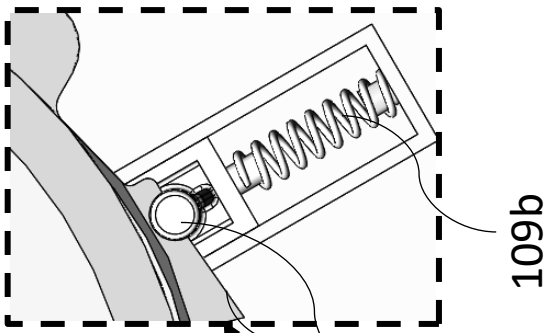

Fig. 8c

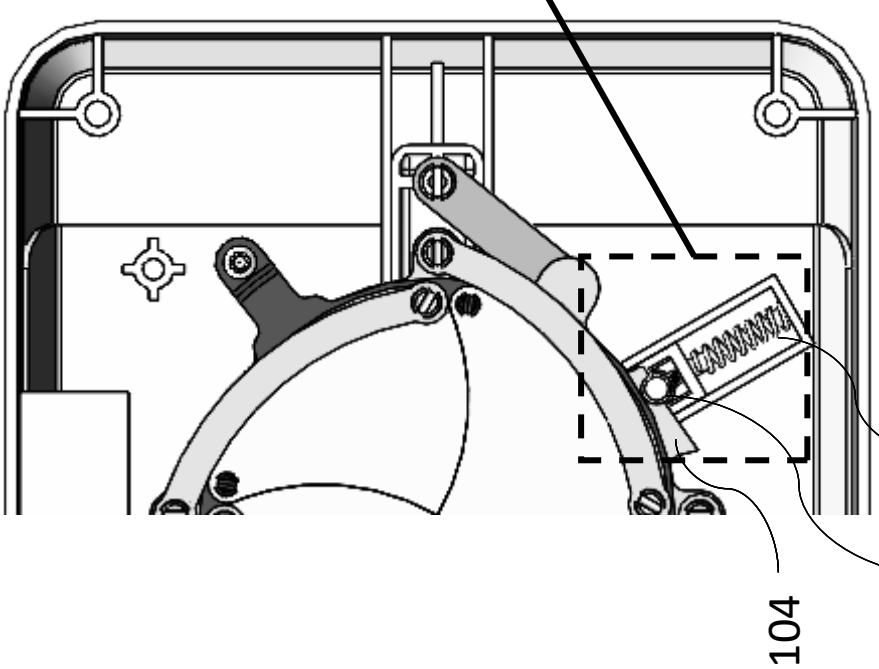

Fig. 8b

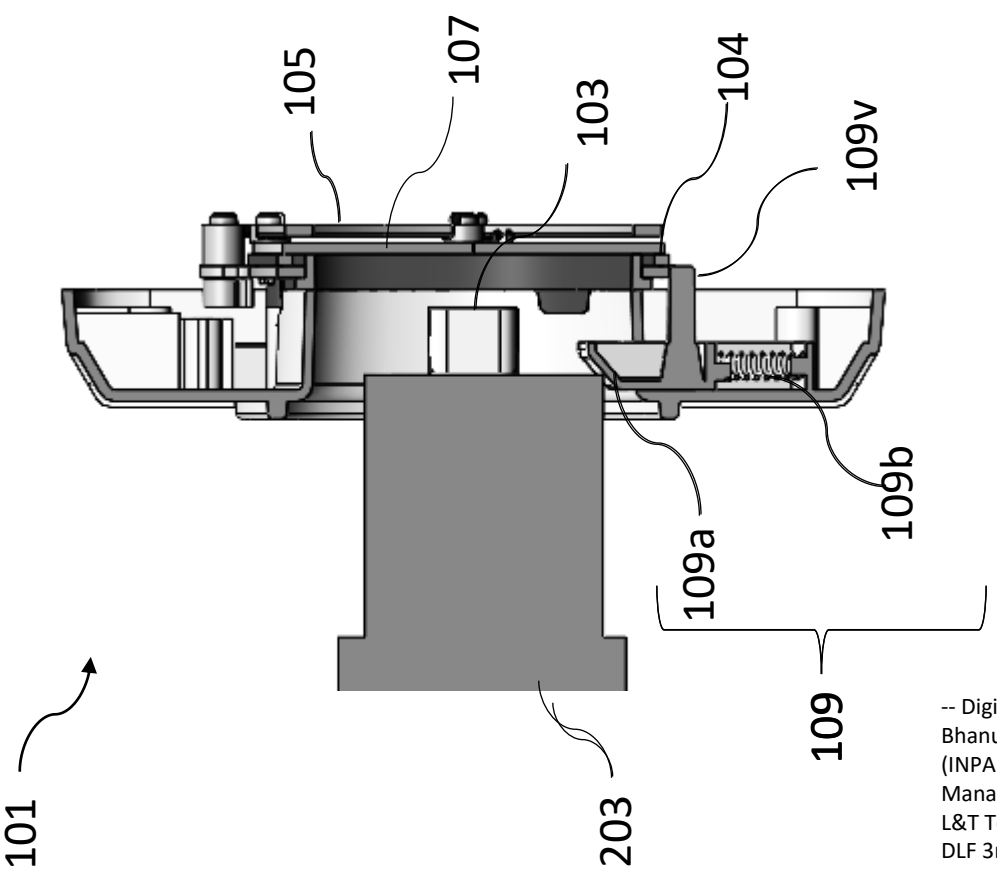

Fig. 8a

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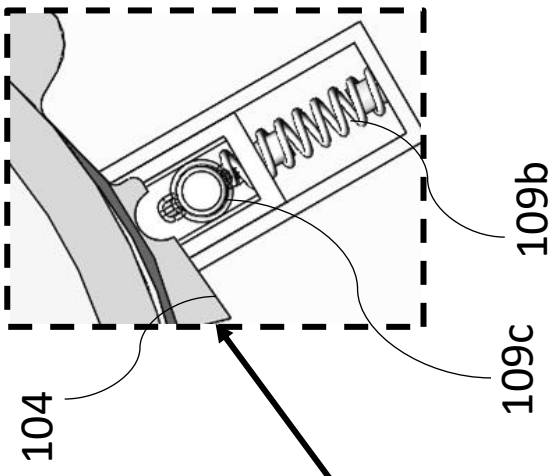

Fig. 8f

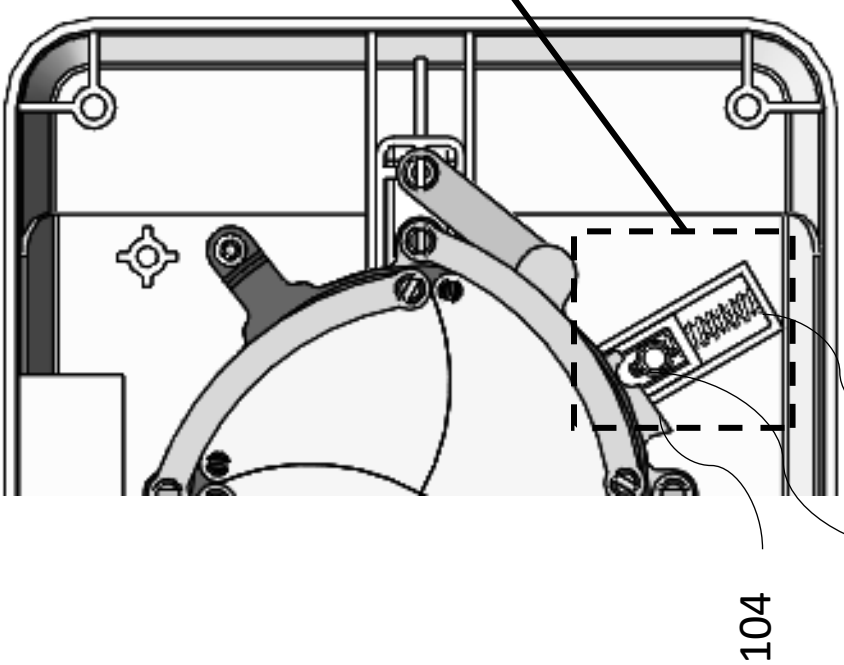

Fig. 8e

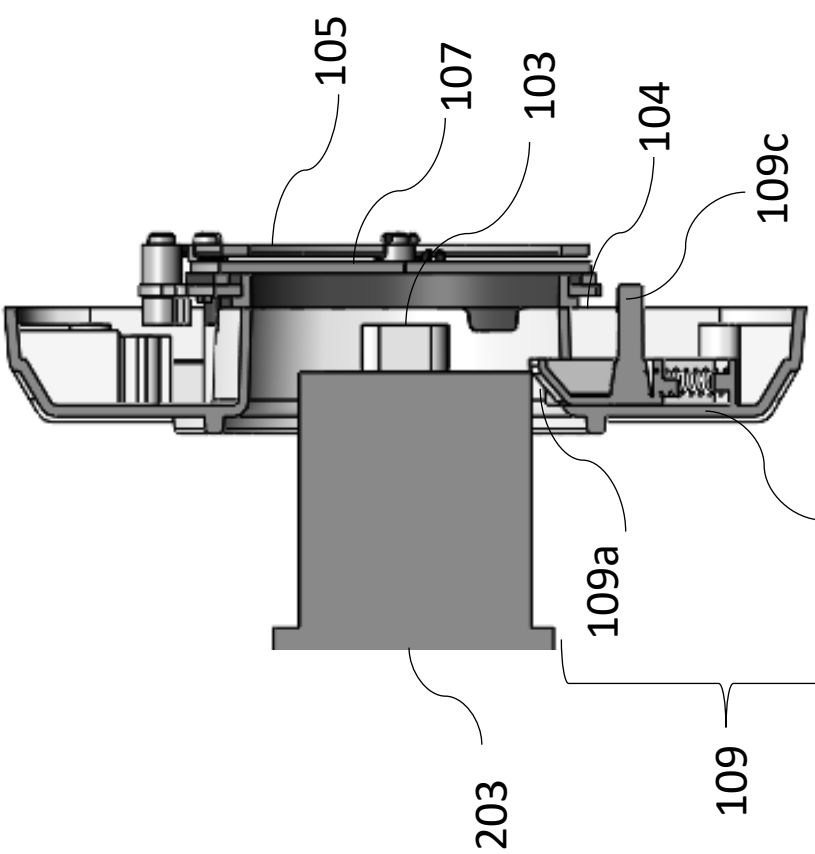

Fig. 8d

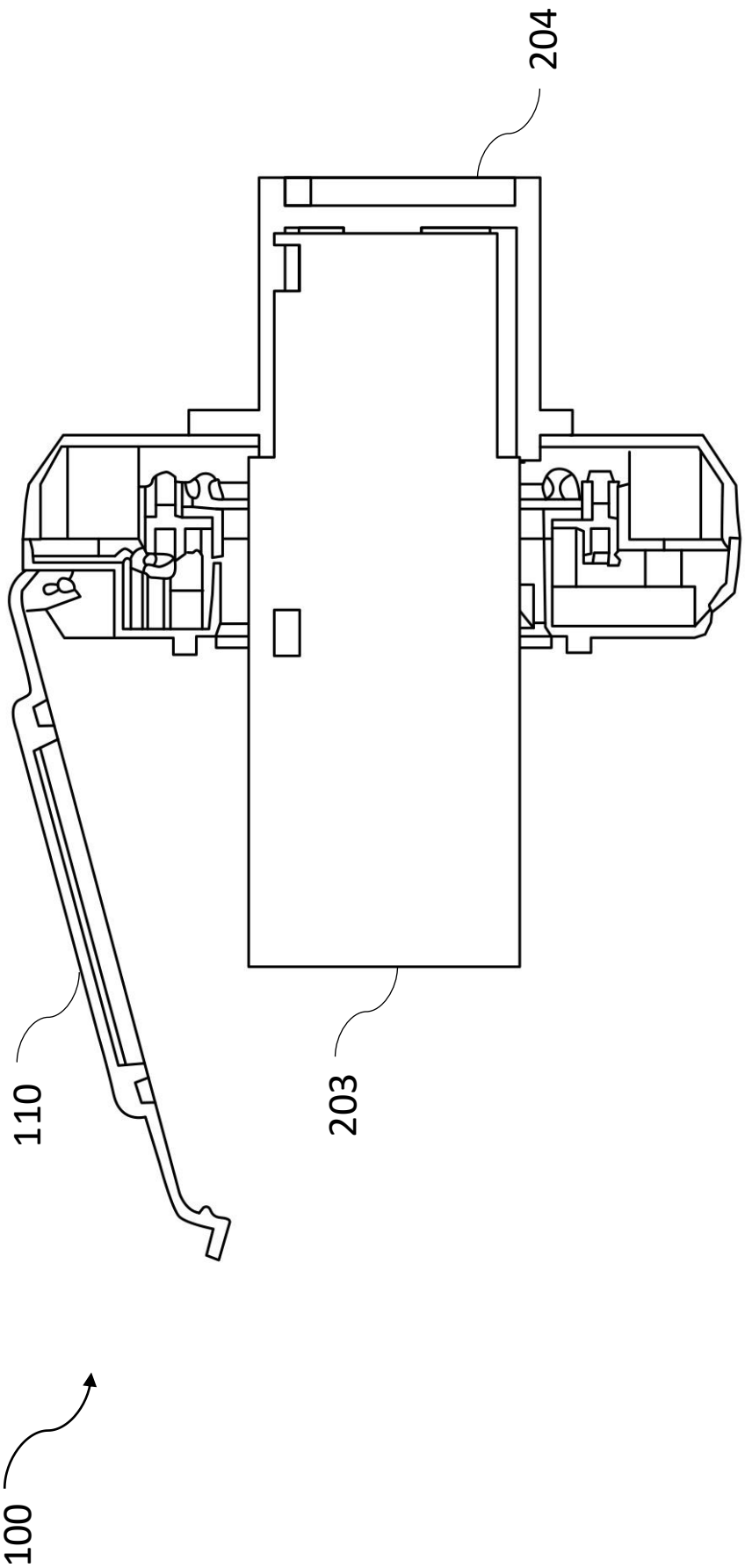

Fig. 9

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