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(54) POWER DEVICE FOR SUPPORTING AUTOMATIC MOVEMENT OF SKIS

(57) A power device (100) for supporting the automatic movement of skis, comprising a fitting (111) which can be fixed on the skis (110); a connection assembly (112); and a driving assembly (120). The connection assembly (112) connects the fitting (111) and the driving assembly (120) such that the driving assembly (120) and the skis (110) are arranged side by side. The connection assembly (112) is detachable. Thus, the skis (110) withstand most of the weight of the load when bearing weight, while the driving assembly (120) of smaller size and power can be used, or a driving assembly (120) of the same power can be used to provide greater endurance. In addition, the connection assembly (112) may comprises a quick disassembly and assembly connection assembly (200) to achieved the quick engagement and disengagement between the driving assembly (120) and the skis (110).

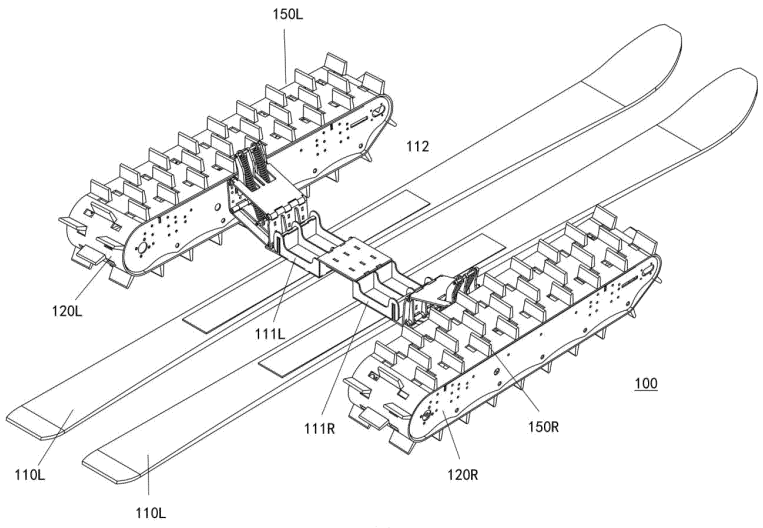

Fig. 1

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Description

Technical field

[0001] The present disclosure relates to a power device enabling ski board to travel automatically. The power device has a driving assembly, so that the ski board can travel autonomously on snow.

Background technique

[0002] In the inventor's previous patent applications, such as Chinese Invention Patent Application No. 201910345131.6 and PCT application PCT/CN2020/085929, which are incorporated herein by reference, a power device enabling ski board to travel automatically is proposed. In this power device, the driving assembly is arranged on the lower side of the ski board. Therefore, the driving assembly carries the ski board to travel autonomously on the snow or other roads, providing the skier with great convenience.

[0003] In the above-mentioned power device enabling ski board to travel automatically, since the driving assembly needs to carry the skier while traveling on snow or other cross-country roads, the driving assembly needs to carry a large weight. Therefore, a driving component or motor with large power is required, which results in limitation on the travel range or endurance of the power device enabling ski board to travel automatically. At the same time, the lateral stability is poor and cannot be used for both single and double ski board.

[0004] Therefore, there is a need for an improved power device enabling ski board to travel automatically.

Disclosure of the Invention

[0005] According to the present disclosure, a power device is provided that enables ski board to travel automatically, so that skier can use the power device to reach high places on snow slopes or mountain peaks without the need to take a cable car or climb as usual.

[0006] According to the present disclosure, a power device enabling ski board to travel automatically is provided. The power device overcomes the shortcomings in existing power devices, e.g. short cruising range.

[0007] According to the present disclosure, a power device enabling ski board to automatically travel is provided. The power device enabling ski board to travel automatically can be easily manipulated and can be quickly assembled and disassembled to meet the requirements of various situations.

[0008] According to one aspect of the present disclosure, a power device enabling ski board to travel automatically is provided, which includes: an adapter that can be fixed on the ski board, a connecting component and a driving component, and the connecting component is connected to the driving assembly via the adapter so that the driving assembly and the ski board are arranged side by side, wherein the connecting assembly is a detachable connecting assembly.

[0009] The power device further includes a suspension assembly, the suspension assembly is connected to the driving component, and the connecting assembly connects the adapter to the suspension assembly.

[0010] In one embodiment, the power device further includes an adapter fixed on the ski board, the adapter includes a hook, and the hook is inserted into a receiving groove provided on the side wall of the driving assembly or the suspension assembly, so that the ski board is detachably connected to the suspension assembly or driving assembly.

[0011] In one embodiment, the detachable connection is achieved through a quick release connector.

[0012] This allows the driving assembly and ski board to be quickly connected or disconnected to suit requirement in different situations. In extreme cases, the connection assembly may include explosive bolts, etc., in order to disengage the driving assembly at an extremely fast speed and return the ski board to a more maneuverable state, such as in a solo combat situation.

[0013] In one embodiment, the suspension assembly is configured to support the ski board off the ground when the ski board is unloaded, and to allow the ski board to contact the ground and bear most of the weight of the load when the ski board is loaded. Wherein, when the ski board is loaded, the load carrying ratio of the ski board and the driving assembly is 6:4, preferably 7:3, more preferably 8:2, and most preferably 9:1. In one embodiment, the spring or the length of the spring can be adjusted, for example the elastic coefficient thereof, to achieve optimal balance of friction and energy consumption.

[0014] Therefore, when carrying a load, the ski board will bear most of the weight of the load, and the driving assembly is mainly responsible for maneuvers such as traveling. Therefore, a driving assembly of smaller size and power can be used, or a larger Maneuvering range can be obtained with the same driving assembly.

Description of the drawings

[0015] The above and other features, advantages and technical advantages of the invention may be understood from the following detailed description of preferred embodiments of the invention with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of a power device enabling ski board to travel automatically according to a first embodiment of the present disclosure;

Fig. 2 is an exploded view of the power device enabling ski board to travel automatically shown in Fig. 1;

Fig. 3 is a view showing the suspension mechanism of the power device enabling ski board to travel automatically in Fig. 1 in a first state;

Fig. 4 is a view showing the suspension mechanism of the power device enabling ski board to travel au-

tomatically in Fig. 1 in a second state;
Fig. 5 is an exploded perspective view illustrating a driving assembly of a power device enabling ski board to travel automatically according to the present disclosure;
Fig. 6 is an exploded view showing a quick release connector according to a second embodiment of the present disclosure;
Fig. 7 is a cross-sectional view showing the quick release connector of Fig. 6;
Fig. 8 is a perspective view showing an unlocking member of the ski board connector in the quick release connector shown in Fig. 7;
Fig. 9 is a perspective view showing the connector support of the ski board connector;
Fig. 10 is a perspective view showing the receptacle of the ski board connector;
Fig. 11 is a perspective view showing a push-away ring of a ski board connector;
Fig. 12 is a cross-sectional view showing the ski board connector;
Fig. 13 is a perspective view showing the unlocking member in the driving assembly connector;
Fig. 14 is a perspective view showing a receptacle in a driving assembly connector;
Fig. 15 is a perspective view showing a retainer in the driving assembly connector;
Fig. 16 is a perspective view showing a push-away plate of the driving assembly connector;
Fig. 17 is a cross-sectional view showing the driving assembly connector;
Fig. 18 is an exploded perspective view showing another embodiment of the ski board connector;
Fig. 19A to 19C are cross-sectional views showing three different states of the ski board connector shown in FIG. 18;
Fig. 20 is an exploded perspective view showing another embodiment of a driving assembly connector;
Figs. 21A to 21C show cross-sectional views of the driving assembly connector shown in Fig. 20 in three different states;
Fig. 22 is a perspective view illustrating use of the power device with a ski board with the connection assembly in a connected state; and
Fig. 23 is a perspective view illustrating use of the power device with a ski board with the connection assembly in a disengaged state.

Embodiments for Carrying Out the Invention

[0016] Hereinafter, the power device enabling ski board to travel automatically according to the present invention will be described in detail with reference to the accompanying drawings. It should be noted that in the following description, the present invention is described and explained in detail by taking ski board as an example, but those skilled in the art will understand that the present invention is not limited thereto, but can be applied to snowboards or similar equipment.

[0017] In the following description, directional terms such as "front", "back", "upper" and "lower" are used. These terms are used as examples to facilitate understanding of the present invention, and the present invention should not be limited thereto. Generally speaking, "front" is described with reference to the direction of the ski board. In ordinary snowboarding conditions, the direction in which the raised end of the ski board points to the front or forward direction, while "rear" refers to the direction along the length of the ski board and opposite to the direction referred to as front. "down" when describing a part refers to a direction closer to the ground or the slopes, and "up" is the direction opposite to "down."
the present disclosure will be described in detail below with reference to the accompanying drawings. It should be understood that these embodiments are to help readers understand the technical solutions of the present disclosure, but are not intended to limit the present disclosure.

[0018] The present disclosure provides a power device enabling ski board to travel automatically. This power device includes a board, such as a commonly used double ski boards, and a driving assembly provided at one side of the board in a direction parallel to the length direction of the board. The driving assembly is respectively connected to the two ski boards through an elastic suspension mechanism, so that when the skier or user uses this power device, the ski boards are pressed down by the user's own weight, causing the boards to contact the ground. In this way, most of the weight will be supported by the ground through the board, and the driving assembly mainly provides forward, backward, steering and other maneuverable movements. Therefore, compared with the previous power device enabling ski board to travel automatically, a driving assembly with smaller power can be used.

[0019] Various embodiments of the present disclosure are described in detail below with reference to the accompanying drawings.

First embodiment

[0020] Referring first to FIGS. 1 to 4, FIGS. 1 to 4 illustrate a power device enabling ski board to travel automatically according to a first embodiment of the present disclosure.

[0021] As shown in Fig. 1, a power device 100 enabling ski board to travel automatically includes two ski boards 110L and 110R, driving assemblies 120L and 120R which are connected to one side of each ski boards 110L and 100R through suspension assemblies 150L and 150R, respectively, and connection assemblies 112 connecting the two ski boards 100L and 100R together. Since the two ski boards, the two suspension assemblies, and the two driving assemblies are mirrored with each other, in the following description, only one of the ski boards, the suspension assemblies, and the driving assemblies

will be described, and are denoted collectively by 110, 120, and 150, except where a distinction needs to be made between components on both sides.

[0022] The ski board 110 is similar to a traditional ski board, having an elongated body that includes a contact surface or bottom surface that is in contact with the snow when skiing, and an opposite top surface, on which a binding device (not shown) is usually provided in its intermediate portion to secure the skier's boots and ski board to each other. For example, in the middle position of the binding device, an adapter 111 is provided, which is used to connect the left and right ski boards with each other and to connect the ski boards to the suspension assemblys, respectively.

[0023] As shown in Figs. 2 to 4, the adapter 111 is of groove-shaped to avoid interference with the ski boots. On opposite sides of the groove, a insertion groove 113 and an insertion hook 114 are respectively formed. The respective insertion slots 113 of the two adapters 111 respectively provided on the two ski boards face each other and are on the inside, while the insertion hooks 114 are on the opposite side, so that a connecting component 112 used to connect the two ski boards together can be inserted into the insertion slots 113 of the adapters 111 of the two ski boards respectively, thereby connecting the two boards together. As shown in FIG. 2, in this embodiment, the connecting component 112 is in the shape of an inverted frame, and the side walls on each side are respectively inserted into the insertion slots 113 .

[0024] The insert hook 114 of the adapter 111 is inserted into a receiving groove 151 formed on the opposite side of the suspension assembly 150, thereby connecting the snowboard to the suspension assembly 150 and further to the driving assembly 120. The receiving groove 151 may have a width greater than the thickness of the insertion hook 114, thereby allowing a certain amount of swinging of the ski board relative to the suspension assembly.

[0025] The suspension assembly will be described below with reference to Figs. 3 and 4.

[0026] As shown in Figs. 3 and 4, the suspension assembly 150 includes a first link 152, a second link 153, and a third link 154. One end of the first link 152 is pivotably connected to the side wall of the driving assembly 120, and the other end is pivotally connected to one end of the third link 154. One end of the second link 153 is pivotally connected to the side wall of the driving assembly 120, and the other end thereof is pivotally connected to the other end of the third link, thus forming a parallelogram structure. Although these features are named here as connecting rods, in this embodiment, as shown in the Fig., they are implemented in the form of plates to meet load-bearing and mounting requirements. However, the present disclosure is not limited thereto.

[0027] On the side wall of the driving assembly 120, a support plate 155 is also fixed. A suspension spring 156, preferably a coil spring, is installed between the free end of the support plate 155 and a position between the two ends of the second link 153, providing elasticity and cushioning for the suspension.

[0028] Figs. 3 and 4 are views respectively showing the suspension assembly 150 in two different states. That is, Fig. 3 is a view showing the power device under no load condition, and Fig. 4 shows the power device under load.

[0029] As shown in Fig. 3, under no-load condition, that is, when the skier is not standing on the boards, due to the tension of the suspension springs 156, the ski boards 110 are pulled up and away from the snow surface or the ground. In this case, the user can remotely control the power device to travel to a designated location.

[0030] As shown in Fig. 4, after the skier stands on the snowboard by engaging the ski boots with the bindings on the boards, the ski boards are pressed down due to the weight of the skier, and the springs 156 in the suspension assembly 150 is stretched, thereby providing suspension force. Thus, when the skier stands on the ski boards and operates the power device, the ski board is pressed down into contact with the snow by the skier's weight, so that the main weight of the skier is carried by the ski board, while only a small amount remains bore by the suspension assembly. Preferably, the load-carrying ratio between the two is 6:4; 7:3; or 8:2; or 9:1 or other ratios. In addition, the elastic constant of the suspension spring 156 can be adjusted or the length of the suspension spring 156 can be adjusted, thereby adapting to different weights of the skiers.

[0031] As shown in FIG. 5, which is an exploded perspective view of the driving assembly 120. The driving assembly 120 includes a frame 121, a track 122 arranged around the periphery of the frame 121 to improve the ground gripping effect, a driving wheel 124 arranged in the frame 121 and driving the movement of the track, a drive motor 123 configured to provide driving power to the drive wheel 124 via a gearbox 125, multiple track support wheel 126, and a driven wheel 127 arranged opposite to the driving wheel 124, wherein the shaft of the driving wheel 124 is installed on opposite side plates of the frame 121 through shaft mounting members 129 to rotate relative to the side plate, thus, the track 122 is driven to move; the shaft of the driven wheel 127 is installed on the opposite side plates of the frame 121 through mounting members 128, and the hole of the mounting member 128 for receiving the shaft is in the shape of a long hole, so that the driven wheel 127 can be adjusted along the long hole, to adjust the tension of the track 122.

[0032] Optionally, in order to deal with ice or compacted snow roads which is very slippery, anti-slip elements, such as anti-slip chains or anti-slip teeth, can be provided on the tracks 122 to increase the adhesion capacity of the tracks.

[0033] The driving assembly 120 further includes a battery (not shown) that provides power to the motor and a control circuit (not shown) that controls the operation of the entire driving assembly 120.

[0034] The control circuit includes a circuit board and a controller installed on the circuit board, such as a microprocessor or CPU. In addition, the control circuit also includes a memory to store the running program and data generated during the running process or preset data, etc. The controller reads the data stored in the memory and performs control functions. The control circuit also includes a plurality of sensors, such as geographical information sensors, to receive signals from global satellite positioning systems such as GPS, Beidou, Galileo, etc. to determine the position information of the ski board and transmit the position information to the controller and memory; the control circuit also includes other sensors, such as millimeter wave radar, lidar, etc., to detect environmental information; the control circuit may further include a communication system, for example, a communication system based on 4G, 5G, Bluetooth, wifi and other protocols, to communicate with the remote control center or the user's terminal (such as a mobile phone), and receive commands from the remote control center or the user's terminal, thereby driving the power device to move according to a preset program or mode. The control circuit may also include an alarm circuit or an alarm to send an alarm signal when a malfunction or other situation occurs. The alarm signal may include information indicating the location of the driving assembly.

[0035] According to one embodiment, the driving assembly may have an autonomous mode. In the autonomous mode, the ski board can be in on load state on which a skier is carried or the ski board is in an unloaded state, the driving assembly can be driven according to a pre-planned path or instruction or command from a remote control center or user, so that the ski board can autonomously transport the skier to a designated location under load or return to the designated location autonomously without load. In one embodiment, the power device may have a control mode in which the power device may be driven in response to a skier's control instruction who is carried thereon. For example, the skier may control the operating speed and/or operating direction of the driving assembly by actuating the button or button combination provided on the handle of the skier's poles, thereby controlling the entire power device.

[0036] In one embodiment, the driving assembly may include a folding propeller, and the folding propeller may be connected to the driving component of the driving assembly, such as the motor, so that the driving assembly is brought to a designated location or return to the starting position by relying on the drive of the driving assembly. In addition, the skier can also carry the driving assembly in his backpack while skiing.

Second embodiment

[0037] a second embodiment according to the present disclosure will be described with reference to FIGS. 6 to 17. Compared with the first embodiment, this second embodiment adopts a driving assembly with the same structure, and therefore, the description of the driving assembly will be omitted. The difference between the second embodiment and the first embodiment is that it adopts a quick disassembly and assembly connection method, that is, between the adapter parts 211L and 211R of the ski boards and between the adapters 211L and 211R of the ski boards and its corresponding suspension assemblies 250L and 250R, a quick release connection assembly 200 is used.

[0038] As shown in Fig. 6, Fig. 6 shows an exploded perspective view of the quick release connection assembly 200, wherein the quick release connection assembly 200 includes four connector parts for connecting the left and right ski boards and connecting the left and right ski board respectively with its corresponding driving assemblies, to be exactly, with the driving assemblies via its corresponding suspension assemblies. Since these four connector parts are mirrored in pairs, only one of them is described in the drawings and the following description, and this structure is applicable to the other one, which are in mirror image relationship.

[0039] As shown in Figs. 6 and 7, a ski board connector is provided between the adapters 211L and 211R. The board connector is a combination of two connectors and includes a connector support 212. The connector support 212 is in the form of a sleeve, including a reduced-diameter intermediate sleeve 2121 (see Fig. 9) and an increased-diameter sleeve 2122 at opposite ends of the intermediate sleeve (see Fig. 9). A socket 215 is screwed in a threaded hole 2123 formed on the large- diameter sleeve 2122 through a screw (not marked). at both ends of the connector support 212, see FIG. 12.

[0040] In conjunction with FIG. 10, FIG. 10 shows a perspective view of one of the sockets 215. The socket 215 is a multi-section cylindrical shape with flanges, starting from the end connected to the connector support 212, the socket 215 includes a connecting section (not labeled) to be connected to the increased diameter sleeve 2122; a locking section (not labeled) adjacent to the connecting section, in which a plurality of holes 2152 are uniformly formed in the circumferential direction through the thickness of the locking section to accommodate the locking balls 216, the holes 2152 are formed to allow a predetermined portion of the balls 216 to pass through the inner circumference surface of the locking section but cannot completely pass through, that is, the opening of the hole 2152 on the inner circumferential surface of the locking section is smaller than the diameter of the ball 216; a guide section adjacent to the locking section, on which a plurality of pins 2153 with a track-shaped cross section are formed to provide a guiding function for the push-away ring 214; and a flange 2151, which extends radially outward from the guide section to provide a stop for the push-away ring 214, and an arc-shaped slot 2155 is formed on the end surface of the flange 2151 (to be described later).

[0041] With reference to Figs. 7, 8 and 12, an unlocking member 213 is arranged around the locking section of

the socket 215, and can rotate by a certain angle around the locking section. The unlocking member 213 includes a handle 2131, an annular portion 2135 connected to the handle, a plurality of push blocks 2132 formed on the outer circumference of the annular portion 2135, a plurality of cam grooves 2134 provided on the inner circumference of the annular portion 2135 at intervals, and a notch 2133 formed at one side of the annular portion 2135. The unlocking member 213 is placed over the locking section of the socket 215, and a spring 2136 (not shown in Fig. 8 , see Fig. 12) is provided in the notch 2133. One end of the spring 2136 is hooked on a pin 2154 formed on the outer periphery of the locking section of the socket, and the other end of the spring 2136 abuts against the side wall of the notch, thereby biasing the unlocking member 213 to the locking position.

[0042] Further with reference to Fig. 11, a push-away ring 214 is shown. The push-away ring 214 is sleeved on the guide section of the socket and includes a guide groove 2142. The pin 2154 on the guide section is inserted into the guide groove 2142, thereby guiding the push-away ring 214 moves axially along the socket. On the end surface of the push-away ring 214 facing the unlocking member 213, a protrusion 2141 is formed. The protrusion 2141 includes an inclined surface that cooperates with the pushing block 2132 of the unlocking member 213.

[0043] Fig. 12 also shows a plug 223 fixed on the adapter 211, the plug 223 includes a groove 2231 near the end, and a pin 2232 is formed on the side wall of the adapter 211 forming the plug 223 towards the connector. 2232 (see Fig. 6).

[0044] Referring to Fig. 12, in the connected state, the plug 223 is inserted into the socket 215, and the locking balls 216 installed on the locking section of the socket 215 falls into the groove 2231 of the plug 223, because the unlocking member 213 is in the state that the inner peripheral surface of the annular portion thereof abuts the outer end of the balls 216 under the action of the spring 2136 so that the ball 216 cannot move radially outward, thereby locking the plug (the adapter 211) on the socket 215.

[0045] By including such connectors at both ends of the connector support 212, the two ski boards are connected together.

[0046] When preparing to separate the two ski boards, for example, with the help of snow poles or hands or other tools, the handle 2131 of the unlocking member 213 is pressed. The rotation of the unlocking member 213 causes the cam groove 2134 on the inner circumferential surface of the annular portion 2135 to align with the ball 216, thereby allowing the ball 216 to move radially outward, while the rotation of the unlocking member 213 causes the slope of the pushing block 2132 to slide on the slope of the projection 2141 of the push-away ring 214 , pushing the push-away ring 214 away from the unlocking member 213 , and as shown in Fig. 7, as the push-away ring 214 abuts the side wall of the adapter 211, thereby pushing the adapter 211 away from the socket (connector), thereby pushing the plug out of the socket, that is, disconnecting the connection between the adapter 211 and the connector support 212.

[0047] It can be seen that with a simple action, the connector can be quickly disconnected, thereby quickly separating the two ski boards.

[0048] In addition, during assembly, the two ski boards can be connected only by inserting the plug 223 of the adapter 211 into the socket 215 while appropriately rotating the unlocking member 213. In this state, the side wall of the adapter 211 abuts the push-away ring 214 and the pin 2232 formed on the side wall of the adapter is inserted into the arc-shaped groove 2155 formed on the end surface of the flange of the socket 215, thus, allows the two ski boards to be rotated only in a certain angle relative to each other.

[0049] The structure of the connector between the adapter 211 of the ski board and the suspension assembly 150 is described below with reference to Figs. 6, 7, 13 to 16. The structure of the connector is similar to the structure of the board connector described above. Hereinafter referred to as the driving assembly connector.

[0050] As shown in the Figs., the driving assembly connector includes a generally cylindrical socket 218 with a plurality of through holes 2181 formed in the circumferential wall of the socket 218 to allow the locking balls 219 to be received in the holes but not pass therethrough. Then, similar to the holes 2152, a plurality of pins 2182 are formed on the outer peripheral surface of the socket 218 for fixing one end of the spring 2175 (see FIG. 17) that biases the unlocking member 217.

[0051] Similar to the unlocking member 213, the unlocking member 217 includes a handle 2171, an annular portion 2175, a cam groove 2174 formed on the inner peripheral surface of the annular portion 2175, and a pushing block 2172 formed on the outer peripheral surface of the annular portion 2175. The pushing block 2172 includes a slope. A notch 2173 is also formed on one end of the annular portion 2175, and a spring 2175 is accommodated in the notch 2173 and biases the unlocking member 217 toward the locked state.

[0052] The unlocking member 217 is sleeved on the outer periphery of the socket 218 and is fixed on the side wall of the adapter 211 through a retainer 220 (see Fig. 15). As shown in Fig. 15, the retainer 220 includes a retaining plate 2203 and four claws 2201 extending radially from the retaining plate 2203. The claws 2201 include bosses 2204 and holes 2202 formed in the bosses 2204.

[0053] The retaining plate 2203 includes a central circular hole into which one end of the socket 218 is inserted and the flange 2183 of the socket 218 abuts against the side wall of the retaining plate 220. The retaining plate 220 is fixed to the side wall of the adapter 211 by four bolts 222.

[0054] The pushing member 221 is generally in the shape of a square frame and includes four holes 2212

at four corners. The bosses 2204 of the retainer 220 is inserted into the holes 2212 so that the pushing member 221 can move axially along the bosses 2204. Bolts 222 passes through the holes 2202 formed in the bosses 2204 and are screwed into the side wall of the adapter 211, respectively, thereby fixing the retainer 220. The head size of the bolts 222 is larger than the size of the holes 2212 of the pushing member 221, to provide a stop for movement range of the pushing member 221. protrusions 2211 are formed on the end surface of the pushing member 221 facing the unlocking member 217. The protrusions each includes a slope corresponding to the slope of the push blocks 2172 on the unlocking member 217.

[0055] Similarly, a plug 251 is formed on the side wall of the suspension assembly, and the plug 251 includes a groove 2511 to mate with locking balls 219.

[0056] Similar to the board connector, when the driving assembly is to be disengaged, by depressing the handle 2171 of the unlocking member 217, the cam groove 2174 of the unlocking member 217 is aligned with the locking balls 219, allowing the locking balls 219 to move radially outward. It can thereby be disengaged from the groove 2511 of the plug 251 to allow the plug 251 to be withdrawn from the socket. At the same time, the inclined surface of the pushing block 2172 of the unlocking member 217 slides on the inclined surface of the protrusions 2211 of the pushing member 221 to push the pushing member 221 away from the socket. The pushing member 221 further moves the side wall of the suspension assembly away from the snow. The direction of the board pushes, thereby decoupling the driving assembly, along with the suspension assembly, from the snowboard in one motion.

[0057] When connecting, similar to a board connector, the plug 251 is inserted into the socket 218 while the unlocking member 217 is appropriately rotated, thereby connecting the driving assembly and suspension assembly to the ski board.

[0058] In the driving assembly connector, there are no limiting pins, thereby allowing a greater range of relative rotation of the board relative to the driving assembly, thereby allowing the power device to adapt to various uneven surfaces.

[0059] By providing a quick release connector to connect the ski boards and the driving assembly to each other, when needed, the user can quickly detach the driving assembly and the ski boards through a simple action, that is, pressing down the unlocking member; and the ski boards and driving assembly can also be quickly connected for motorized travel as necessary. As mentioned above, after disengagement, the skier or user can quickly put into ski just like an ordinary skier, and the driving assembly can, for example, according to a preset program or a command from a remote control center or the user's terminal, travel independently to a designated location. Optionally, the driving assembly can record the route traveled and follow the route traveled back to the starting point.

[0060] The above description has been made with reference to ski board, but it will be understood that it can also be applied on a snowboard or other load-carrying tools, and the driving assembly is simply connected to both sides of the load-carrying tool through the connecting assembly, so that carrying person or goods to travel on snow.

[0061] Referring to Figs. 18 to 21, another embodiment of the quick release and attachment structure is shown. In this embodiment, after connection, the quick release structure is energized, so that when release is triggered, the stored energy is quickly released, thereby decoupling the driving assembly from the ski boards. As an option, storage of energy may be accomplished by the skier standing on the board and/or the skier's shoes engaging the bindings on the ski board. In one embodiment, the quick release and attachment structure includes a quick release and attachment structure for connecting the two ski boards and a quick release and attachment structure for connecting ski board to the suspension assembly.

[0062] This embodiment of the quick-release structure is described in detail below with reference to FIGS. 18 to 21. In order to maintain simplicity and avoid repetition, the same parts as the quick-release connection described in FIGS. 6 to 17 will be omitted.

[0063] First, the structure of the board connector connected between the ski boards will be described. As shown in Figs. 18 and 19, the board connector 300 is connected between the two ski board adapters 211L and 211R, and includes a connector support 312 in the form of a sleeve, which can be identical to the connector support 312 shown in Fig. 6, and therefore will not be described again.

[0064] At each end of the connector support 312, a quick release structure is provided. The quick release structure 300 includes a socket 315, which is a multi-section cylindrical shape with a flange 3151, including a first diameter section 3152, a second diameter section 3153 and a bottom 3154. The first diameter section 3151 is provided with a plurality of through holes (not labeled) on its circumferential wall, and locking balls (not shown) can pass through the through holes and embed in corresponding holes of a plug 223 of the adapter inserted into the first diameter section 3152, thereby preventing the adapter from disengaging from the ski boards connected to the adapter.

[0065] The second diameter section 3153 of the socket 315 is provided with a plurality of connection holes (not labeled) on its circumferential wall. These connection holes may be threaded holes, whereby the socket 315 is connected in the corresponding ends of the connector support 312 through fasteners such as screws.

[0066] An inner cavity is formed in the socket 315, and an energy accumulating piston 314 is movably accommodated in the inner cavity. The bottom 3154 of the socket 315 is a closed bottom and is provided with a through hole (not labeled) in its center, thus, an energy accumulating spring 316 is provided between the energy accu-

mulating piston 314 and the inner surface of the bottom of the socket 315. The accumulating piston 314 includes a piston head 3141 and a piston rod 3142. The piston rod 3142 passes through the through hole formed in the bottom 3154 and is fixed with a nut, for example, at its end, to ensure that the piston will not drop from the inner cavity of the socket 315. The energy accumulating spring 316 can be wrapped around the piston rod 3142 and thereby be compressed between the piston head 3141 and the bottom 3154, biasing the piston head 3141 away from the bottom 3154.

[0067] An unlocking member 313 is further provided over the outer circumference of the first diameter section 3152 of the socket 315. As shown in FIGS. 7, 8 and 12, the unlocking member 313 is limited in the range between the flange 3151 of the socket 315 and the end surface of the support in the axial direction of the support 212, but can rotated in the circumferential direction between a locked position and an unlocked position. With reference to Figs. 7, 8 and 12 and related descriptions, the inner circumferential surface of the unlocking member 313 forms a cam groove, whereby in the locking position , the inner circumferential surface of the unlocking member 313 abuts the locking balls, thereby preventing the locking balls from removing from the corresponding holes of the plug 223, thereby preventing the ski board adapter disengaging from the connector support 212. In the unlocked position, the deeper portion of the cam groove aligns with the hole in the first diameter section 3152 of the socket 315, thereby allowing the locking balls move radially outward, allowing the ski board adapter to disengage from the support. As the locking and unlocking structures in this embodiment may be provided similarly with those in the embodiments with reference to FIGS. 6 to 17, no further description is given here.

[0068] The board adapter 211 is also provided with an energy accumulating member, which includes an energy accumulating lever 317, a pin 320 and a push rod 318. The energy accumulating lever 317 is fixedly connected to the push rod 318 through the pin 320, and is pivotably connected to the adapter 211 via the pin 320. Referring to Figs. 19A to 19C, Fig. 19A shows the state before the energy accumulating lever 317 is pressed down by, for example, a skier's ski boots. At this time, the push rod 318 rests on the piston head 3141 but does not push the piston 314. As the ski boots of the skier engage with the binder of the ski board, the boots will press the energy accumulating lever 317 down. At this time, the push rod 318 and the energy accumulating lever 317 rotate together to push the piston head 3141 toward the bottom surface of the socket 315, thereby compressing the energy accumulating spring 316, as shown in Fig. 19B.

[0069] When it is necessary to disengage, the skier, for example, presses the unlocking button 321 fixed with the unlocking member 313 and rotates the unlocking member 313 to the unlocked position, thereby allowing the plug 223 of the adapter 211 to be disengaged from the socket 315. At this time, the energy stored in the spring 316 becomes a driving force, pushing the socket, the connector support 312, etc. away from the adapter 211, thereby disengaging the ski board adapter 211 from the connector support 312, as shown in Fig. 19C.

[0070] Next, with reference to FIGS. 20 and 21, the structure of the driving assembly connector 400 will be described. The locking and unlocking structure of the driving assembly connector, including the unlocking member, locking balls, etc., can be provided similarly to the driving assembly connector described in Figs. 6, 7, and 13 to 16, and therefore will not be described again here. The difference from the previous embodiment is that the pushing structure for pushing the driving assembly and the adapter apart away, such as the pushing member 221 etc., is eliminated, and an energy accumulating and quick release structure is added.

[0071] The energy accumulating and quick release structure is provided on the suspension assembly of the driving assembly. As shown in Fig. 20, a plug 215 is fixedly connected to the side wall 154 of the suspension assembly. The plug 415 can be inserted into a socket 218 on sidewall of the ski board adapter 211. The structure related to the socket and the relevant structure of the unlocking member and the socket can refer to the description of the socket 218 in the previous embodiment, and will not be described again here.

[0072] The plug 415 includes an inner cavity (not labeled), and a piston 414 is accommodated in the inner cavity. The piston 414 may include a piston rod 4142 fixedly connected to the bottom surface of the plug 415 and a piston head 4141 sleeved on the piston rod 4142 and movable along the piston rod 4142. An energy accumulating spring 416 is provided between the piston head 4141 and the inner surface of the bottom surface of the plug 415. The spring 416 is compressed between the piston head 4141 and the bottom surface of the plug 415. In this embodiment, the piston head and the piston rod are separate structures, and the piston rod is fixed on the bottom of the plug, so that the piston head can move along the piston rod, but the present disclosure is not limited thereto, and the structure in which the piston head and piston rod are formed into an integral structure and move together along a guide hole or other guide structure at the bottom of the plug, as above described, can also be used.

[0073] Similar to the board connector, an energy accumulating member is provided on the adapter 211. The energy accumulating member includes an energy accumulating lever 417, a push rod 418 and a pin 420. The energy accumulating lever 417 and the push rod 418 can rotates relative to the adapter 211 about the pin 42, together, thereby achieving energy-accumulation when, for example, a skier's ski boots are engaged with a binder of a ski board.

[0074] As shown in Fig. 21A, in this position, the energy accumulating lever 417 is not depressed, and the push rod 418 is in contact with the piston head but does not exert force on the piston head. At this time, the adapter

211 is connected to the suspension assembly of the driving assembly and the unlocking member 413 (not labeled) is in the locked position.

[0075] As shown in Fig. 21B, as the skier's boots engage with the ski board binders, the energy accumulating lever 417 is pressed down, thereby rotating the push rod 420 and then pushing the piston head 4141, thereby compressing the energy accumulating spring 416. At this time , since the unlocking member 413 is in the locked position , the driving assembly and the board adapter still cannot be disengaged.

[0076] As shown in Fig. 21C, when it is necessary to quickly release the driving assembly, the skier, for example, uses a ski pole to press the unlocking button 419, thereby causing the unlocking member 413 to rotate to the unlocked position. At this time, the locking balls (not shown) can be moved out of the holes (slot) formed on the outer circumference of the plug. 415, allowing the driving assembly and the adapter to be disengaged. At this time, under the action of the energy accumulating spring 416, the driving assembly is pushed away from the adapter 211 of the ski board, thereby completing disengagement quickly.

[0077] Although not described in detail, those skilled in the art can understand that in order to reduce the energy accumulating resistance, the head of the pushing piston of the push rod can be installed with, for example, bearings, rollers, etc. or be provided with a friction-reducing coating or other measurement for reducing the friction to reduce the energy accumulating resistance, the present disclosure is not limited to thereto.

[0078] In addition, in the energy accumulating position shown in 19B or 21B, the push rod can rotate through a force action line, so that in this energy accumulating position, the force applied on the push rod by the energy accumulating spring via the piston head will not cause the push rod to reverse, that is, , in the position of Figs. 19B and 21B, the line of action of the force by the piston head is above the pivot axis of the push rod, so that the force will not cause the energy accumulating lever to tilt.

[0079] In addition, although it is not described in detail, for each connector, multiple energy accumulating mechanisms can be used to ensure sufficient force during release and ensure rapid disengagement. In addition, although in the above description, a rotation-type energy accumulating structure is used, those skilled in the art can conceive any other energy accumulating structure, such as a translational energy accumulating structure such as an inclined plane or a separate manual energy accumulating structure similar to a mechanical watch. etc., the present disclosure is not limited thereto.

Variant

[0080] Referring to Figs. 22 and 23, a power device for use on a snowboard is described. As shown in Figs. 22 and 23, adapters 311 are fixed on both sides of the single snowboard. The adapter 311 is connected to the suspension assembly of the driving assembly through the same connecting assembly as mentioned above, thereby achieving the same or similar function or effect as that in the ski boards described above. The connection assembly, the suspension assembly and the driving assembly may adopt the same structures as those of the first and second embodiments described above, and therefore will not be described again.

[0081] Although the power device according to the present invention is described in detail above with reference to specific embodiments, those skilled in the art should understand that the following description is only a preferred embodiment of the power device according to the present invention, and the present invention should not be limited thereto. The scope of the present invention is limited only by the appended claims and their equivalents.

Claims

1. A power device enabling a ski board to travel automatically, including:

   at least one adapter configured to fixed on at the ski board;
   at least one connecting assembly; and
   at least one driving assembly, wherein the connecting assembly connects the adapter with the driving assembly so that the driving assembly and the board are arranged side by side, and the connecting assembly is a detachable connecting assembly.

2. The power device according to claim 1, further comprising at least one suspension assembly, wherein the suspension assembly is connected to the driving assembly, and the connecting assembly connects the adapter to the suspension assembly.

3. The power device according to claim 1 or 2, wherein the adapter includes a hook, and the hook is inserted into a receiving groove provided on the side wall of the driving component or the suspension assembly, to detachably connect the ski board to the suspension assembly or the driving assembly.

4. The power device according to claim 1 or 2, wherein the connecting assembly includes a quick-release connector.

5. The power device according to any one of claims 1 to 4, wherein it includes two adapters to be connected to two ski boards respectively, and the connecting assembly includes board connector to connect the two adapters.

6. The power device according to any one of claims 2

to 5, wherein the suspension assembly includes a first link, a second link, a third link and a fourth link, wherein the first to fourth links are pivotably connected to each other to form a parallelogram structure, and further include a spring, which is stretched between the second link and a support plate fixed on the suspension assembly to provide elasticity to the suspension assembly.

7. The power device according to any one of claims 2 to 6, wherein the suspension assembly is configured to support the ski board off the ground when the ski board are unloaded; and when the ski board is loaded, the ski board is allowed to contact the ground and carry most of the load.

8. The power device according to claim 7, wherein when the ski board are loaded, the load-carrying ratio of the ski board and the driving assembly is 6:4, preferably 7:3, more preferably 8:2, and most preferably 9:1.

9. The power device according to any one of claims 4 to 8, wherein the connecting assembly further includes:
a driving assembly connector configured to quickly release and engage the ski board and the driving assembly.

10. The power device according to any one of claims 5 to 9, wherein the board connector includes:

a connector support;
sockets or plugs respectively provided at both ends of the connector support;
plug or socket provided on each of the adapter fixed to the ski board,
wherein, the plug can be inserted into the socket and pulled out from the socket, and the socket includes a locking member engaged with the plug, and an unlocking member that switches between a locking position and an unlocking position, and in the locking position, the unlocking member retains the locking member engaged with the plug, while in the unlocking position the unlocking member allows the locking member to disengage from the plug.

11. The power device according to claim 9 or 10, wherein the driving assembly connector includes:

a socket or plug provided on the adapter fixed with the ski board;
a plug or socket provided on the driving assembly or suspension assembly;
wherein, the plug can be inserted into the socket and pulled out from the socket, and the socket includes a locking piece engaged with the plug, and an unlocking member that switches between a locking position and an unlocking position, and in the locking position, the unlocking member retains the locking member engaged with the plug, while in the unlocking position the unlocking member allows the locking member to disengage from the plug.

12. The power device according to claim 10 or 11, further comprising a pushing member that pushes the plug away from the socket when the unlocking member switches from the locking position to the unlocking position.

13. The power device according to claim 12, wherein the pushing member includes protrusions with inclined surface, and the unlocking member includes a pushing block with an inclined surface, when switching from the locking position to the unlocking position, the inclined surface of the pushing block slides on the inclined surface of the protrusions of the pushing member, thereby pushing the pushing member.

14. The power device according to any one of claims 10 to 13, wherein the locking member is at least one locking ball, and the locking ball is accommodated in a hole formed in the socket, a portion of said locking ball may pass through the hole and engage a groove formed in the plug;
the unlocking member includes an annular portion that is sleeved on the outside of the ball, the annular portion forms a cam groove on its inner circumference, wherein in the locking position, a portion of the inner circumferential surface of the annular portion that does not form the cam groove opposes to the ball to prevent radial outward movement of the balls and in the unlocked position the cam groove opposes to the ball to allow radial outward movement of the ball.

15. The power device according to any one of claims 10 to 14, wherein the unlocking member further includes a handle, and the switching of the unlocking member from the locked position to the locking position is achieved by depressing the handle.

16. The power device according to any one of claims 10 to 15, further comprising a biasing spring to bias the unlocking member to the locking position.

17. The power device according to claim 10 or 11, further comprising an energy accumulating member accommodated in the plug or socket, and when the unlocking member is put in the locked position, the energy accumulating member can store energy, and when the unlocking member is actuated to switch from the locked position to the unlocked position, the stored energy causes the plug to disengage from the sock-

et.

18. The power device according to claim 17, wherein energy accumulating of the energy accumulating member is achieved by engaging the ski boots of the skier with the binder of the ski board.

19. The power device according to claim 17 or 18, wherein the energy accumulating member includes a piston movably accommodated in the inner cavity of the plug or socket, an energy accumulating spring associated with the piston, and an energy accumulating member that is actuated to move a piston when the skier's boot is engaged with the ski board thereby causing the energy accumulating spring to store energy.

20. The power device according to claim 19, wherein the energy accumulating member includes an energy accumulating lever that is pivotably disposed on the adapter of the ski board and a push rod configured to rotate together with the energy accumulating lever, the push rod is rotatable to push the piston and thereby compress the energy accumulating spring.

21. The power device according to any one of claims 17 to 20, wherein the locking member is locking balls, and the locking balls are accommodated in holes formed in the socket, a portion of each of said locking balls may pass through the hole and engage with a groove formed in the plug;
wherein the unlocking member includes an annular portion that is sleeved on the outside of the balls, the annular portion forms cam grooves on the inner circumference; in the locking position, a portion of the inner circumferential surface of the annular portion that does not form the cam grooves is opposed to the balls to prevent radial outward movement of the balls, and in the unlocked position, the cam grooves are opposed to the balls to allow radial outward movement of the balls.

22. The power device according to any one of claims 17 to 21, wherein the unlocking member further includes a handle, and movement of the unlocking member from the locked position to the unlocked position is done by depressing the handle.

23. The power device according to any one of claims 17 to 22, further comprising a biasing spring to bias the unlocking member to the locking position.

24. The power device according to claim 4, wherein the quick release connection assembly includes explosive bolts.

25. The power device according to any one of claims 1 to 24, wherein the driving assembly further includes a controller configured to receive instructions from a remote-control center or a user to control the operation of the driving assembly.

26. The power device according to any one of claims 1 to 25, further comprising a flight kit, the flight kit can be connected to the driving assembly to carry the driving assembly to a destination.

27. The power device according to claim 24 or 25, wherein the controller is further configured to operate autonomously according to a preset program.

28. A power device, including:

at least one adapter suitable for being fixed on a bearing member;
at least one connecting assembly; and
at least one driving assembly, wherein the connecting assembly connects the adapter with the driving assembly such that the driving assembly and the bearing member are arranged side by side, and the connecting assembly is a detachable connecting assembly.

29. The power device of claim 28, wherein the connection assembly is a quick release connection assembly.

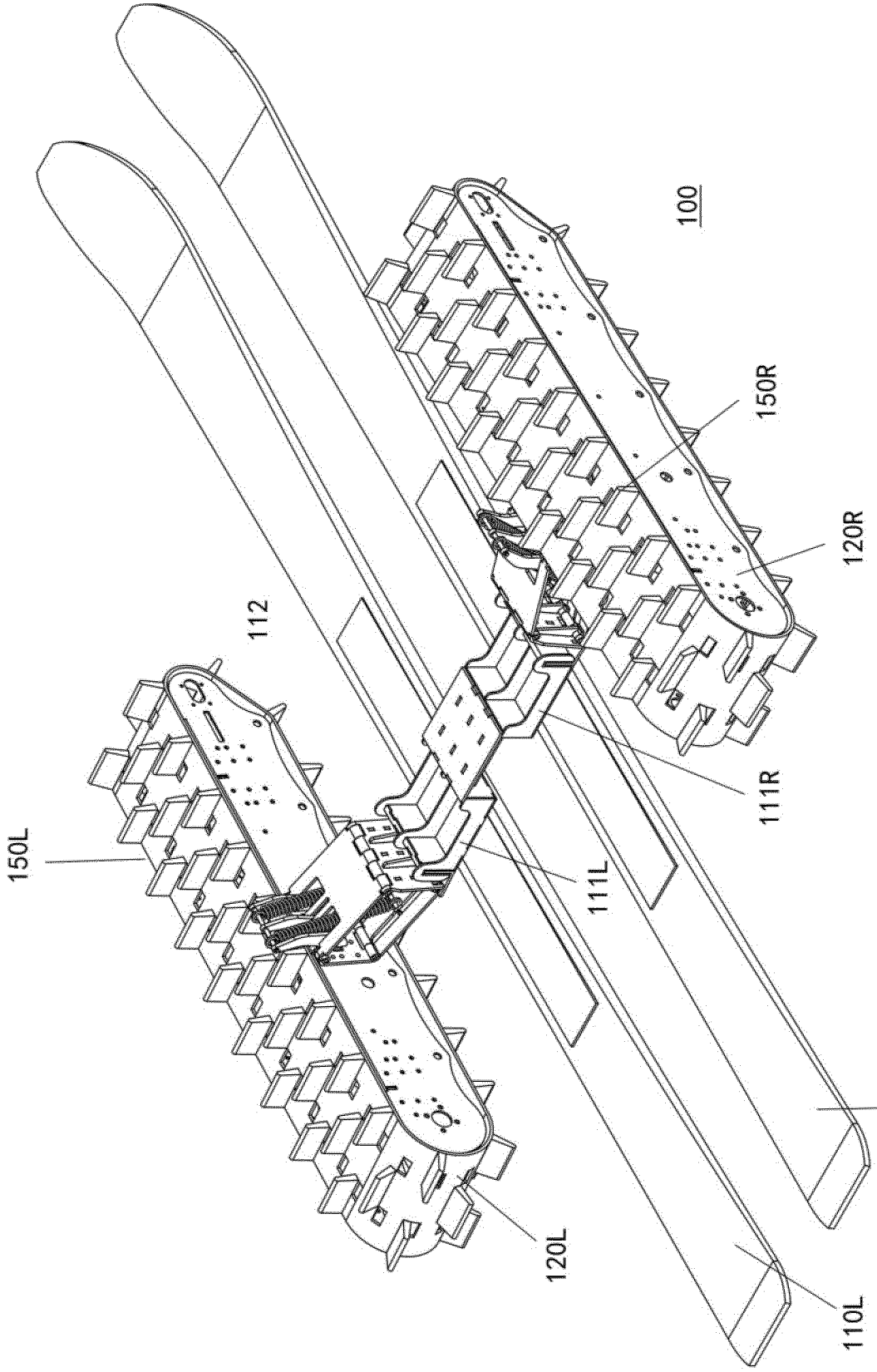

Fig. 1

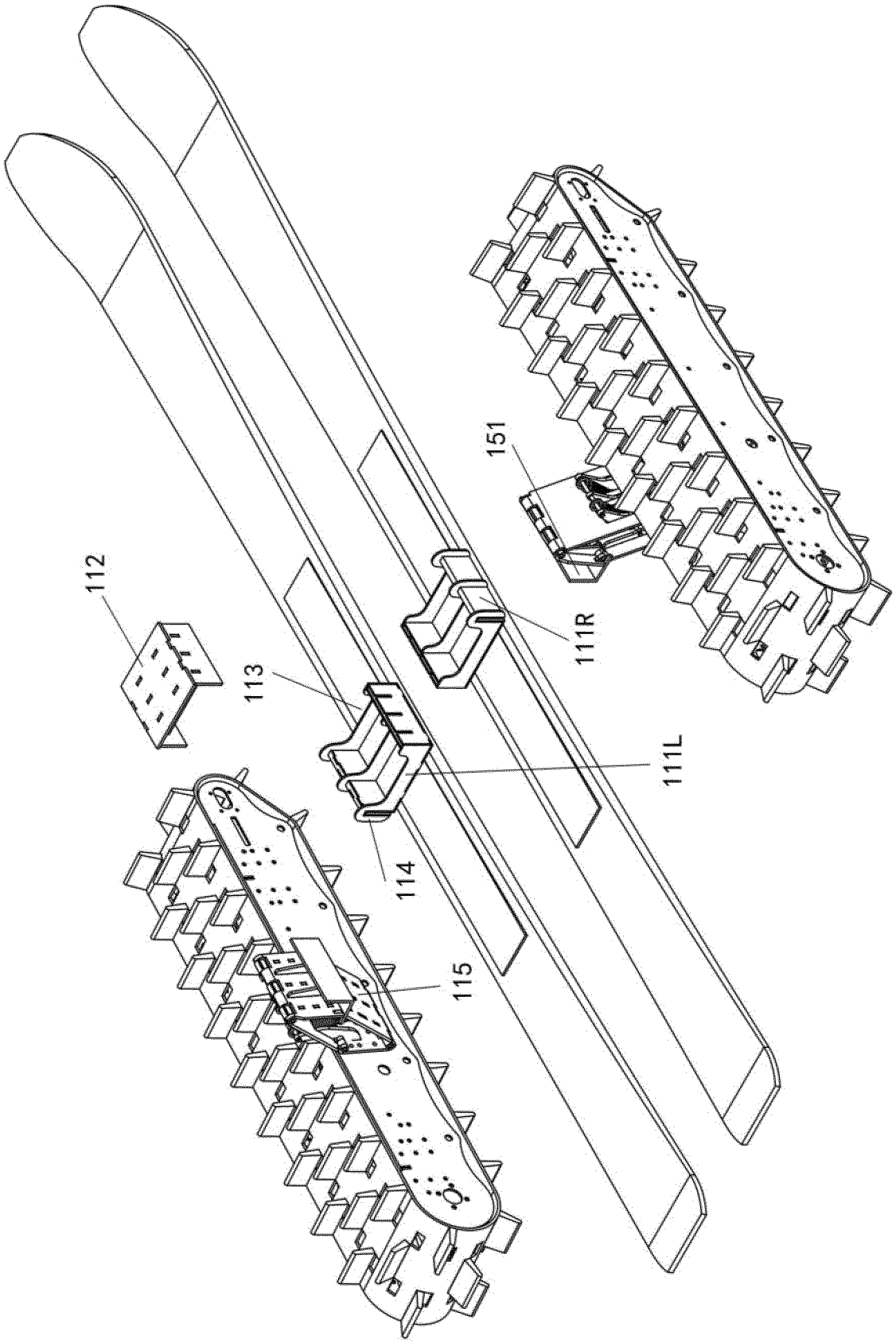

Fig. 2

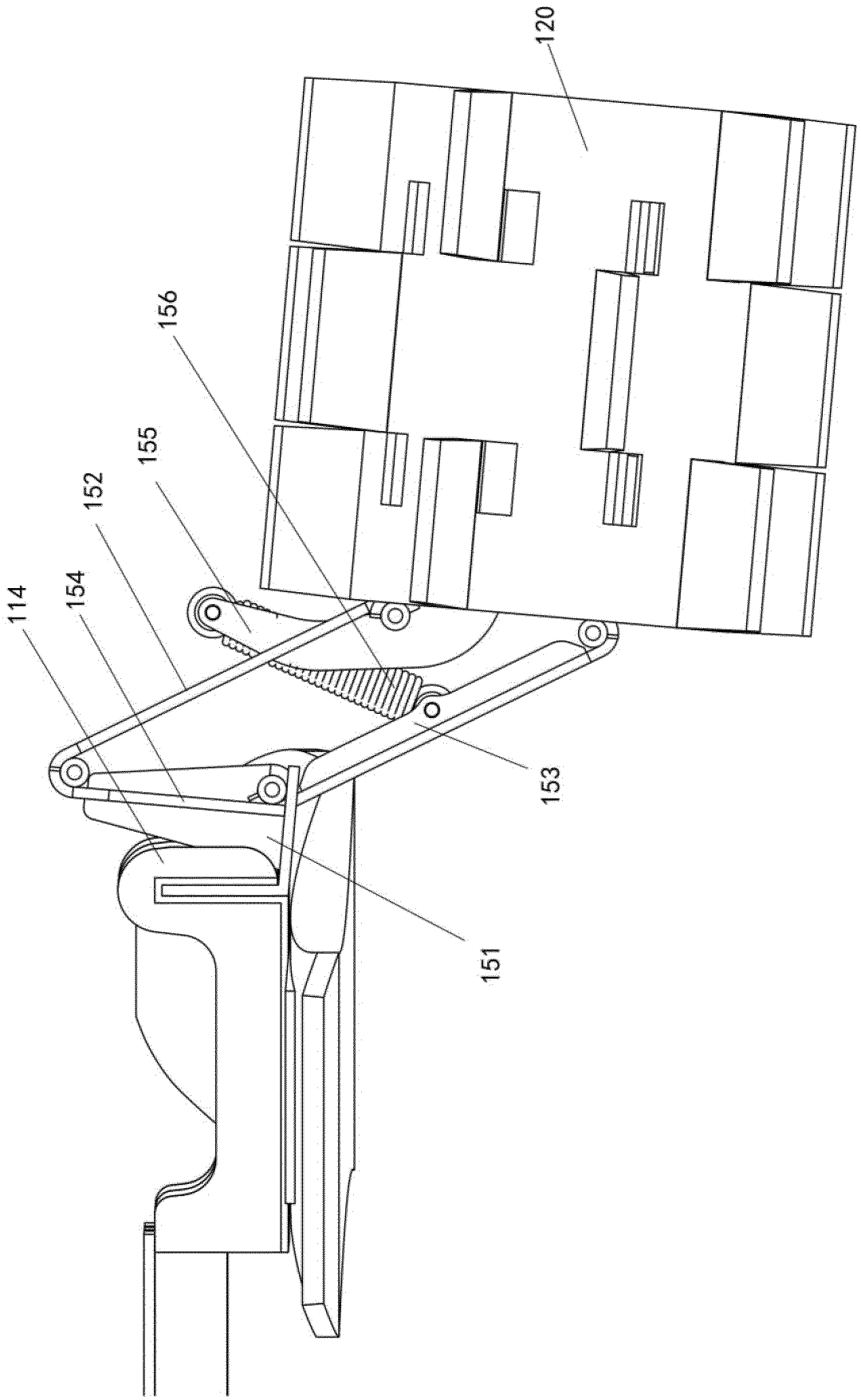

Fig. 3

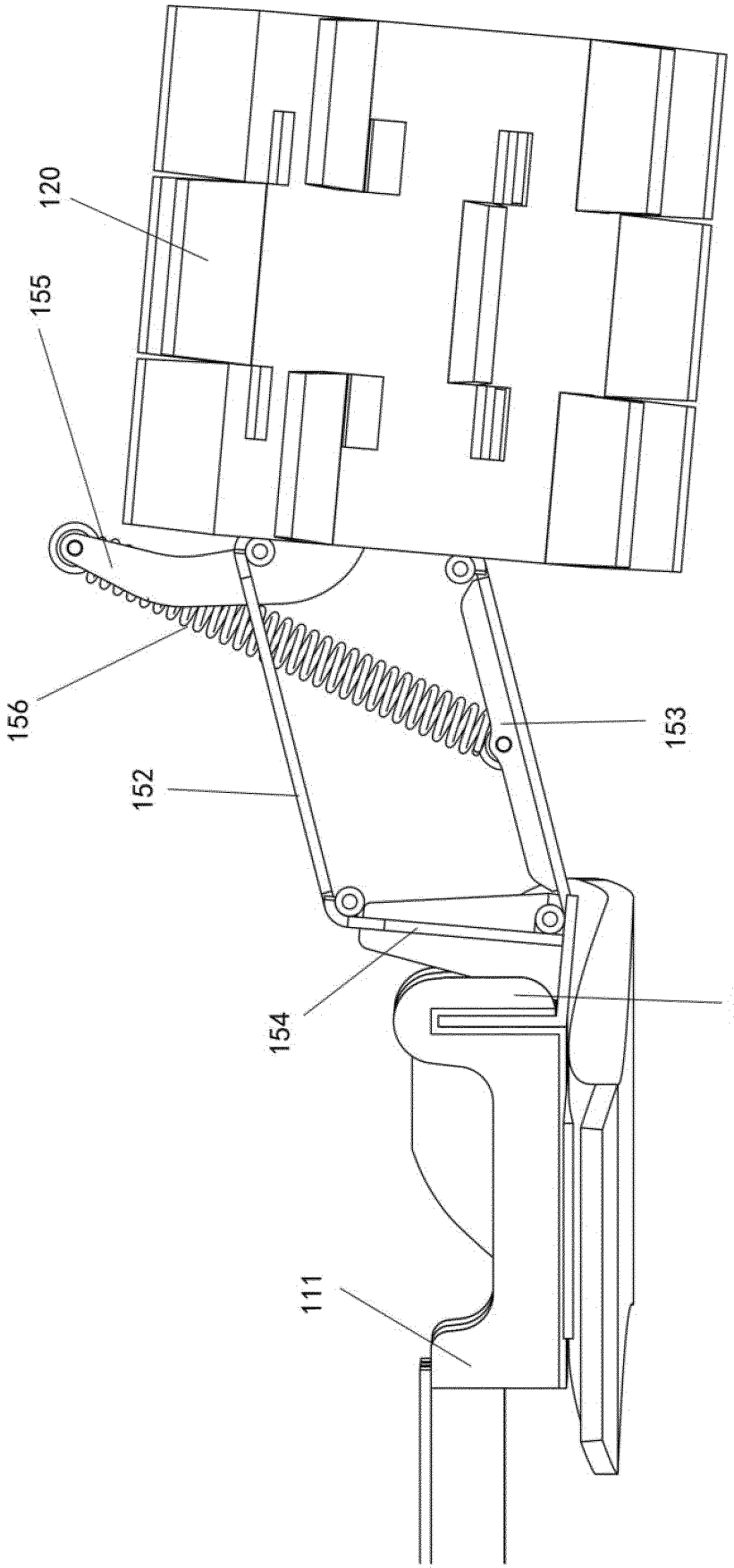

Fig. 4

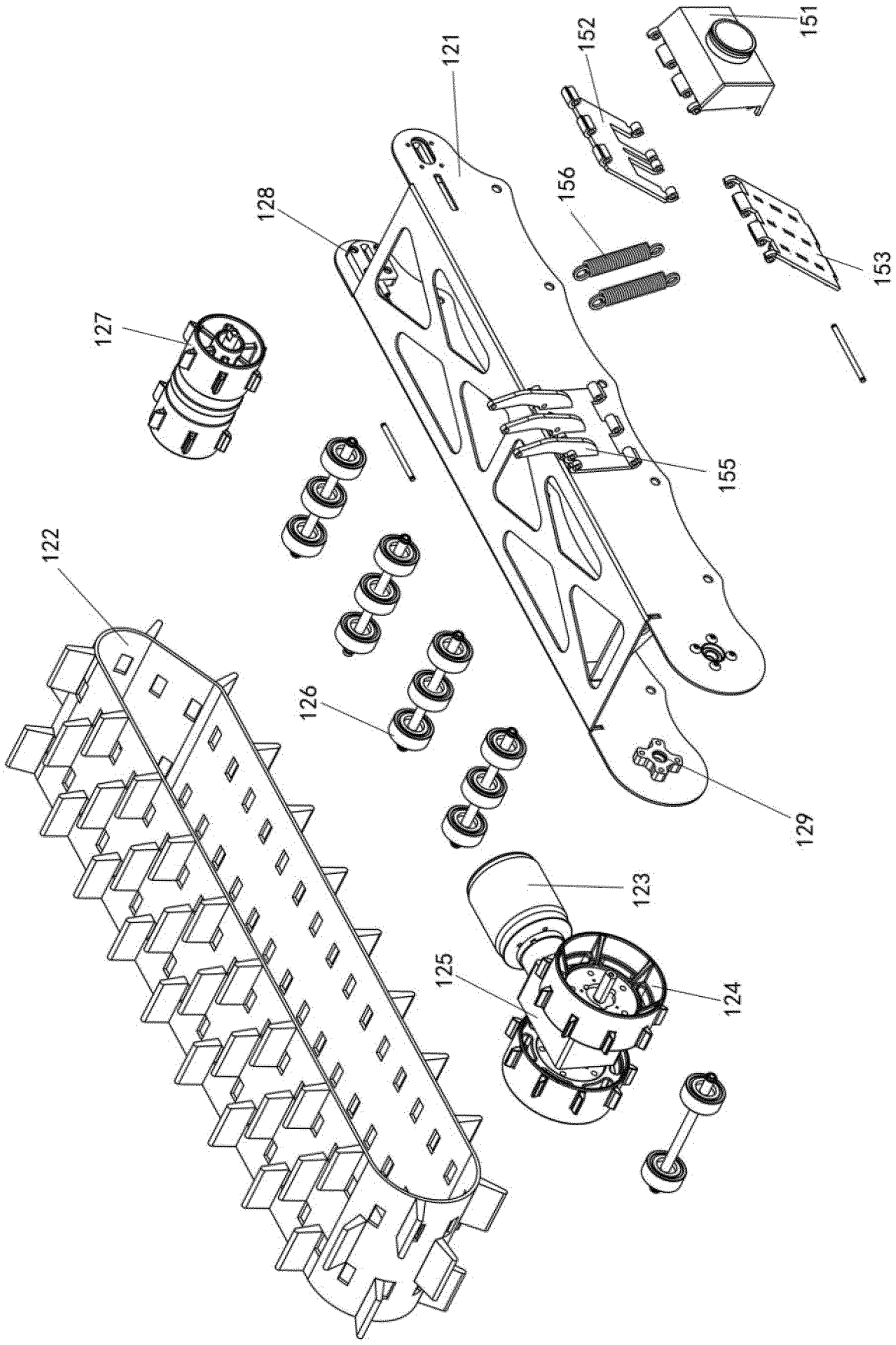

Fig. 5

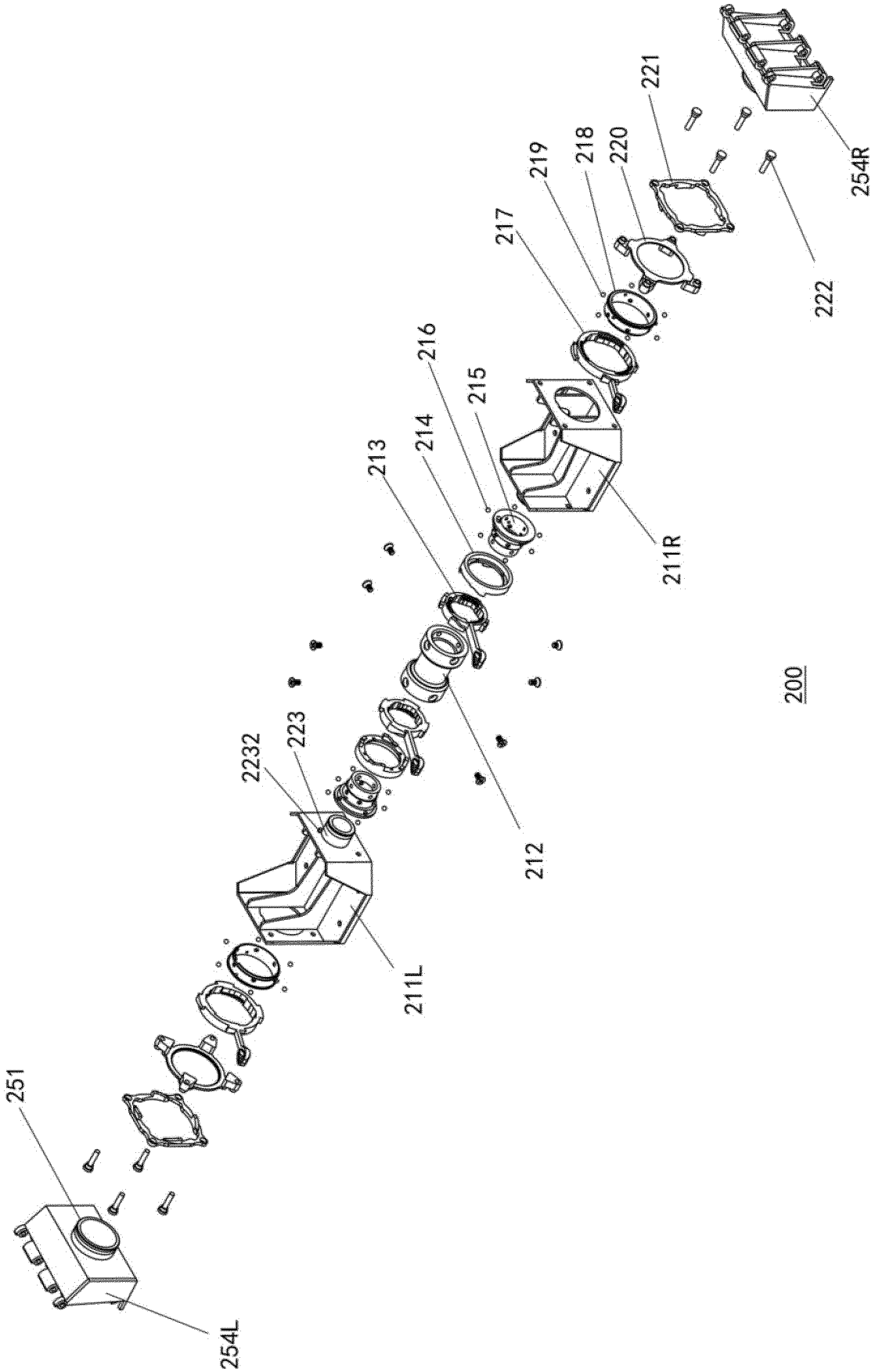
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Fig. 6

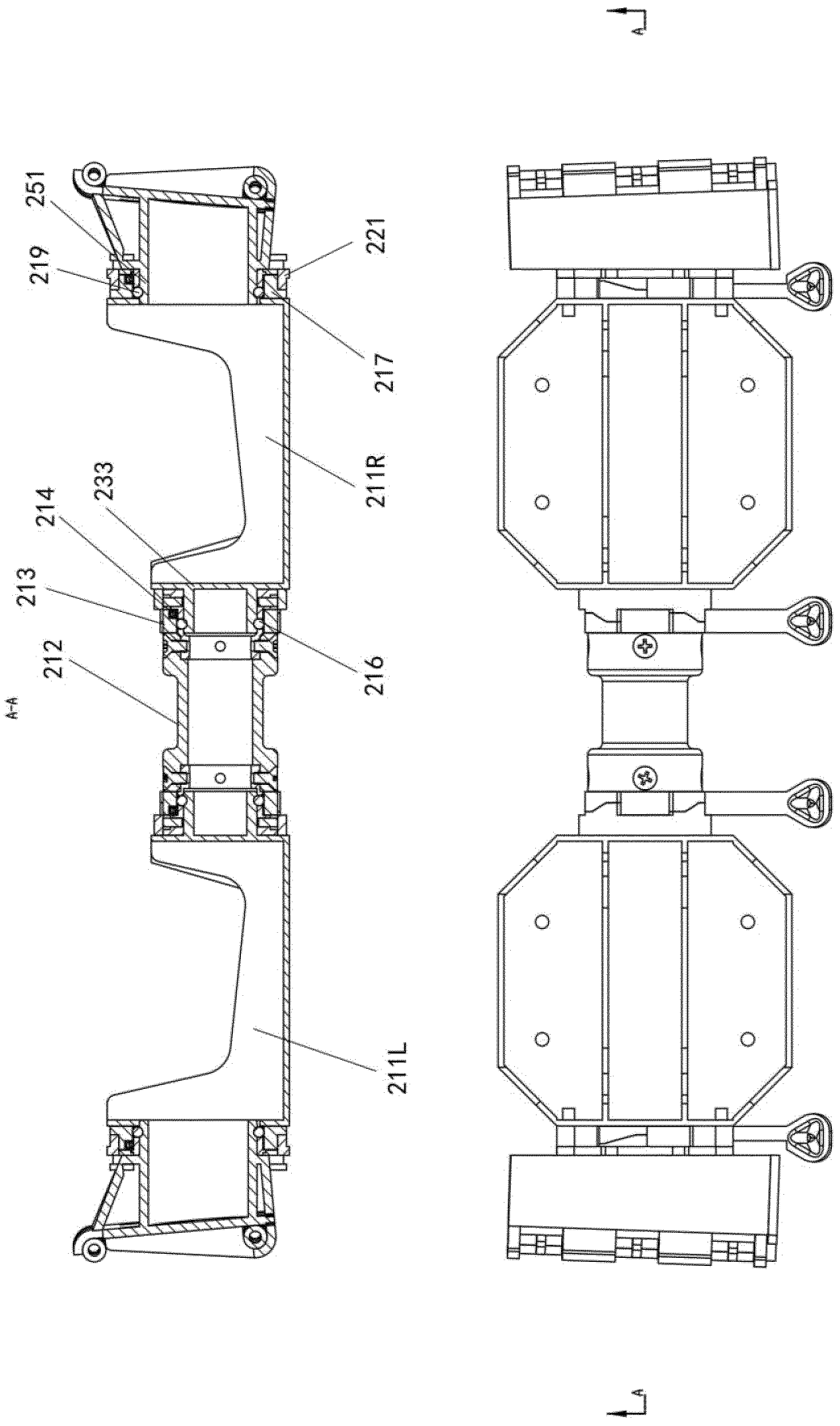

Fig. 7

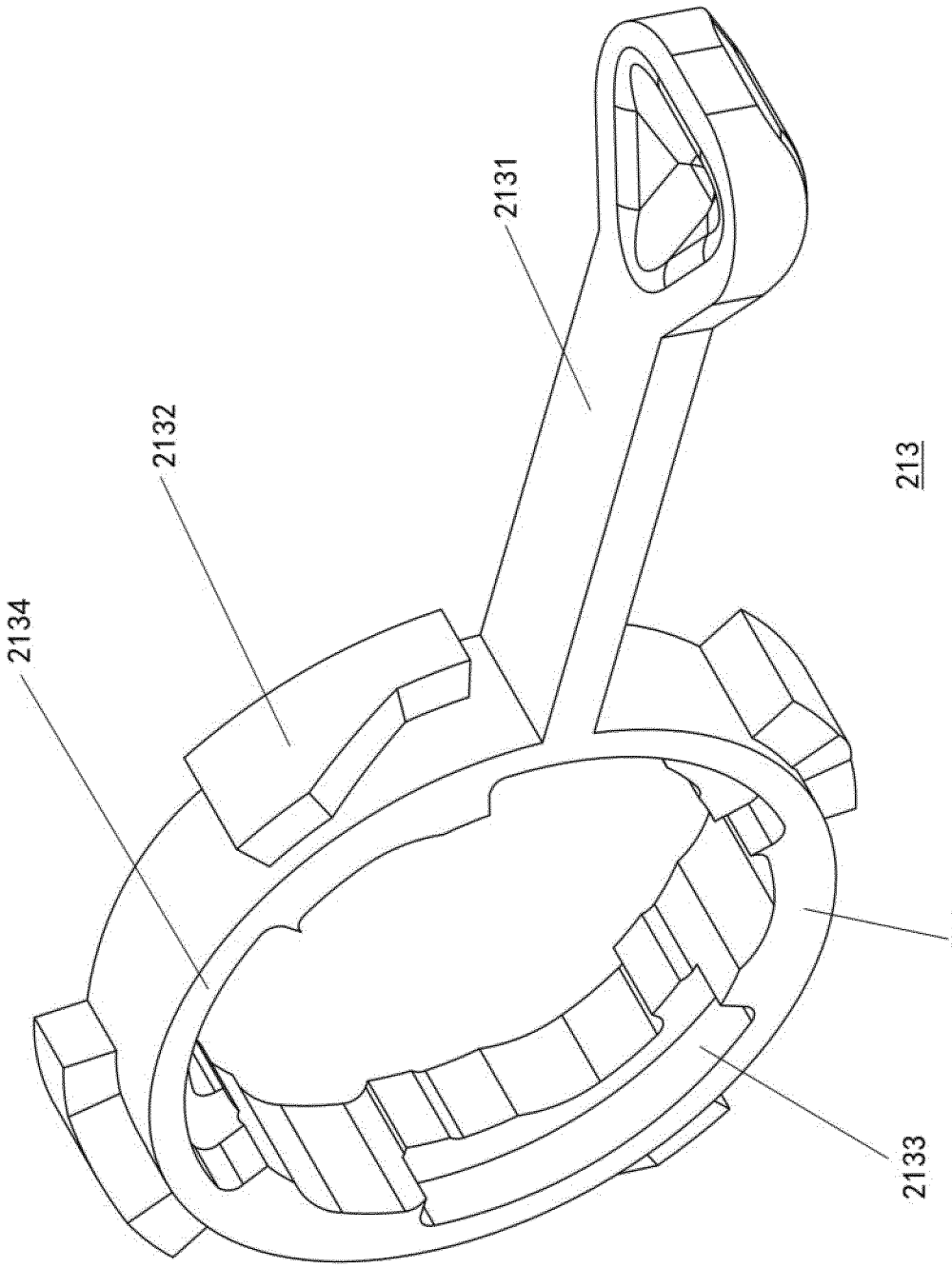

Fig. 8

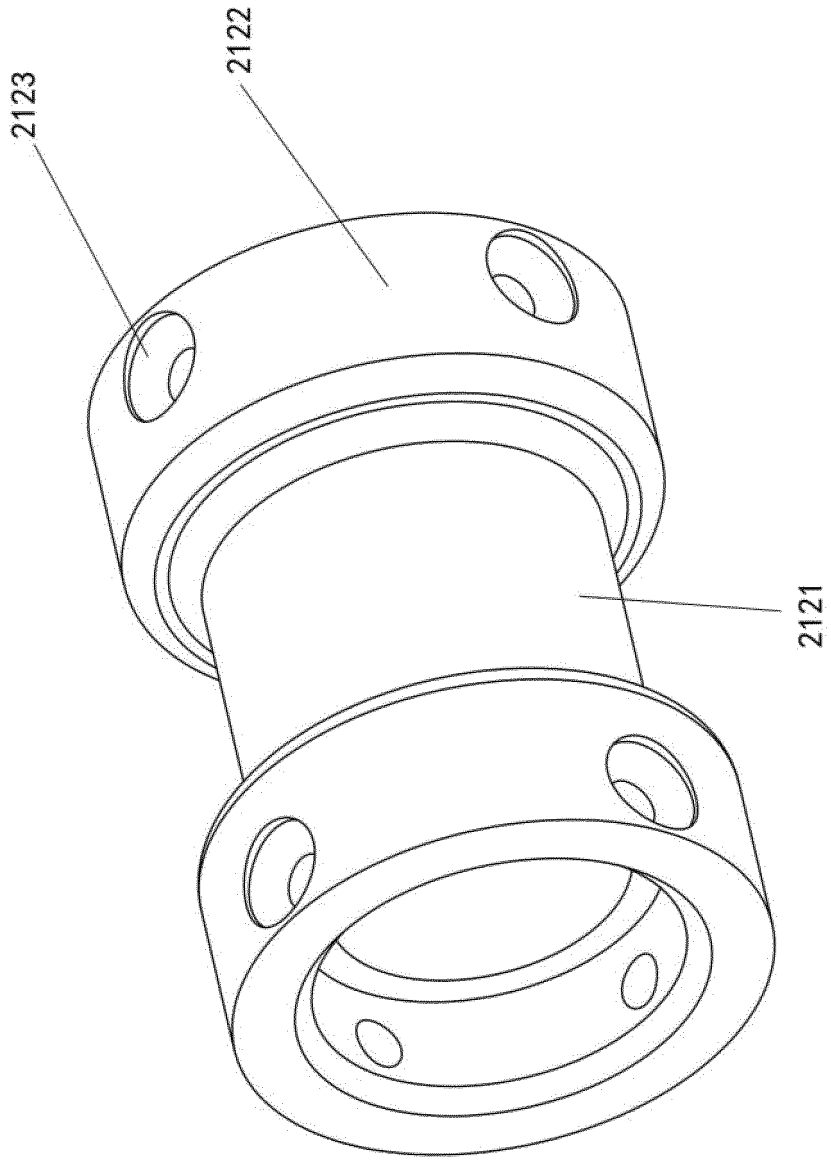

Fig. 9

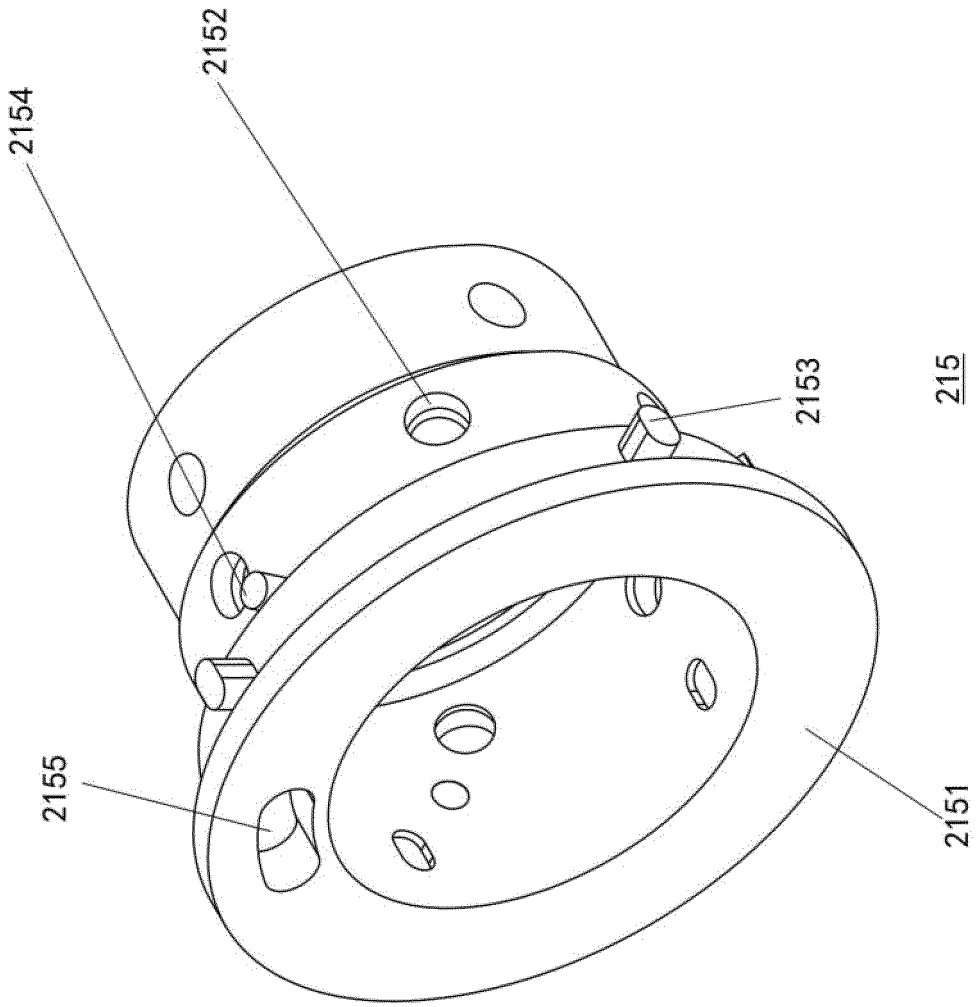

Fig. 10

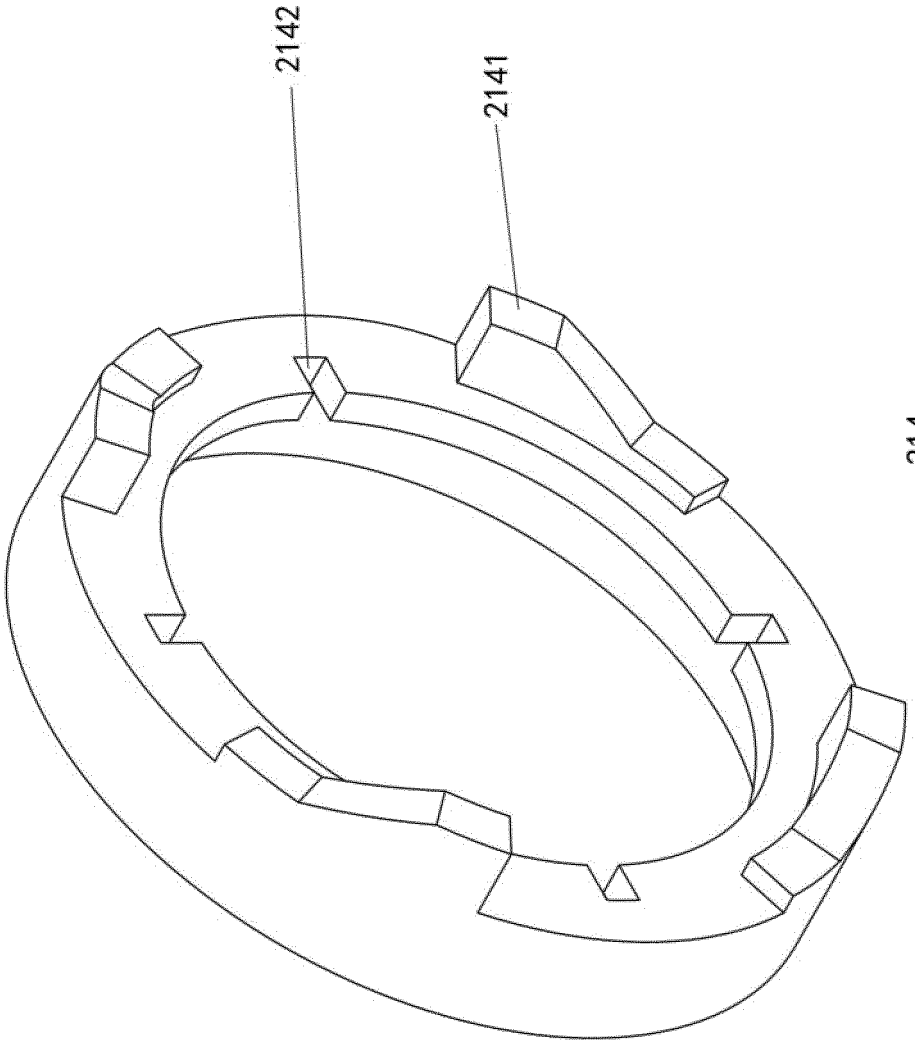

Fig. 11

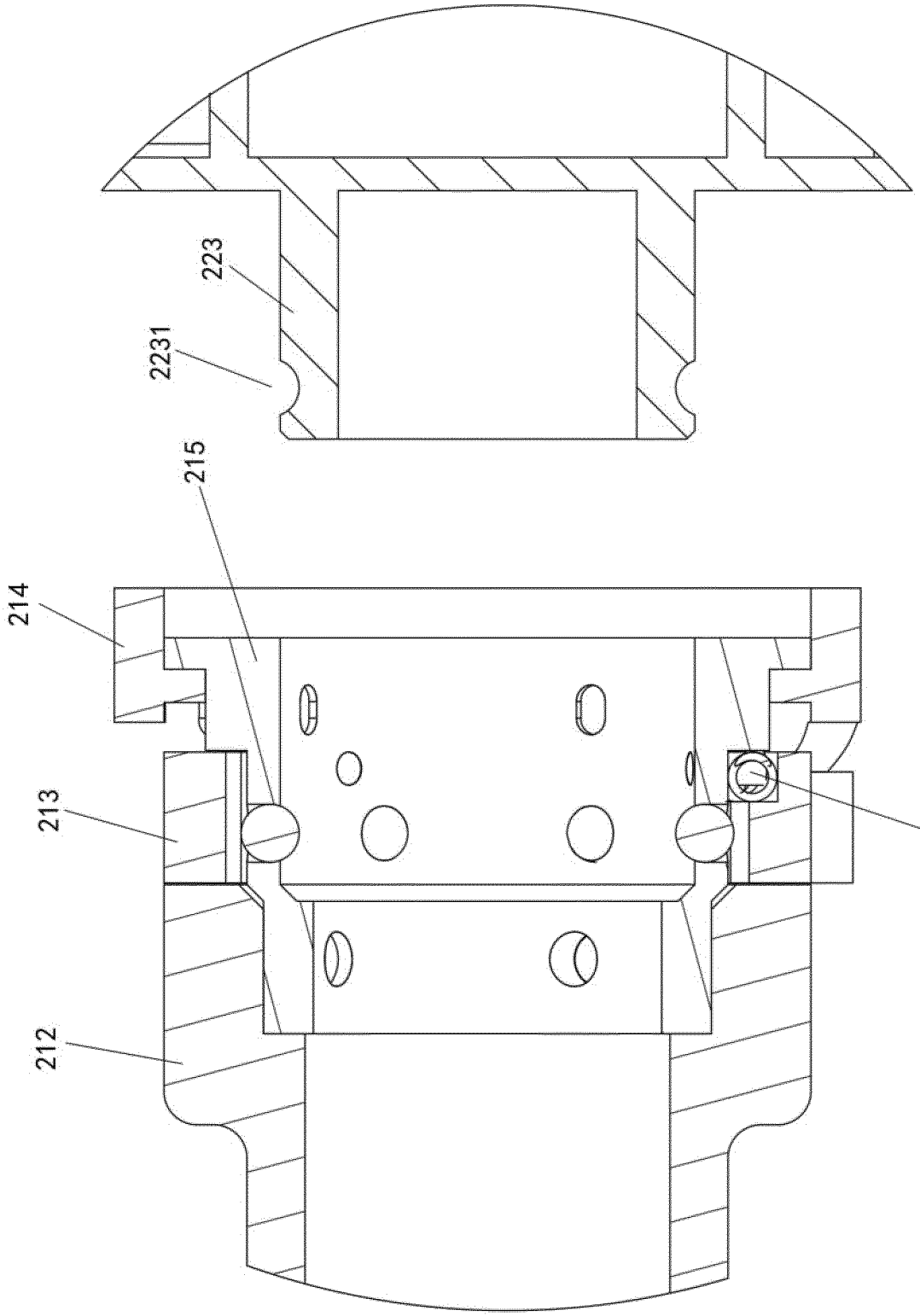

Fig. 12

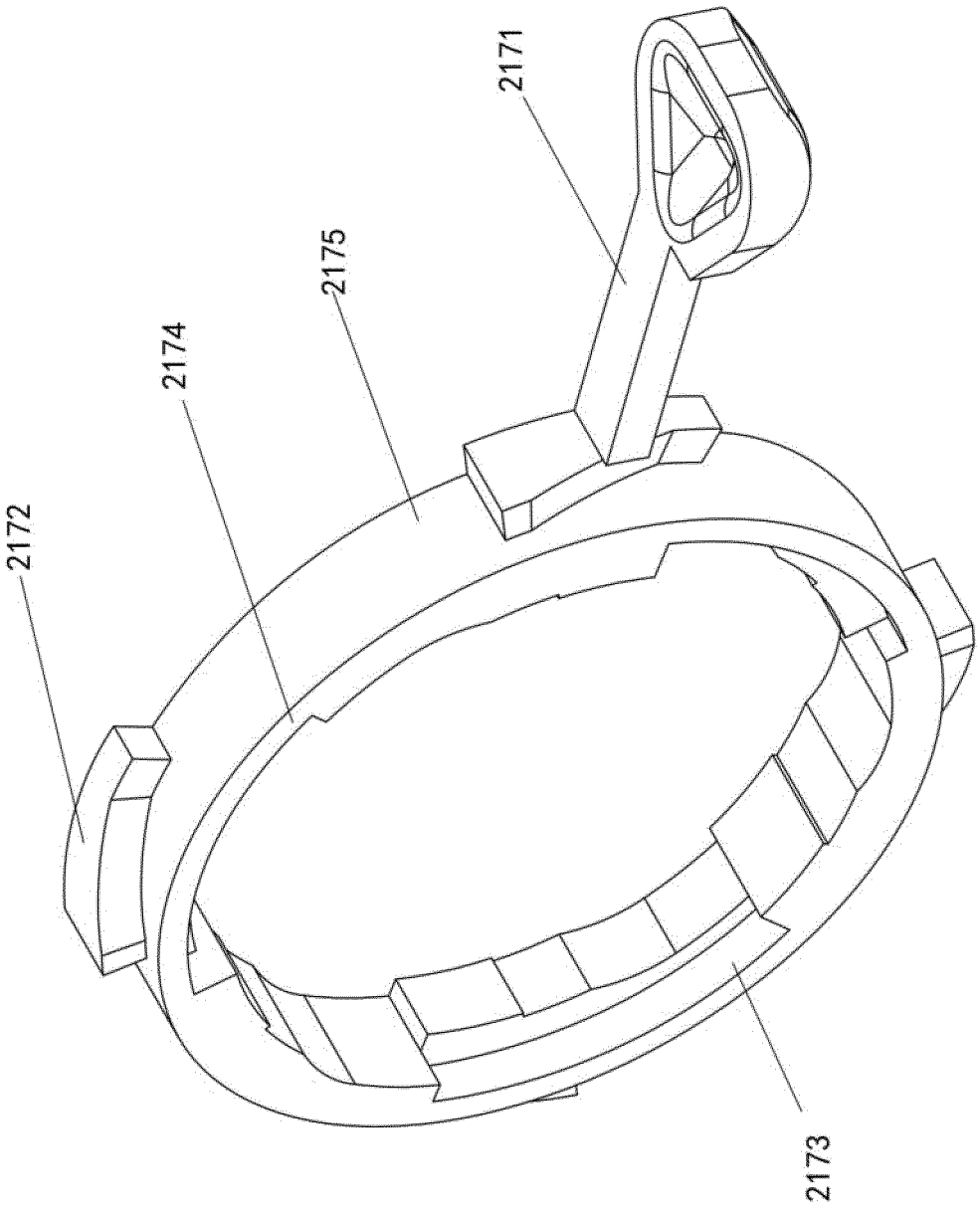

Fig. 13

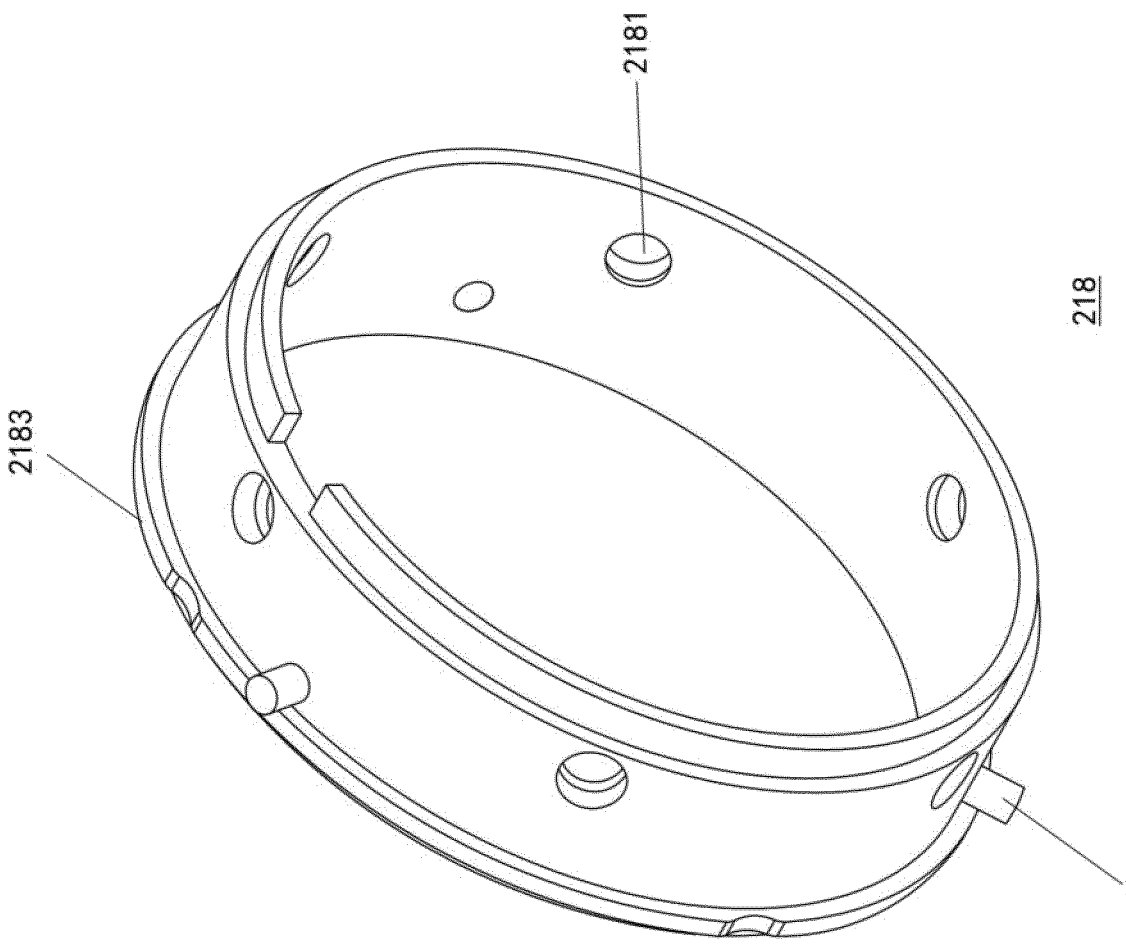

Fig. 14

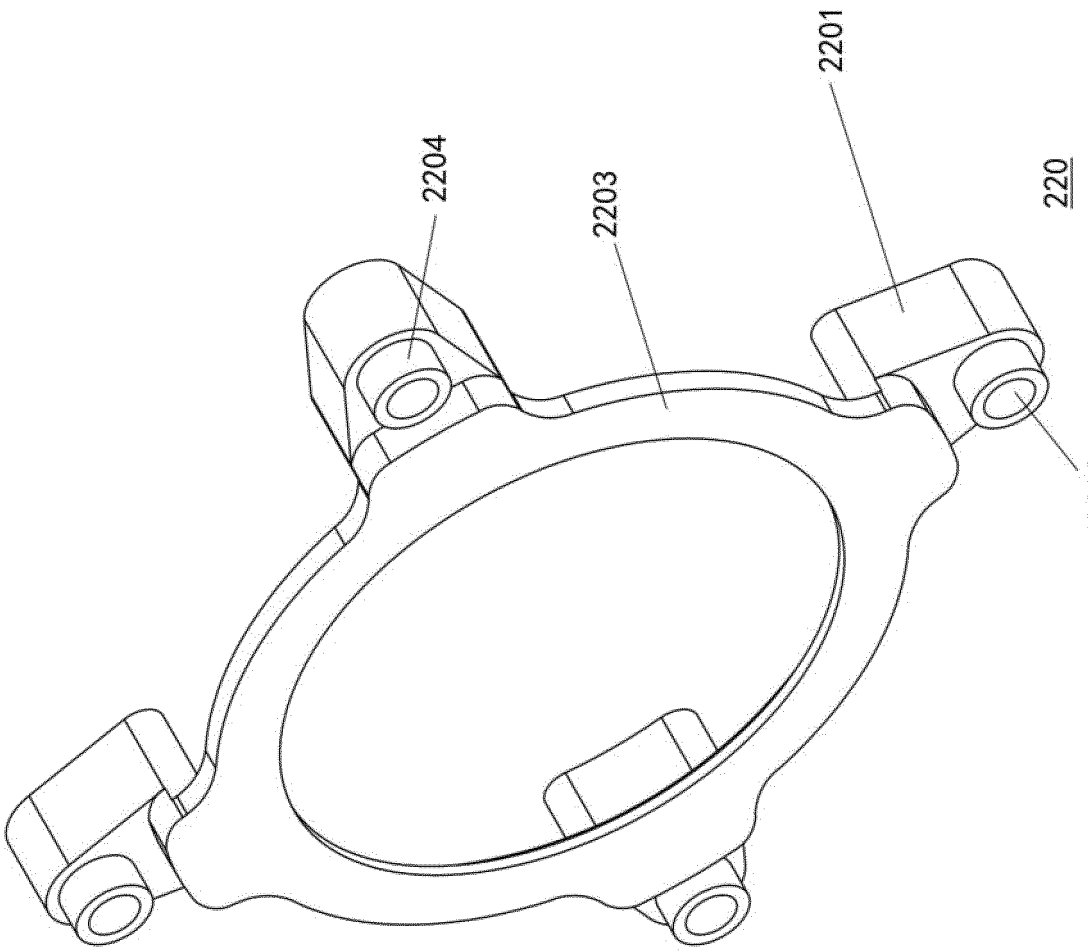

Fig. 15

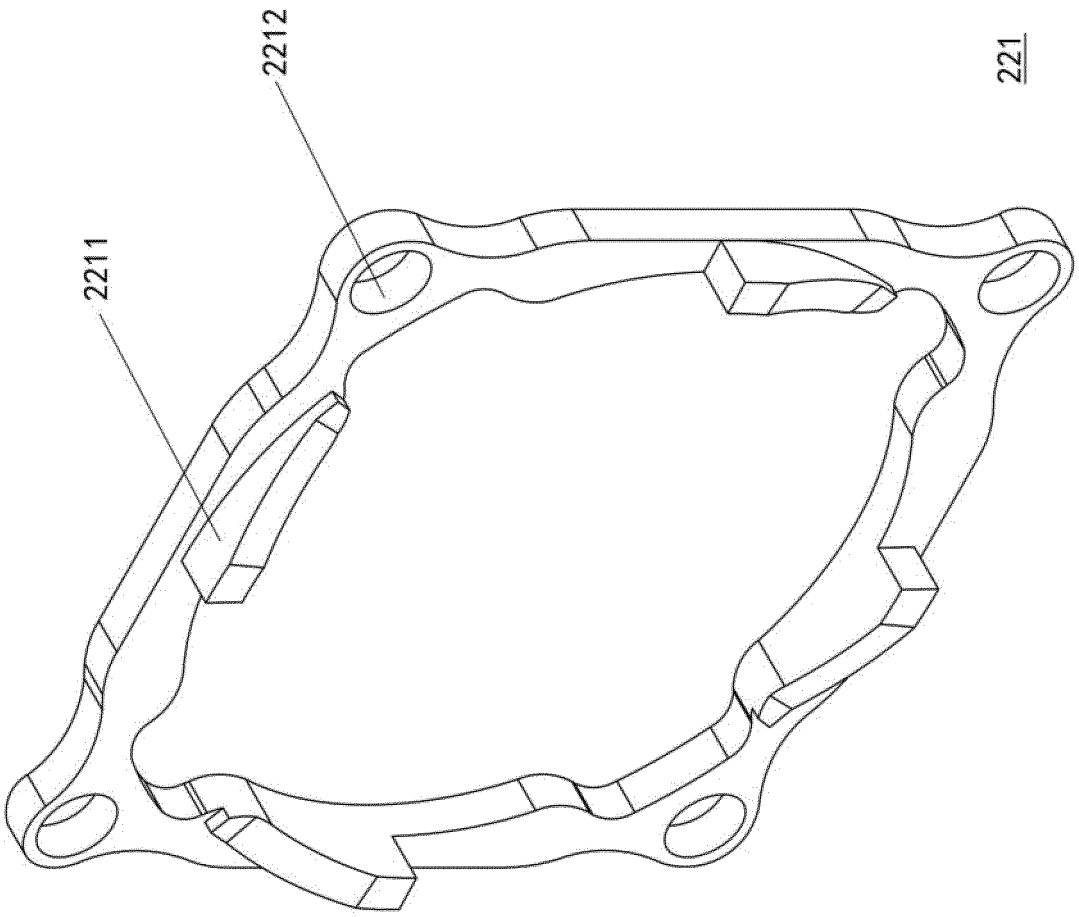

Fig. 16

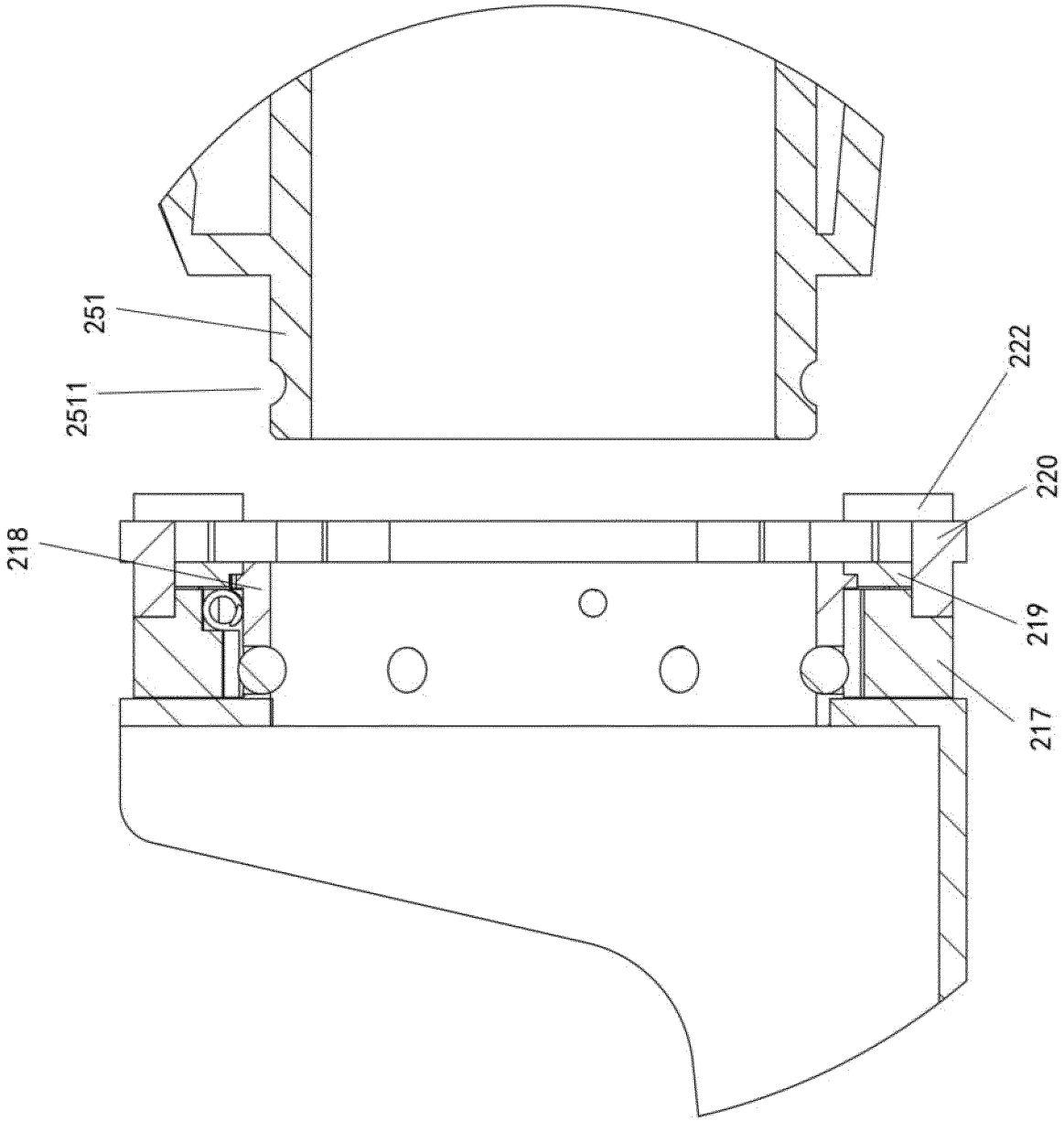

Fig. 17

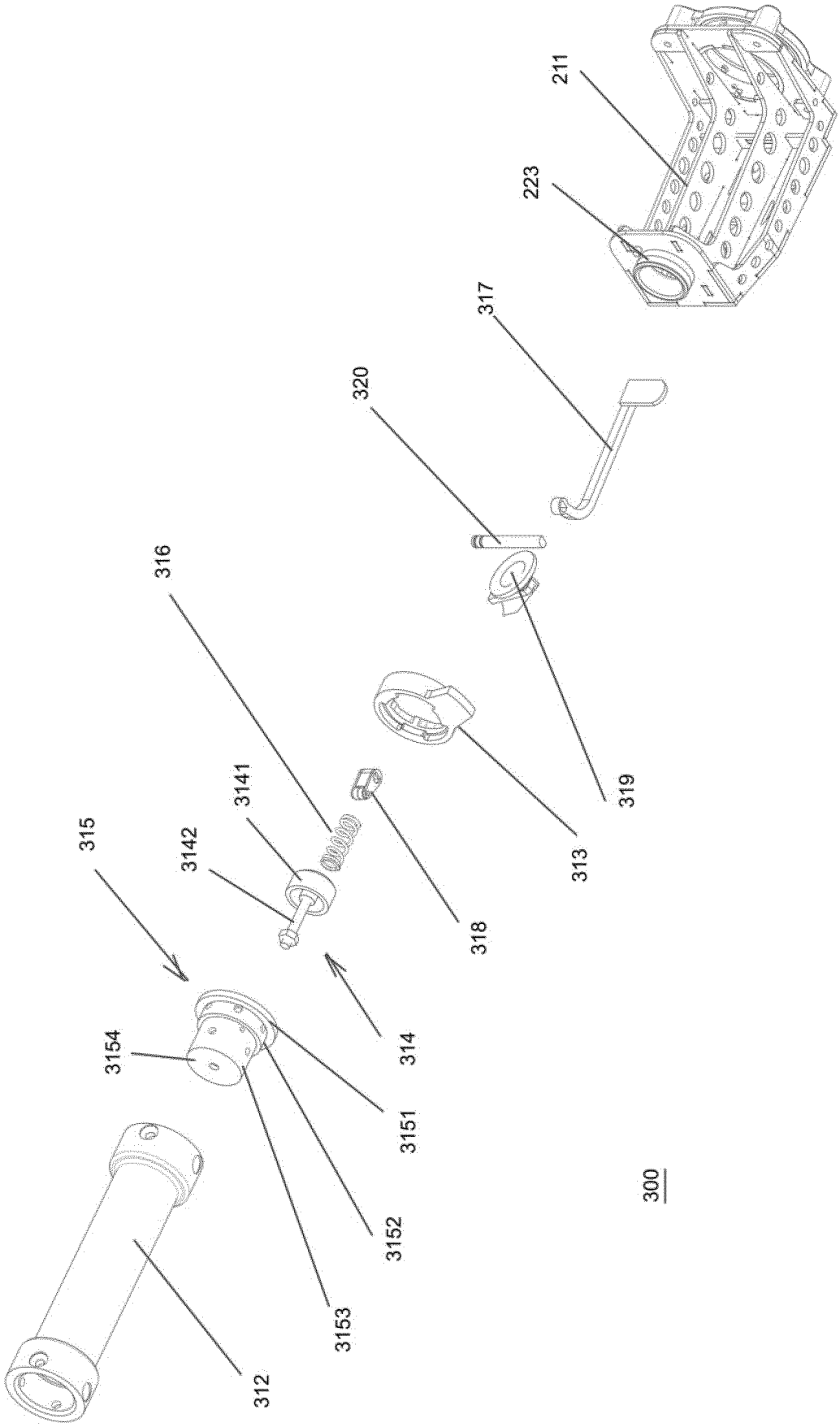
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Fig. 18

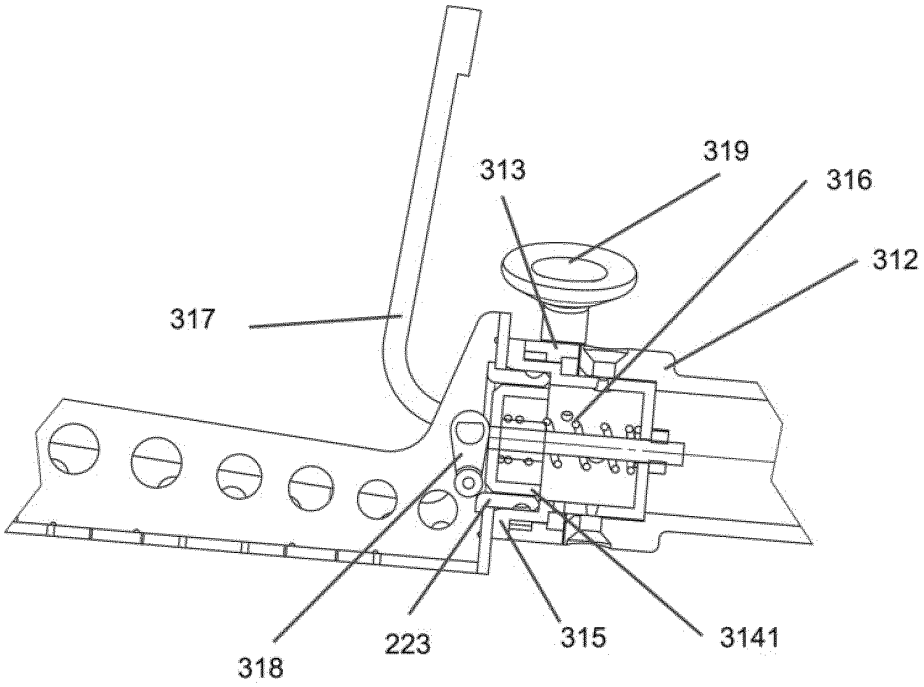

Fig. 19A

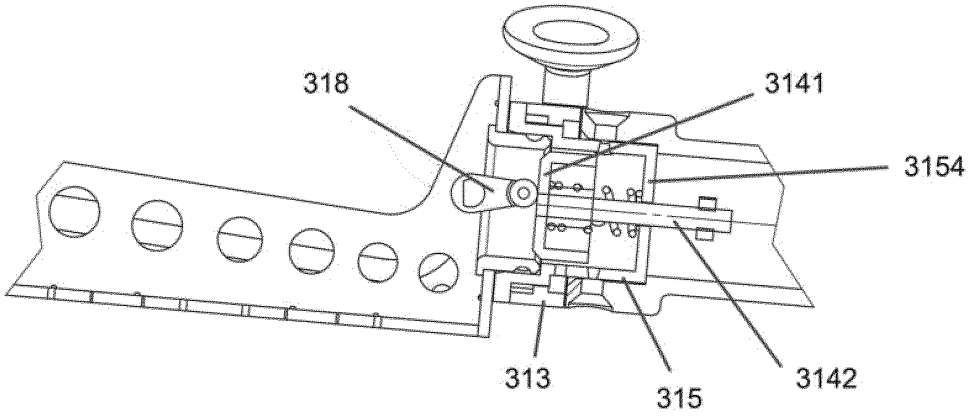

Fig. 19B

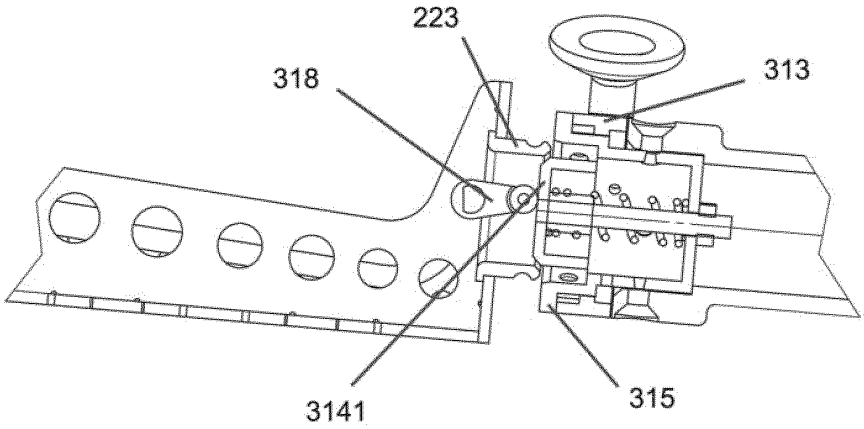

Fig. 19C

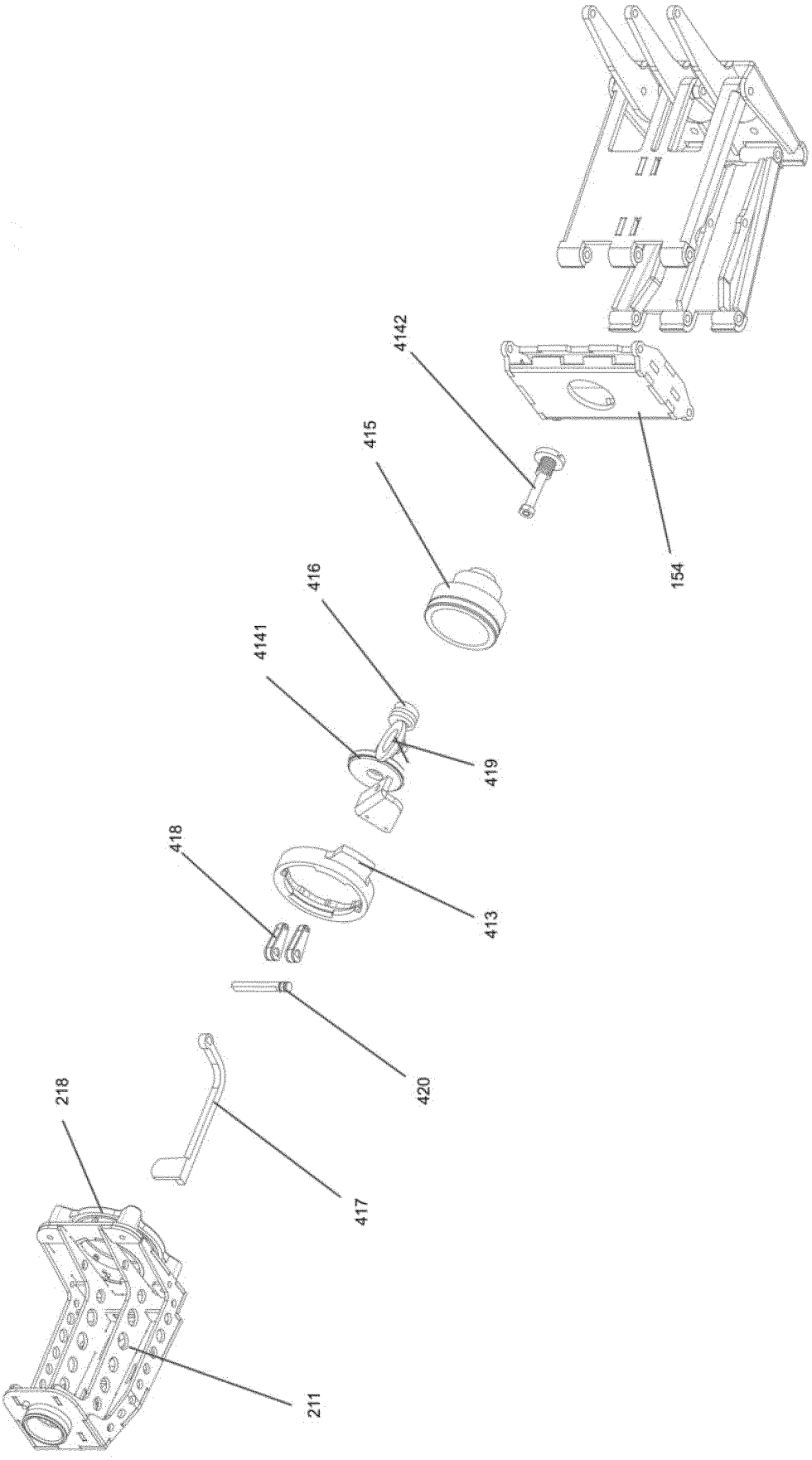

Fig. 20

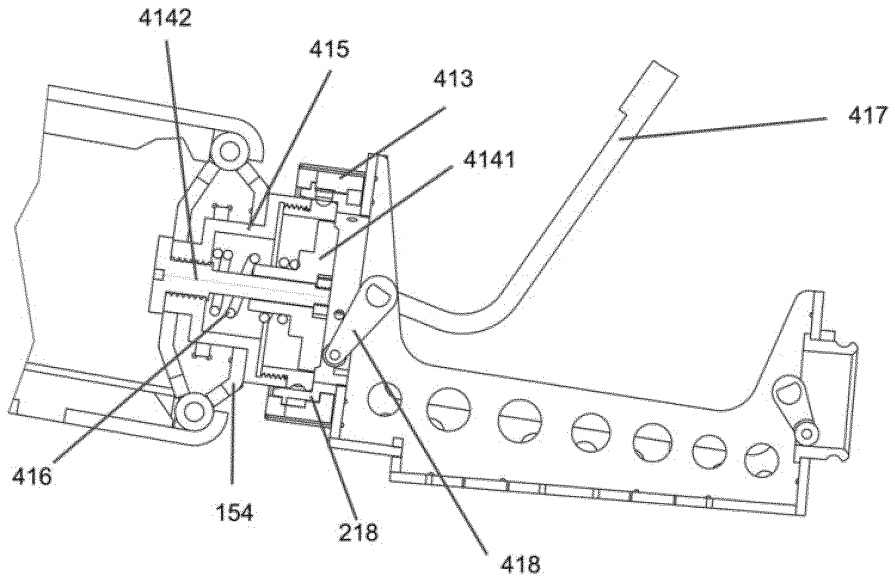

Fig. 21A

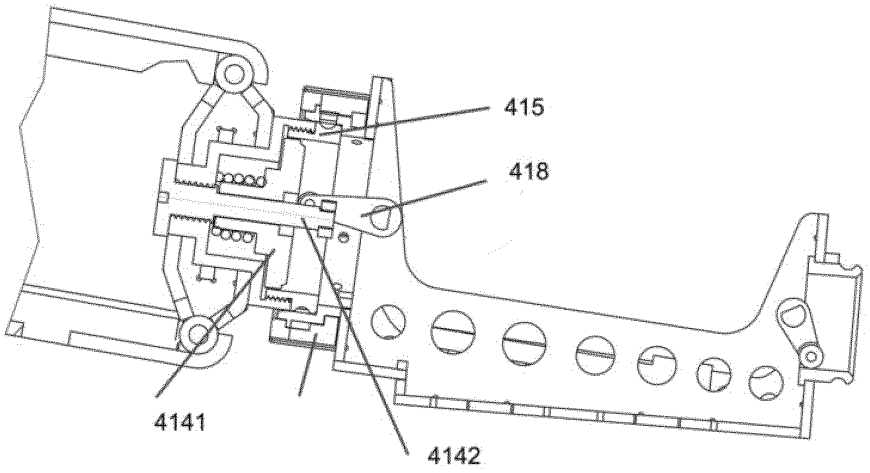

Fig. 21B

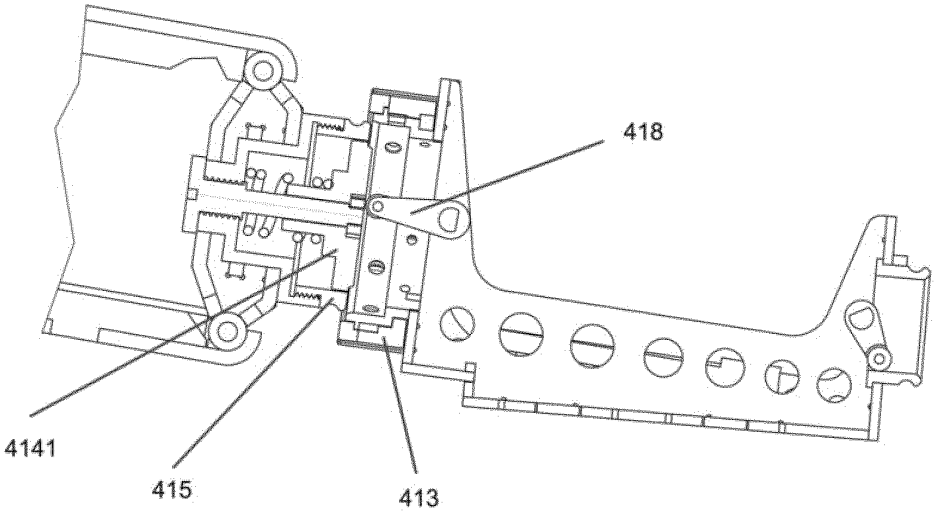

Fig. 21C

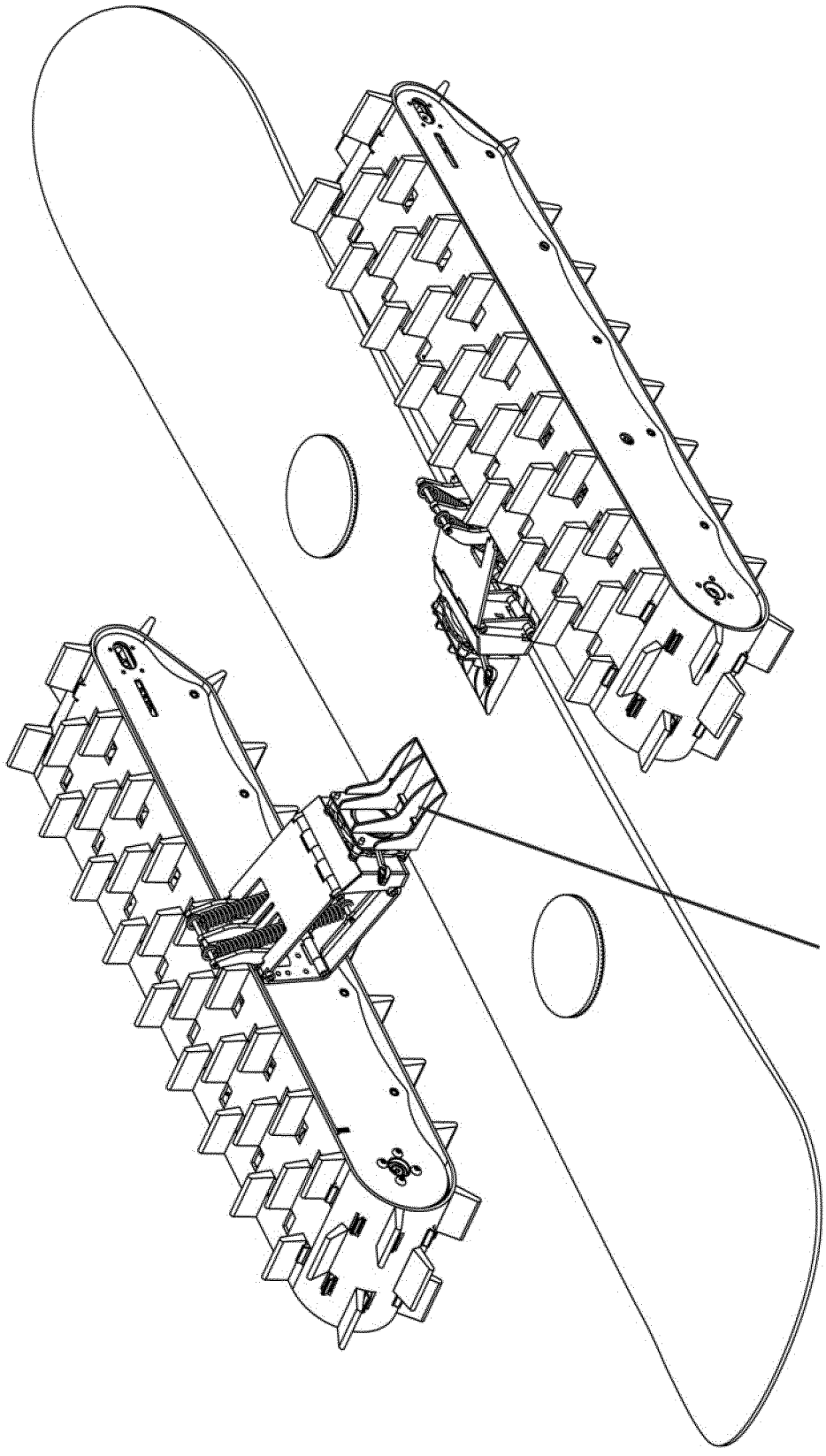

Fig. 22

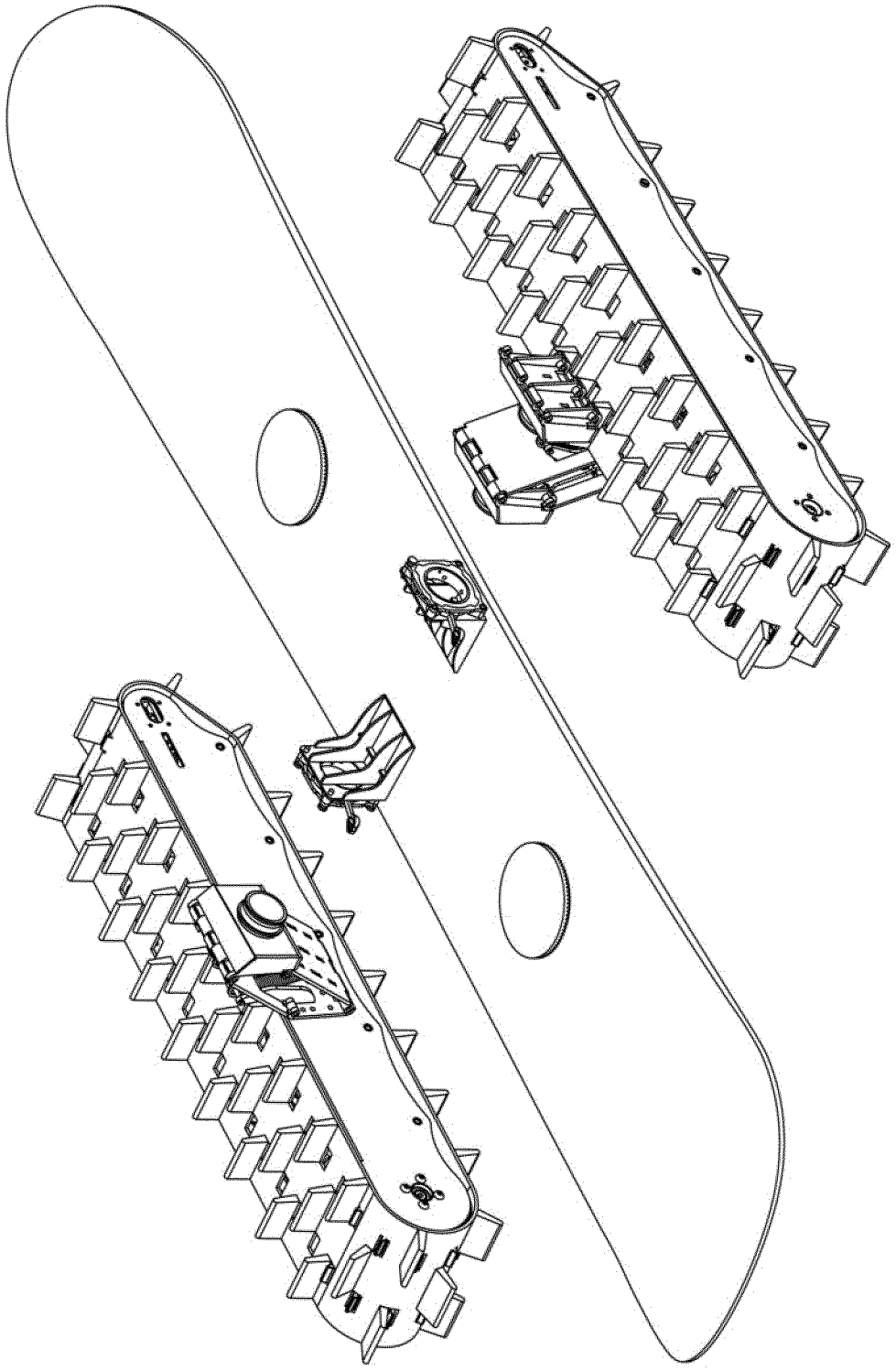

Fig. 23

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/082739

A. CLASSIFICATION OF SUBJECT MATTER

A63C 5/08(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A63C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

DWPI; CNABS; CNTXT; SIPOABS; ISI Web of Science; Elsevier Science Direct; 读秀, DUXIU; 超星科技数字图书馆, Superstar Technology Digital Library; 中国期刊网全文数据库, CNKI: 孙寅贵, 雪板, 滑雪, 适配, 配合, 连接, 联结, 结合, 驱动, 电动, 电机, 动力, 组装, 拆装, 分解, 拆卸, 安装, engin, driv+, power+, snowboard+, joint+, connect+, depart+, dismantl+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2017361202 A1 (MATTIANGELI, L.) 21 December 2017 (2017-12-21) claims 1, 8, and 9, description, paragraph 9, and figures 1-10	1, 25-28
A	US 2017361202 A1 (MATTIANGELI, L.) 21 December 2017 (2017-12-21) claims 1, 8, and 9, description, paragraph 9, and figures 1-10	2-24, 29
A	CN 109069912 A (EVOLVE SKATEBOARDS PTY LTD.) 21 December 2018 (2018-12-21) entire description	1-29
A	CN 111840969 A (BEIJING SUNYINGUI GREEN TECHNOLOGY INSTITUTE CO., LTD.) 30 October 2020 (2020-10-30) entire description	1-29
A	CN 209155067 U (NINGBO MATRIX SPORT GOODS CO., LTD.) 26 July 2019 (2019-07-26) entire description	1-29
A	EP 0091707 A1 (GIOVANNI, A.) 19 October 1983 (1983-10-19) entire description	1-29
A	US 2004154849 A1 (FODOR, J. V.) 12 August 2004 (2004-08-12) entire description	1-29

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
09 June 2022	**20 June 2022**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088, China** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2022/082739

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		WO 2016110759 A1	14 July 2016
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		IT 8267495 D0	14 April 1982
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REFERENCES CITED IN THE DESCRIPTION

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