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(54) SYSTEM FOR POSTURAL RE-EDUCATION

(57) System for performing physical exercises comprising a first device (100) that includes a first frame (100) fixed to a first plate (110), substantially extending along a first longitudinal axis and comprising a first central slot (115) that is entirely contained therein and extends along the first longitudinal axis, configured to housing a spine of a user during stretching exercises, a first edge of the first slot (115) and a first end of the first plate (110), transversal to the first longitudinal axis, delimiting a first head portion (111), the first plate (110) being configured to support the user when lying supine on it with the head on the first head portion (111), the system including at least two support elements (117) having support edges with a circumferential profile fixed to the first frame (120) on the side opposite to the first plate (110) whereby the first device (100) is in an unstable equilibrium when it rests onto a plane through the at least two support elements (117).

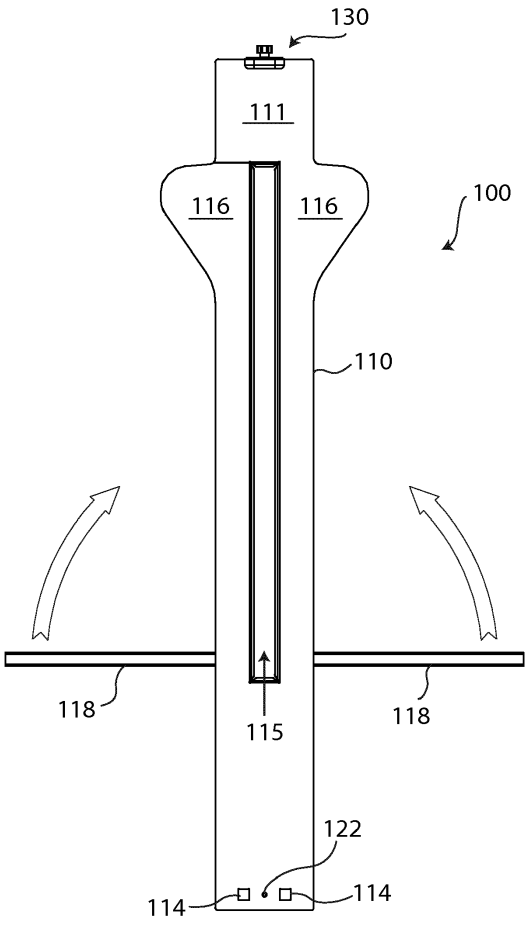

Fig. 2

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Description

[0001] The present invention relates to a system for performing physical exercises for rehabilitation, postural re-education, physiotherapy and preventive, compensatory and adapted physical activity, which is versatile, easy to use and economical for allowing multiple physical exercises to be performed in a safe and simple way.

[0002] Although the present invention is mainly oriented towards general postural rehabilitation and in particular the rehabilitation of minor scoliosis, it can also be used for postural decompensation and for muscle strengthening and in other physiotherapy fields, for example for the treatment of further types of paramorphisms, such as kyphosis and lordosis, for the treatment of rachialgia, such as cervicalgia and low back pain, and for the treatment of traumatic injuries, such as injuries to the ankle, knee, hips, still remaining in the scope of protection defined by the attached claims.

[0003] The present invention refers to the nonlinear principles of posturology, in fact it starts from a medical diagnosis, from a postural evaluation, a neuro-psychomotor evaluation of the subject, from a careful radiographic evaluation and is particularly directed to subjects with scoliosis within 20 degrees Cobb in developmental age.

[0004] Several prior art documents describe various devices and equipment for physiotherapy exercises. For example, a gravity device is disclosed in EP 2 842 535 A1. Document US5730706 (A) describes a spine therapeutic device for treating column damages, which applies motor controlled traction forces to the feet of a person using the same. Even Document DE10253630 (A1) discloses a therapeutic device for the treatment of scoliosis and kyphosis.

[0005] The prior art devices and equipment show some disadvantages. First of all they are not versatile, meaning that they are dedicated to specific treatments and to specific parts of a body, for example to the treatment of spine paramorphisms but not of injuries of knees and ankles, and therefore a limited number of physical exercises can be performed. A further disadvantage is that such devices and equipment are often complex, with a large number of elements, and are therefore not economic, require maintenance and are not easily transportable, for example at home in case of need. Still further disadvantages are that they are configured for the execution of passive exercises, whereby they do not develop the necessary awareness of the body structures involved in the movement, and that they require the presence of a specialized operator during the execution of the same.

[0006] Therefore, it is an object of the present invention to overcome the disadvantages described above, providing a support tool for physiotherapy that is versatile for the treatment of different parts of the body and different problems, easily usable by a user even in autonomy, easily transportable, impact-resistant, and economical.

[0007] It is specific subject matter of the present invention a system for performing physical exercises comprising a first device that includes a first frame fixed to a first plate, said first plate substantially extending along a first longitudinal axis and, comprising a first central slot that is entirely contained therein and extends along the first longitudinal axis, said first central slot being configured to housing a spine of a user during stretching exercises, a first edge of the first slot and a first end of the first plate, transversal to the first longitudinal axis, delimiting a first head portion, the first plate being configured to support the user when lying supine on it with the head on the first head portion, the system including at least two support elements having respective support edges with a circumferential profile, said at least two support elements being fixed to the first frame on the side opposite to the first plate whereby the first device is in an unstable equilibrium when it rests onto a plane through the at least two support elements.

[0008] According to another aspect of the invention, said system may comprise at least two balancing arms for controlling the balance of the first device, said arms being fixed to the first frame and protruding outwards in a direction orthogonal to the longitudinal size of the first plate, optionally provided with feet.

[0009] According to a further aspect of the invention, said at least two balancing arms may assume a first position inside the first plate and a second position outside the first plate through hinges or telescopic systems

[0010] According to an additional aspect of the invention, said first device may be provided with a stretching exercise resistance module, including a framework fixed to the first frame at the first head position, comprising a spring coupled through a pin to said framework and to a slab, optionally provided with a cushion, which assumes a first position whereby it protrudes perpendicularly from the first frame towards the first plate, said slab being configured to be longitudinally shifted towards the outside of the first device by applying a force opposed to the elastic force of the spring allowing a user does exercises with the head positioned at the first portion and in contact with said plate.

[0011] According to another aspect of the invention, said plate may assume a second position rotated by $\pm$ 90° with respect to the first position.

[0012] According to a further aspect of the invention, said first plate may comprise two first wing portions for correcting winged shoulder blades symmetrically arranged with respect to the first longitudinal axis and projecting towards the outside of the first plate at the first edge of the first slot and not included in the first portion, whereby when the first device is used with the spine housed in the first slot and the user head positioned at the first portion his shoulder blades are positioned at the first wing portions.

[0013] According to an additional aspect of the invention, said system may comprise a removable second device connected to the first device through a connection system and including a second frame fixed to a second

plate, said second plate substantially extending along a second longitudinal axis, the first and second plates being orthogonally facing each other and an end opposite the first end of the first plate being adjacent to an end opposite to a second end of the second plate, whereby, when a user in supine position use the system used with connected devices, the back is positioned on the first plate of the first device and the lower limbs are pointed up and totally or partly supported on the second plate of the second device.

[0014] According to another aspect of the invention, said connection system may comprise at least two protruding elements outward from the end opposite to the second end of the second plate in the longitudinal direction that engage in corresponding apertures of the first device positioned at the end opposite to the first end, and a handwheel blocking the first and the second device by respective through holes.

[0015] According to a further aspect of the invention, said second plate may comprise a second central slot entirely contained therein, said second central slot extending along the second longitudinal axis and being configured to housing the spine of the user during stretching exercises, a second edge of the second slot and the second end of the second plate, transversal to the second longitudinal axis, delimiting a second head portion, the second device comprising at least one pair of lateral slits, symmetrically arranged with respect to the second longitudinal central axis, for fastening coupling elements for coupling the second device to a user so that the back of the user is in contact with the second plate with the spine housed in the second slot and the head positioned at the second head portion while performing stretching exercises.

[0016] According to an additional aspect of the invention, said second device may be provided with the stretching exercise resistance module as described above.

[0017] According to another aspect of the invention, said second plate may comprises two second wing portions for correcting winged shoulder blades symmetrically arranged with respect to the second longitudinal axis and projecting towards the outside of the second plate at the second edge of the second slot and not included in the second portion, whereby when the second device is used with the spine housed in the second slot and the user head positioned at the second portion his shoulder blades are positioned at the second wing portions.

[0018] According to a further aspect of the invention, said second device may be provided with at least two support elements having respective support edges with a circumference profile, said at least two support elements being fixed to the second frame on the side opposite to the second plate whereby the second device is in an unstable equilibrium when it rests onto a plane through the at least two support elements, in order to perform physical exercises on said second device in supine position, back position or quadrupedal position.

[0019] According to an additional aspect of the invention, said system may comprise at least two balancing arms, optionally provided with feet, fixed to the second frame and protruding outwards in an orthogonal direction to the longitudinal size of the second plate for controlling oscillations, as described above.

[0020] The present invention allows to obtain the following main advantages with respect to the solutions of the state of the art. The main advantage of the present invention is the versatility of the system which allows to perform multiple exercises including, for example, exercises in clinostasis, i.e. in supine or prone lying position, without resistance or against resistance, in orthostasis, i.e. in upright position, without resistance or against resistance, and also in quadrupedal position, with postures for stretching muscular chains and leading to correct the spine paramorphisms by searching for correct postures both in conditions of advantageous and disadvantageous balance, exercises for muscle strengthening in isotonic and isometric muscle contraction, and exercises for the treatment of parts of the body other than the spine, such as knees, ankles, hips. Furthermore, the shape of the system according to the invention advantageously helps the correction of winged shoulder blades and the search for shoulder disharmony. A further important advantage compared to other equipment already in use for postural rehabilitation is the capability to involve the psycho-emotional area, the segments of the locomotor apparatus and the global and analytical myofascial system, vestibulespinal, cybernetic-postural system. Still advantageously the system increases the user esteroceptive and proprioceptive perception. Due to the above mentioned advantages, the system can be used by specialized operators performing a rehabilitation protocol that follows the orthopaedic, neurophysiological, biomechanical and posturological principles. Another advantage is that it is a simple system that can be easily used by a user even in autonomy. Furthermore, the system of the present invention includes few elements that can be made of lightweight materials with the further advantage of being easily transported, even at home, and of being impact-resistant. An additional advantage is that the presence of a central slot not only allows to channel the vertebral column trying to correct the segmental deviations thereof, but it also allows to insert electrodes and/or sensors to carry out physical measurements such as electromyographic recording for neuro-motor control, detection of displacements and rotations of vertebral metamers for postural analysis in 3D and/or for biofeedback.

[0021] The present invention will be now described, by way of illustration and not by way of limitation, according to its preferred embodiments, by particularly referring to the Figures of the annexed drawings, in which:

Figure 1 shows a front perspective view (a), a rear perspective view (b), and a rear front view (c) of a first preferred embodiment of the system for performing physical exercises according to the invention;
Figure 2 shows a front view of the system of Figure 1;

Figure 3 shows an exploded perspective view of the system of Figure 1;
Figure 4 shows an enlarged view of a portion of the system of Figure 1, wherein a perspective view (a) and a lateral view (b) of a compensation system of the system of Figure 1 are shown;
Figure 5 shows an exploded perspective view of the compensation system of Figure 4;
Figure 6 shows a perspective view (a) of a second preferred embodiment of the system for performing physical exercises according to the invention and an enlarged perspective view of a portion of said system;
Figure 7 shows a front view (a) and a rear view (b) of a second device of the system of Figure 6;
Figure 8 shows an exploded perspective view of the second device of Figure 7;
Figure 9 schematically shows feasible configurations of system of Figure 1 for performing different physical exercises from a user;
Figure 10 schematically shows feasible configurations of system of Figure 6 for performing different physical exercises from a user;
Figure 11 shows a rear perspective view of a second device of a further preferred embodiment of the system for performing physical exercises according to the invention;

[0022] In the Figures, identical reference numerals will be used for alike elements.

[0023] Figures 1 to 3 shows a preferred embodiment of a system according to the present invention including a first device 100 for performing physical exercises that comprises a first plate 110 substantially extending along a first longitudinal axis. The first device 100 also comprises a first frame 120 to which the first plate 110 is fixed in such a way that, when the first device 100 is used from a user, the first plate 110 is faced towards the user and the first frame 120 is faced outward. In particular, when the first device 100 rests onto a plane for performing exercises, the user is positioned onto the first plate 110 and the first frame 120 is faced towards the plane. The first plate 110 includes a first central slot 115, which is entirely contained therein and extends along the first longitudinal axis, configured to house a spine of a user. Such a first central slot 115 has the function of assisting the user to control the spine during the execution of exercises for correcting any non-physiological curves. The first central slot 115 also allows to apply electrodes to the user for neuro-motor control, such as electromyography, and/or sensors for 3D postural analysis and/or for biofeedback, for example detecting displacements and rotations of vertebral metamers. The first central slot 115 has a length ranging from 40 cm to 130 cm, optionally ranging from 60 cm to 120 cm, more optionally equal to about 100 cm. Its width ranges from 2 cm to 7 cm, optionally from 3 cm to 5 cm, more optionally equal to about 4 cm.

[0024] The position of the first central slot 115 is such that a first edge of the first central slot 115 and a first end of the first plate 110, which are transversal to the first longitudinal axis, delimit a first head portion 111 of the first plate 110. The longitudinal size of this first head portion 111, i.e. the distance between the first edge of the first central slot 115 and a first end of the first plate 110, is in the range of 10 cm to 30 cm, optionally equal to about 21 cm. When the first device 100 is used in supine position, for example for stretching exercises with the spine housed in the first central slot 115, the head of a user is positioned at the first head portion 111 of the first plate 110, as shown for example in Figure 9a. The length of the first plate 110 is not lower than the sum of the longitudinal size of the first head portion 111 and the length of the first central slot 115, which is entirely contained in the first plate 110, and ranges from 75 cm to 210 cm, optionally from 85 cm to 180 cm, still more optionally equal to about 165 cm. Therefore, the length of the first plate 110 is such that a user can lie supine thereon, at least with bent knees, resting the head on the first head portion 111 towards the first end of the first plate 110 and the feet in the direction of an end opposite to the first one, as shown in Figure 9a.

[0025] In the preferred embodiment, the first plate 110 comprises two first wing portions 116 symmetrically arranged with respect to the first longitudinal axis and projecting towards the outside, at the first edge of the first central slot 115 and not included in the first head portion 111. In other words, the first two wing portions 116 lie substantially on the same plane as the plate 110 and extend outwardly symmetrically to each other with respect to the first longitudinal axis. Thus, the position of the first winged portions 116 is such that, when the first device 100 is used, for example, for stretching exercises by a user in supine position with the spine housed in the first central slot 115 and the head on the first head portion 111, the user's shoulder blades are positioned at the first winged portions 116. The first plate 110 comprising said first winged portions 116 is configured to operate as winged shoulder blade correction support. Further embodiments of the present invention may be not provided with such first winged portions 116. In the preferred embodiment shown in Figure 1 to 3, the first plate 110 is shaped with said first winged portions 116. In order to make the first device 100 as much light as possible, in the preferred embodiment, the first plate 110 is made of 3 mm aluminium shaped through water splash cutting system and the first frame 120 is made of a 20mm x 20 aluminium tubular structure through laser welding.

[0026] The first device 100 shown in Figure 1 to 3, includes three two support elements 117 fixed to the first frame 120 on the side opposite to the first plate 110 in such a way that when the first device 100 is positioned on a plane for use, it rests onto the plane through said support elements 117. Each support element 117 has a respective support edge with a profile of (portion of) circumference and is configured to induce the continuous loss of balance of the system on a plane. In particular,

the profile of (portion of) circumference of each support edge delimits a portion of a disc lying on a plane orthogonal to the first longitudinal axis. In further embodiments, the support elements 117 may have respective support edges with (portion of) cylindrical surface. The support elements 117 can also be incorporated in a single cylindrical portion support having a support edge with (portion of) cylindrical surface. In other words, the support edges of the support elements 117 operate as support edges of the first device 100 when the first device 100 is positioned on a plane for use. Thus, the first device 100 rests onto the plane through the support elements 117 in an oscillating unstable, i.e. tilting, manner. The oscillating instability induced by said support elements 117 has a proprioceptive function and a motivational stimulus for the user. In the system of Figures 1-3, a first support element 117 is positioned on the first frame 120 in proximity of the end opposite to the first end of the first plate 110, a second and a third support element 117 are positioned on the first frame 120 in proximity of the edges (perpendicular to the longitudinal direction) of the first slot 115. In other embodiments, the support elements 117 may be only two or more and may be differently positioned on the first frame 120. The first device 100 also includes two balancing arms 118, optionally provided with feet 119, fixed to the first frame 120 and protruding outwards in a direction orthogonal to the longitudinal size of the first plate 110 for controlling the oscillations from 3° to 8°, optionally equal to 4°. In the preferred embodiment said arms 118 are fixed to the first frame 120 in proximity of the edge of the first slot 115 opposite to the first edge. Other embodiments of the present invention may provide different positioning, or may be devoid of such balancing arms 118. Optionally, the two balancing arms 118 can be closed with hinges, or with other systems known to those skilled in the art, for example telescopic systems, so that they can assume a first position inside the first plate 110 and a second position outside the first plate 110, see, for example, Figures 9a and 9b respectively. The first position is such that, looking frontally at the first plate 110, the balancing arms 118 are not visible. Furthermore, in order to make the first device as much light as possible, the support elements 117 can be made of plastic material, the arms 118 in aluminium and the hinges in stainless steel. Further embodiments may be provided with further pairs of balancing arms 118.

[0027] The first device 100 of the preferred embodiment of the invention also includes a resistance module 130 for performing stretching exercises against resistance, better shown in the enlargement of the first device 100 of Figure 4 and in the exploded view of Figure 5. With reference to Figures 4 and 5, the resistance module 130 has a framework 131, fixed to the first frame 120 at the first head portion 111, which includes an upper metal sheet 137, arranged in proximity of the first end of the first plate 110, and a lower metal sheet 137' to which two guides 132 are orthogonally fixed, where a slide 133 positioned between the two metal sheets 137, 137' can slide on the two guides 132. The slide 133 is fixed to a first end of a pin 138, parallel to the guides 132, the second end of which, opposite to the first one, is inserted in a through hole 140 of the upper metal sheet 137 and can slide through said through hole 140 making the slide 133 integrally shift. The resistance module 130 includes a compression spring 134 externally wound to the pin 138 on which it can slide in the compression and elongation steps and a slab 135 fixed to the second end of the pin 138 by a handwheel 139 (optionally spring fixed to 133 and 137). The slab 135 is configured to assume a first position, which we define as work position, whereby it protrudes perpendicularly from the first frame 120 in the direction of the first plate 110 and which can longitudinally shift, and a second position, which we define as rest position, which is rotated by ± 90° compared to the first work position. In this way, when the first device 100 is used to perform stretching exercises and the sheet 135 is in the work position, the head of a user is positioned in contact with it and has to apply a force opposed to the elastic force of the spring for longitudinally shifting the slab 135 towards the outside of the first plate 110. The resistance module 130 allows to add the stretching movement calibrated and guided by a gradual pressure to the posture exercises, in order to extend the spine and at the same time strengthen the antigravity muscles. The slab 135 may be provided with a cushion 136 to increase the comfort of the user during the exercises. In the preferred embodiment, the spring is made of stainless steel, the guides are made of aluminium and the slide is made of plastic material. In other embodiments, the resistance module 130, i.e. the slab, the guides and the spring can be made of different materials. Other embodiments of the present invention may be devoid of such a resistance module 130.

[0028] It should be noted that Figure 3 and Figure 5 respectively show an exploded view of the first device 100 and of the resistance module 130 described above, which are immediately comprehensible for a person skilled in the art.

[0029] The up to now described embodiments of the present invention, therefore, allow to perform exercises assuming the postures of corrections, possibly suggested from an operator, first starting from advantageous and subsequently disadvantageous situations, both in the muscular open kinetic chain and in the closed field. It should be noted that the first device 100, when it is resting on the ground, can also be used by the user to perform exercises in positions other than the supine one, for example on the back, as shown in Figure 9c, in orthostasis, as will be also shown in the following of the description with reference to Figure 10a, or quadrupedal position.

[0030] Figure 6 shows a second preferred embodiment of a system for performing physical exercises according to the present invention which includes a second device 200 orthogonally connected in a removable manner to the first device 100 described above in relation to the system shown in Figures 1 to 3. The removable connec-

tion allows a user to perform physical exercises both with the first and second devices connected to each other and with the first and second devices disconnected from each other, as it will be evident in the following description. Furthermore, the first and second devices can also be simultaneously used from two separate users when they are disconnected. The second device 200 will be hereinafter described with reference to Figure 7 and to Figure 8, the latter showing an exploded view immediately comprehensible for a person skilled in the art. The second device 200 comprises a second plate 210 substantially extending along a second longitudinal axis and a second frame 220 to which the second plate 210 is fixed in such a way that, when the second device 200 is used from a user, the second plate 210 is faced towards the user and the second frame 220 is faced outward. The second plate 210 includes a second central slot 215, which is entirely contained therein and extends along the second longitudinal axis, configured to house a spine of a user. Such a second central slot 215 has the function of assisting the user to control the spine during the execution of exercises for correcting any non-physiological curves. The second central slot 215 also allows to apply electrodes to the user for neuro-motor control, such as electromyography, and/or sensors for 3D postural analysis and/or for biofeedback, for example detecting displacements and rotations of vertebral metamers. The second central slot 215 has a length ranging from 40 cm to 130 cm, optionally ranging from 60 cm to 120 cm, more optionally equal to about 100 cm. Its width ranges from 2 cm to 7 cm, optionally from 3 cm to 5 cm, it is more optionally equal to about 4 cm.

[0031] The position of the second central slot 215 is such that a second edge of the second central slot 215 and a second end of the second plate 210, which are transversal to the second longitudinal axis, delimit a second head portion 211 of the second plate 210. The longitudinal size of this second head portion 211, i.e. the distance between the second edge of the second central slot 215 and a second end of the second plate 210, is in the range of 10 cm to 30 cm, optionally equal to about 21 cm. When the second device 200 is used for performing exercises in orthostasis or quadrupedal position, for example for stretching exercises with the spine housed in the second central slot 215, the head of a user is positioned at the second head portion 211 of the second plate 210, as shown for example in Figure 10a. The length of the second plate 210 is not lower than the sum of the longitudinal size of the second head portion 211 and the length of the second central slot 215, which is entirely contained in the second plate 210, and ranges from 51 cm to 145 cm, optionally from 77 cm to 135 cm, still more optionally equal to about 123 cm.

[0032] The second device 200 includes a pair of lateral slits 212, symmetrically arranged with respect to the second central longitudinal axis, for fastening coupling elements 212', such as for example elastic belts and/or hook and loop strips (schematically shown in Figure 10a). These coupling elements have the function of coupling the second device 200 to a user so that the back of the user is in contact with the second plate 210 while performing stretching exercises. These lateral slits 212 are positioned at a distance from the second edge of the second central slot 215 of about 1/4 of the length of the second central slot 215 itself. Thus, the coupling elements 212' are positioned under the armpits of a user. In the preferred embodiment, the device 200 includes an additional pair of lateral slits 212 arranged at greater distances from the second edge of the second central slot 215 so that further coupling elements 212' are positioned, for example, at the height of a user waist (see again Figure 10a). Other embodiments may be provided with further pairs of lateral slits, for example for adapting the position of the coupling elements 212' with respect to different users of different sizes.

[0033] In the preferred embodiment, the second plate 210 comprises two second wing portions 216 symmetrically arranged with respect to the second longitudinal axis and projecting towards the outside, at the second edge of the second central slot 215 and not included in the second head portion 211. In other words, the second two wing portions 216 lie substantially on the same plane as the plate 210. Thus, the position of the second winged portions 216 is such that, when the second device 200 is used, for example, for stretching exercises by a user with the spine housed in the second central slot 215 and the head on the second head portion 211, the user's shoulder blades are positioned at the second winged portions 216. The second plate 210 comprising said second winged portions 216 is configured to operate as winged shoulder blades correction support. Further embodiments of the present invention may be not provided with such second winged portions 216. In the preferred embodiment shown in Figure 1 to 3, the second plate 210 is shaped with said second winged portions 116. In order to make the second device 200 as much light as possible, in the preferred embodiment, the second plate 210 is made of 3 mm aluminium shaped through water splash cutting system and the second frame 220 is made of a 20mm x 20mm aluminium tubular structure by laser welding.

[0034] The second device 200 of the preferred embodiment of the invention also includes a resistance module 230 for performing stretching exercises against resistance, corresponding to the resistance module 130 shown in Figure 4 and 5 described above. Similarly to the positioning and use of the resistance module 130 in relation to the first device 100, the resistance module 230 has a framework 231, fixed to the second frame 220 at the second head portion 211, which includes an upper metal sheet 237, arranged in proximity of the second end of the second plate 210, and a lower metal sheet 237' to which two guides 232 are orthogonally fixed, where a slide 233 positioned between the two metal sheets 237, 237' can slide on the two guides 232. The slide 233 is fixed to a first end of a pin 238, parallel to the guides 232,

the second end of which, opposite to the first one, is inserted in a through hole 240 of the upper metal sheet 237 and can slide through said through hole 240 making the slide 233 integrally shift. The resistance module 230 includes a compression spring 234 externally wound to the pin 238 on which it can slide in the compression and elongation steps and a slab 235 fixed to the second end of the pin 238 by a handwheel 239 (optionally spring fixed to 233 and 237).

[0035] The slab 235 is configured to assume a first position, which we define as work position, whereby it protrudes perpendicularly from the second frame 220 in the direction of the second plate 210 and which can longitudinally shift, and a second position, which we define as rest position, which is rotated by ± 90° compared to the first work position. In this way, when the second device 200 is used to perform stretching exercises and the sheet 235 is in the work position, the head of a user is positioned in contact with it and has to apply a force opposed to the elastic force of the spring for longitudinally shifting the slab 235 towards the outside of the second plate 210. The resistance module 230 allows to add the stretching movement calibrated and guided by a gradual pressure to posture exercises, in order to extend the spine and at the same time strengthen the antigravity muscles. The slab 235 may be provided with a cushion 236 to increase the comfort of the user during the exercises. In the preferred embodiment, the spring is made of stainless steel, the guides are made of aluminium and the slide is made of plastic material. In other embodiments, the resistance module 230, i.e. the slab, the guides and the spring can be made of different materials.

[0036] Other embodiments of the present invention may be devoid of such a resistance module 230.

[0037] When the first device 100 is (removably) connected to the second device 200, the first and second plates 110, 210 are orthogonally facing each other and an end opposite to the first end of the first plate 110 is adjacent to an end opposite to a second end of the second plate 210. Thus, when the system is used with connected devices from a user in the supine position, the back may rest on the first plate 110 of the first device 100, which is resting on a plane through the support element 117, and its lower limbs may be directed upwards and may totally or partially rest on the second plate 210 of the second device 200, as schematically shown, for example, in Figures 10b and 10c. The two devices are connected by a connection system that includes a centering and locking system. In particular, in the system of Figure 6, the second frame 220, fixed to the second plate 210, is provided with protruding elements 213 symmetrical with respect to the second central longitudinal axis, which protrude outwardly from the end opposite to the second end of the second plate 210 in the longitudinal direction and that engage into corresponding openings 114 of the first device 100, i.e. in the first plate 110, positioned at the end opposite to the first end. A handwheel 221 blocks the two devices 100, 200 through respective through holes 122, 222.

[0038] In a further embodiment of the present system, the second device 200 may be provided with support elements 217 as shown in Figure 11, corresponding to the support elements 117 of the first device 100, to allow to perform physical exercises in supine position, on the back or in quadrupedal position, for example also for children, similarly to the use of the first device 100. Said support elements 217 are fixed to the second frame 220 on the side opposite to the second plate 210 in such a way that when the second device 200 is positioned on a plane for use, it rests onto the plane through said support elements 217. Each support element 217 has a respective support edge with a profile of (portion of) circumference and is configured to induce the continuous loss of balance of the system on a plane. In particular, the profile of (portion of) circumference of each support edge delimits a portion of a disc lying on a plane orthogonal to the second longitudinal axis. In further embodiments, the support elements 217 may have respective support edges with (portion of) cylindrical surface. The support elements 217 can also be incorporated in a single cylindrical portion support having a support edge with (portion of) cylindrical surface. In other words, the support edges of the support elements 217 operate as support edges of the second device 200 when the second device 100 is positioned on a plane for use. Thus, the second device 200 rests onto the plane through the support elements 217 in an oscillating unstable, i.e. tilting, manner. Further embodiments provided with elements 117 may be provided with pairs of balancing arms similar to the balancing arms 118 above described in relation to the first device 100 of the preferred embodiment of the present invention.

[0039] The preferred embodiments of this invention have been described and a number of variations have been suggested hereinbefore, but it should be understood that those skilled in the art can make other variations and changes without so departing from the scope of protection thereof, as defined by the attached claims.

Claims

1. System for performing physical exercises comprising a first device (100) that includes a first frame (120) fixed to a first plate (110), said first plate (110) substantially extending along a first longitudinal axis and comprising a first central slot (115) that is entirely contained therein and extends along the first longitudinal axis, said first central slot (115) being configured to housing a spine of a user during stretching exercises, a first edge of the first slot (115) and a first end of the first plate (110), transversal to the first longitudinal axis, delimiting a first head portion (111), the first plate (110) being configured to support the user when lying supine on it with the head on the first head portion (111), the system including at least two support elements (117) having respective sup-

port edges with a circumferential profile, said at least two support elements (117) being fixed to the first frame (120) on the side opposite to the first plate (110) whereby the first device (100) is in an unstable equilibrium when it rests onto a plane through the at least two support elements (117).

2. System according to claim 1 comprising at least two balancing arms (118) for controlling the balance of the first device (100), said arms (118) being fixed to the first frame (120) and protruding outwards in a direction orthogonal to the longitudinal size of the first plate (110), optionally provided with feet (119).

3. System according to claim 1 or 2, wherein the at least two balancing arms (118) assume a first position inside the first plate (110) and a second position outside the first plate (110) through hinges or telescopic systems.

4. System according to any one of the preceding claims, wherein the first device (100) is provided with a stretching exercise resistance module (130, 230), including a framework (131, 231) fixed to the first frame (120) at the first head position (111), comprising a spring (134, 234) coupled through a pin (138, 238) to said framework (131, 231) and to a slab (135, 235), optionally provided with a cushion (136, 236), which assumes a first position whereby it protrudes perpendicularly from the first frame (120) towards the first plate (110), said slab being configured to be longitudinally shifted towards the outside of the first device (100) by applying a force opposed to the elastic force of the spring (134, 234) allowing a user does exercises with the head positioned at the first portion (111) and in contact with said plate (135, 235).

5. System according to claim 4 wherein the plate (135, 235) assumes a second position rotated by $\pm$ 90° with respect to the first position.

6. System according to any one of the preceding claims, wherein the first plate (110) comprises two first wing portions (116) for correcting winged shoulder blades symmetrically arranged with respect to the first longitudinal axis and projecting towards the outside of the first plate (110) at the first edge of the first slot (115) and not included in the first portion (111), whereby when the first device (100) is used with the spine housed in the first slot (115) and the user head positioned at the first portion (111) his shoulder blades are positioned at the first wing portions (116).

7. System according to any one of the preceding claims, comprising a removable second device (200) connected to the first device (100) through a connection system and including a second frame (220) fixed to a second plate (210), said second plate (210) substantially extending along a second longitudinal axis, the first and second plates (110, 210) being orthogonally facing each other and an end opposite the first end of the first plate (110) being adjacent to an end opposite to a second end of the second plate 210, whereby, when a user in supine position use the system used with connected devices, the back is positioned on the first plate (110) of the first device (100) and the lower limbs are pointed up and totally or partly supported on the second plate (210) of the second device (200).

8. System according to claim 7, wherein the connection system comprises at least two protruding elements (213) outward from the end opposite to the second end of the second plate (210) in the longitudinal direction that engage in corresponding apertures (114) of the first device (100) positioned at the end opposite to the first end, and a handwheel (221) blocking the first and the second device (100, 200) by respective through holes (122, 222).

9. System according to claim 7 or 8, wherein the second plate (210) comprises a second central slot (215) entirely contained therein, said second central slot (215) extending along the second longitudinal axis and being configured to housing the spine of the user during stretching exercises, a second edge of the second slot (215) and the second end of the second plate (210), transversal to the second longitudinal axis, delimiting a second head portion (211), the second device (200) comprising at least one pair of lateral slits (212), symmetrically arranged with respect to the second longitudinal central axis, for fastening coupling elements (212 ') for coupling the second device (200) to a user so that the back of the user is in contact with the second plate (210) with the spine housed in the second slot (215) and the head positioned at the second head portion (211) while performing stretching exercises.

10. System (10, 20) according to claim 9 wherein the second device (200) is provided with the stretching exercise resistance module (130, 230) as described in claim 4 or 5.

11. System according to any one of the preceding claims 7 to 10, wherein the second plate (210) comprises two second wing portions (216) for correcting winged shoulder blades symmetrically arranged with respect to the second longitudinal axis and projecting towards the outside of the second plate (210) at the second edge of the second slot (215) and not included in the second portion (211), whereby when the second device (200) is used with the spine housed in the second slot (215) and the user head positioned at the second portion (211) his shoulder blades are

positioned at the second wing portions (216).

12. System according to one of the preceding claims 7 to 11, wherein the second device (200) is provided with at least two support elements (217) having respective support edges with a circumference profile, said at least two support elements (217) being fixed to the second frame (220) on the side opposite to the second plate (210) whereby the second device (200) is in an unstable equilibrium when it rests onto a plane through the at least two support elements (217), in order to perform physical exercises on said second device (200) in supine position, back position or quadruped position.

13. System according to claim 12 comprising at least two balancing arms (118), optionally provided with feet (219), fixed to the second frame (220) and protruding outwards in an orthogonal direction to the longitudinal size of the second plate (210) for controlling oscillations, as described in claim 2 or 3.

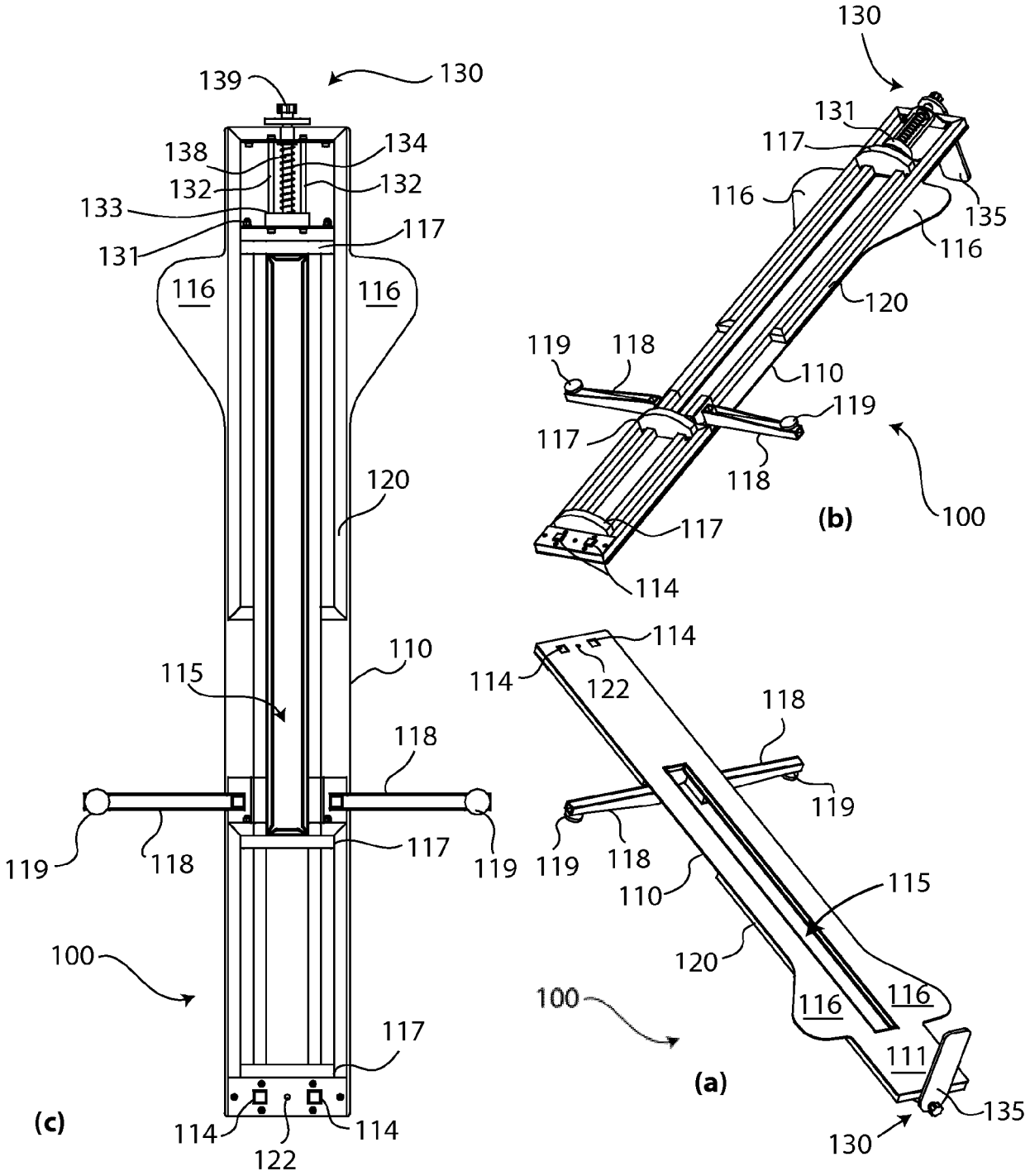

130
139
138
134
132
132
133
131
117
116
116
120
110
115
118
119
118
117
119
100
117
114
122
114
(c)
130
131
117
116
135
116
120
119
118
110
119
117
118
100
(b)
117
114
114
114
122
118
119
119
118
110
115
120
100
116
116
111
135
130
(a)

Fig. 1

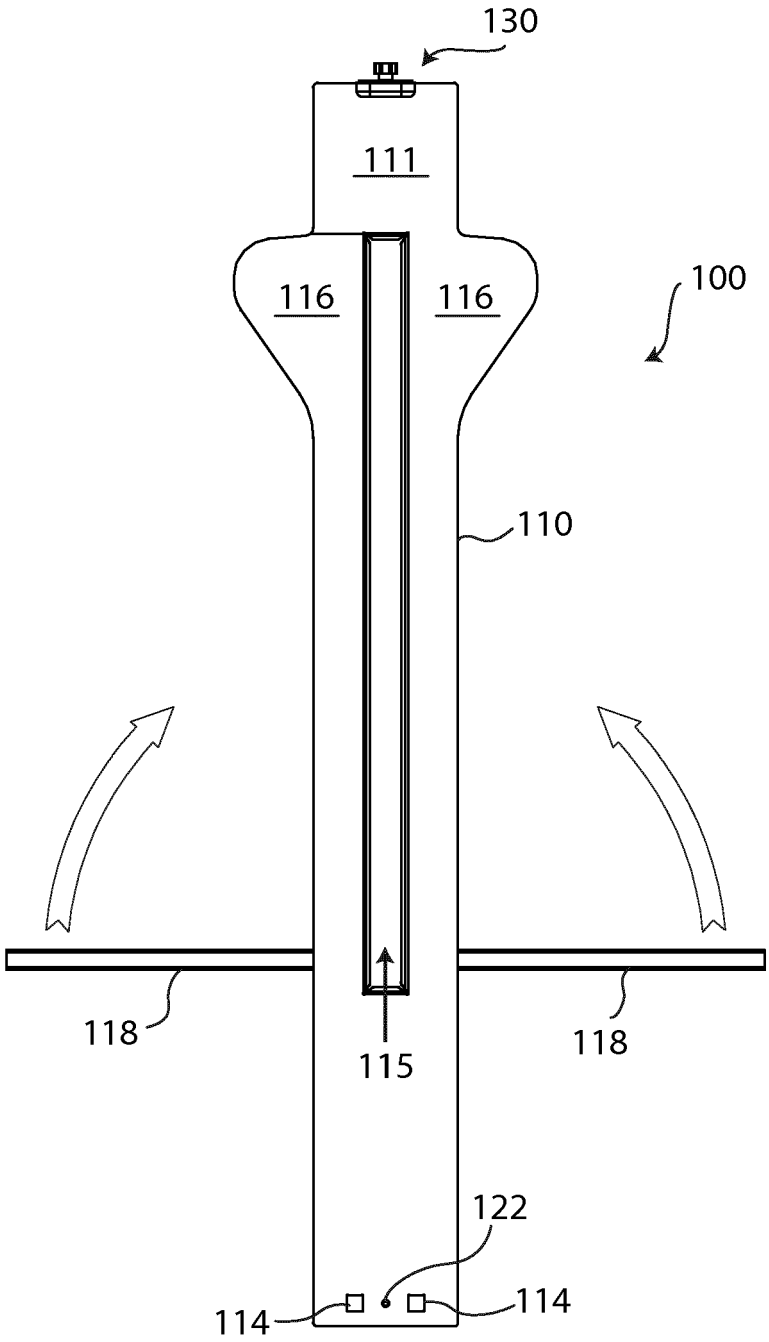


Fig. 2

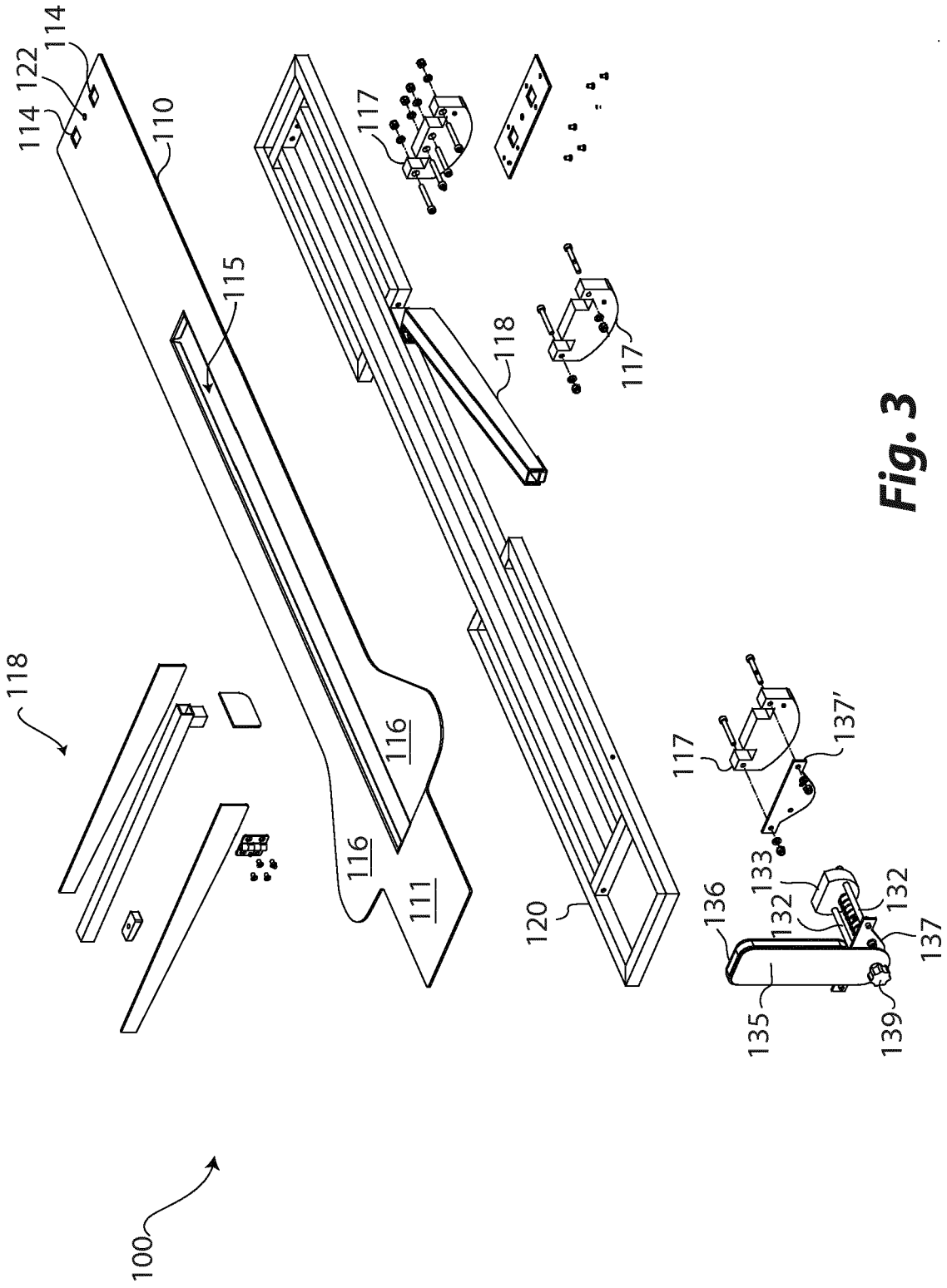

100
118
114
122
114
110
115
116
116
111
117
118
117
120
117
137'
133
136
132
132
137
135
139

Fig. 3

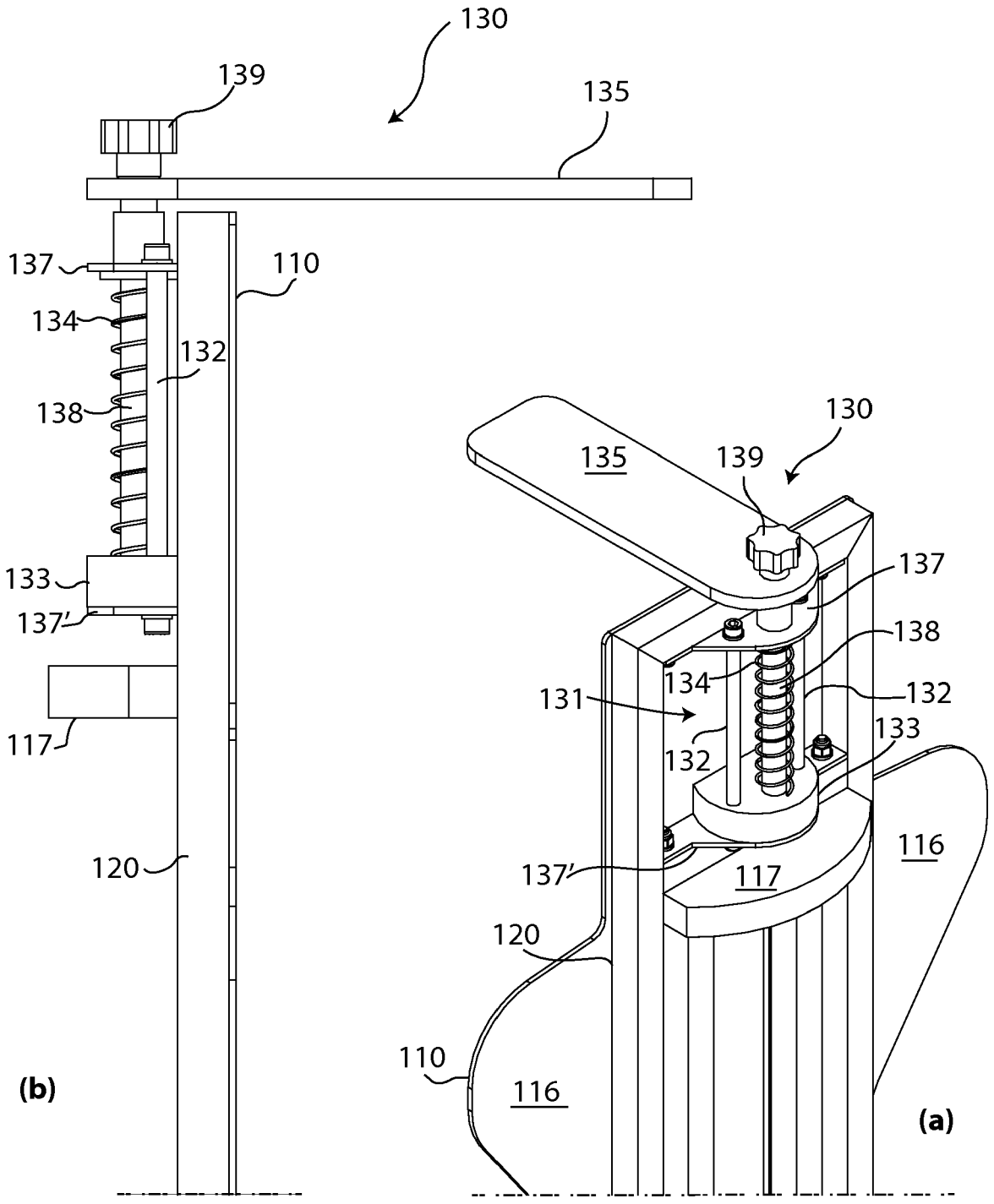

130
139
135
137
110
134
132
138
133
137'
117
120
(b)
130
135
139
137
138
134
131
132
133
116
137'
117
120
110
116
(a)

Fig. 4

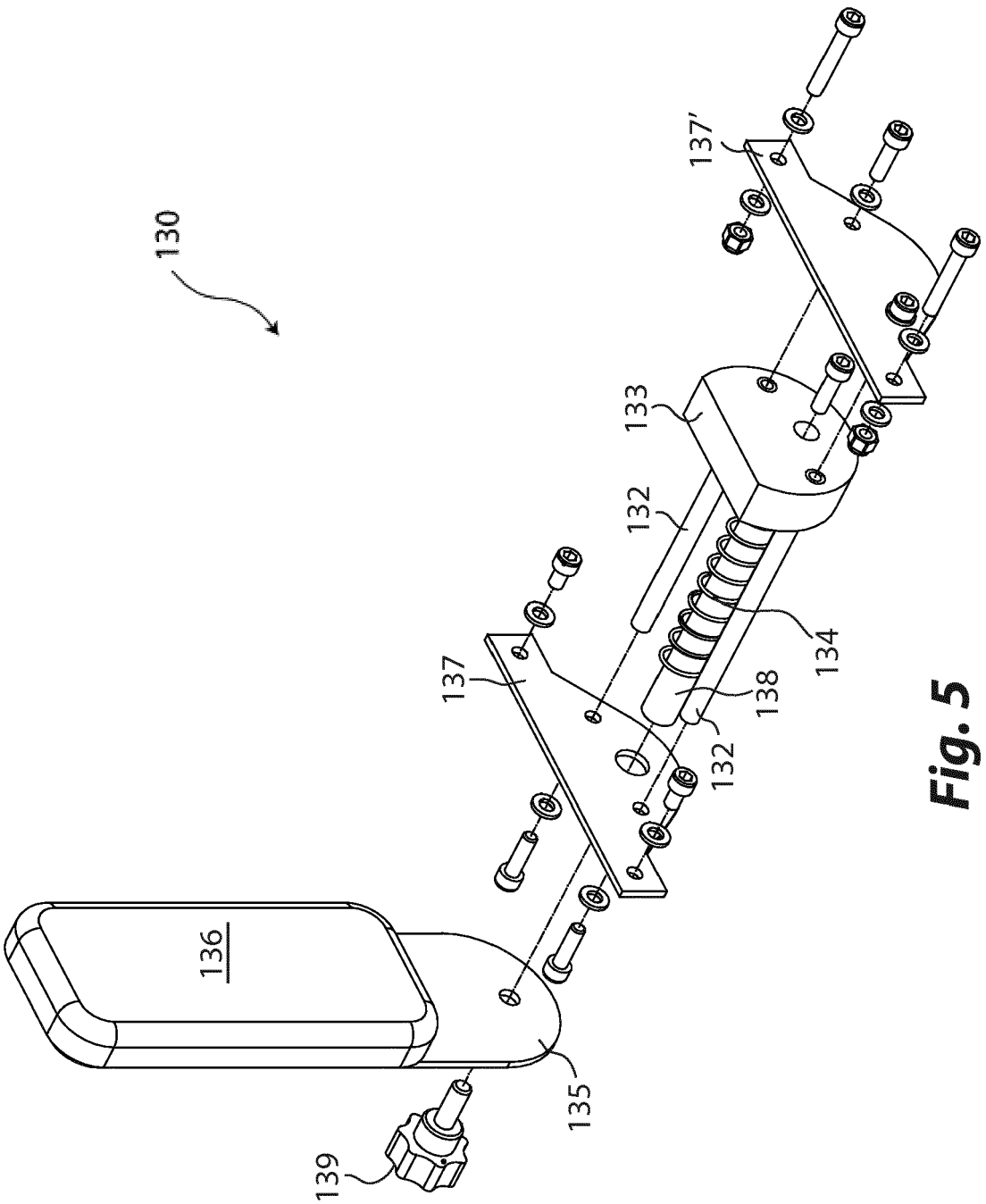
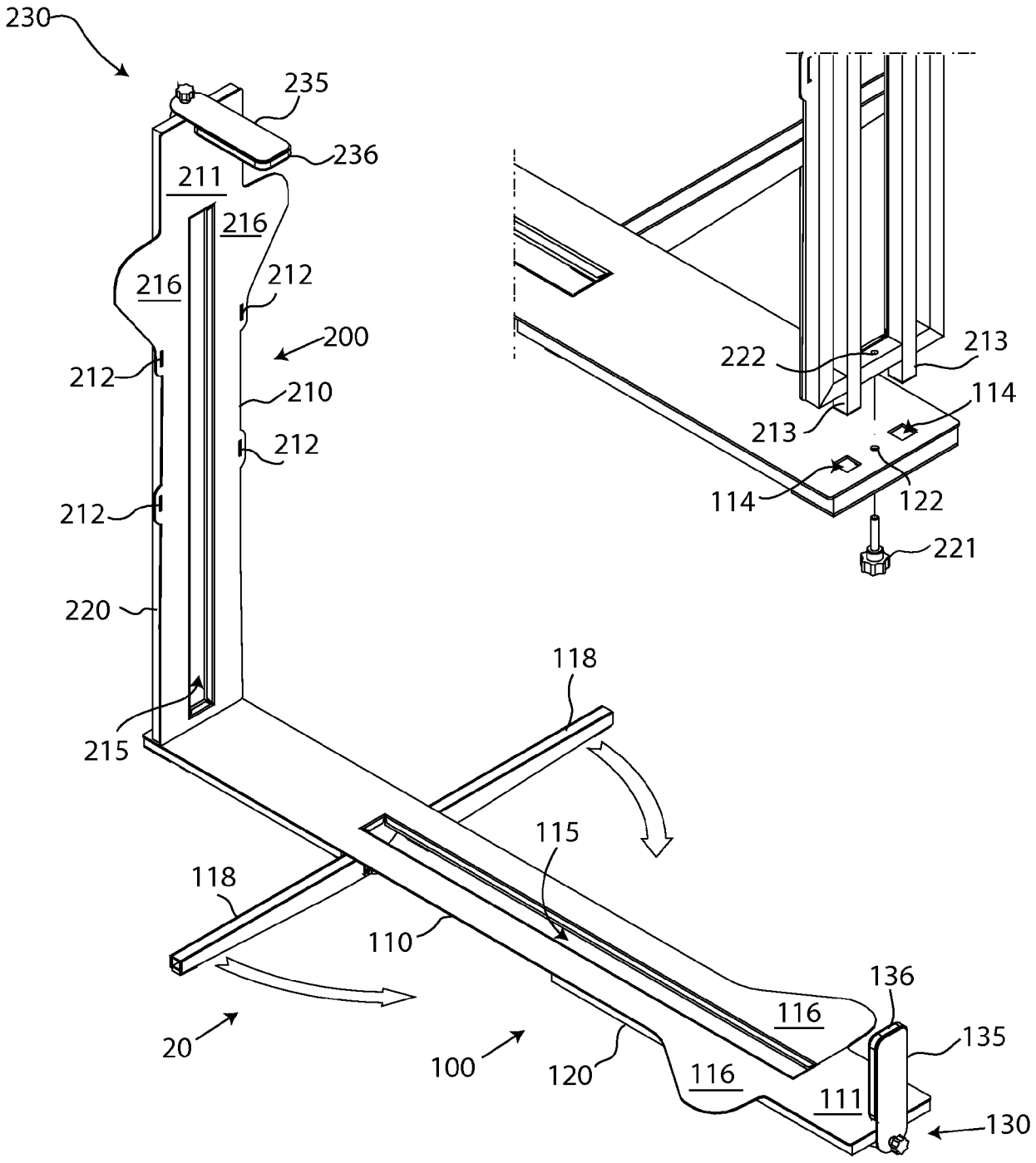


Fig. 5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236
211
216
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212
200
212
210
212
212
220
215
118
115
118
110
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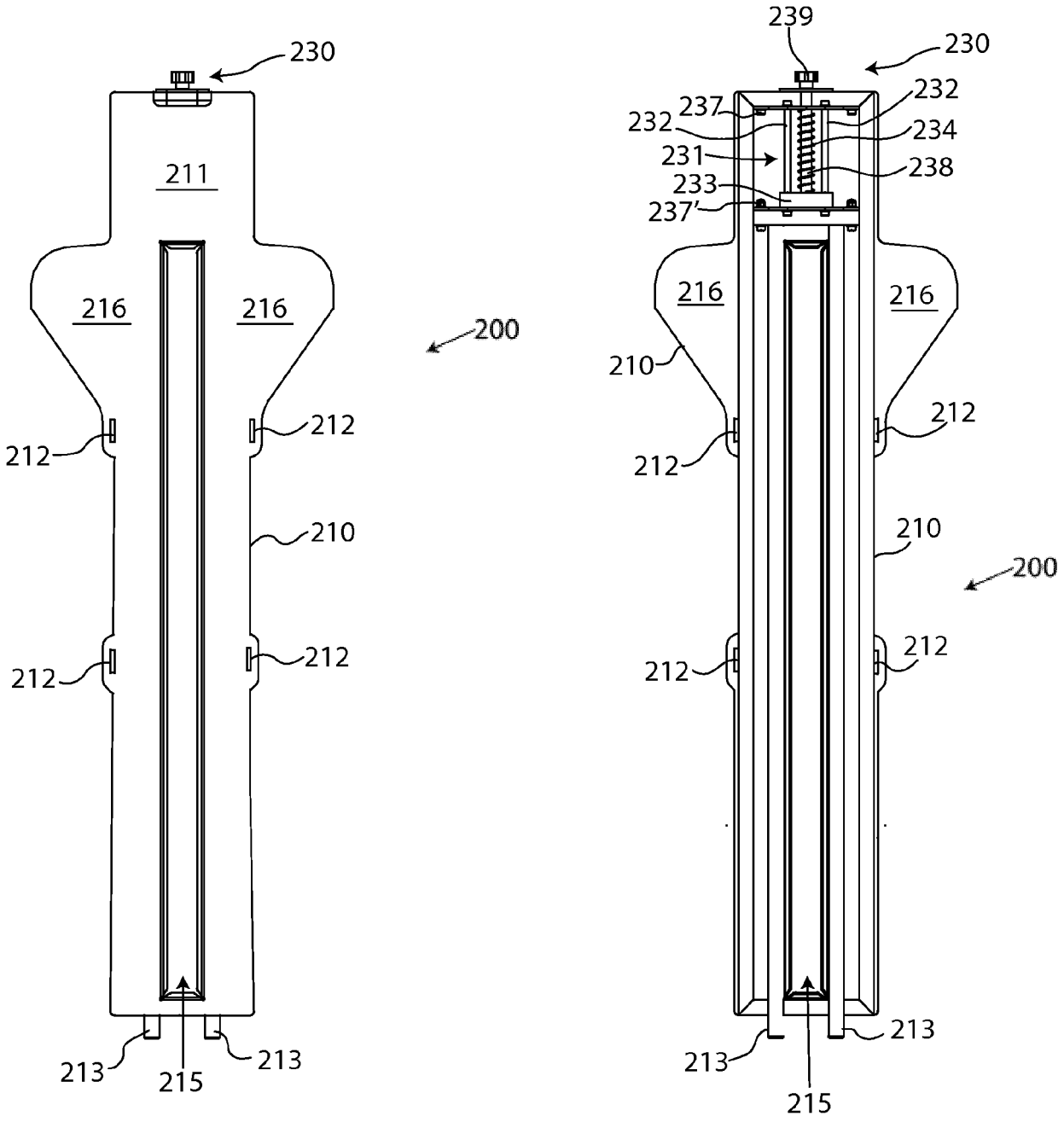
120
116
116
136
135
111
130
222
213
213
114
114
122
221

Fig. 6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213
213
215
239
230
232
237
232
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233
237'
216
216
210
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210
200
212
212
213
213
215

Fig. 7

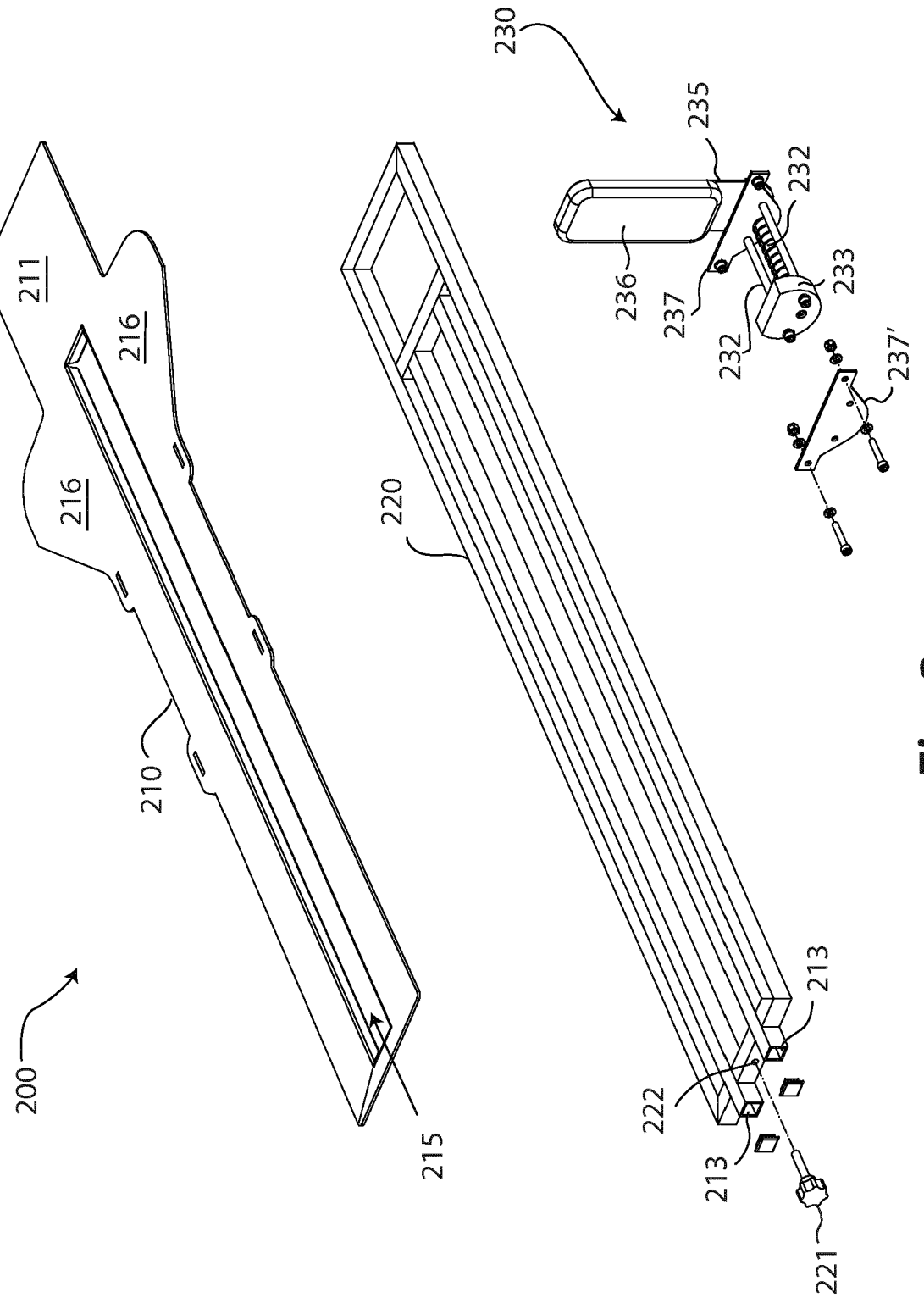
200
210
211
216
216
215
220
230
235
232
236
237
232
233
237'
213
222
213
221

Fig. 8

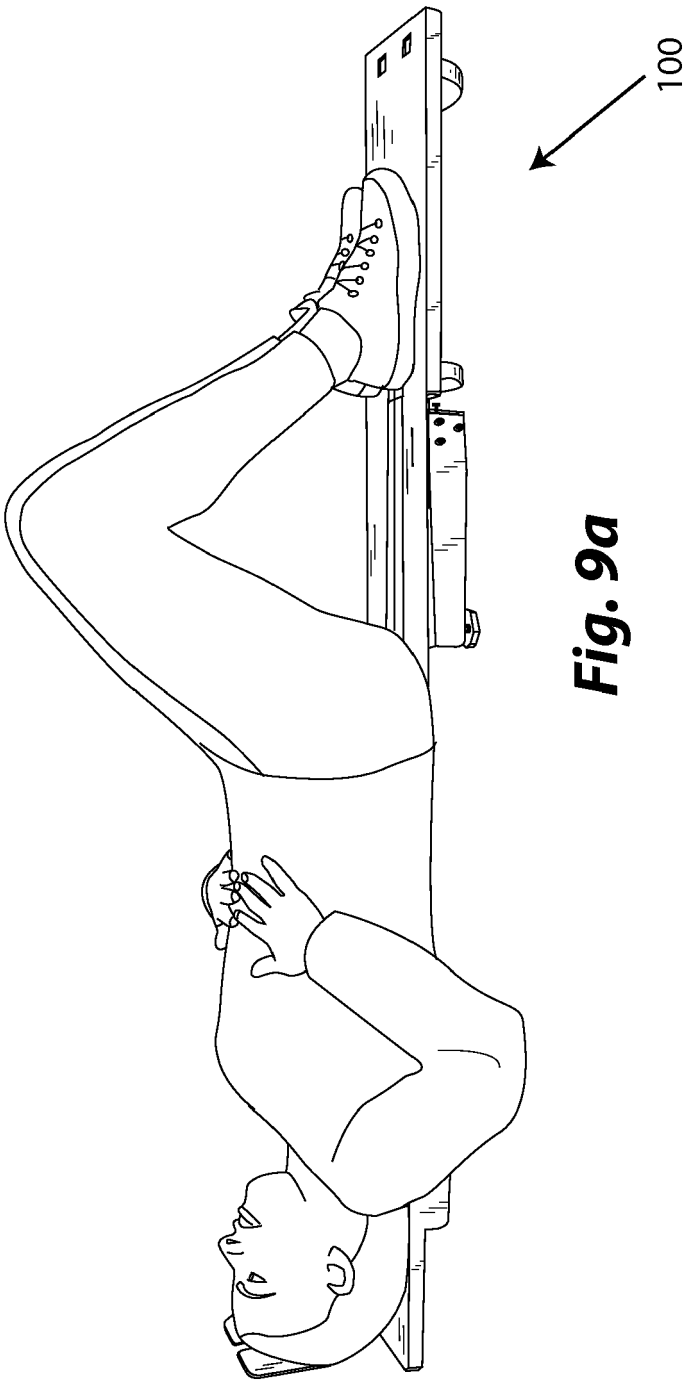

Fig. 9a

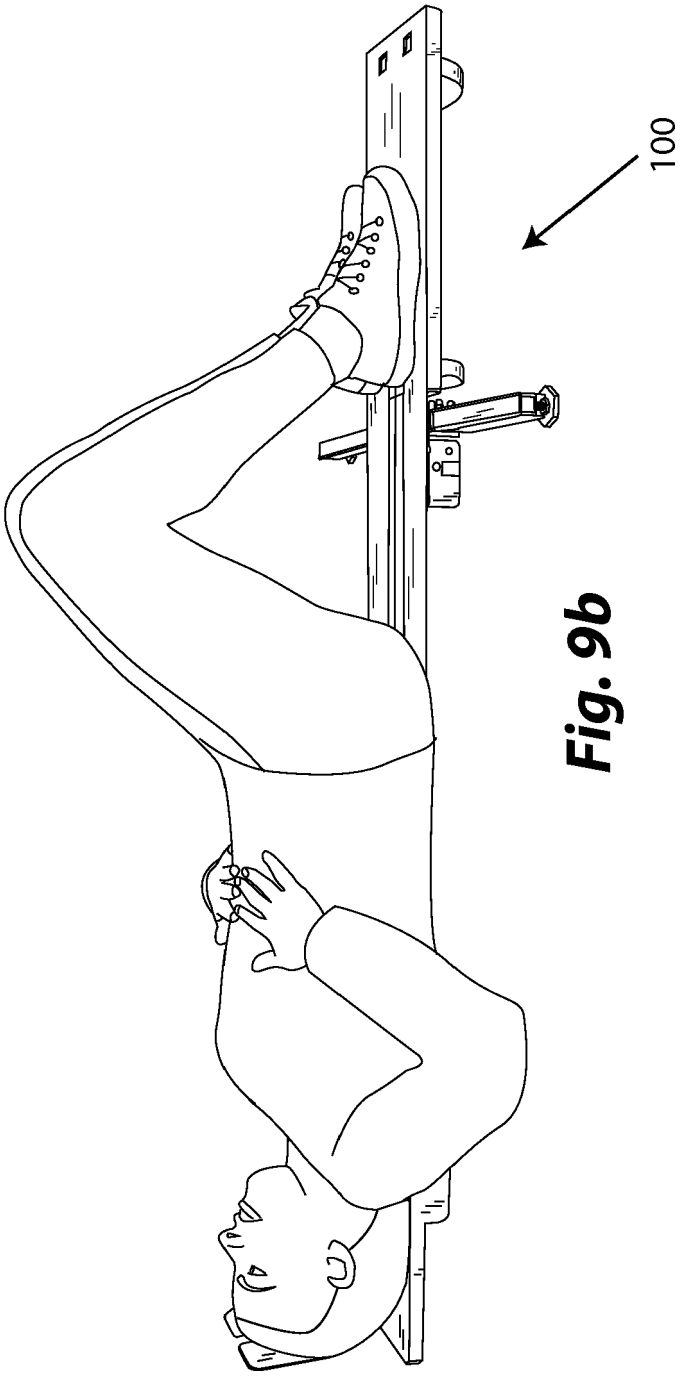

Fig. 9b

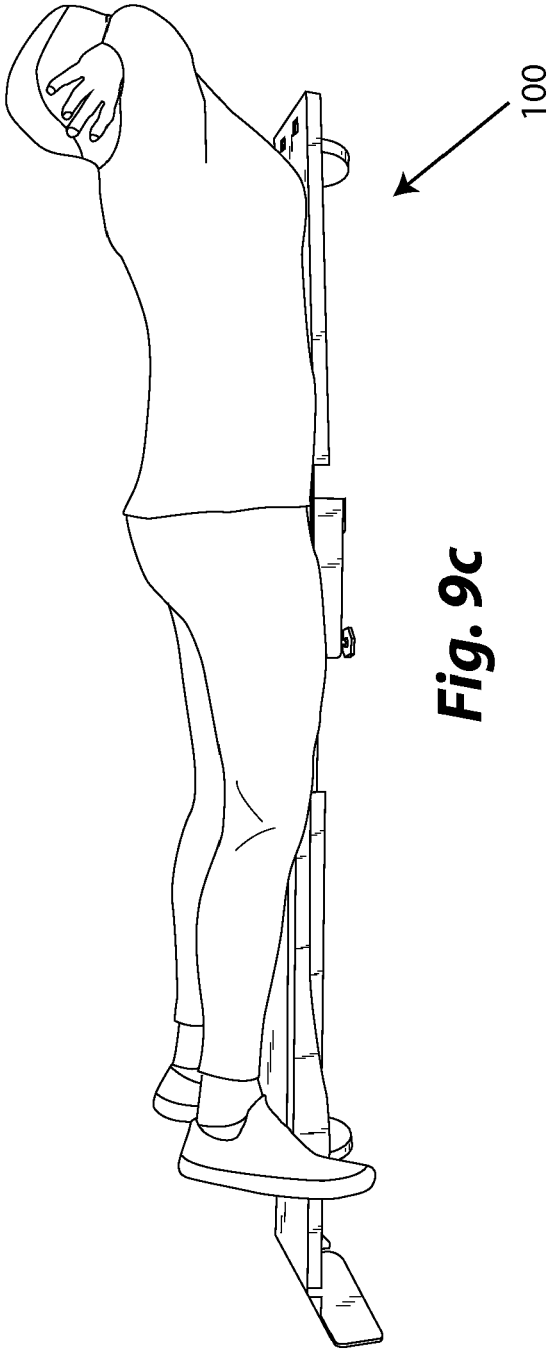

Fig. 9c

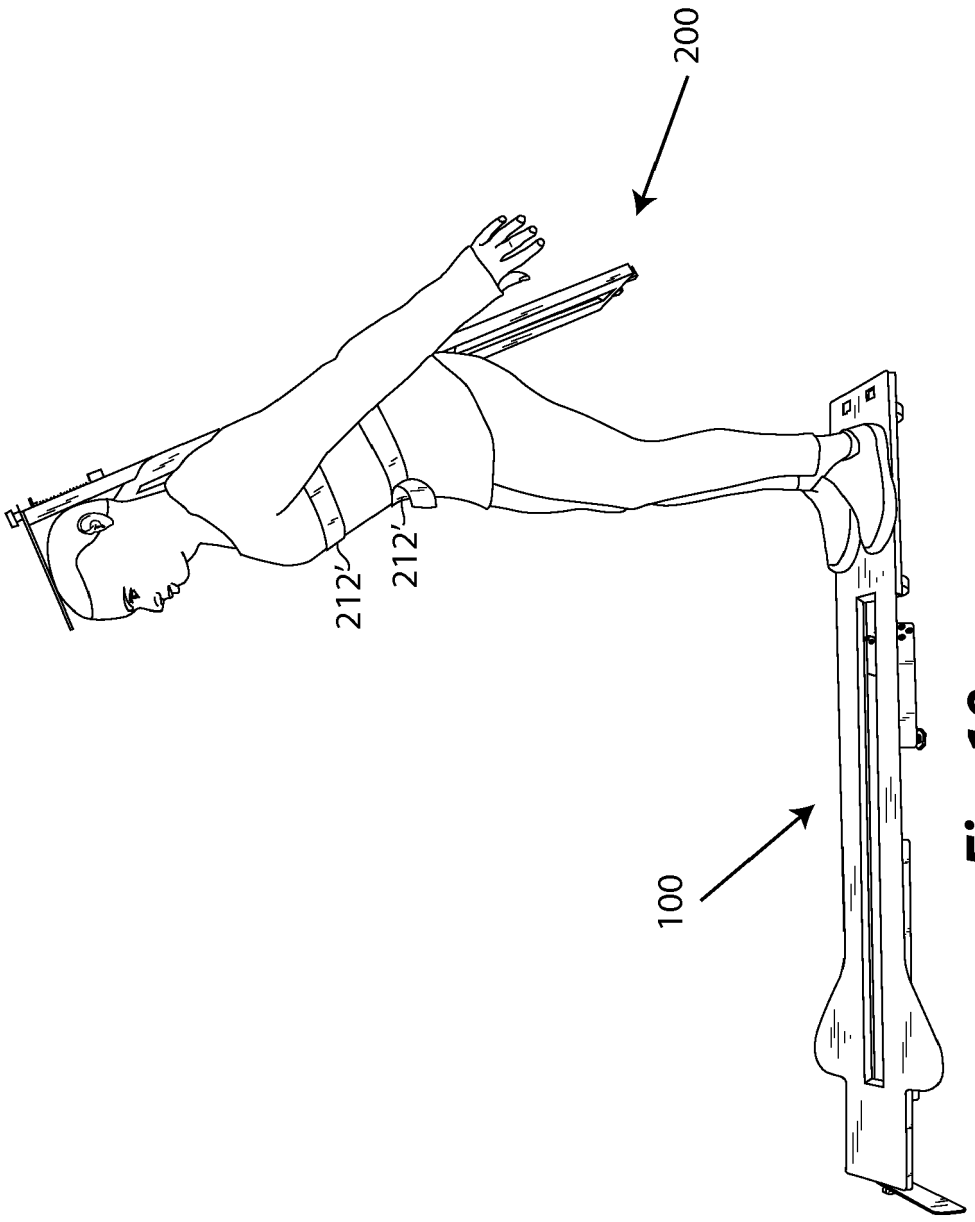

Fig. 10a

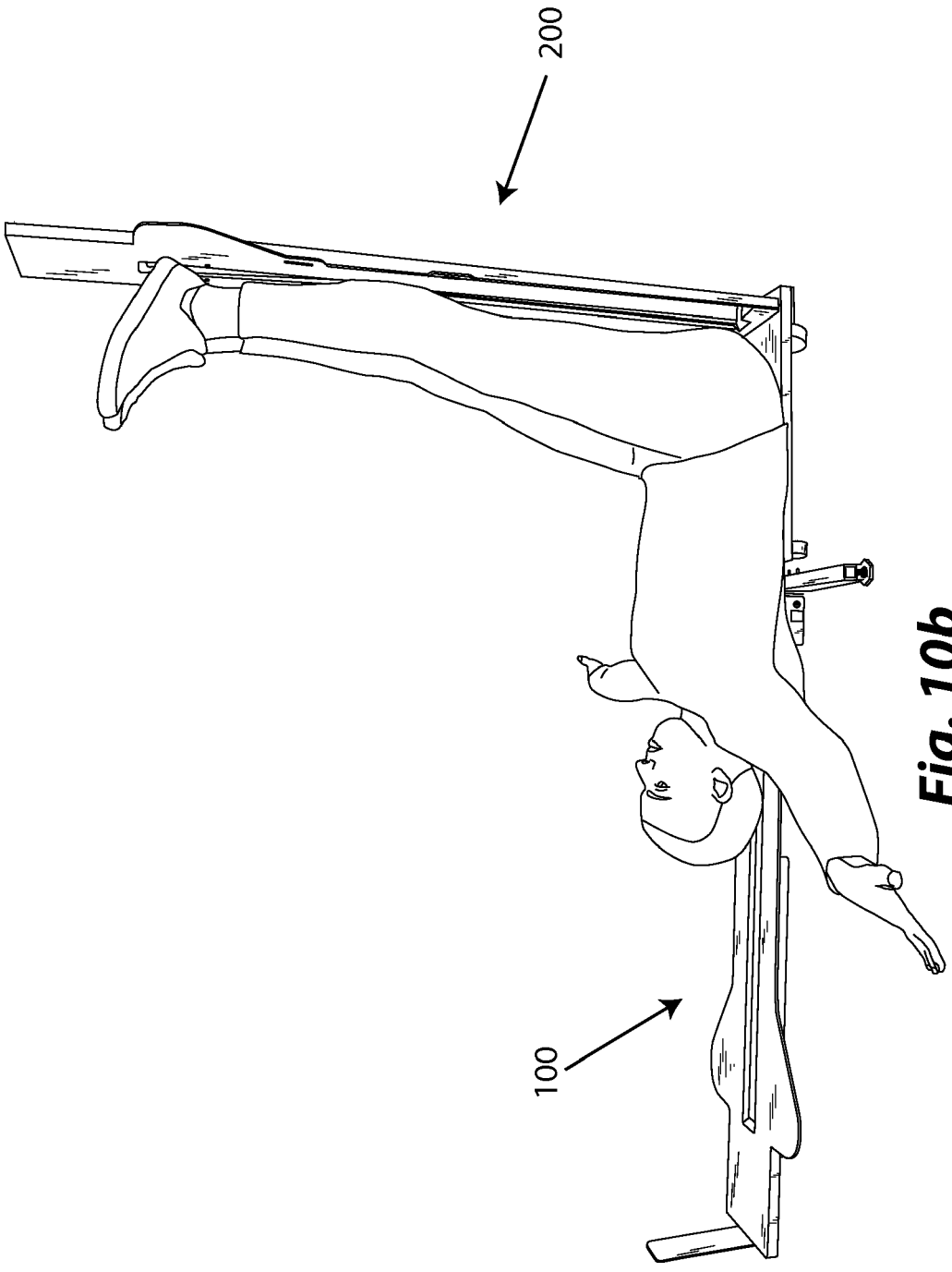

Fig. 10b

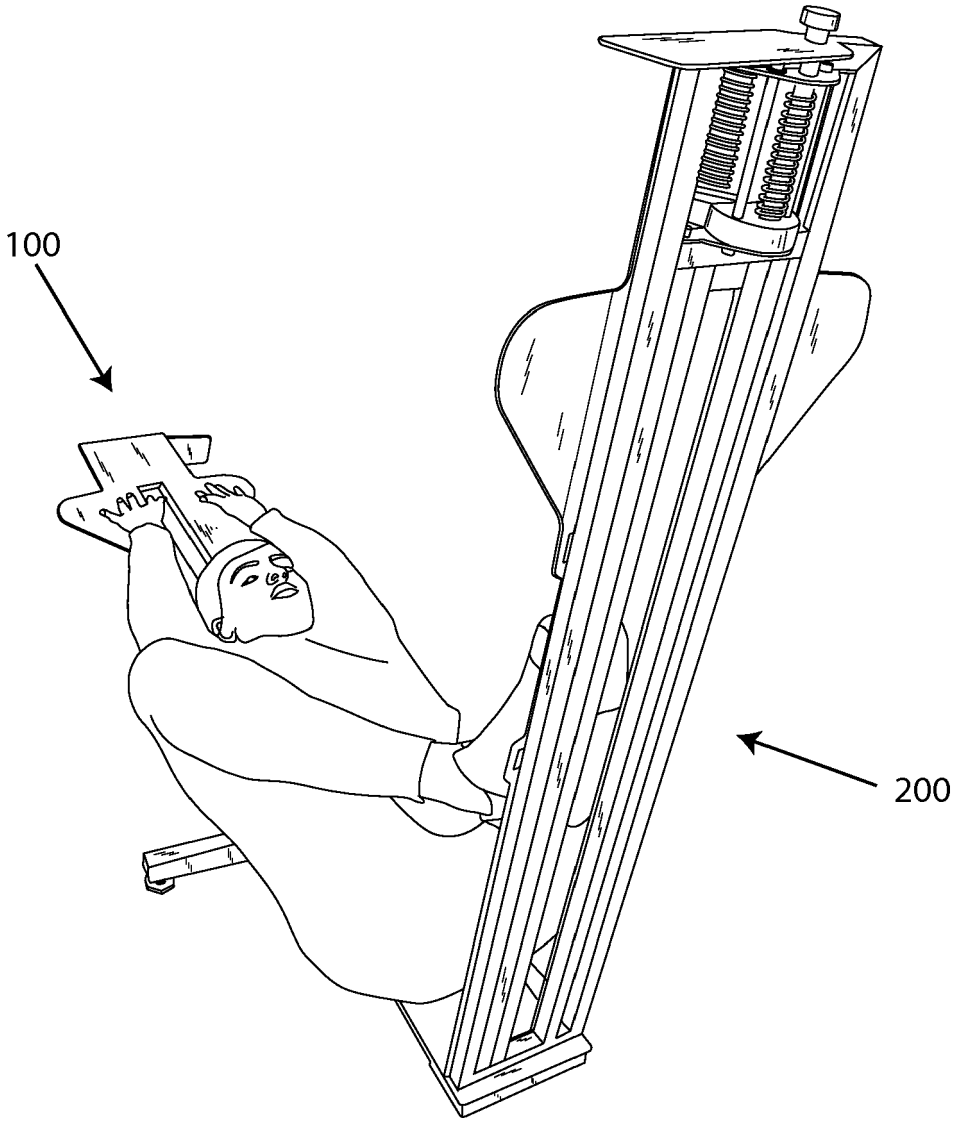

Fig. 10c

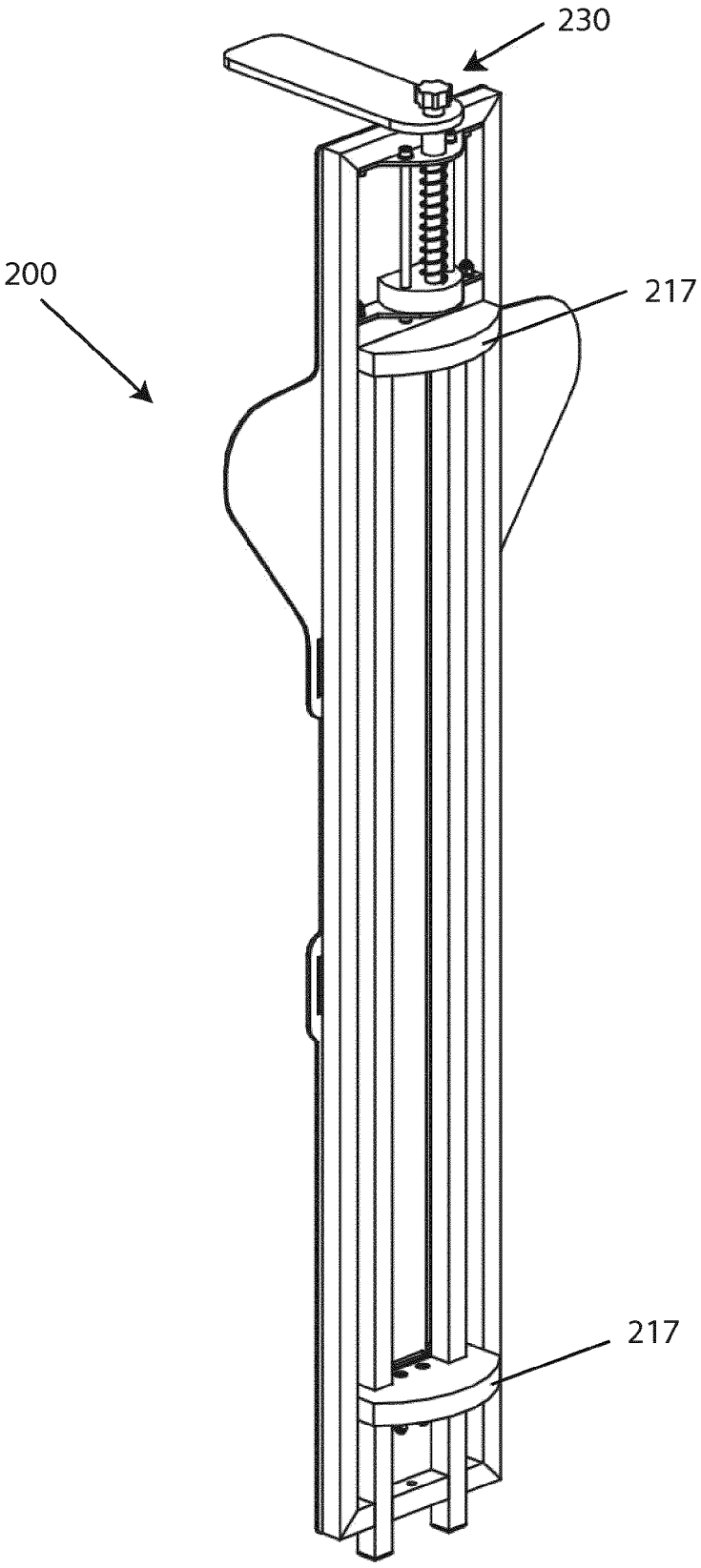

Fig. 11

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EUROPEAN SEARCH REPORT

Application Number
EP 18 19 1421

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	7 February 2019	Borrás González, E

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