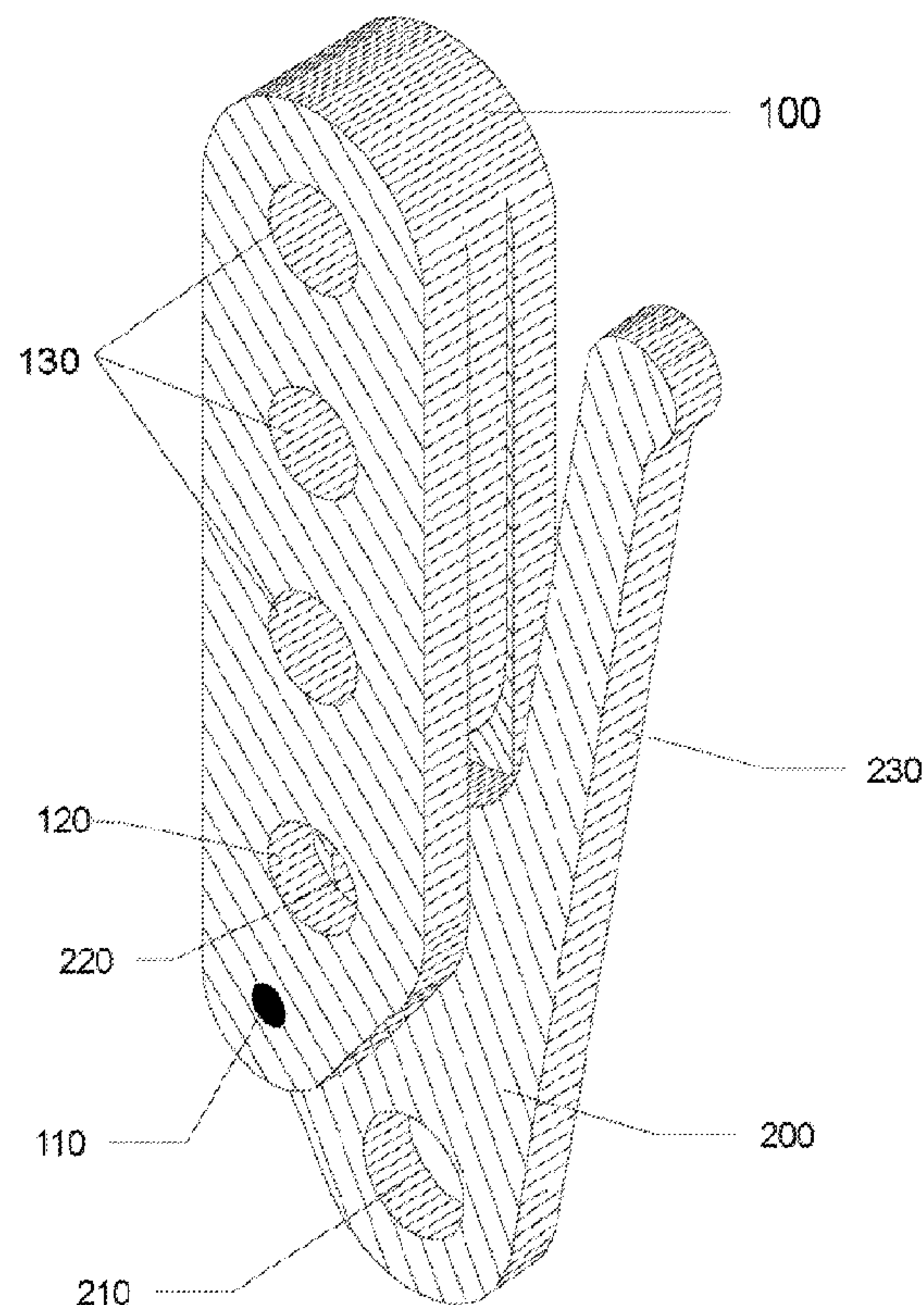




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(54) Titre : DISPOSITIF DE DESCENTE SUR CORDE COMPACTE AUTOVERROUILLABLE
(54) Title: AUTO-LOCK COMPACT ROPE DESCENT DEVICE



(57) **Abrégé/Abstract:**

A descent control device is disclosed manufactured with a bar having holes for guiding a rope used in descent, and a lever designed to pivot or move relative to the bar and compress the opening of one of the holes. Compressing the opening increases friction and slows or stops descent. Control can be from manually moving the lever or by connecting the lever to the descending weight, thereby automatically moving the lever. Hole and pivot geometry may be altered to provide multiple braking options, accommodate varying ropes, and alter normal operating friction.



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[Continued on next page]

(54) Title: AUTO-LOCK COMPACT ROPE DESCENT DEVICE

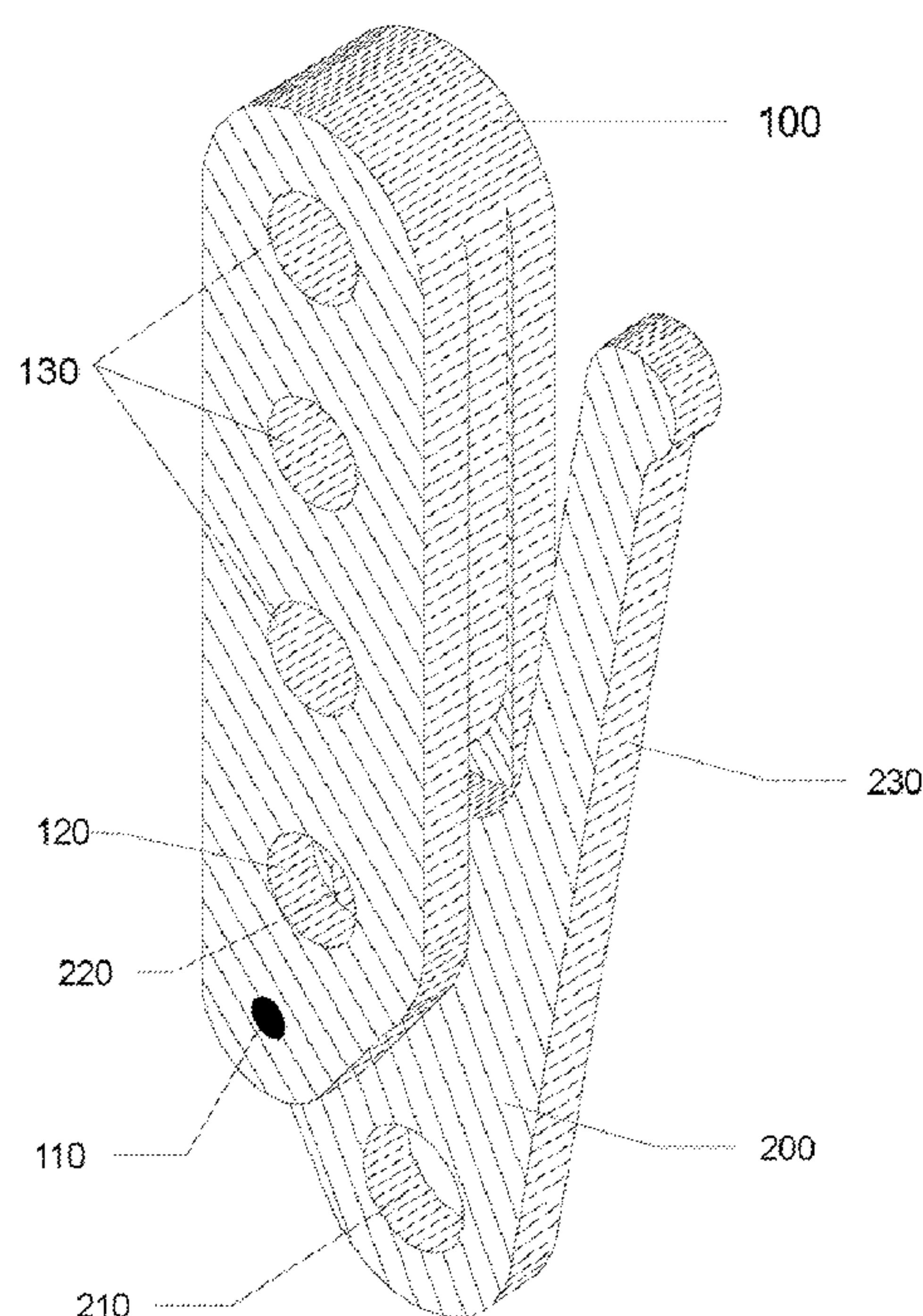


Fig. 6B

(57) Abstract: A descent control device is disclosed manufactured with a bar having holes for guiding a rope used in descent, and a lever designed to pivot or move relative to the bar and compress the opening of one of the holes. Compressing the opening increases friction and slows or stops descent. Control can be from manually moving the lever or by connecting the lever to the descending weight, thereby automatically moving the lever. Hole and pivot geometry may be altered to provide multiple braking options, accommodate varying ropes, and alter normal operating friction.

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Declarations under Rule 4.17:

- as to the identity of the inventor (Rule 4.17(i))
- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

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AUTO-LOCK COMPACT ROPE DESCENT DEVICE

Utility Patent Application

of

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BACKGROUND OF THE INVENTION

Field of the Invention

[0003] This invention relates to descent control devices, and more particularly to devices that control the descent of a person or other load supported by rope or other cable.

[0004] The descent device market is a broad market that encompasses a wide range of devices intended to control the descent of persons or objects on a vertical rope or cable. Such devices vary significantly depending on the specific intended purpose; such purposes include providing a controlled descent of an individual by another (a belay), a solo descent in a sport environment (such as rock climbing or caving), a controlled descent for tactical or rescue purposes, or an emergency egress from a building, tower or other structure. Due to the varying purposes, descent devices range from very simple (merely a carabiner or fixed "figure 8" with a wrap of rope) to quite complex and heavy (e.g. a lever box like a Rollgliss™). Sport market devices are more often light and simple, yet they require significant training to set up and use properly. Industrial versions are often very heavy and complex in order to allow the device to provide a very controlled descent with little input from the operator, including a fail safe "auto-stop" feature which automatically stops the descent if the operator is unable to operate the device (such as due to an accident or incapacity). Recently, emergency descent devices for first responders have become more prevalent, and have attempted to provide pre-rigged, simple devices that can be carried on a firefighter's person at all times in order to allow for emergency egress from buildings. While such devices have borrowed from a variety of existing devices, none has provided all of the simplicity and functionality of the proposed device.

Description of Prior Art

[0005] The original method of lowering oneself to the ground, a body rappel wrapping a rope around one's body, was painful on long and free-hanging drops. In

the old days of fat manila rope it could be tolerated, but as thinner nylon lines came into popular use, the technique has almost disappeared from routine use. Long before the new ropes came into play, people were already looking for a better way to rappel using mechanical devices of various kinds. The basic principle of a rappel or descent device is to provide a friction surface over which a rope passes thereby slowing the descent as the person's potential energy is transferred into heat. In all cases the combination of the friction surface and the perpendicular force exerted on that surface generates the necessary total friction to slow the descent. The force exerted perpendicular to the friction surface has traditionally been provided by curving the rope around the surface and applying "back-tension" exerted on the free end of the rope by the hand of the operator. If the friction surface is limited (such as with a carabiner discussed below), the amount of tension required to be exerted on the free end of the rope can be significant (often causing significant discomfort, if not burning of the rope in ones hand). In order to provide additional friction surface to overcome this requirement, often the rope path is long and sinuous and/or the device applies extra mechanical pressure on the rope as it passes over the surface thereby increasing the friction, and hence the control over the descent. In some methods, cams act against the rope in order to apply such pressure; in other methods, pressure is applied by increasing the length of winding of the path (either by repeated wraps or by increasing the length of the device to extend the surface over which the rope passes). In many cases, the geometry of the device is variable and can be adjusted by the operator by means of a handle or lever. In some devices, the geometry is designed to "auto lock" or "auto stop" the descent when the individual releases the device (such as in an accidental fall or incapacitation).

[0006] There are many categories of modern descent devices:

[0007] Carabiners: the most basic method of controlling one's descent is by means of wrapping a rope around a carabiner or other metal ring, either singly or in combination, using a variety of hitches or other rope arrangements. The control is exerted by varying the backpressure on the rope using a free hand. Occasionally, brake bars are added to a carabiner, which aids in the control. While such devices

are ubiquitous, the method requires proper configuration of a hitch (such as the Munter hitch) and continuous handling of the rope in order to properly control the descent. If the operator fails to control the free hand, the results will be an uncontrolled descent.

[0008] Figure 8's: These are fixed cast or milled devices shaped loosely like the figure "8". As in carabiners, the rope is varyingly threaded through the device in order to provide friction. Figure 8's are small, light and relatively inexpensive, but have the same drawbacks as carabiners in that they require proper rigging and attentive handling.

[0009] Hooks and Horns: This is a broad category of fixed devices including any shaped bar or hook over and around which ropes are snaked or wrapped in order to create friction. Again, similar to figure 8's they are light and relatively inexpensive while requiring a level of skill to operate properly.

[0010] Bobbins: Bobbins are mechanical descenders where the rope path follows an S-shaped path from bottom to top. In general the braking surface consists of two non-rotating bollards fixed to a side plate, with a second pivoting side plate provided to keep the rope from jumping off the other end of the bollards. A third (usually smaller) bollard may be provided. The attachment point for the individual usually attaches to holes in extensions of the two side plates; these holes are aligned when the side plates pivot to the closed position. Examples would be the Petzl SIMPLE or STOP (auto-stop).

[0011] Fixed Multi-bar devices: These devices consist of an arrangement whereby the rope snakes around at least three fixed bars or bollards, often machined out a single piece of metal. An example would be the Whaletail.

[0012] Moving Multi-Bar Devices: Similar to a simple bollard, the rope snakes around at least three bollards, but the geometry is such that the bollards compress against one another thereby increasing friction. The compression is controlled by a

lever or screw, thereby modulating the friction. An example would be the Gemini Rescue Equipment Gemlock. These devices can be quite effective although they are often large and cumbersome.

[0013] Racks: Devices with frames that accept a number of brake bars arranged similar to a ladder, at least some of which can slide on the frame. J-frame racks have an open side; U-frame racks do not. In either case, the rope is snaked around the "rungs" causing a circuitous path and creating friction. Because the bars collapse on themselves, the inherent friction in the device can be quite high, thereby making the amount of "back tension" required to undertake a long controlled descent very manageable.

[0014] Spools: Devices where the rope wraps around a fixed drum. The drum axis can be horizontal or vertical. Friction is varied by varying the number of wraps.

[0015] Lever Boxes: Lever boxes are devices with (1) a body with a complex rope channel milled, cast, or otherwise formed into it, (2) a cover plate, and (3) a lever that allows the rappeller to control the descent, yet automatically stops the descent if the rappeller lets go (an auto-stop feature). The enclosed rope path provides some protection, although it can be a liability in heavy mud. Lever boxes tend to be complex, and the cost of manufacturing is accordingly high. They are also often large and heavy. Examples would be the Petzl Grigri, the Rollgliss and the RIT Rescue and Escape Systems F.I.R.E.-A.L.

[0016] United States Patent 5,131,491 "Descent Controller" (Varner, 07-21-1992) is an example of a variation of a spool type descender, with an alternate ladder capstan also disclosed.

[0017] United States Patent 5,597,052 "Descender" (Rogleja, 01-28-1997) is an example of a bobbin type descender.

[0018] United States Patent 5,850,893 "Self-Locking Descender for a Rope with an Operating Lever" (Petzl, 12-22-1998) is another example of a bobbin type descender covering variations of the Petzl STOP device.

[0019] All of the above devices fall into either the category of simple devices that are extremely limited in their ability to control one's descent without significant training and setup time or complex devices that are either heavy, complicated to operate, expensive to manufacture or susceptible to damage and wear.

BRIEF SUMMARY OF THE INVENTION

[0020] The device consists simply of two pieces: (1) a fixed bar of metal through which several holes have been drilled for passing a rope through and (2) a lever which is fitted into a center slot in the lower portion of the bar longitudinally with its handle protruding from the side. The combined bar and lever have one concentric hole drilled through them for additional passage of the rope. The lever is hinged with the bar and has an attachment point drilled at its bottom end through which a carabiner or other attachment device is threaded. The attachment point is offset from the hinge point and the concentric hole thereby providing torque to open the lever when the device is weighted by the rappeller. To operate the device, a rope is threaded through the bar, passing from one hole back through the next. Finally the rope is threaded through the concentric hole in the bar and lever. While the rope is attached to a fixed point from which a descent is desired, the rappeller is attached to the attachment point on the lever by means of a carabiner or other hardware. The weight of the operator opens the lever, thereby squeezing the rope in the bottom hole between the sides of the bar and the lever in a scissors action, increasing the friction throughout the device. By relieving the pressure on the lever by squeezing the bar and lever combination, the operator can control the descent of the device. In the event that the operator fails to operate the device or is unable to do so due to incapacity, the device automatically locks off and stops the descent.

Features and Advantages

[0021] **Simplicity:** the device consists of only two pieces (plus hinge pin) with no moving part other than the lever. There are no springs or other elements, such as covers or locking pins, to maintain and replace if worn out. This dramatically simplifies manufacture.

[0022] **Reliability:** Often devices are dragged through the mud, and the resulting grit and grime contaminate sensitive bearings, cams, and locks such that the devices fail to operate properly. Because of the essentially fixed nature of the device's main

bearing surfaces (simply holes drilled through a solid bar), the device is reliable and easy to maintain. The specific contour of the holes (which have quarter-round edges back to back) allows the rope to travel in a smooth path. The rope path is external and visible and mud and grit are easily washed off and the condition of the path capable of being visibly confirmed. In this respect it is similar to a fixed bar device, although with a lever control and auto-stop feature.

[0023] **Obvious and simple operation:** other descent devices are sometimes extremely complex in the way they need to be set up. This device is intuitive in its operation, with the threading of the device obvious to the user. While some devices can be opened to allow for attachment to a rope without threading from the end, this feature often complicates the device and confuses the operator. Some lever box devices are pinned shut by the manufacturer in order to not allow users to thread the device in the field, requiring them to return them to the factory.

[0024] **Compact:** because of its simple construction, the device is light and small. Since the rope's path is linear along the axis of the device, the device need not be much wider than the width of the rope being used. In addition, when the lever is in the squeezed position, the lever nests conveniently alongside the device, allowing the device to stow compactly in a carrying bag along with a pre-rigged rope.

[0025] **Flexible:** Since varying demands require different amounts of friction (e.g. depending on the weight of the operator or the stiffness or size of the rope being used), the device can be rigged in varying ways: for example, if a slower, more controlled descent is desired or if the rope being utilized is thin or flexible, the rope can be passed through all of the holes. However, if the load is lighter (e.g. a small, light firefighter) or a stiffer or thicker rope is being used, the device can be rigged without using all of the holes.

[0026] **Multiple Permutations:** By varying during manufacture the exact geometry of the lever, specifically its offset relationship between the attachment point, rope

hole, hinge pin and lever angle, the device may be made to perform in a wide variety of different environments and manners.

In some embodiments of the present invention, there is provided a descent control device, consisting of:

three connected singular pieces;

the first singular piece comprising a bar of a width to be gripped by one hand, the bar having:

a plurality path holes fully through the bar from one exposed side to another exposed side, the a plurality path holes aligned approximately linear and defining a rope path, each path hole having a rounded surface edge;

a rope control hole fully through the bar, the rope control hole positioned towards an end of the bar and aligned approximately linear with the three path holes;

a horizontal slot in a side of the bar, the horizontal slot encompassing the control hole; and

a hinge hole;

the second singular piece comprising a lever connected to the bar at the hinge hole, the lever having:

an attachment hole for connecting to an external load; and

a constricting hole fully through the lever from one exposed side to another exposed side;

the third singular piece comprising a hinge pin pivotally connecting the lever to the bar at the hinge hole such that the lever moves on a plane perpendicular to a plane defined by the path holes through the bar;

wherein the lever fits into the slot of the bar such that when fully closed against the bar, and without interfering with the path holes, the constricting hole of the lever overlaps with the control hole of the bar creating an open path through the control hole and path holes for a rope, and when fully open away

from the bar the constricting hole is moved away from alignment with the control hole therein constricting the rope path; and

wherein applying force at the attachment hole in a direction away from the bar will pivot the lever away from the bar, thereby constricting the passage of a rope through the space formed by the control hole and the constricting hole.

In some embodiments of the present invention, there is provided a descent control device, comprising:

a bar of a width to be gripped by one hand, the bar having

a plurality of path holes defining a rope path, the path holes aligned approximately linear;

a rope control hole, the rope control hole positioned towards an end of the bar and aligned approximately linear with the plurality of path holes;

a horizontal slot in a side of the bar, the horizontal slot encompassing the control hole; and

a hinge hole;

a lever pivotally connected to the bar at the hinge hole through a hinge pin, the lever having

an attachment hole; and

a constricting hole;

wherein the lever fits into the slot of the bar such that both when fully closed against the bar and when fully open away from the bar the constricting hole of the lever is moved away from alignment with the control hole of the bar therein constricting the rope path, and at a point in between fully open and fully closed the constricting hole overlaps with the control hole creating an open path through the control hole; and

wherein applying force at the attachment hole in a direction away from the bar assists with pivoting the lever towards either fully open away from the bar or fully closed against the bar, thereby easing control by constricting the passage of a rope through the space formed by the control hole and the constricting hole.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] In the drawings, closely related figures and items have the same number but different alphabetic suffixes.

[0028] **FIG. 1a** is a front view of the bar.

[0029] **FIG. 1b** is a side view of the bar with a rope threaded through it.

[0030] **FIG. 2a** is a front view of the lever.

[0031] **FIG. 2b** is a side view of the lever.

[0032] **FIG. 3a** is a front of the device in a fully open position.

[0033] **FIG. 3b** is a front view of the device in a closed position.

[0034] **FIG. 4a** is a front view of the device, configured in a double brake style, in a clenched closed position.

[0035] **FIG. 4b** is a front view of the device, configured in a double brake style, in a fully open position.

[0036] **FIG 4c** is a front view of the device, configured in a double brake style, in an unclenched closed position.

[0037] **FIG. 5a** is a front view of the device, configured with a slotted hinge hole, in a fully open position.

[0038] **FIG. 5b** is a front view of the device, configured with a slotted hinge hole, in an increased friction position.

[0039] **FIG. 5c** is a front view of the device, configured with a slotted hinge hole, in a closed position.

[0040] **FIG. 6a** is a three dimensional perspective view of the device in a clenched position.

[0041] **FIG. 6b** is a three dimensional perspective view of the device in an unclenched position.

[0042] **FIG. 7a** is a front view of the device with an alternate attachment hole showing direction of force from an attached load while configured in a double brake style, in a clenched closed position.

[0043] **FIG 7b** is a front view of the device with an alternate attachment hole showing direction of force from an attached load while configured in a double brake style, in an unclenched closed position.

DETAILED DESCRIPTION OF THE INVENTION, INCLUDING THE PREFERRED EMBODIMENT

Terminology

[0044] The terminology and definitions of the prior art are not necessarily consistent with the terminology and definitions of the current invention. Where there is a conflict, the following definitions apply.

[0045] **“Load”** means the individual who is rappelling with the device or other object being lowered that is attached.

[0046] **“Hinge” or “Hinge Pin”** means a rod, pin, bolt or other item that acts as a pivot point and connects the bar and lever to form the device.

[0047] **“Rope”** means a rope, cable, or other linear tension device made of any material, including metal or natural or synthetic fiber.

Operation

[0048] In the following detailed description of the invention, reference is made to the accompanying drawings which form a part hereof, and in which are shown, by way of illustration, specific embodiments in which the invention may be practiced. It is to be understood that other embodiments may be used, and structural changes may be made without departing from the scope of the present invention.

[0049] Referring to **FIGs. 1a, 1b, 2a, 2b, 3a & 3b**, the invention consists of two pieces through which a rope may be threaded and to which a rappeller or other load may be attached with a carabiner or other hardware. The pieces consist of bar **100** and lever **200**. In a preferred embodiment, Lever **200** may be fitted into slot **140** in bar **100**. Lever **200** and bar **100** may be pivotally connected together at one corner, for example with hinge pin **110**. Bar **100** and lever **200** also may be pivotally joined but oriented alternatively, such as on different planes.

[0050] Bar **100** may contain one or more rope path holes **130** drilled through bar **100**. In a preferred embodiment the holes are arranged in a line to simplify use and configuration of the device and avoid entanglement possibilities. Alternative non-linear hole alignments may be desirable to allow alternate shapes and sizes of bar **100**. The surface edge of each hole may be rounded such that the holes increase from a minimum diameter at a central depth in bar **100** to a maximum diameter at the surface of bar **100**. This curvature to the edging of holes **130**, coupled with the spacing of the holes, enables rope **150** to travel in a smooth approximately circular path as the rope exits and enters bar **100** when passed back and forth through holes **130**. The number of holes and their size may be varied depending on the weight of the load and the stiffness, surface friction characteristics, and size of the rope used in the device and the resulting performance desired. At the lower end of bar **100**, an additional rope control hole **120**, aligned with and having a rounded edge similar to holes **130**, may be drilled. If bar **100** and lever **200** are configured in alternative alignments, rope control hole **120** also may be configured in alternative alignment so that control hole **120** aligns with a constricting mechanism of lever **200**. The length and width of bar **100** need only be sufficient to support the drilled holes and connecting hinge pin **110**. The top of bar **100** may be smoothed and curved to avoid snagging the rope during operation, and the width at the bottom of bar **100** may be minimized to accommodate hinge pin **110**. Alternate widths, lengths, and shape of bar **100** may be made to accommodate gripping the device or for any aesthetic purpose.

[0051] Perpendicular to hole **120**, and laterally in the center of bar **100**, slot **140** may be cut into bar **100** and may extend from the bottom of bar **100** upwards beyond hole **120** towards but not to holes **130**. Slot **140** may separate bar **100** into two exterior bars **160**, with hole **120** passing through both exterior bars. Slot **140** may be left out in order to allow operation in alternative configuration including pivot of lever **200** in a non-parallel direction.

[0052] In a preferred embodiment, lever **200** may consist of a plate of thickness slightly less than the depth of slot **140** and of width slightly greater than the width of bar **100**. Lever **200** may nest within slot **140** with a portion of lever **200** extending outside the length of bar **100** and forming handle **230** for lever **200**. An additional portion of lever **200** may extend below bar **100** and enclose attachment hole **210**, to which a load may be attached by means of a carabiner or other attachment hardware. Constriction hole **220** may be drilled in lever **200** such that when bar **100** and lever **200** are assembled lever **200** may be rotated such that hole **220** and hole **120** are approximately concentric. Rotation of lever **200** may be enabled by hinged connection to bar **100**. For example, hinge pin **110** may connect lever **200** to bar **100** to enable such rotation. In one embodiment rotation on hinge pin **110** to concentric alignment of hole **220** with hole **120** further positions lever **200** such that handle **230** may align parallel to holes **130**. In alternate configurations including operation without slot **140**, lever **200** may be any desired thickness and width.

[0053] To utilize the device, rope **150** may be passed through the device in a path defined by the holes in bar **100**. The operator may utilize all of the holes **130** or less than all depending on the desired performance. Increasing the number of holes utilized increase friction on rope **150** during descent operation, enabling controlled descents of greater weight loads. In addition to utilizing holes **130**, and to enable full stop functionality of the device, the rope may be threaded through concentric holes **120** and **220**.

[0054] In a standard use embodiment, the rope entering holes **130** may attach to a fixed point or otherwise be secured at the top of a descent, and the load may be attached to attachment hole **210**. As the load is applied at attachment hole **210**, lever **200** may pivot on hinge pin **110**, thereby causing holes **120** and **220** to diverge laterally and the resulting opening to diminish. As lever **200** fits between exterior bars **160**, lever **200** may act as a middle bar pressing rope **150** between exterior bars **160**. This resulting scissors action may squeeze rope **150** and increase the friction at hole **120**. The resulting backtension on the rope may also increase the

friction at holes **130**. In alternate configurations, lever **200** may close a constricting mechanism on pivot, thereby increasing friction and squeezing rope **150**.

[0055] The operator may modulate the friction in hole **120**, and thereby the total friction in the device, by squeezing handle **230** of lever **200** in varying amounts. In addition, the total friction may be modulated by the operator using a free hand to apply back tension on rope **150** extending out of the device from holes **120** and **220**, similar to the method used to brake a descent with many other devices. Operation may consist of a combination of the two methods, with one hand operating lever **200** and the other retaining control of the free end of rope **150**.

[0056] The specific geometry of the device, namely the sizes of holes **130**, **120** and **220**, and the relative locations of hinge pin **110**, holes **120** and **220**, and attachment hole **210** may be varied to create alternate embodiments providing specific characteristics for the performance of the device depending on the desired load and the characteristics of the rope being utilized.

[0057] In a preferred embodiment, the device may be configured to provide an auto-stop feature whereby failure by the operator to squeeze lever **200** allows lever **200** to rotate under load until the opening between holes **120** and **220** is reduced sufficiently to cause enough friction in the device to decelerate the load to a full stop. This feature may be desirable in multiple situations, including, but not limited to, in emergency egress or other situations when a rappeller is unable to hold onto the rope with either hand as both hands are used to maneuver the operator out of a window or other situation. In such a situation the device may automatically lock off and prevent the rappeller from rapidly descending. Once out of the window or other similar situation, the rappeller may then squeeze lever **200** as desired to control the descent.

[0058] An alternative method of operation of the device may be to use it as a belay device. The device may be inverted and attachment hole **210** may be attached to a fixed point or to the belaying operator. The rope exiting from holes **130** may be

attached to the individual or other load being lowered. By squeezing lever **200**, rope **150** may be played out through the device, thereby lowering the load.

[0059] In an example embodiment that works with 1/2" and smaller rope and includes an auto-stop, bar **100** may be manufactured such that three holes **130** and rope control hole **120** may each have a minimum 1/2" diameter and curve to a maximum diameter of 1". Holes **130** may be spaced in a row with one inch between centers, with the center of each hole approximately 5/8" from both edges of bar **100**. Hole **120** may be aligned with holes **130** and positioned with 1 1/8" between the center of hole **120** and the center of the lowest of the three holes **130**. Hinge pin **110** may be aligned with its center approximately 3/4" below the center of hole **120** and approximately 3/8" from the edge of bar **100**. Lever **200** may be manufactured with a maximum width of 1 11/16" when aligned such that constricting hole **220** is approximately concentric with hole **120** and lever **200** is connected to bar **100** by hinge pin **110**. Constricting hole **120** may have a 1/2" diameter. Attachment hole **210** may have a 5/8" diameter. The center of attachment hole **210** may be aligned approximately 1 1/4" below the center of hole **220**, and approximately 1 1/16" from the edge of lever **200**. Lever **200** may be angled below hinge pin **110** and curved around attachment hole **210** to minimize size. Handle **230** may extend along the length of bar **100**, with the length of handle **230** approximately 3 3/8" from the center of hole **220**. Handle **230** may have a rounded top for gripping and control purposes.

Other Embodiments

[0060] As will also be apparent to those skilled in the art, the device may also be made with lever geometry that may, in addition to automatically stopping the descent when the operator fails to squeeze the lever (i.e. fully "open"), also stop the descent if the operator were to panic and squeezes the lever frantically (i.e. fully "closed"). Referring to **FIGs. 4a, 4b & 4c**, by manufacturing handle **230** on lever **200** at a wide angle, the holes **120** and **220** may squeeze the rope when either the handle is released, as in **FIG. 4c**, or when the lever is fully squeezed (such as might result in a panicked response), as in **FIG. 4a**. The rope may pass through

concentric holes **120** and **220** when lever **200** is in a neutral position approximately midway between fully open and fully closed, as in **FIG. 4b**. This geometry allows holes **120** and **220** to diverge in either direction.

[0061] Referring also to **FIGs. 5a, 5b & 5c**, in another embodiment lever **200** may be attached with variable hinge geometry by means of slotted hinge hole **500**. Slotted hinge hole **500** may allow lever **200** to slip linearly versus bar **100** without rotation so that even with handle **230** on lever **200** fully squeezed, holes **120** and **220** are no longer fully concentric, as shown in **FIG. 5b**. This would allow the amount of friction with handle **230** on lever **200** being fully squeezed to be varied, further depending on rope size and length of slotted hinge hole **500**, to provide a base level of friction. Further operation of handle **230**, as shown in **FIG. 5c**, such as rotating under the load attached to point **210**, may increase the friction, ultimately to the point of stopping the load. If minimum friction in the device is desired, the operator may fully squeeze lever **200** while simultaneously pulling the device toward attachment hole **210**. This will push lever **200** back into bar **100** and fully open holes **120** and **220** to minimize friction. This method of operation may be useful in minimizing friction in the device in situations such as, but not limited to, a horizontal egress situation prior to exiting a building vertically.

[0062] Referring also to **FIGs. 7a & 7b**, attachment hole **710** may be configured as an elongated hole or in alternative shapes so that the direction of force applied by an attached load may shift as lever **200** is opened or closed. Such shifting may allow the force to assist fully closing or fully opening lever **200**, or otherwise affect ease of controlling lever **200**.

[0063] Alternative embodiments may further alter the connection between bar **100** and lever **200**. The connection between bar and lever may be non-pivotal, such as engaging a constriction mechanism when slid together or pulled apart.

[0064] In order to meet National Fire Protection Association (NFPA) standards as an escape device, the device may be made of materials such that, when assembled, it may withstand loads in excess of 13.5 kilonewtons. Production to withstand lesser force may also be done to create the device for use in non-emergency lesser load situations.

[0065] The scope of the claims should not be limited by the preferred embodiments set forth in the examples, but should be given the broadest interpretation consistent with the description as a whole.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A descent control device, consisting of:

three connected singular pieces;

the first singular piece comprising a bar of a width to be gripped by one hand, the bar having:

a plurality path holes fully through the bar from one exposed side to another exposed side, the a plurality path holes aligned approximately linear and defining a rope path, each path hole having a rounded surface edge;

a rope control hole fully through the bar, the rope control hole positioned towards an end of the bar and aligned approximately linear with the three path holes;

a horizontal slot in a side of the bar, the horizontal slot encompassing the control hole; and

a hinge hole;

the second singular piece comprising a lever connected to the bar at the hinge hole, the lever having:

an attachment hole for connecting to an external load; and

a constricting hole fully through the lever from one exposed side to another exposed side;

the third singular piece comprising a hinge pin pivotally connecting the lever to the bar at the hinge hole such that the lever moves on a plane perpendicular to a plane defined by the path holes through the bar;

wherein the lever fits into the slot of the bar such that when fully closed against the bar, and without interfering with the path holes, the constricting hole of the lever overlaps with the control hole of the bar creating an open path through the control hole and path holes for a rope, and when fully open away

from the bar the constricting hole is moved away from alignment with the control hole therein constricting the rope path; and

wherein applying force at the attachment hole in a direction away from the bar will pivot the lever away from the bar, thereby constricting the passage of a rope through the space formed by the control hole and the constricting hole.

2. The descent control device of claim 1, wherein a surface edge of each hole is rounded.

3. The descent control device of claim 1 or 2, wherein the hinge hole comprises a slotted hinge hole.

4. A descent control device, comprising:

a bar of a width to be gripped by one hand, the bar having

a plurality of path holes defining a rope path, the path holes aligned approximately linear;

a rope control hole, the rope control hole positioned towards an end of the bar and aligned approximately linear with the plurality of path holes;

a horizontal slot in a side of the bar, the horizontal slot encompassing the control hole; and

a hinge hole;

a lever pivotally connected to the bar at the hinge hole through a hinge pin, the lever having

an attachment hole; and

a constricting hole;

wherein the lever fits into the slot of the bar such that both when fully closed against the bar and when fully open away from the bar the constricting hole of the lever is moved away from alignment with the control hole of the bar therein constricting the rope path, and at a point in between fully open and fully

closed the constricting hole overlaps with the control hole creating an open path through the control hole; and

wherein applying force at the attachment hole in a direction away from the bar assists with pivoting the lever towards either fully open away from the bar or fully closed against the bar, thereby easing control by constricting the passage of a rope through the space formed by the control hole and the constricting hole.

5. The descent control device of claim 4, wherein there are three path holes.
6. The descent control device of claim 4 or 5, wherein a surface edge of each hole is rounded.
7. The descent control device of any one of claims 4 to 6, wherein the hinge hole comprises a slotted hinge.

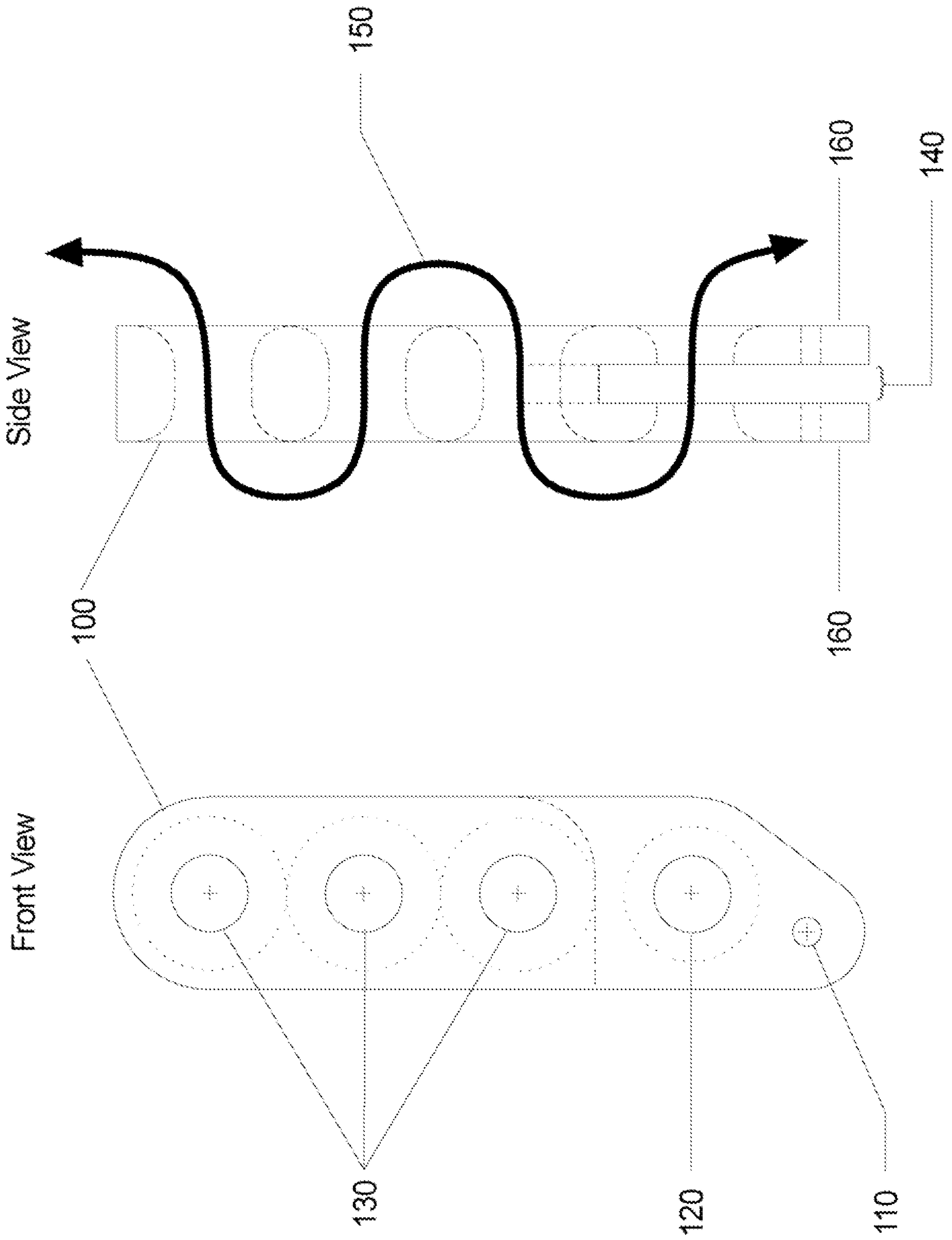


Fig. 1B

Fig. 1A

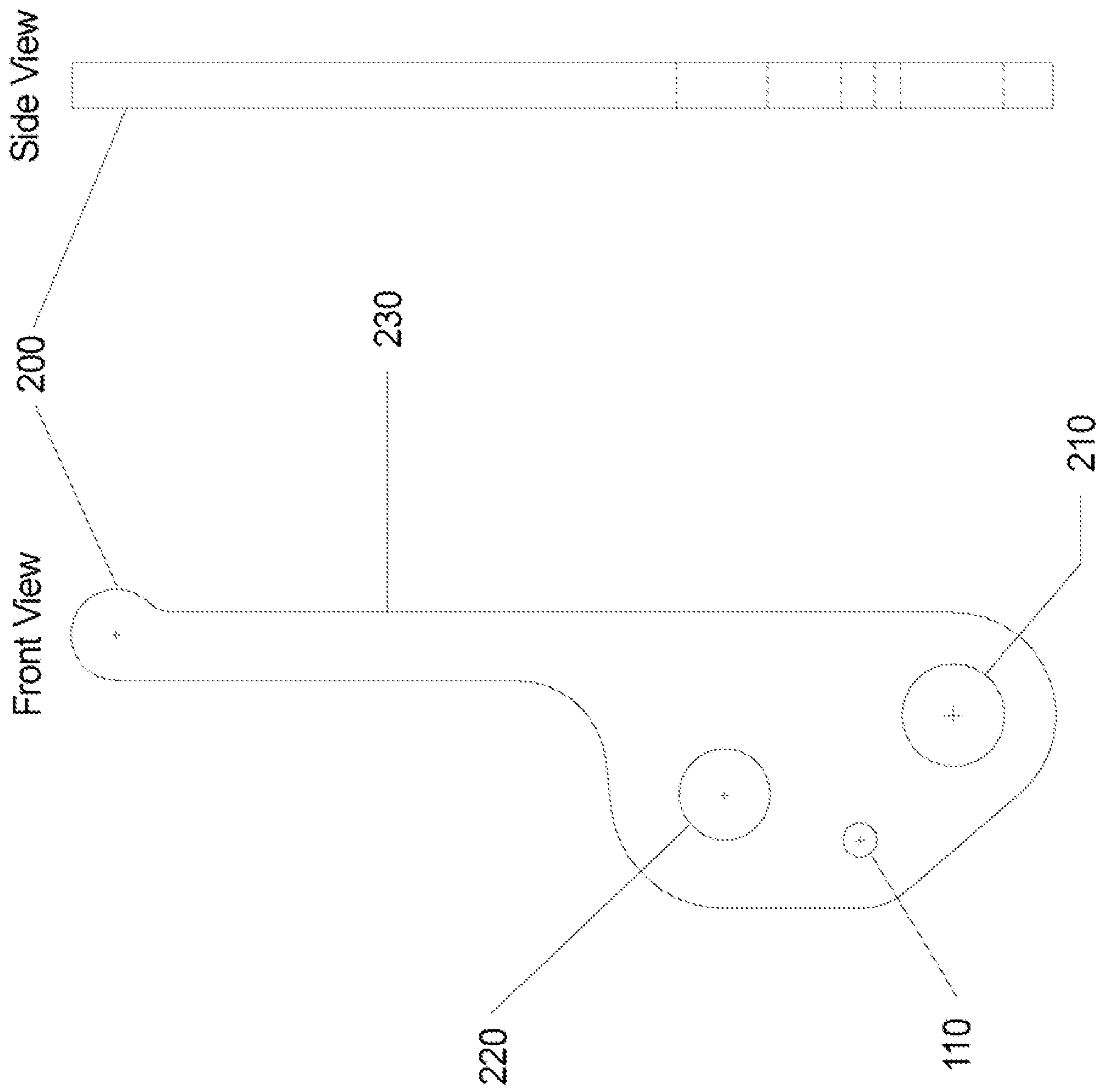


Fig. 2B

Fig. 2A

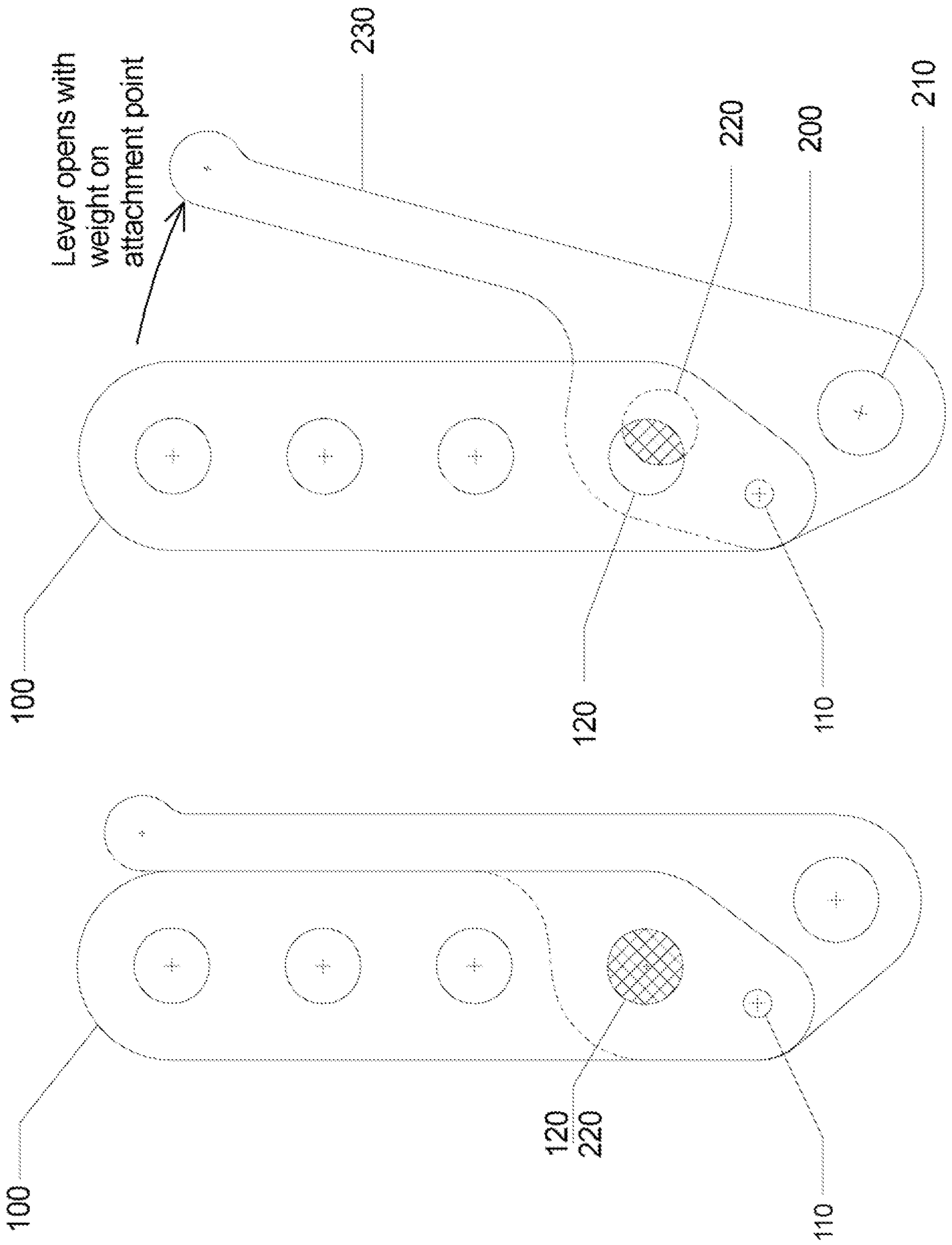


Fig. 3B

Fig. 3A

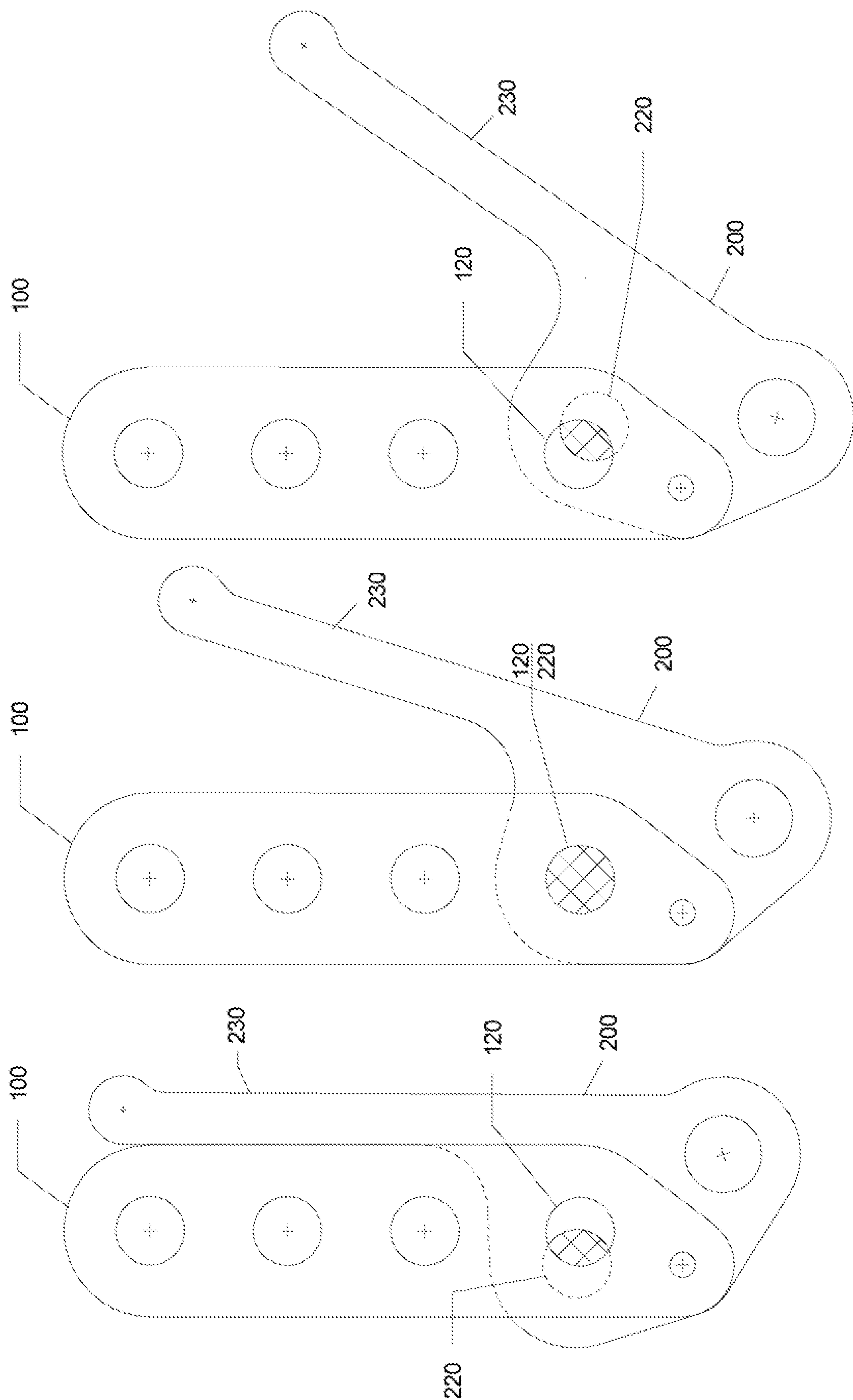
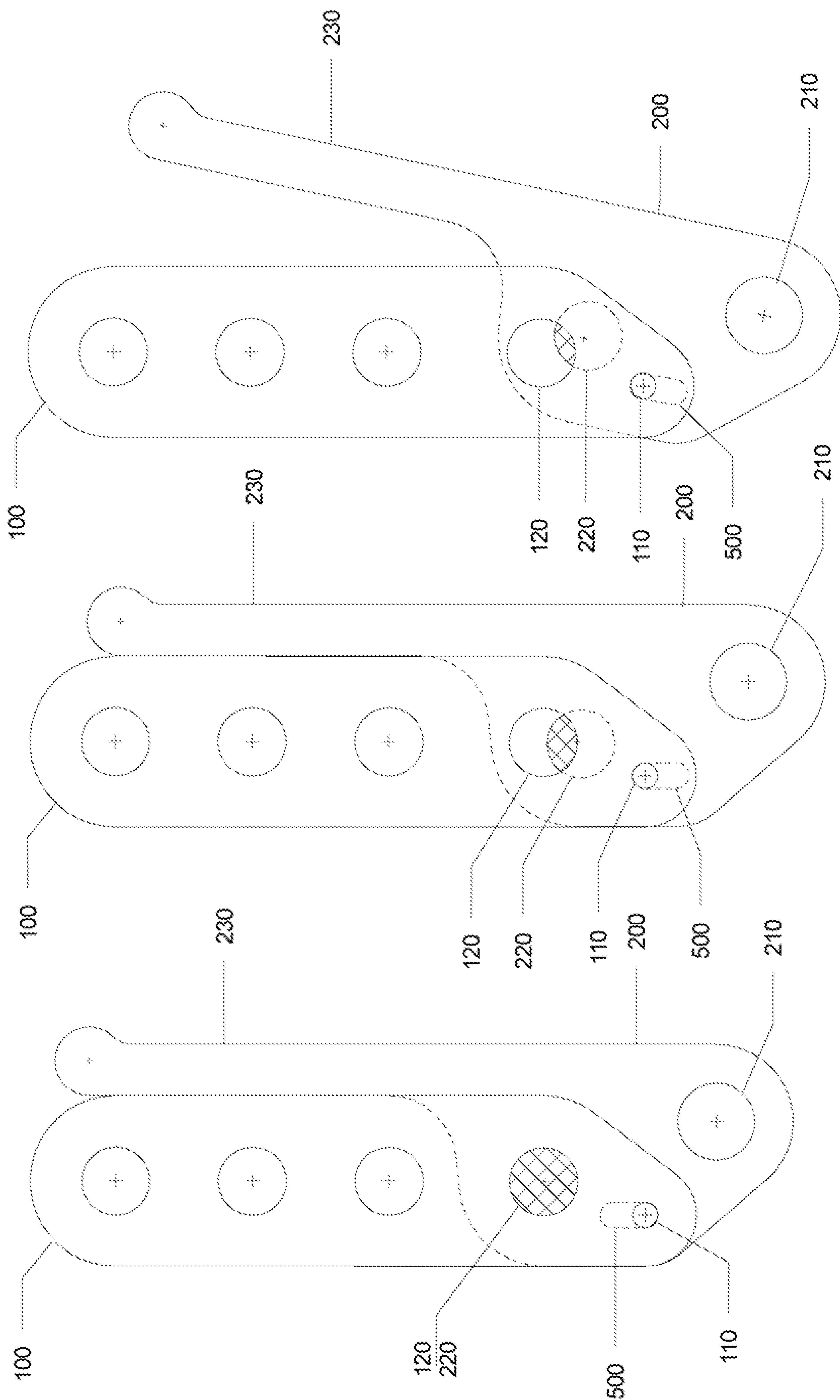
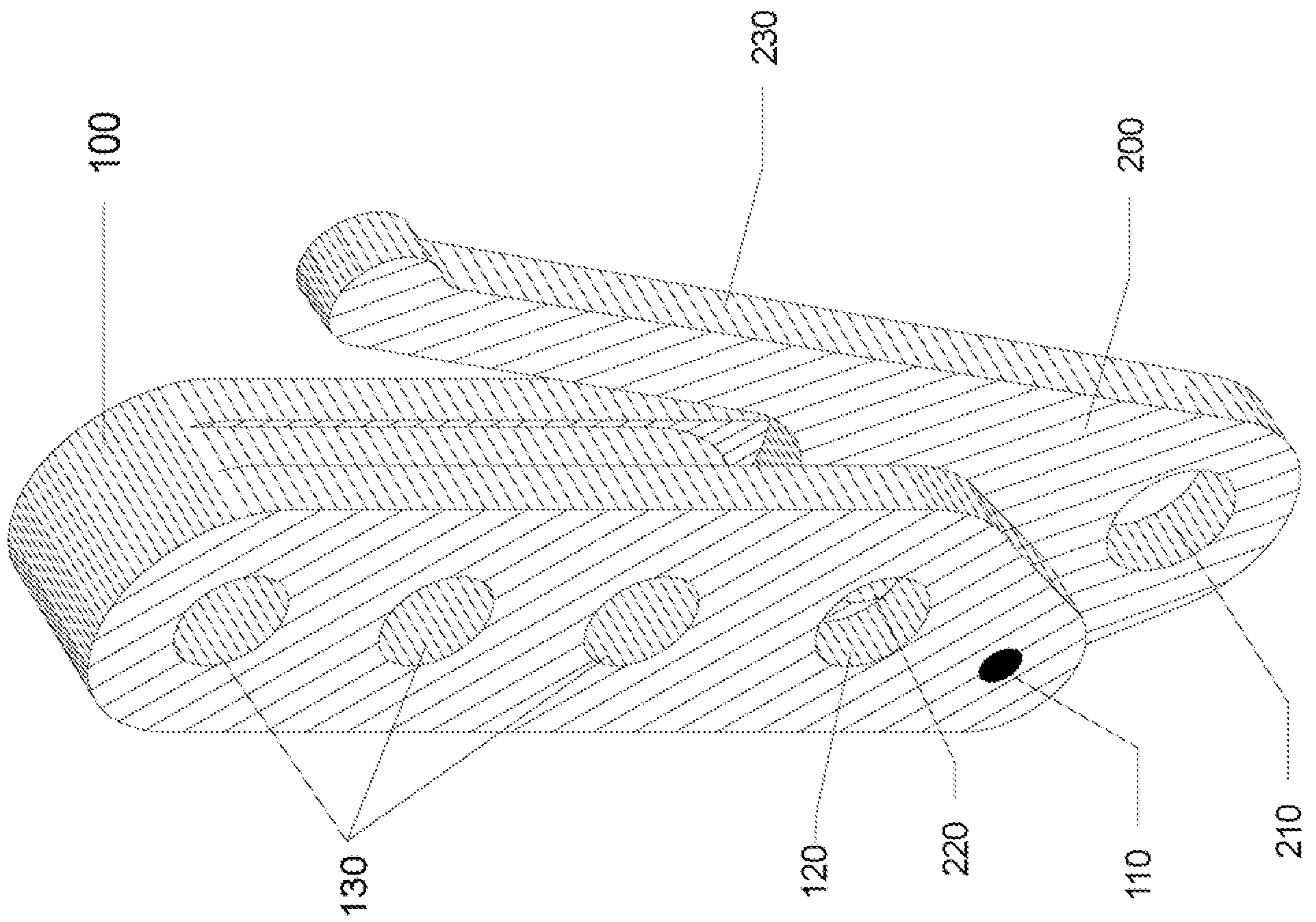
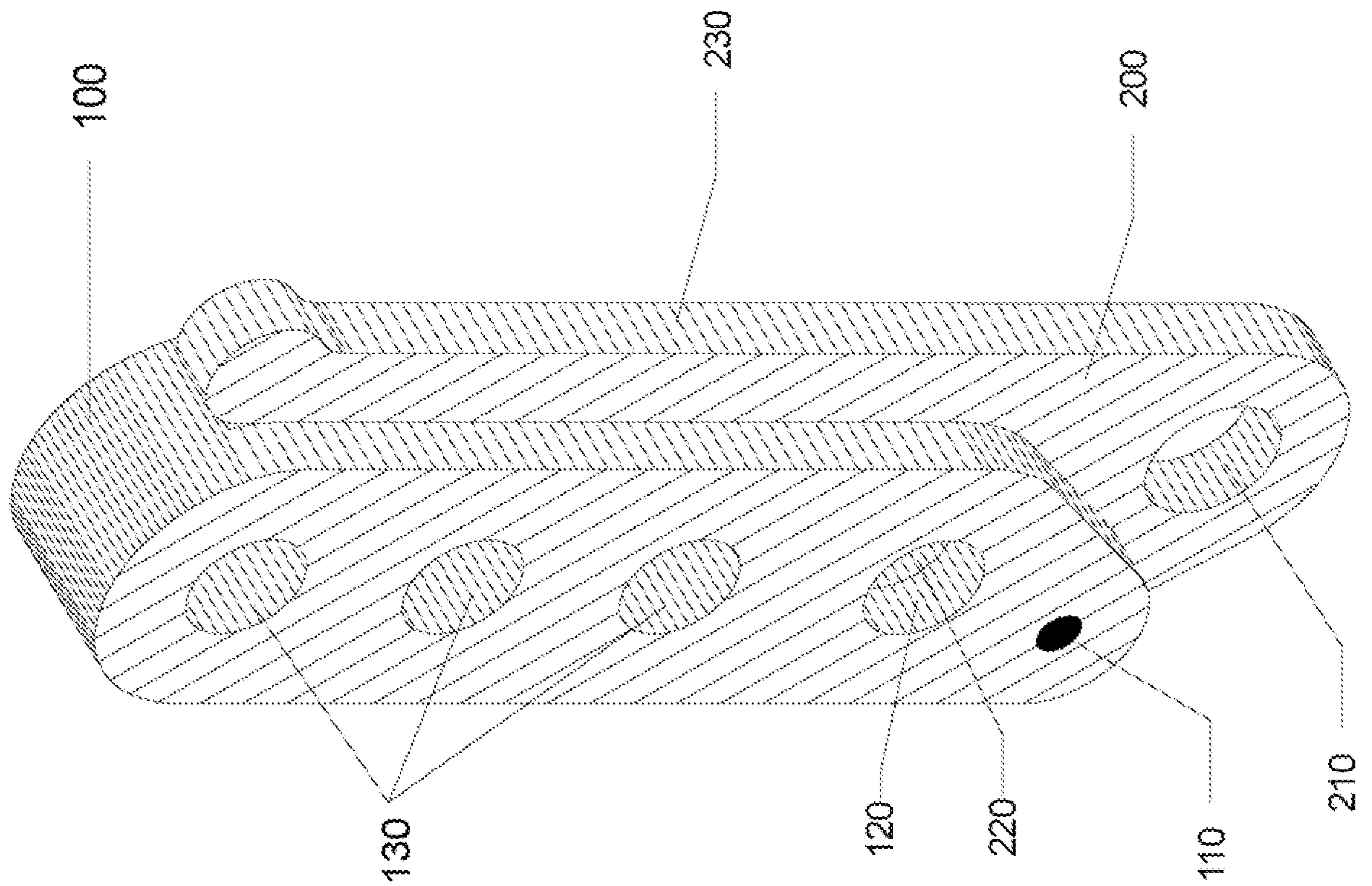


Fig. 4C

Fig. 4B

Fig. 4A

**Fig. 5A****Fig. 5B****Fig. 5C**

**Fig. 6B****Fig. 6A**

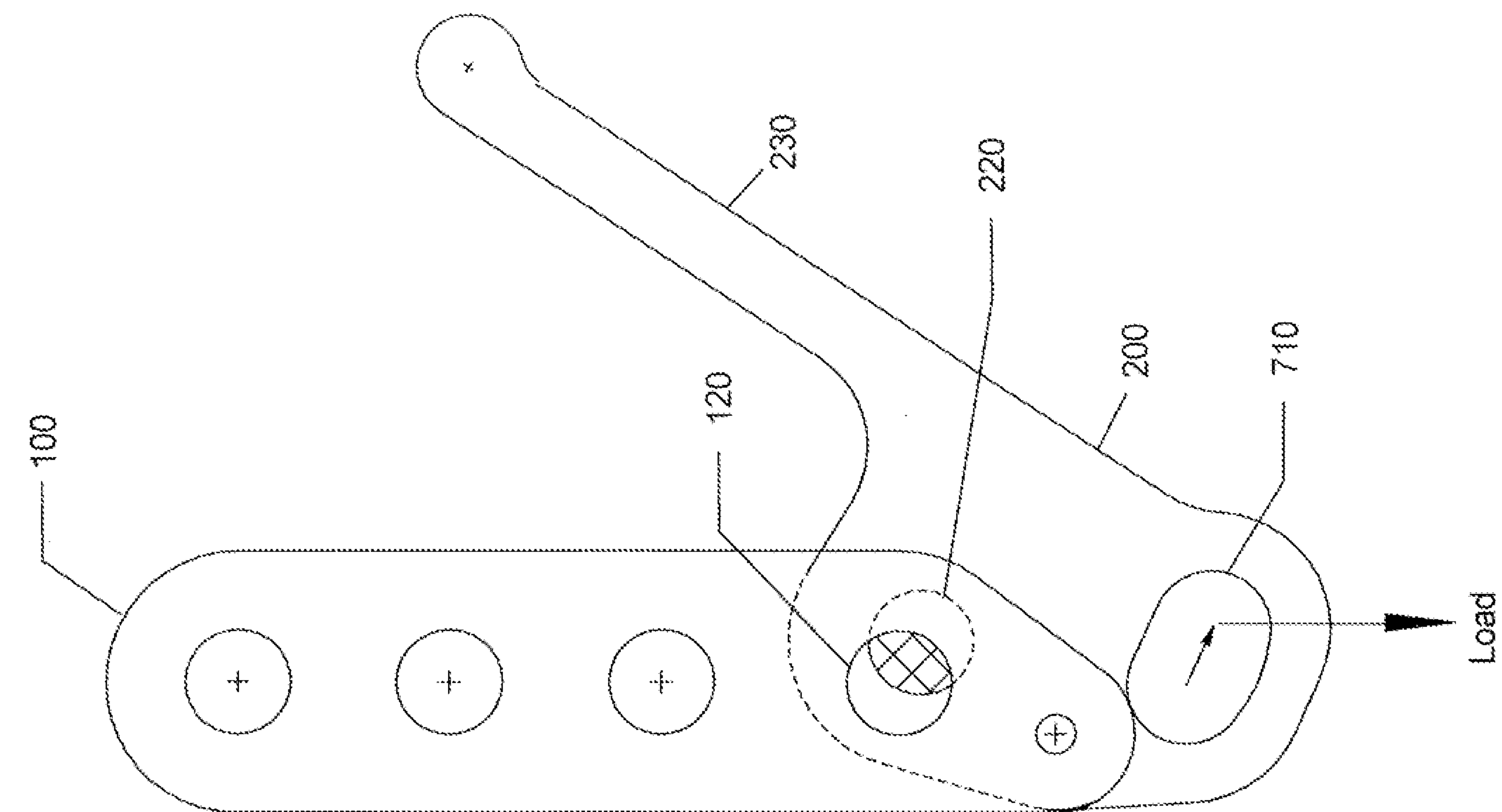


Fig. 7A

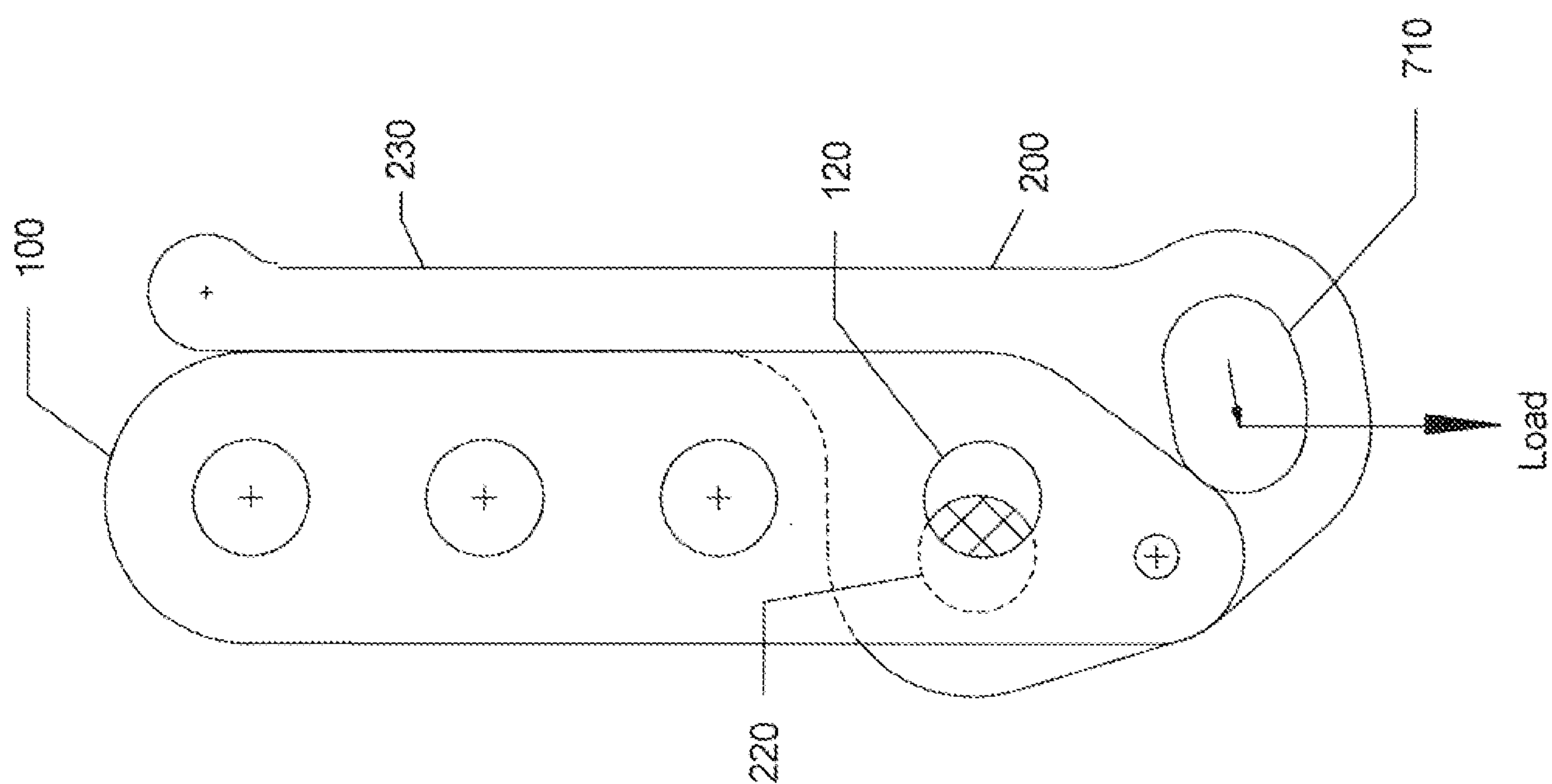


Fig. 7B

