US011813496B2

(12) **United States Patent**
Villarreal, III

(10) **Patent No.: US 11,813,496 B2**
(45) **Date of Patent: Nov. 14, 2023**

(54) **LOWER LEG AND ANKLE REHABILITATION AND EXERCISER**

(71) Applicant: **Santos Villarreal, III**, McAllen, TX (US)

(72) Inventor: **Santos Villarreal, III**, McAllen, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **17/446,157**

(22) Filed: **Aug. 26, 2021**

(65) **Prior Publication Data**

US 2023/0072184 A1 Mar. 9, 2023

(51) **Int. Cl.**
A63B 21/00 (2006.01)
A63B 21/055 (2006.01)
A63B 21/04 (2006.01)

(52) **U.S. Cl.**
CPC ***A63B 21/4013*** (2015.10); ***A63B 21/0407*** (2013.01); ***A63B 21/0552*** (2013.01); ***A63B 21/0555*** (2013.01); ***A63B 21/0557*** (2013.01); ***A63B 21/4025*** (2015.10); ***A63B 21/4034*** (2015.10); *A63B 21/4015* (2015.10)

(58) **Field of Classification Search**
CPC A63B 21/00061; A63B 21/0442; A63B 21/0552; A63B 21/0555; A63B 21/0557; A63B 21/4013; A63B 21/4015; A63B 21/4025; A63B 21/4034; A63B 21/00047; A63B 21/00178; A63B 21/0407; A63B 2023/006
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,215,508	A	6/1993	Bastow	
5,645,516	A	7/1997	Foster	
5,891,002	A	4/1999	Maki	
6,110,078	A	8/2000	Dyer	
6,283,897	B1	9/2001	Patton	
7,322,914	B1 *	1/2008	Vittone	A63B 23/025 482/146
7,666,126	B2 *	2/2010	Rempe	A63B 26/003 482/121
9,744,397	B2 *	8/2017	Pagano	A63B 21/0557
10,183,194	B1 *	1/2019	Louis	A63B 21/023
10,434,365	B2	10/2019	Mack	
11,052,275	B1	7/2021	Garick	
2002/0193210	A1	12/2002	Turner	
2012/0138113	A1 *	6/2012	Spinabella	A47B 97/00 108/50.14

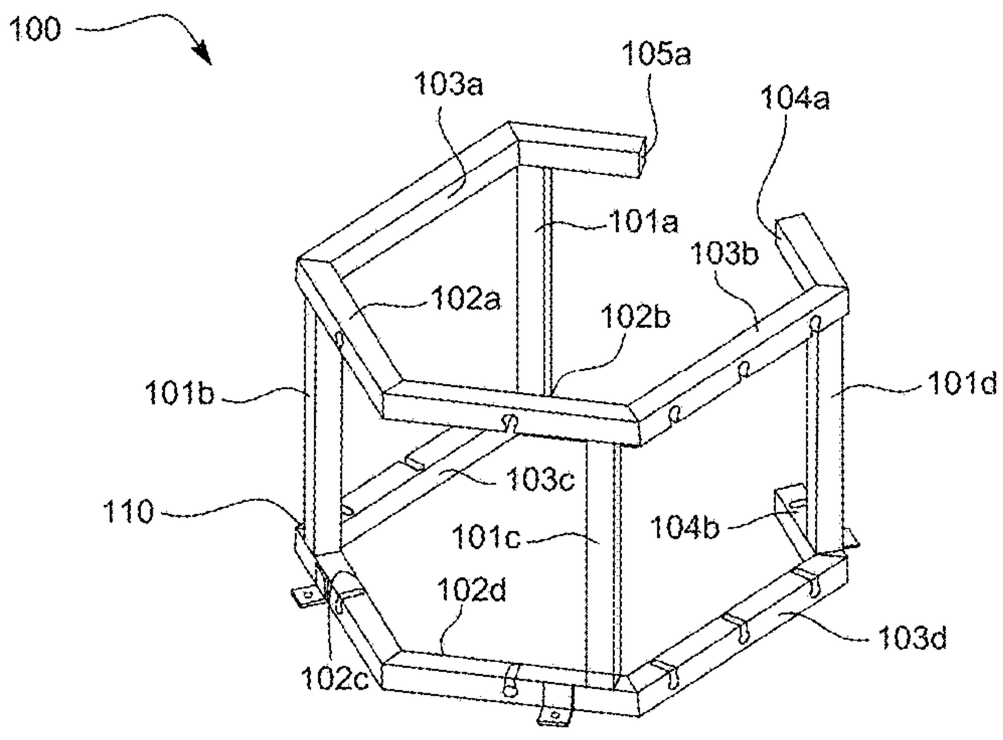
* cited by examiner

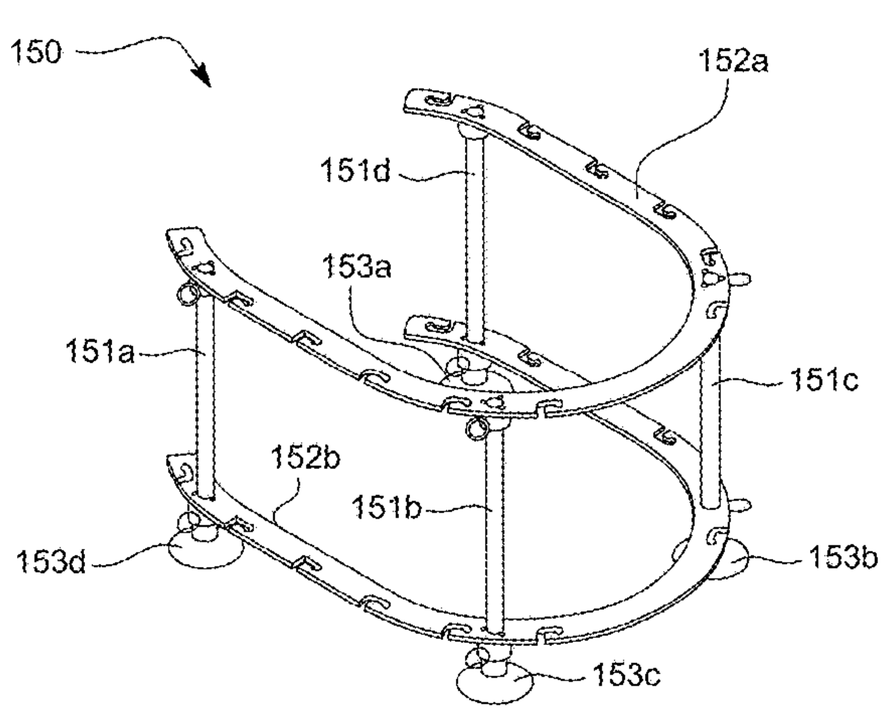
Primary Examiner — Megan Anderson

(57) **ABSTRACT**

An article of manufacture for providing a lower leg and Achilles tendon exercise device according to the present invention, the exercise device includes a top frame structure having a first plurality of connection hooks about its perimeter, a bottom frame structure oriented in parallel to the top frame structure having a second plurality of hooks about its perimeter, a plurality of vertical support members coupled between the top frame structure and the bottom frame structure, a shoe support member having a plurality of connection hooks positioned about an outer edge, and a plurality of stretchable cords configured to couple the shoe support member to the top frame structure and the bottom frame structure, the stretchable cords coupled to the top frame structure position the shoe support member above the bottom support structure.

15 Claims, 17 Drawing Sheets





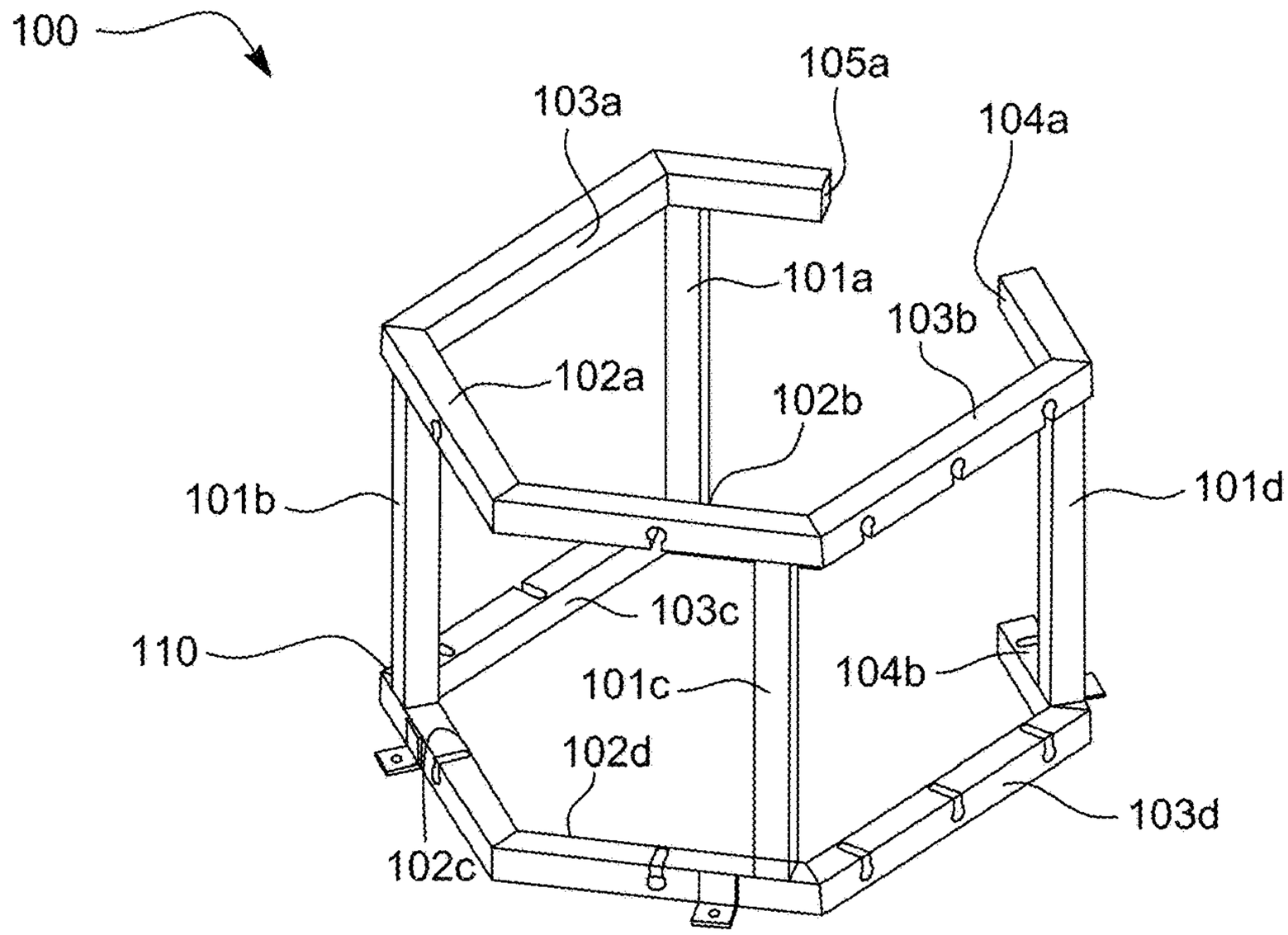

100
105a
103a
104a
101a
103b
102a
102b
101b
101d
103c
110
101c
104b
102d
103d
102c

FIG. 1a

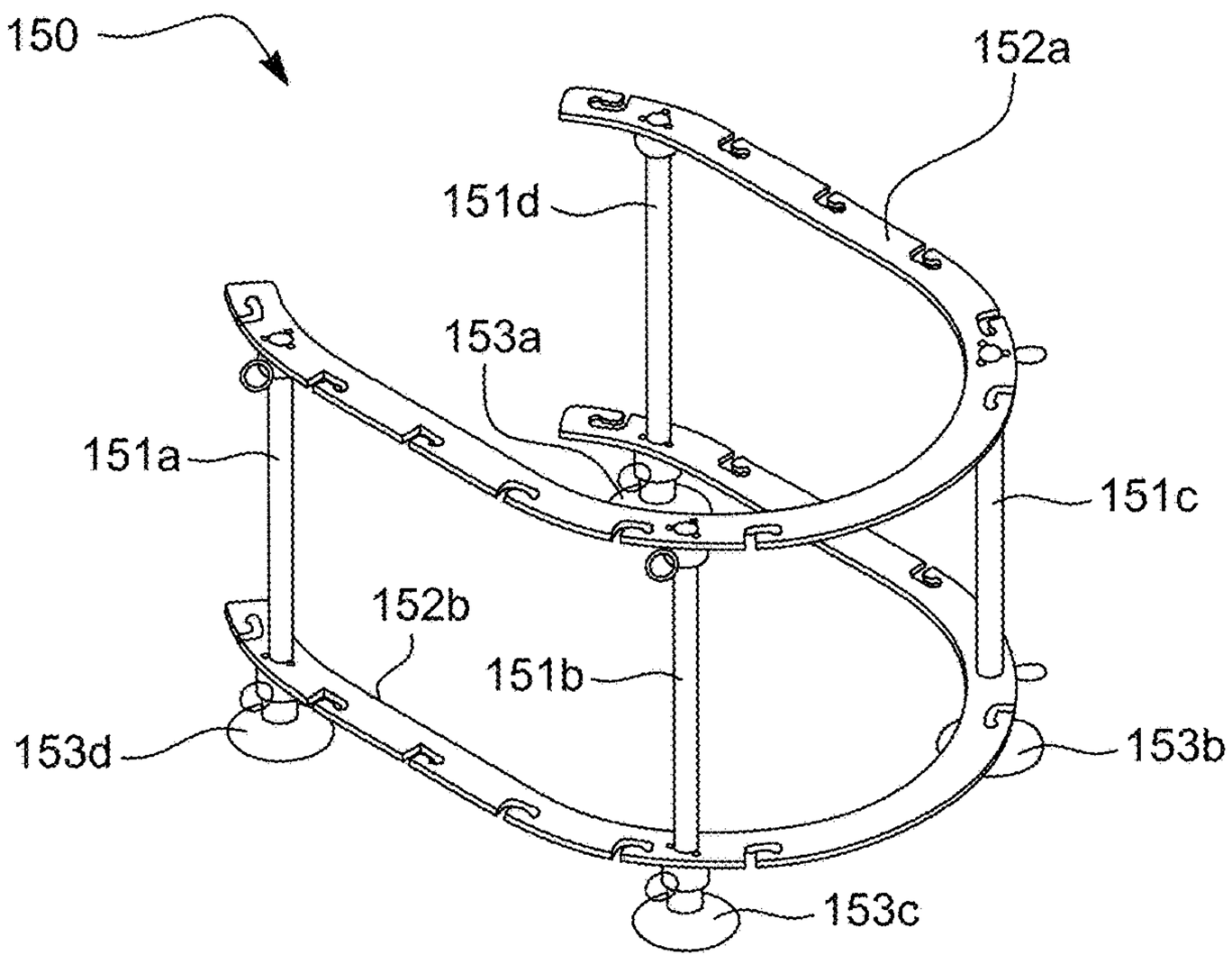

150
152a
151d
153a
151a
151c
152b
151b
153d
153b
153c

FIG. 1b

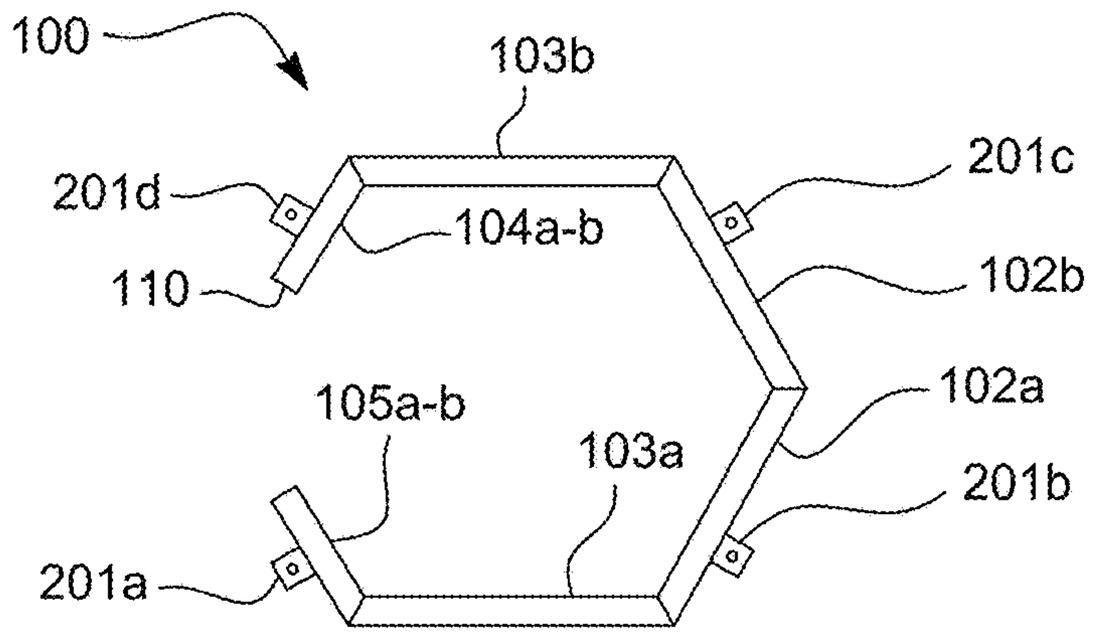


FIG. 2a

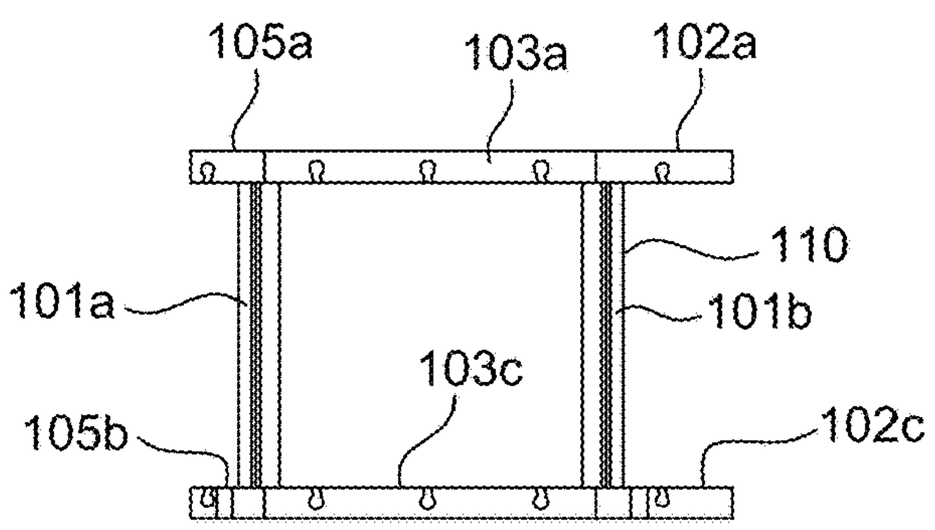


FIG. 2b

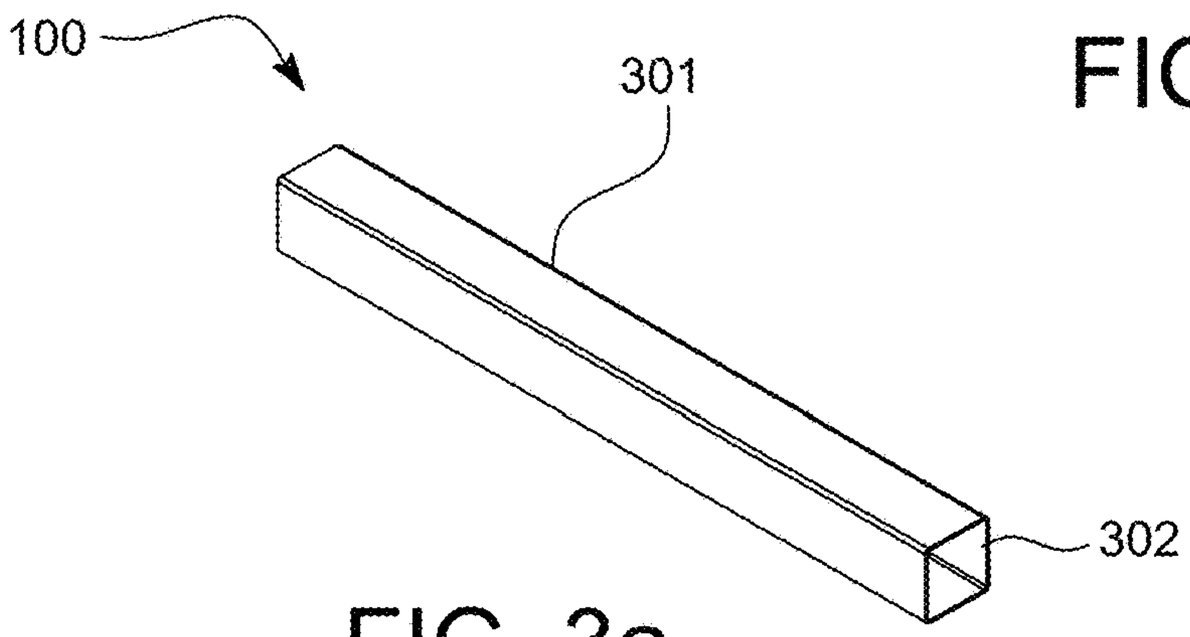


FIG. 3a

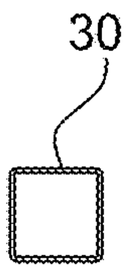


FIG. 3b

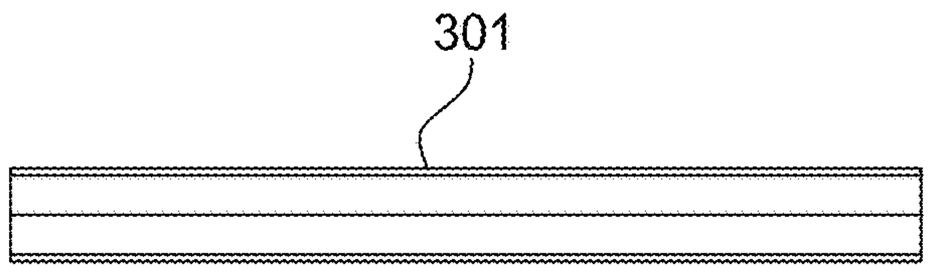


FIG. 3c

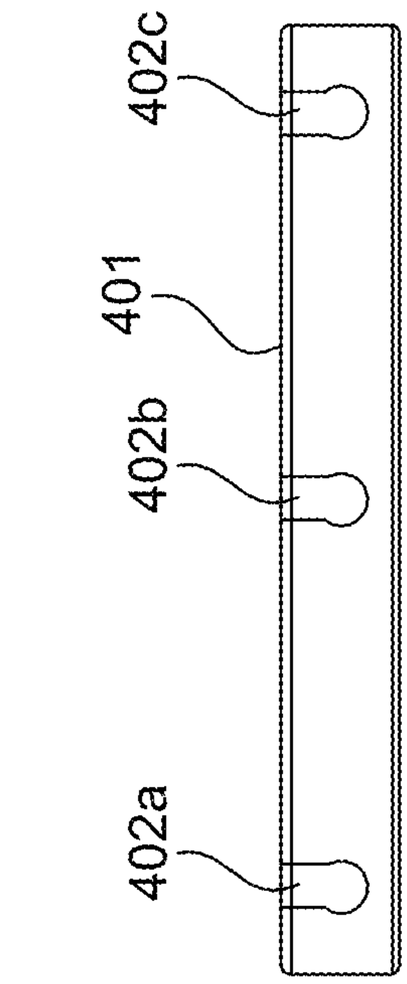


FIG. 4b

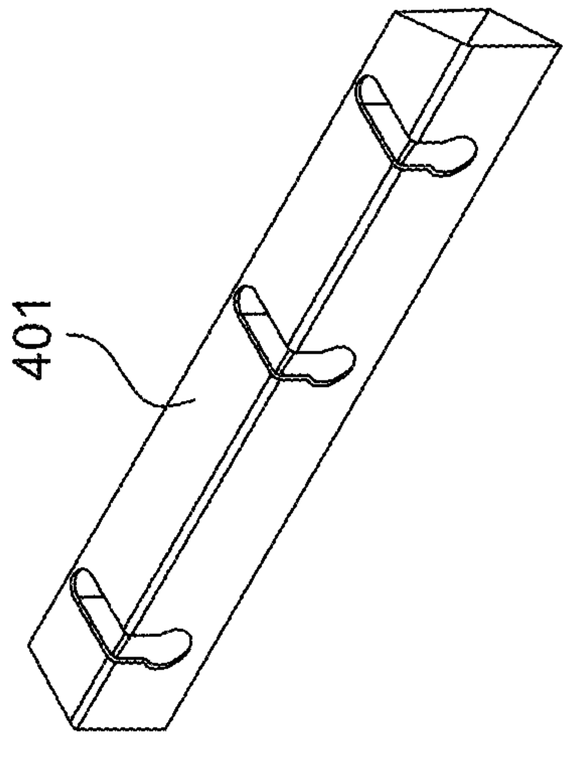


FIG. 4d

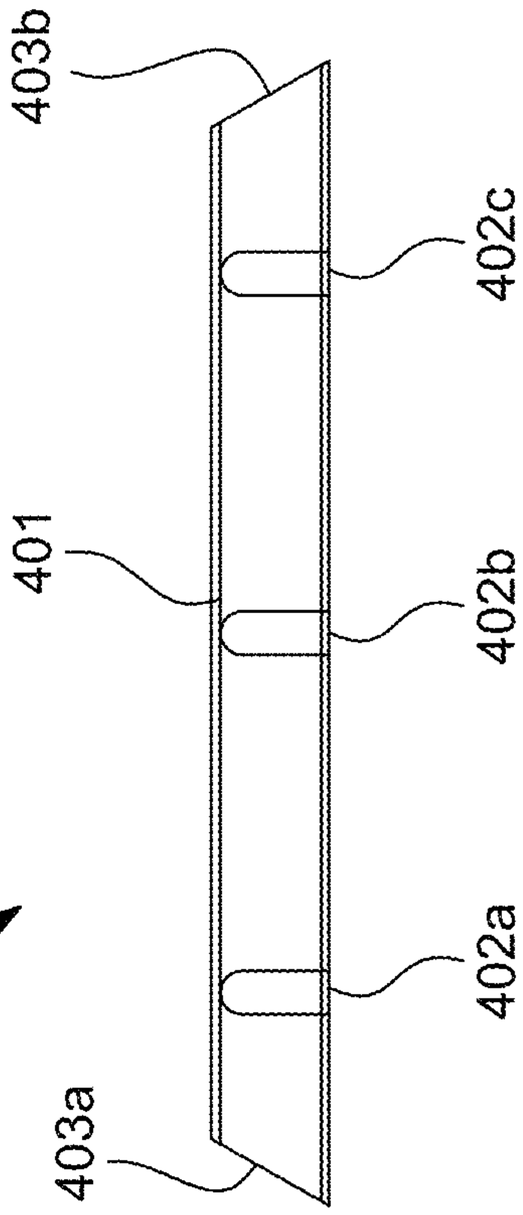


FIG. 4a

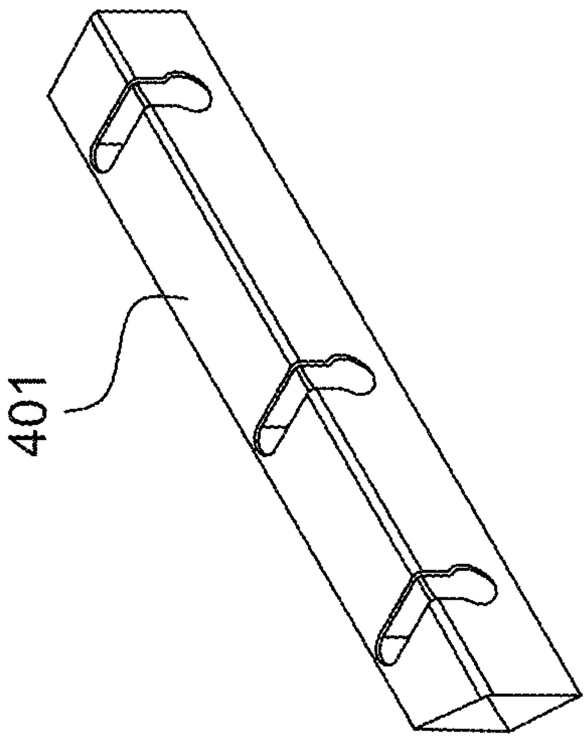


FIG. 4c

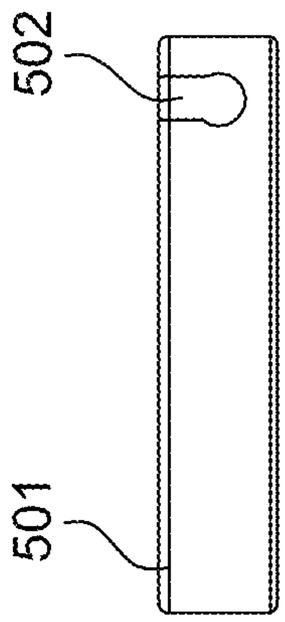


FIG. 5b

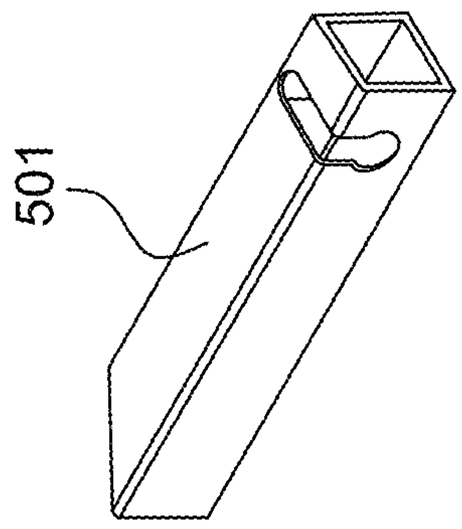


FIG. 5d

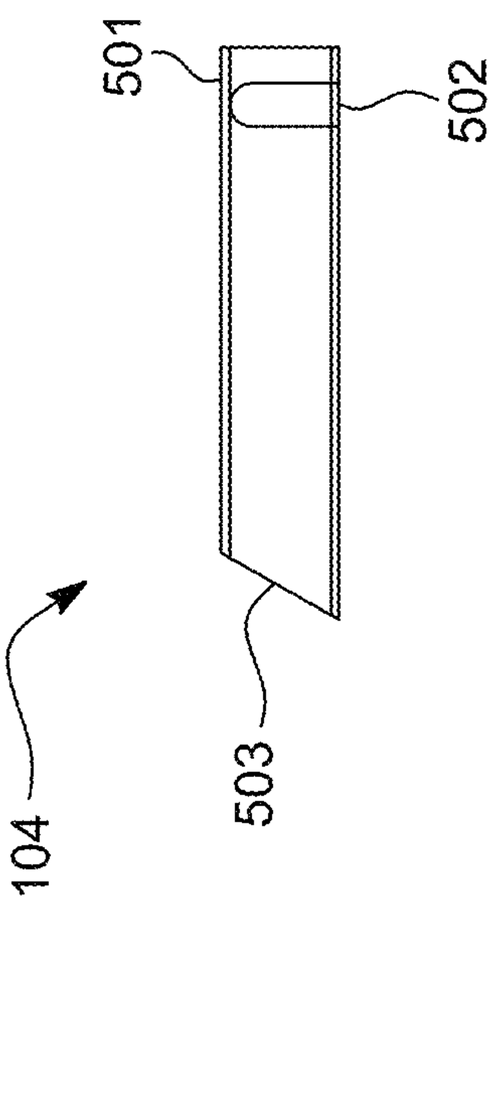


FIG. 5a

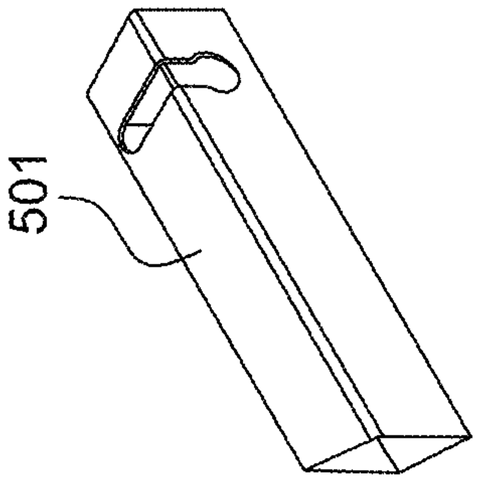


FIG. 5c

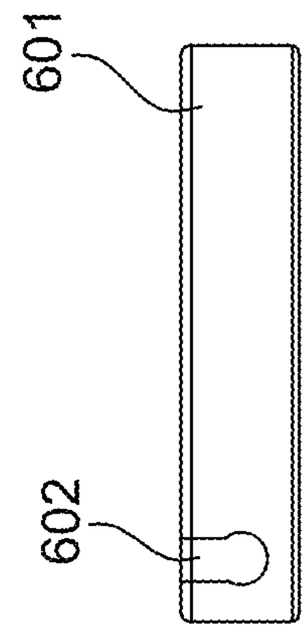


FIG. 6b

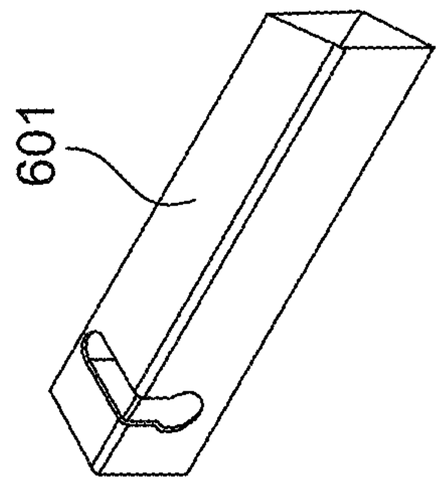


FIG. 6d

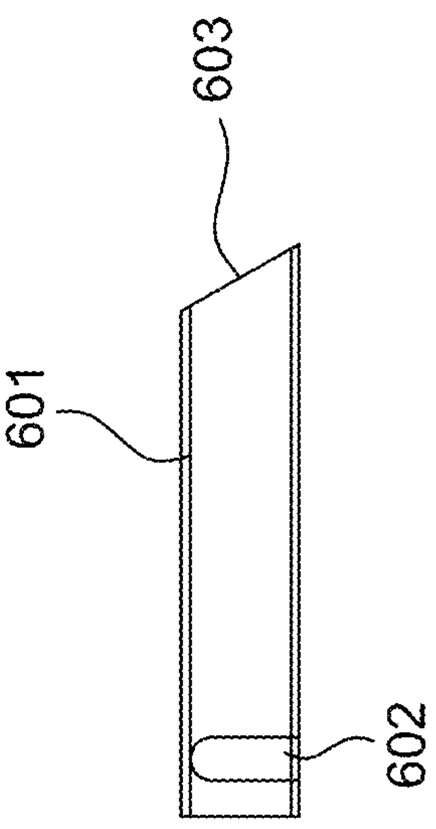


FIG. 6a

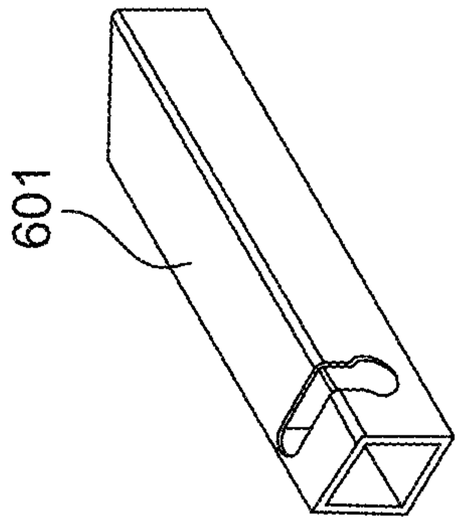


FIG. 6c

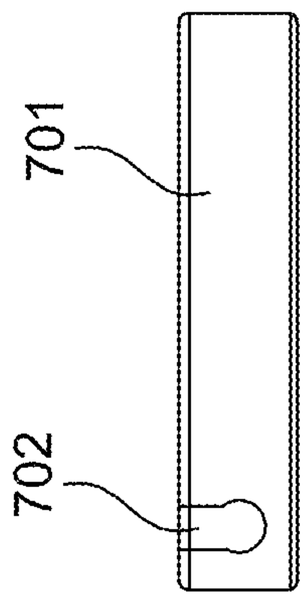


FIG. 7b

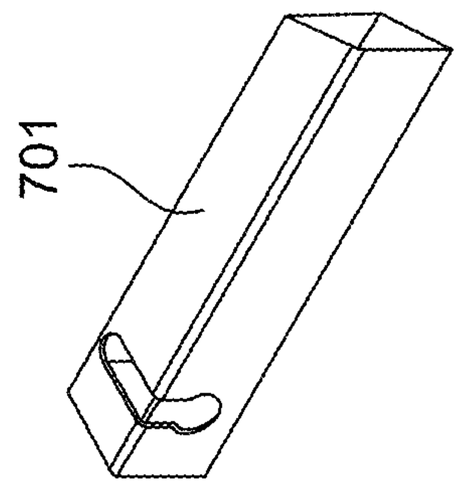


FIG. 7d

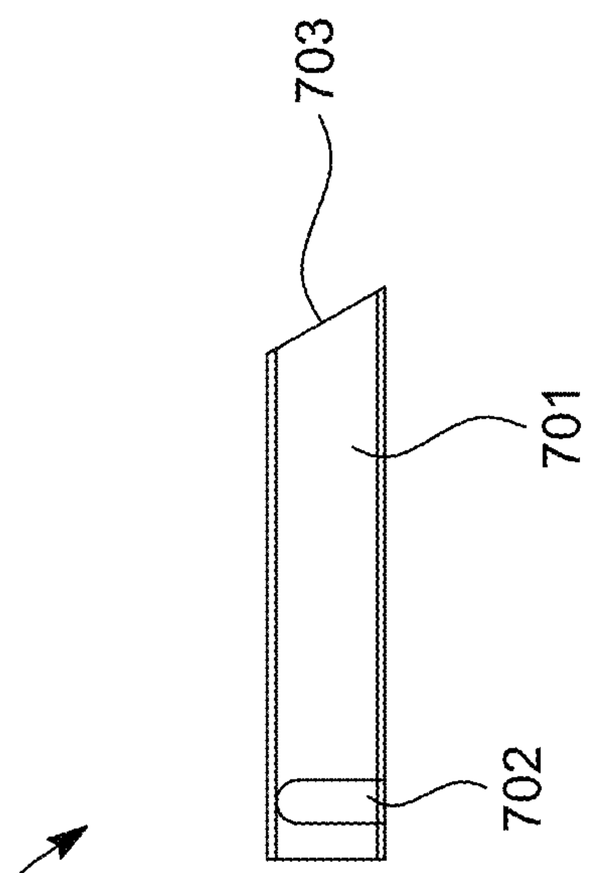


FIG. 7a

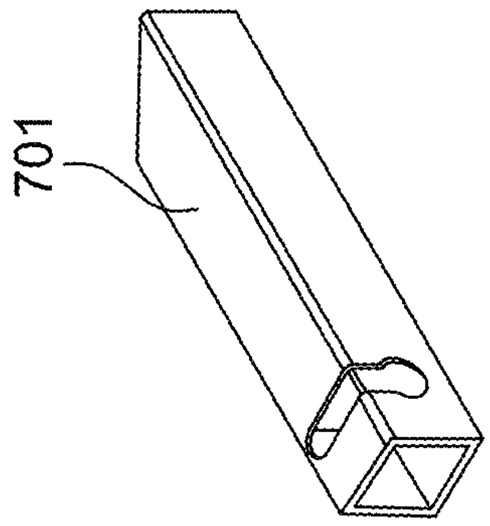


FIG. 7c

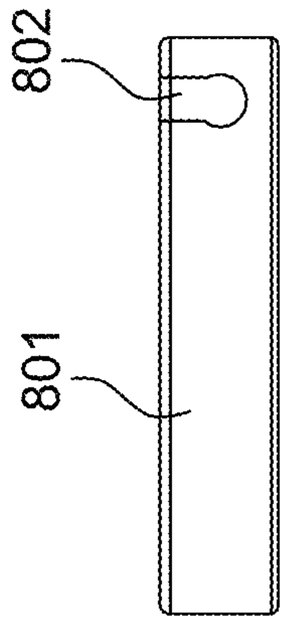


FIG. 8b

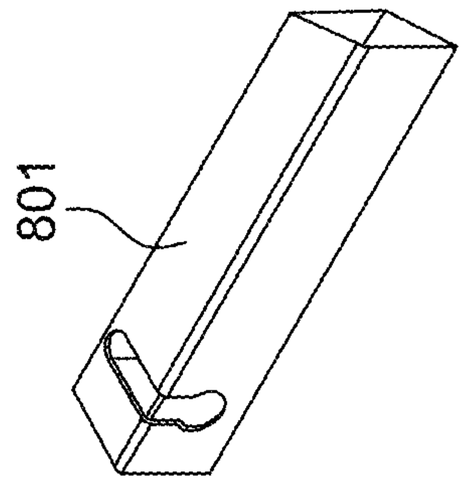


FIG. 8d

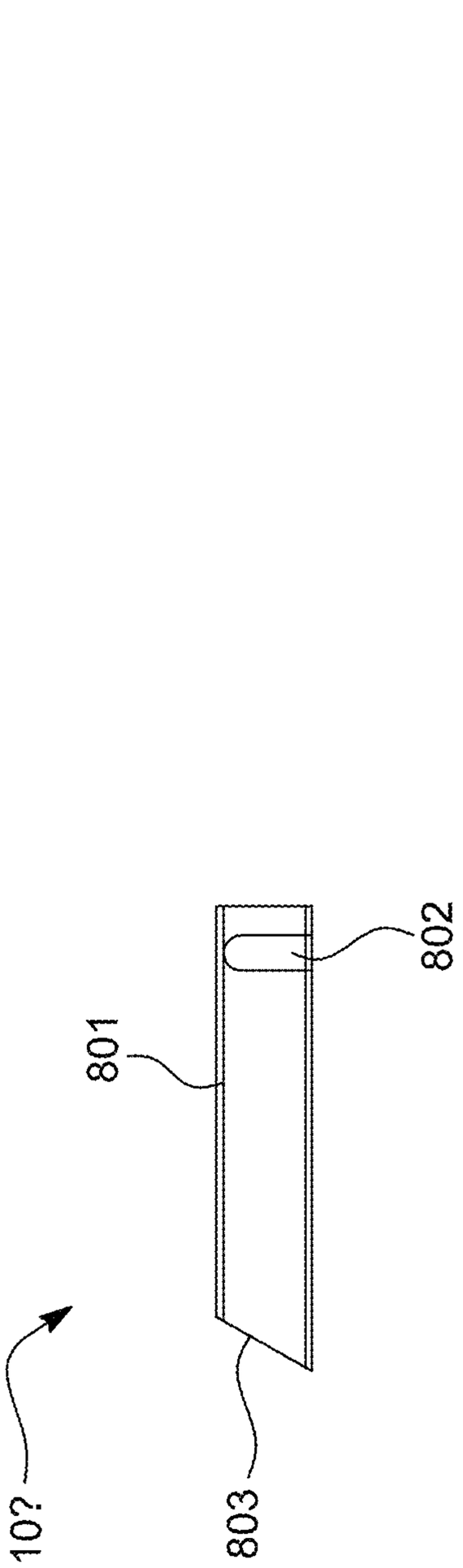


FIG. 8a

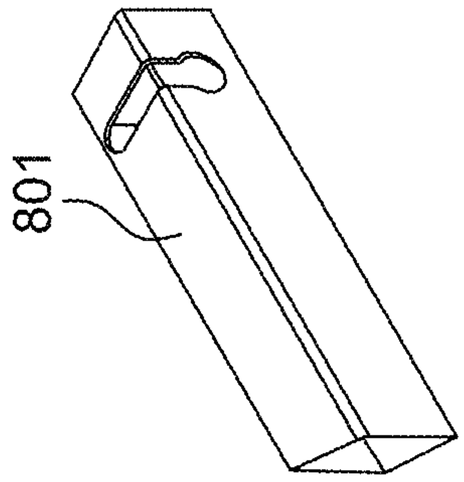


FIG. 8c

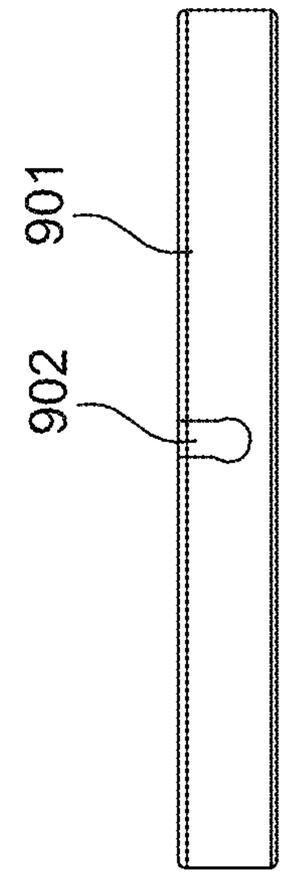


FIG. 9b

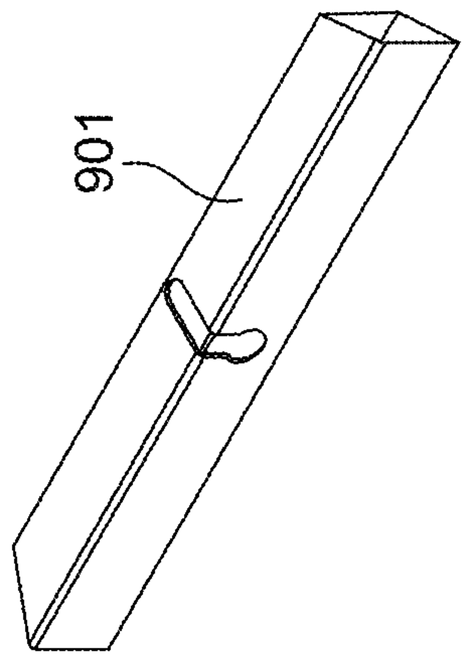


FIG. 9d

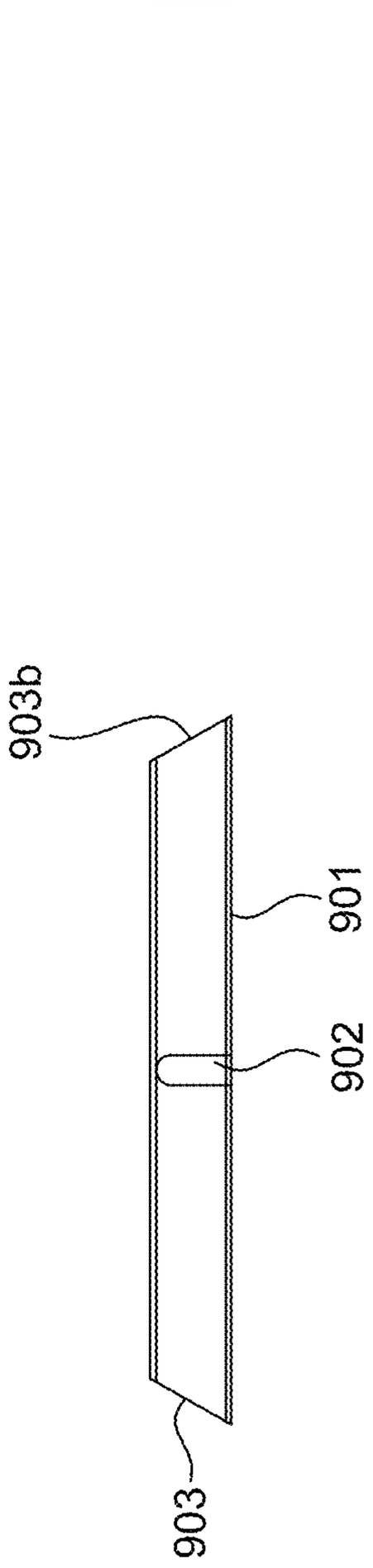


FIG. 9a

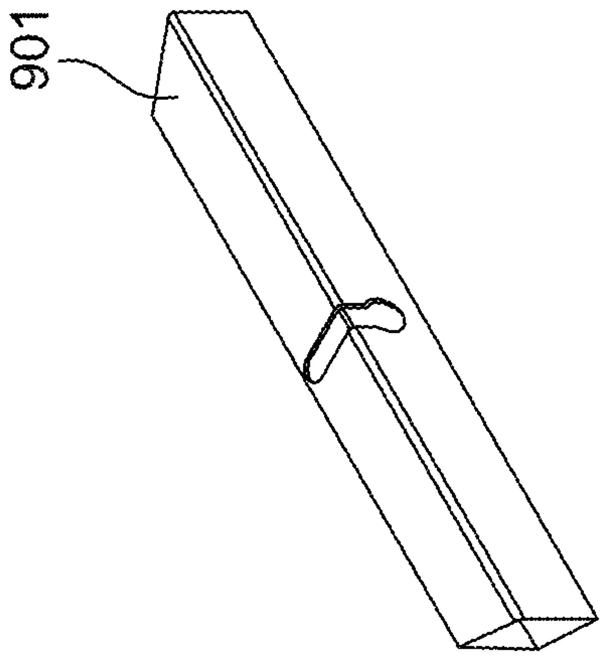


FIG. 9c

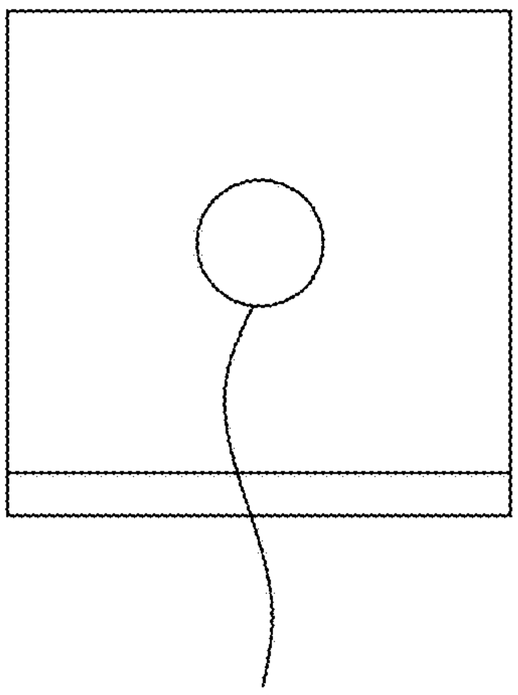


FIG. 10b

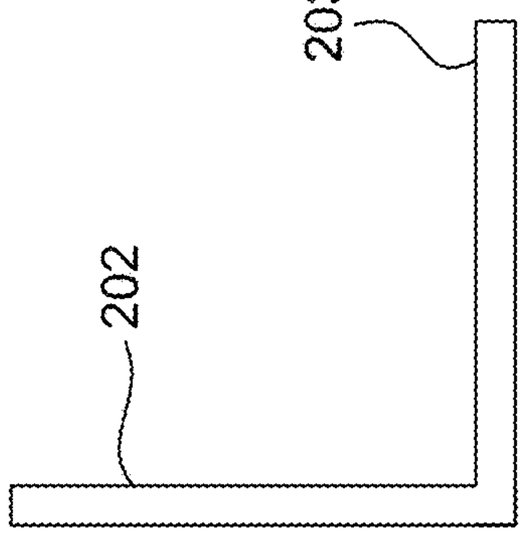


FIG. 10c

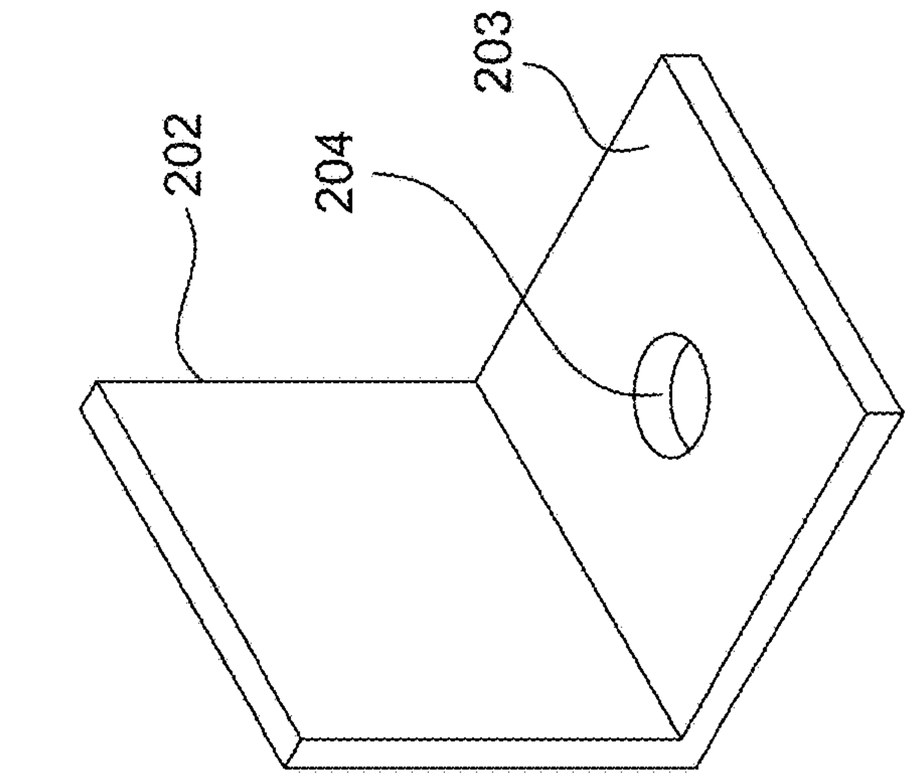


FIG. 10a

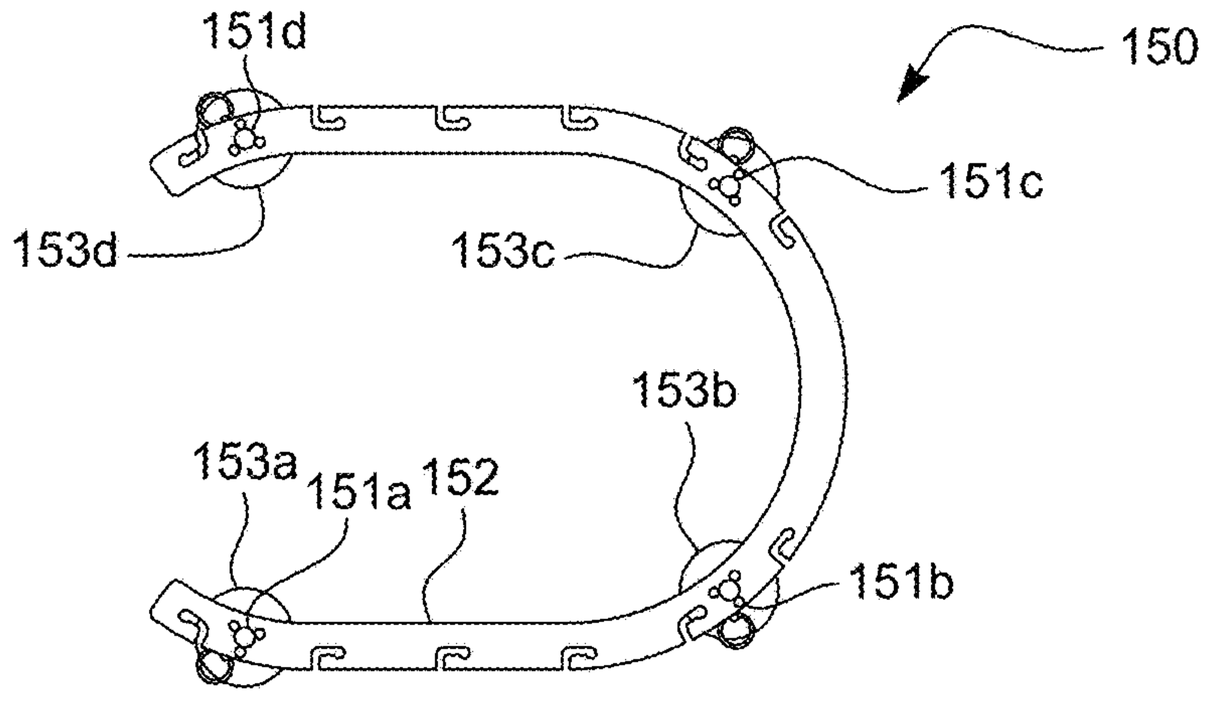


FIG. 11a

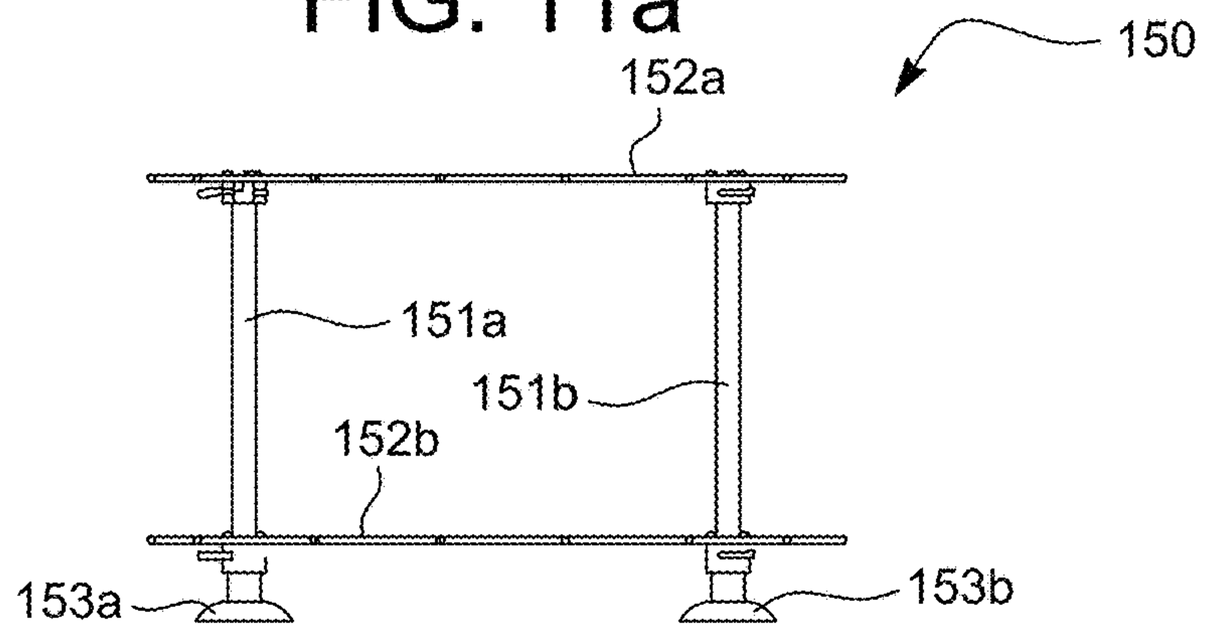


FIG. 11b

FIG. 12a FIG. 12b

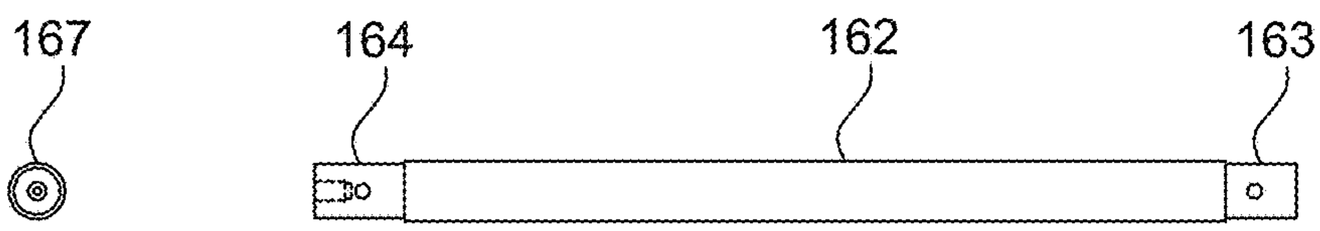


FIG. 12c

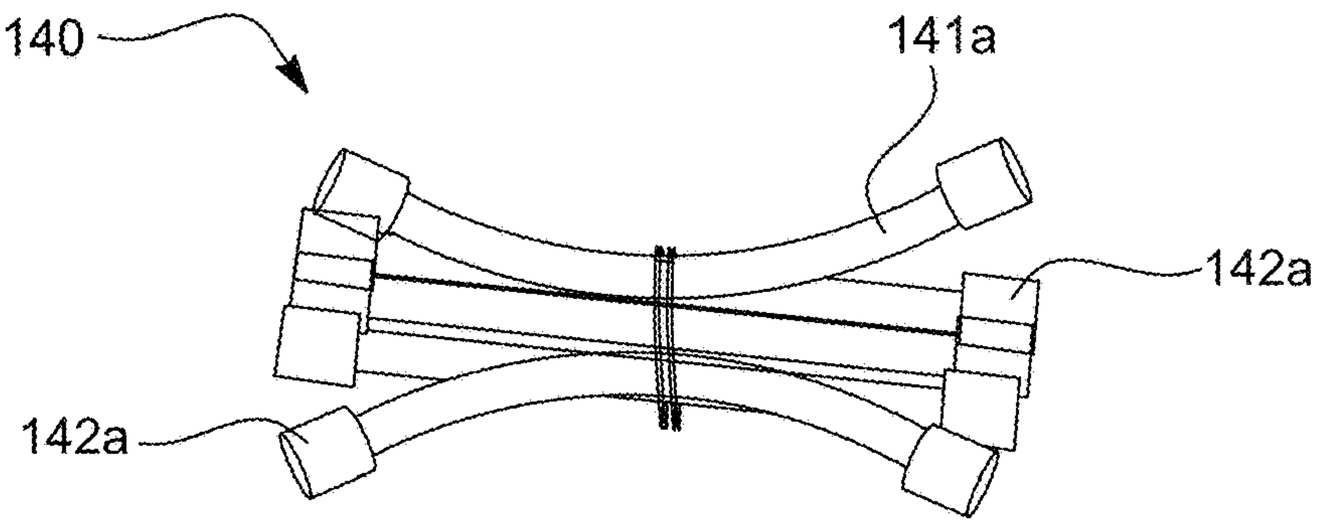


FIG. 13a

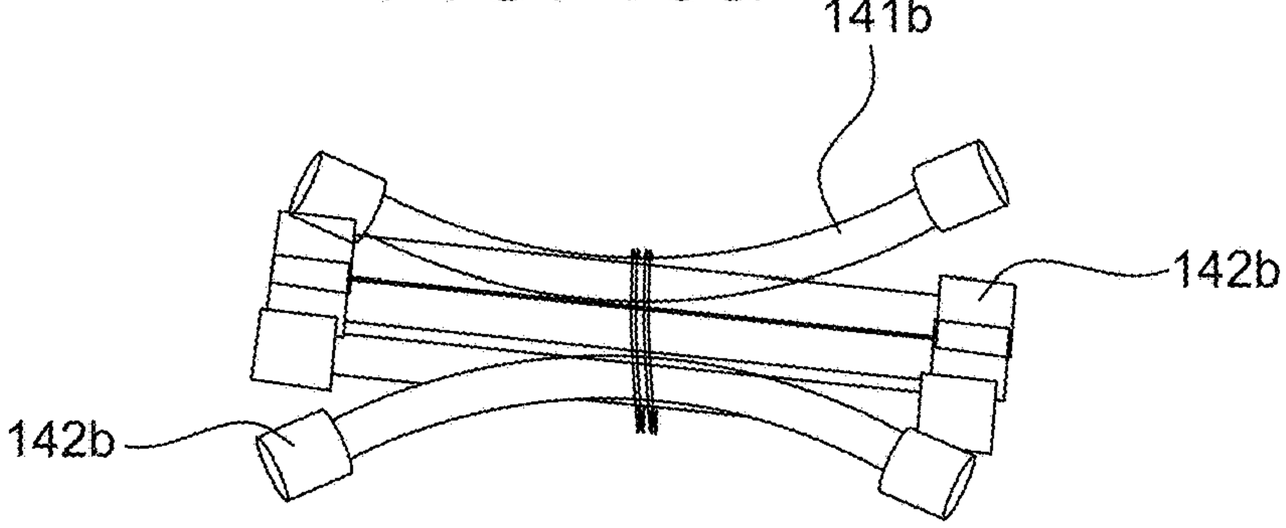


FIG. 13b

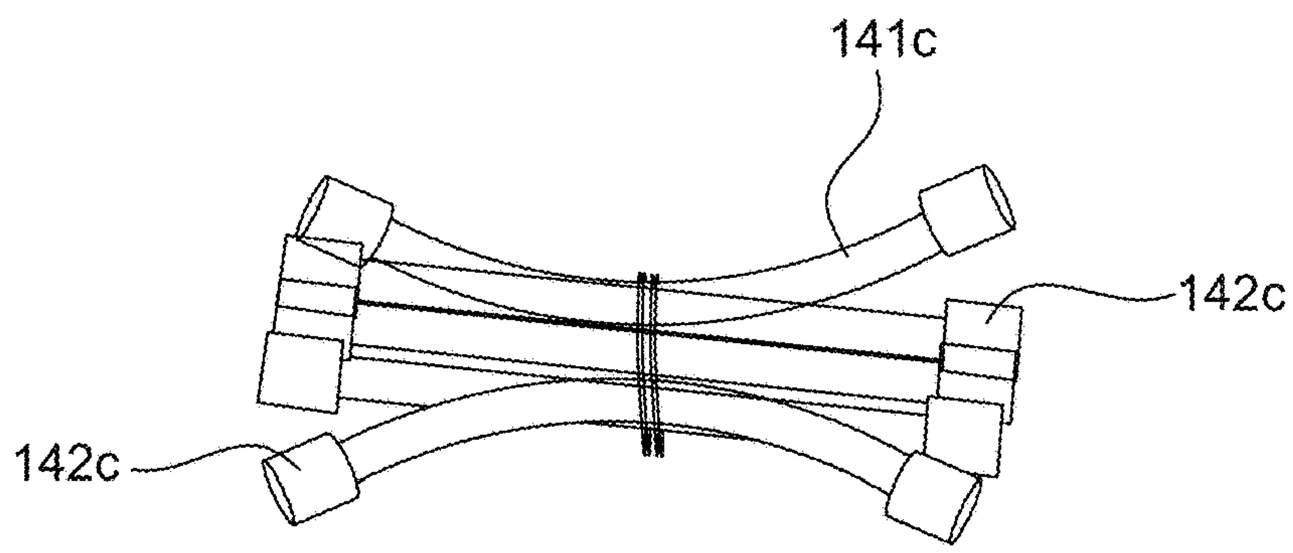


FIG. 13c

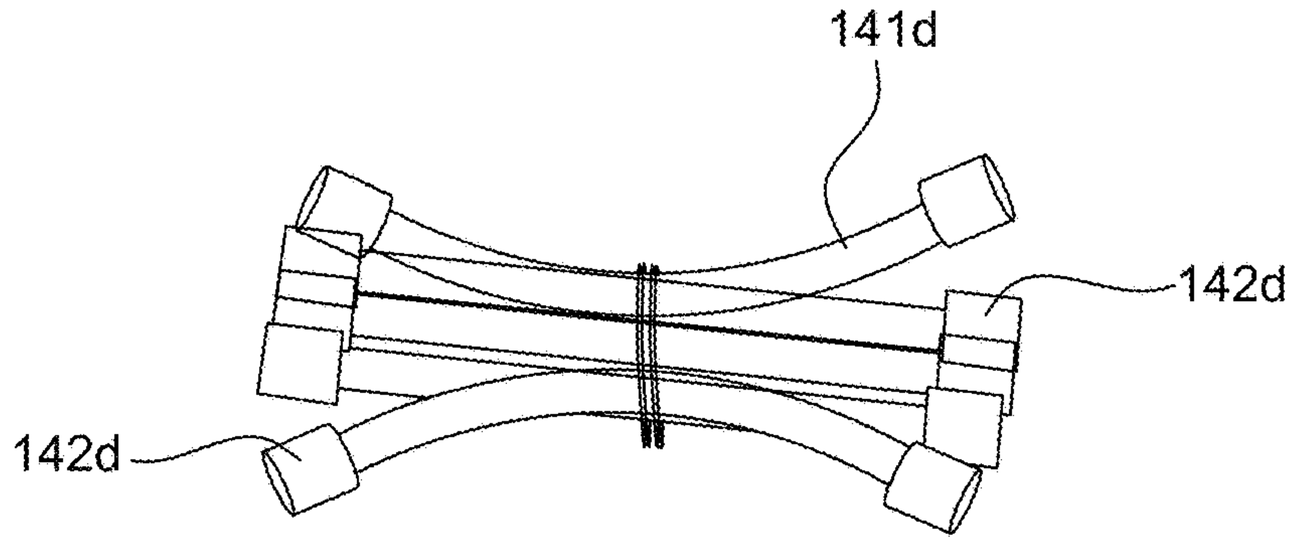


FIG. 13d

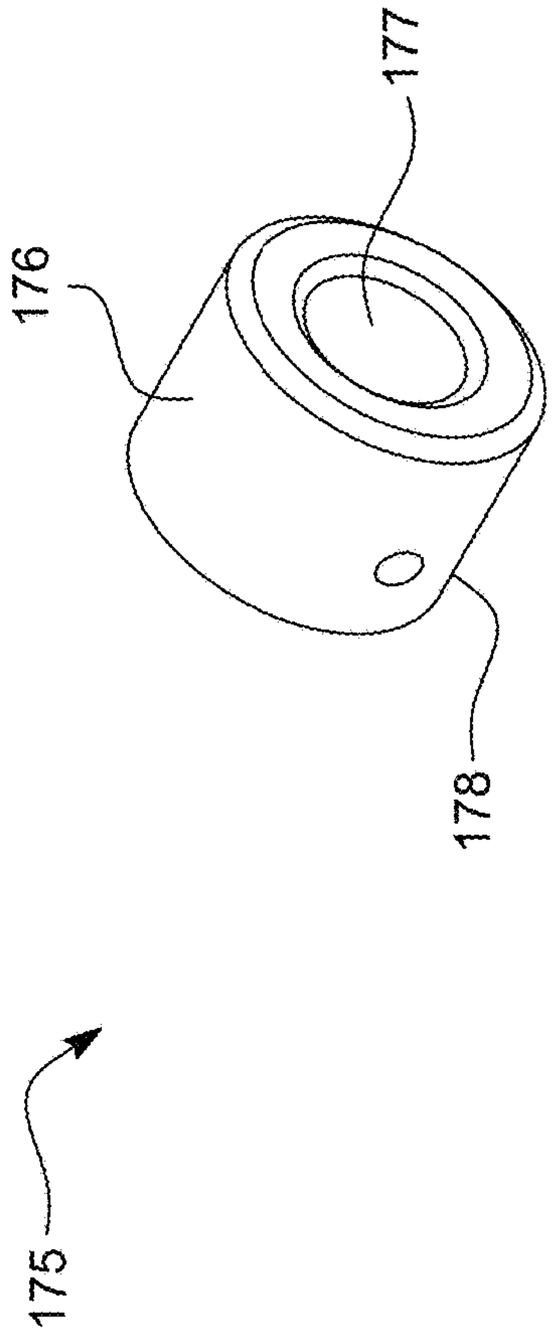


FIG. 14a

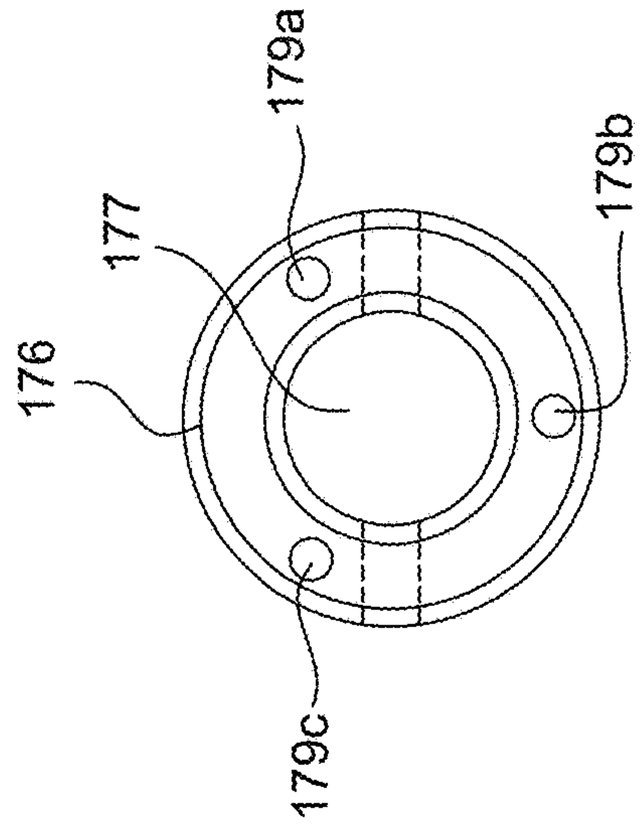


FIG. 14b

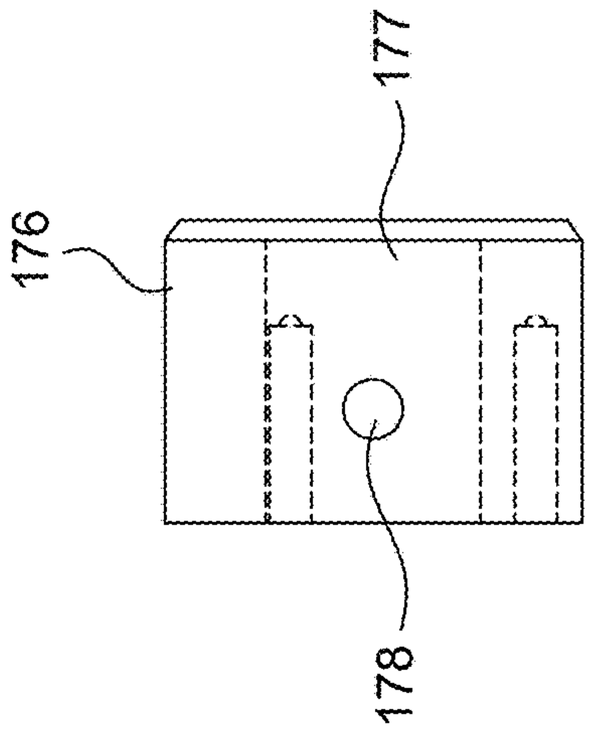


FIG. 14d

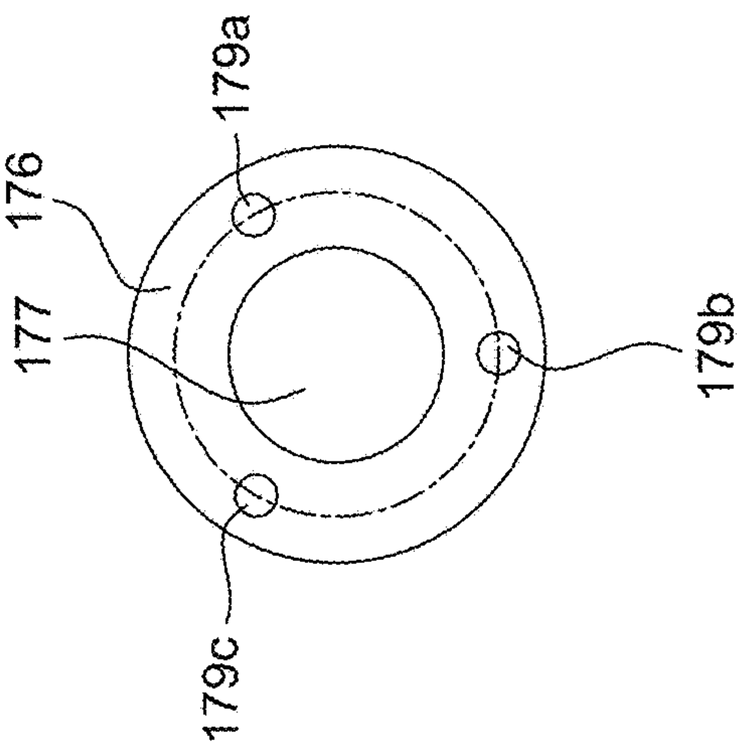


FIG. 14c

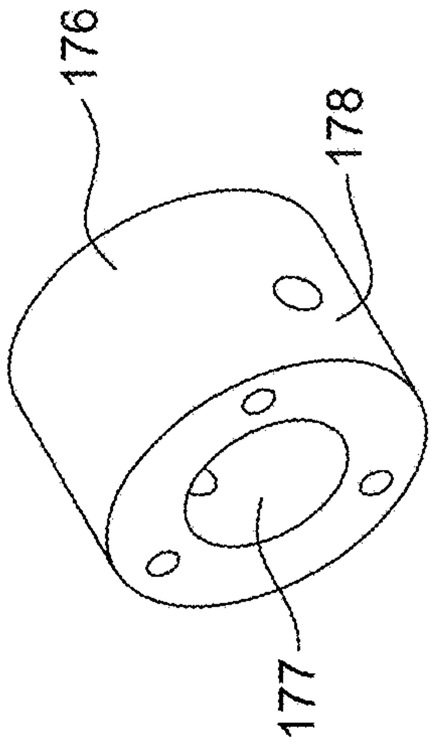


FIG. 14e

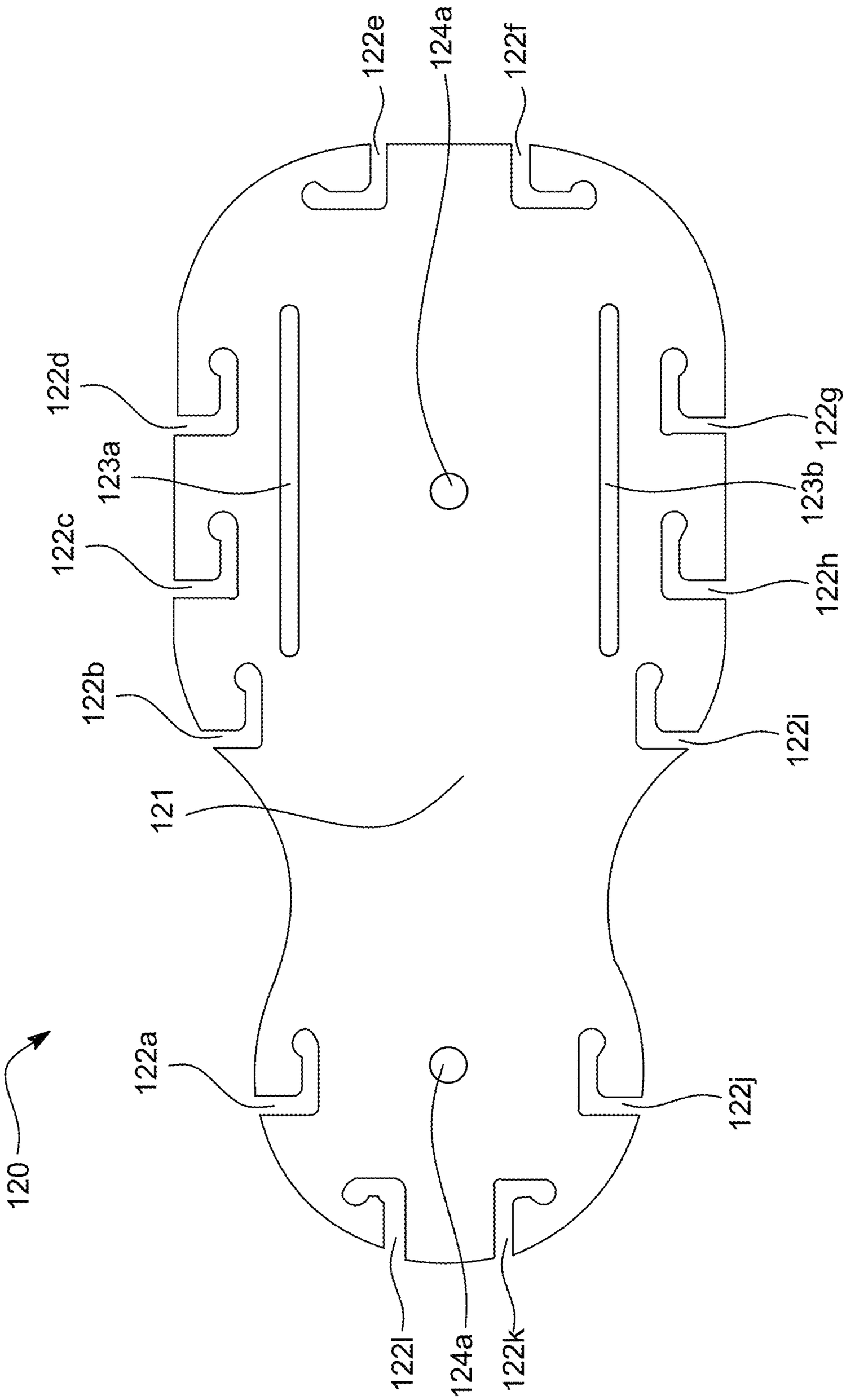

120
122a
122b
122c
122d
122e
122f
122g
122h
122i
122j
122k
122l
123a
123b
124a
121

FIG. 15

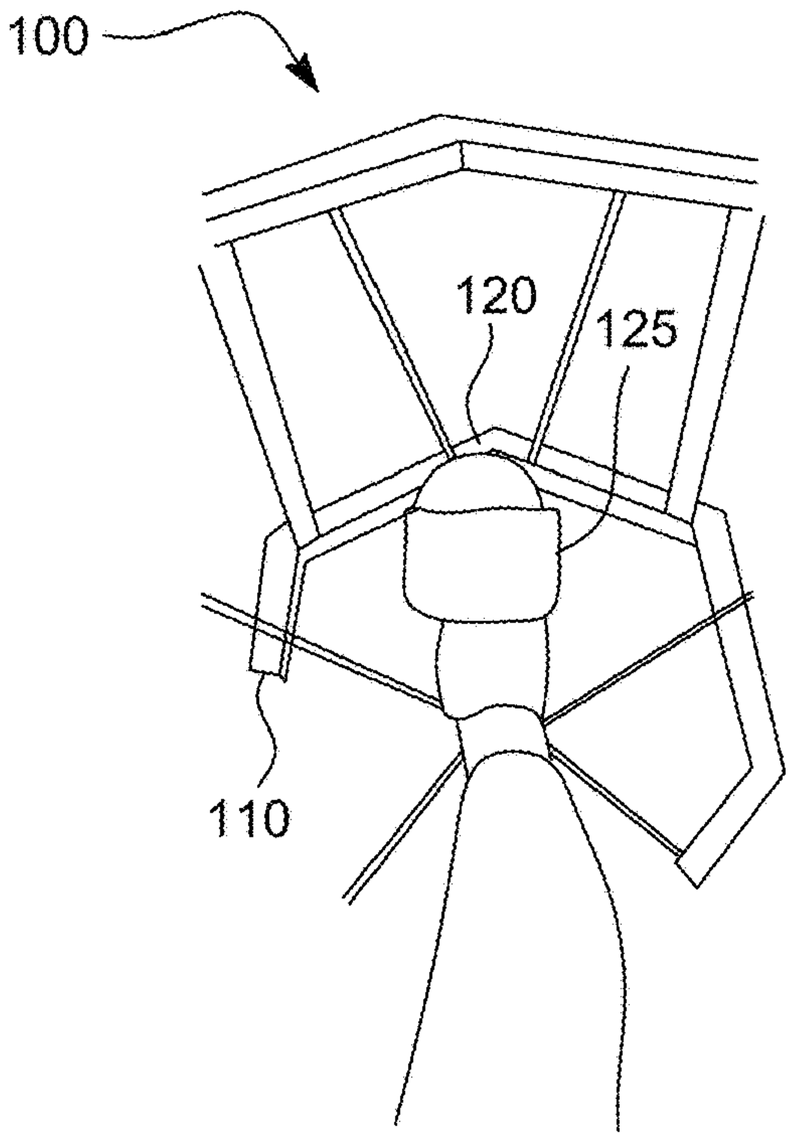


FIG. 16a

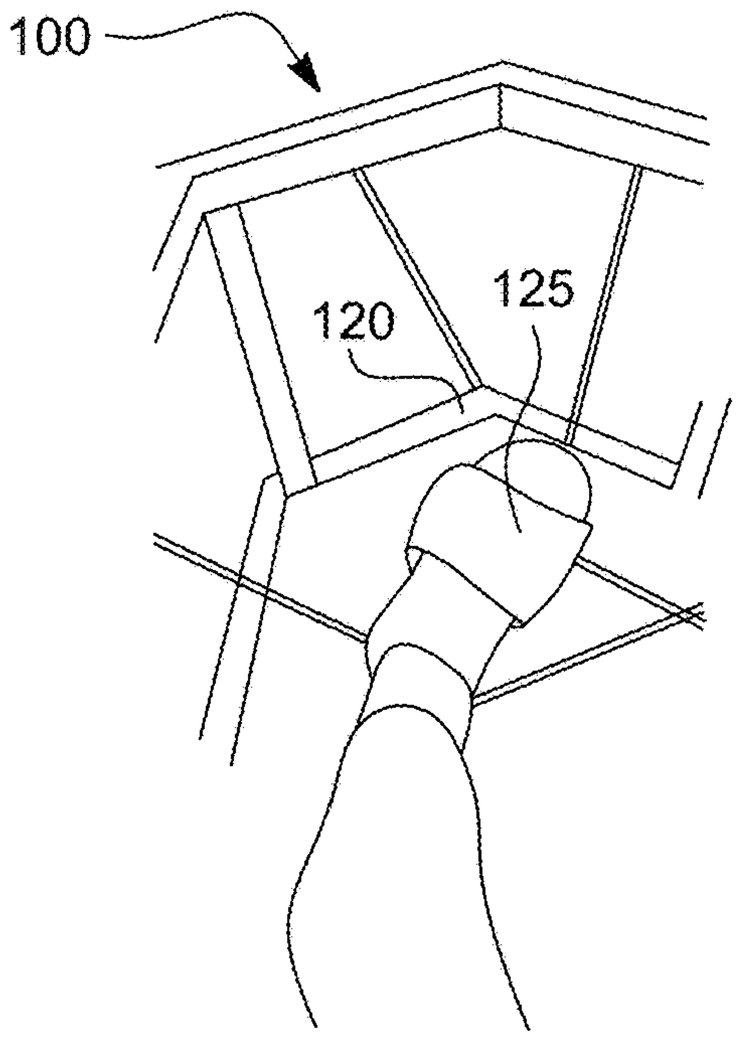


FIG. 16b

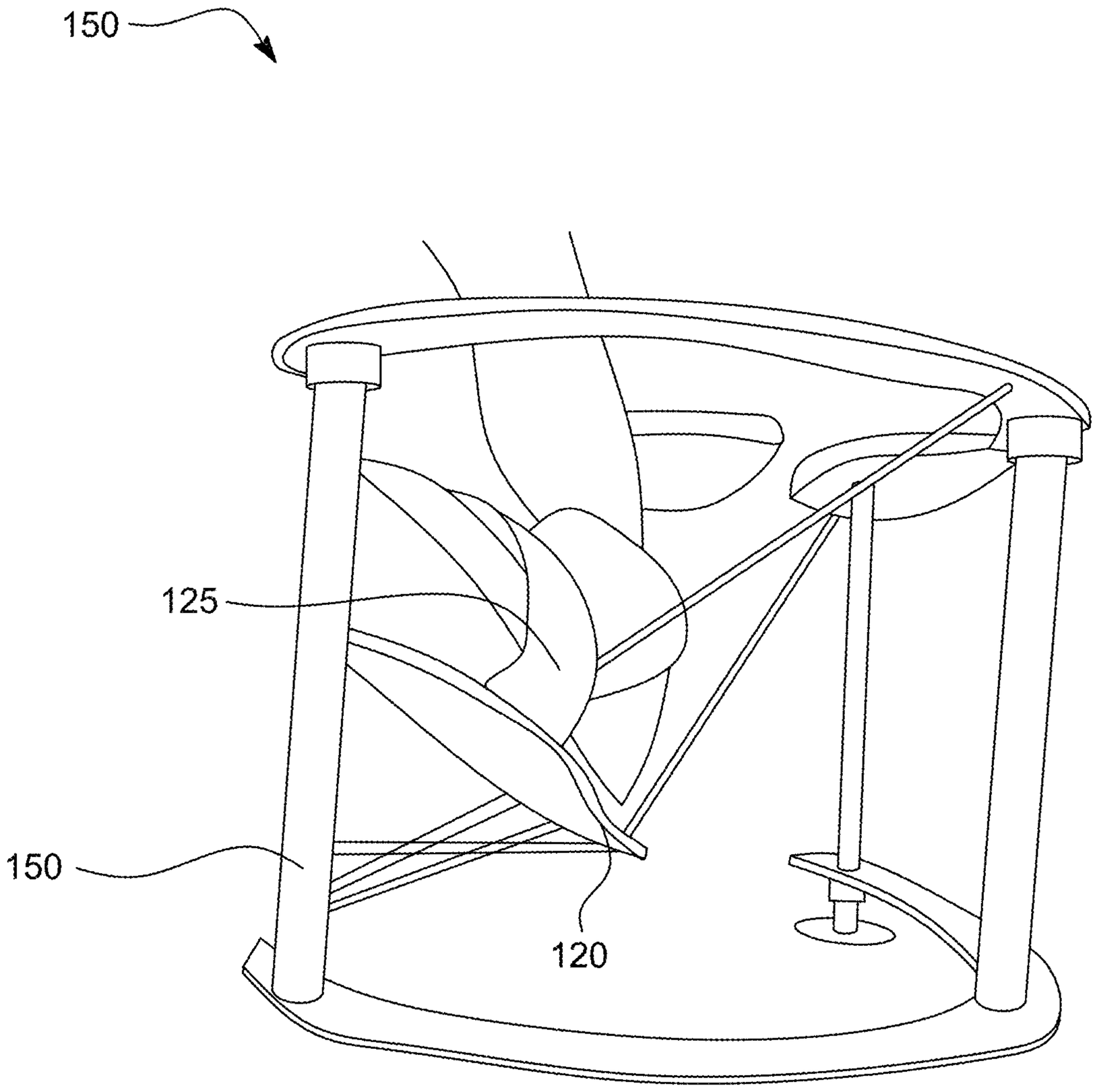


FIG. 16c

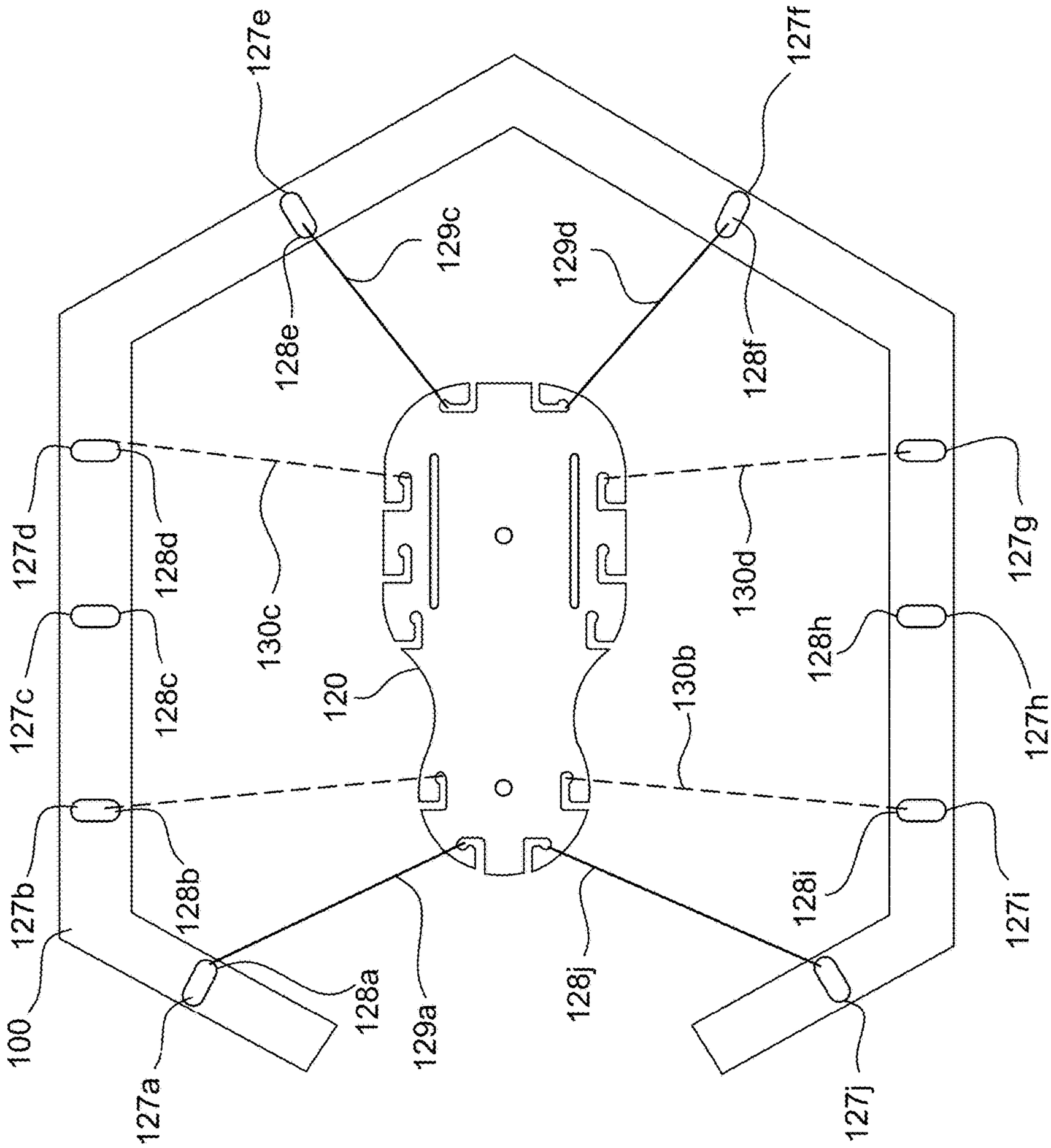

127e
127f
129c
129d
128e
128f
127d
128d
130c
130d
127g
127c
128c
120
130b
128h
127h
127b
128b
128i
127i
100
128a
129a
128j
127a
127j

FIG. 17a

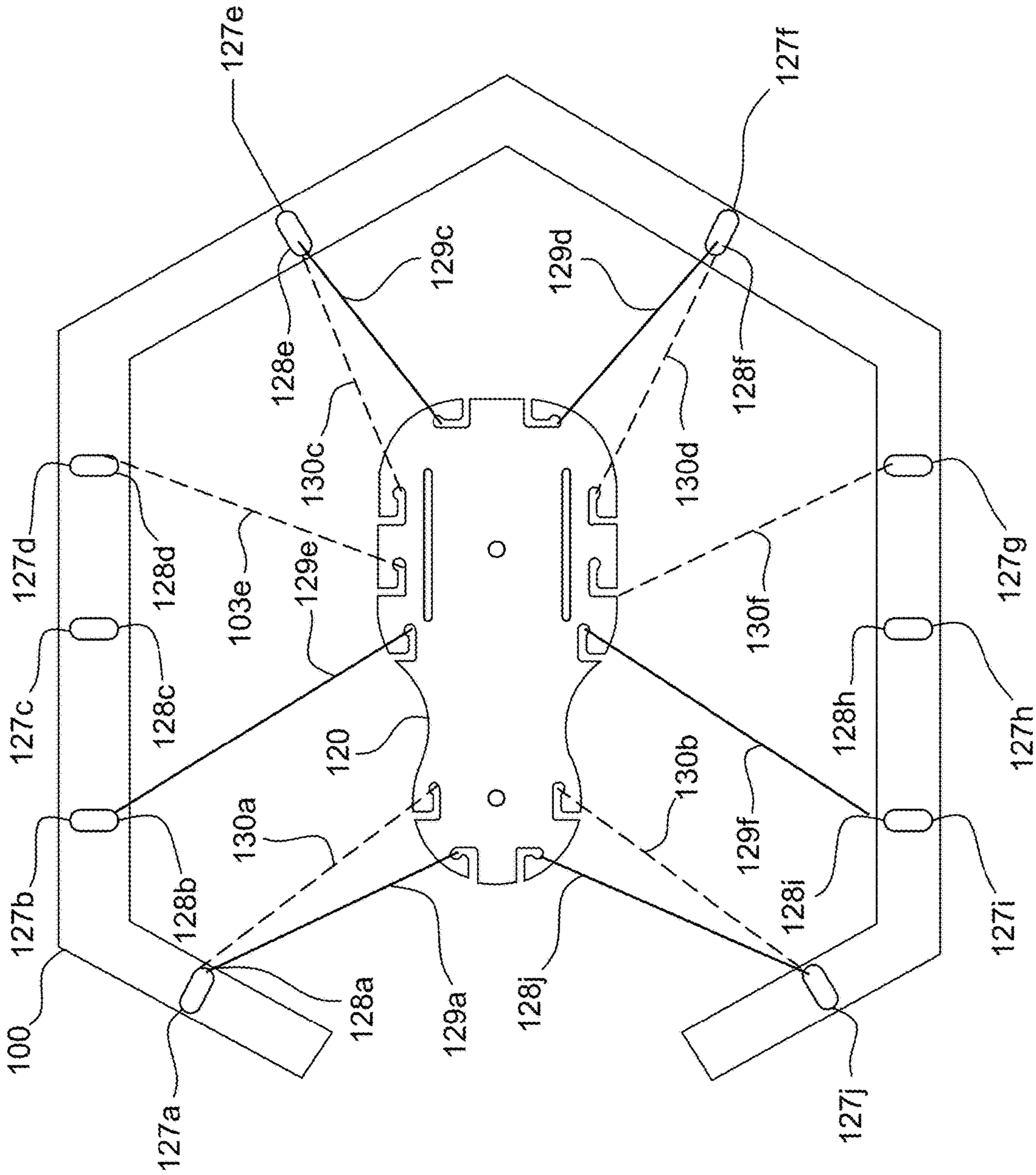

127e
127f
129c
129d
128e
128f
130c
130d
127d
128d
103e
129e
130f
127g
127c
128c
120
128h
127h
130a
130b
129f
128b
128i
127b
127i
100
128a
129a
128j
127a
127j

FIG. 17b

LOWER LEG AND ANKLE REHABILITATION AND EXERCISER

TECHNICAL FIELD

This application relates in general to an article of manufacture for providing a rehabilitation and exercise device, and more specifically, to an article of manufacture providing a lower leg and ankle exercise device.

BACKGROUND

The main function of the Achilles tendon is the transmission of power from the calf muscles to the heel and the foot. This makes it possible to flex the foot; crucial movement when walking and running. Stretching the tendon can help people recover from Achilles tendon damage by increasing mobility.

Therefore, a need exists for an article of manufacture for providing a lower leg and ankle exercise device. The present invention attempts to address the limitations and deficiencies in prior solutions according to the principles and example embodiments disclosed herein.

SUMMARY

In accordance with the present invention, the above and other problems are solved by providing an article of manufacture for a lower leg and ankle exercise device according to the principles and example embodiments disclosed herein.

In one embodiment, the present invention is an article of manufacture for providing a lower leg and ankle exercise device. The exercise device includes a top frame structure having a first plurality of connection hooks about its perimeter, a bottom frame structure oriented in parallel to the top frame structure having a second plurality of hooks about its perimeter, a plurality of vertical support members coupled between the top frame structure and the bottom frame structure, a shoe support member having a plurality of connection hooks positioned about an outer edge, and a plurality of stretchable cords configured to couple the shoe support member to the top frame structure and the bottom frame structure, the stretchable cords coupled to the top frame structure position the shoe support member above the bottom support structure.

In another aspect of the present invention, the connection hooks having a keyhole end and an inner end.

In another aspect of the present invention, the top frame structure and the bottom frame structure comprise an identical set of straight members arranged in a hexagon shape, the hexagon shape having an open end and a closed end.

In another aspect of the present invention, each of the straight members having at least one connection hook.

In another aspect of the present invention, the set of straight support members having a rectangular shape with a hollow center.

In another aspect of the present invention, the top frame structure and the bottom frame structure having a U-shaped frame members, the connection hooks being located about an outer edge of the U-shaped frame members.

In another aspect of the present invention, the connection hooks on the two sides of the U-shaped frame members are located in identical positioned from the open end.

In another aspect of the present invention, the shoe support member having connection hooks positioned on opposing sides to each other.

In another aspect of the present invention, each of the stretchable cords comprising a stretchable band having opposing ends and an elastic band connection end coupled to each opposing end, the elastic band connection end being configured to engage a surface of the top and bottom frame structures with a first end and to engage a surface of the shoe support member when the stretchable band is within the connection hooks.

In another aspect of the present invention, the stretchable bands having a resistance corresponding to a color marking of the stretchable bands between 1.1 lbs. and 7.9 lbs. when stretched an elongation of 25% of its length.

In another aspect of the present invention, the stretchable bands having a resistance corresponding to a color marking of the stretchable bands between 2.9 lbs. and 21.6 lbs. when stretched an elongation of 100% of its length.

In another aspect of the present invention, the stretchable bands having a resistance corresponding to a color marking of the stretchable bands between 5.9 lbs. and 40.1 lbs. when stretched an elongation of 250% of its length.

In another aspect of the present invention, the colored markings comprise one or more of the following: a yellow, a red, a green, a blue, a black, a silver, and a gold marking.

In another aspect of the present invention, the top frame structure and the bottom frame structure are made of steel

In another aspect of the present invention, the set of straight members are welded together.

The foregoing has outlined rather broadly the features and technical advantages of the present invention in order that the detailed description of the invention that follows may be better understood. Additional features and advantages of the invention will be described hereinafter that form the subject of the claims of the invention.

It should be appreciated by those skilled in the art that the conception and specific embodiment disclosed may be readily utilized as a basis for modifying or designing other structures for carrying out the same purposes of the present invention. It should also be realized by those skilled in the art that such equivalent constructions do not depart from the spirit and scope of the invention as set forth in the appended claims. The novel features that are believed to be characteristic of the invention, both as to its organization and method of operation, together with further objects and advantages will be better understood from the following description when considered in connection with the accompanying figures. It is to be expressly understood, however, that each of the figures is provided for the purpose of illustration and description only and is not intended as a definition of the limits of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring now to the drawings in which like reference numbers represent corresponding parts throughout:

FIGS. **1***a-b* illustrate example embodiments of an article of manufacture for providing a lower leg and ankle exercise device.

FIGS. **2***a-b* illustrate top and side views of a first embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention.

FIGS. **3***a-c* illustrate multiple views of a vertical support member of the first embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention.

FIGS. **4***a-d* illustrate multiple views of a 3-hook long side member of the first embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention.

FIGS. **5***a-d* illustrate multiple views of a front I-hook short side member of the first embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention.

FIGS. **6***a-d* illustrate multiple views of a rear I-hook side member of the first embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention.

FIGS. **7***a-d* illustrate multiple views of a I-hook long side member of the first embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention.

FIGS. **8***a-d* illustrate multiple views of a vertical support member of the first embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention.

FIGS. **9***a-d* illustrate multiple views of a rear I-hook side member of the first embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention.

FIGS. **10***a-c* illustrate multiple views of an L-shaped tab of the first embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention.

FIGS. **11***a-b* illustrate top and side views of a second embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention.

FIGS. **12***a-c* illustrate multiple views of a vertical support member of the second embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention.

FIGS. **13***a-d* illustrate a plurality of different strength stretchable cords for connecting the shoe support member to the first and second embodiments of an article of manufacture providing a lower leg and ankle exercise device according to the present invention.

FIGS. **14***a-e* illustrate multiple views of an elastic band connection end of the first embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention.

FIG. **15** illustrates a top view of a shoe support member of the first and second embodiments of an article of manufacture providing a lower leg and ankle exercise device according to the present invention.

FIGS. **16***a-c* illustrate multiple views of first and second embodiments of an article of manufacture in use providing a lower leg and ankle exercise device according to the present invention.

FIGS. **17***a-b* illustrate multiple views of stretchable cord arrangements with the first embodiment of an article of manufacture in use providing a lower leg and ankle exercise device according to the present invention.

DETAILED DESCRIPTION

This application relates in general to an article of manufacture for providing a rehabilitation and exercise device, and more specifically, to an article of manufacture providing a lower leg and ankle exercise device according to the present invention.

Various embodiments of the present invention will be described in detail with reference to the drawings, wherein like reference numerals represent like parts and assemblies throughout the several views. Reference to various embodiments does not limit the scope of the invention, which is limited only by the scope of the claims attached hereto. Additionally, any examples set forth in this specification are not intended to be limiting and merely set forth some of the many possible embodiments for the claimed invention.

In describing embodiments of the present invention, the following terminology will be used. The singular forms "a," "an," and "the" include plural referents unless the context clearly dictates otherwise. As used herein, a plurality of items, structural elements, compositional elements, and/or materials may be presented in a common list for convenience. However, these lists should be construed as though each member of the list is individually identified as a separate and unique member. Thus, no individual member of such list should be construed as a de facto equivalent of any other member of the same list solely based on their presentation in a common group without indications to the contrary. As used herein, the singular forms "a," "an," and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise.

It further will be understood that the terms "comprises," "comprising," "includes," and "including" specify the presence of stated features, steps or components, but do not preclude the presence or addition of one or more other features, steps or components. It also should be noted that in some alternative implementations, the functions and acts noted may occur out of the order noted in the figures. For example, two figures shown in succession may in fact be executed substantially concurrently or may sometimes be executed in the reverse order, depending upon the functionality and acts involved.

The terms "individual" and "user" refer to an entity, e.g., a human, using an article of manufacture providing a lower leg and ankle exercise device according to the present invention. The term user herein refers to one or more users.

The term "invention" or "present invention" refers to the invention being applied for via the patent application with the title "Lower Leg and Ankle Exerciser." Invention may be used interchangeably with exercise device.

In general, the present disclosure relates to an article of manufacture providing a lower leg and Achilles tendon exercise device according to the present invention. FIGS. **1***a-b* illustrate example embodiments of an article of manufacture providing a lower leg and ankle exercise device. FIG. **1***a* shows a first embodiment of a two-level, multi-segment frame structure **100** connected by four vertical support members **101***a-d*. Each level of the frame structure **110** is made up of six segments **101-105** in the shape of a hexagon having part of two end segments **104***a-b*, **105***a-b* shortened to create an opening into the center of the frame structure **110**. The top level is essentially the same as the bottom level. The only difference between the two levels is the location of connection hooks found about the frame structure **110** located on the inner surfaces of the segments.

Each hexagon frame element is made up of two long 3-connection hook segments **103***a-b*, **103***c-d*, along a long side of the hexagon, two long I-connection hook segments **102***a-b*, **102***c-d* forming the closed end of the hexagon, and two short I-connection hook segments **104***a-b*, **105***a-b* creating the opening into the center of the hexagon. Each connection hook in the segments comprises a keyhole-shaped slot cut though an outer edge of the hexagon connection hook segments with a straight line slot cut through a top edge of the hexagon connection hook segments. The keyhole-shaped slot and straight line slot are aligned to

connect to a corresponding keyhole-shaped slot and matching straight line slot. Four L-shaped tabs **201***a-d*, as shown in FIG. **2***a*, are coupled to the outer edge of the hexagon connection hook segments of the lower hexagon frame.

The lower leg and ankle exercise device **100** is machine constructed to exercise the lower leg and ankle muscles. The lower leg and ankle exercise device **100** may be used for rehabilitation and strength, exercise, and flexibility training. The areas that are targeted with the lower leg and ankle exercise device **100** are the tibialis anterior muscle, peroneus longus muscle, and the gastrocnemius muscle and allows for reduced stress on tendons in the ankle, calf, and lower knee.

The lower leg and ankle exercise device **100** helps athletes and average active persons develop the healthy habit of exercising the lower leg muscles for the benefits it provides such as: healthier knees, injury prevention for knees and ankles, rehabilitation, and exercise.

Elastic bands, shown in FIGS. **15***a-d*, may be mounted in multiple positions of the connection hooks that, when coupled to a shoe plate shown in FIG. **14**, secures the user's foot. With this arrangement, the bands provide resistance to allow the user to perform any ankle movements to work the muscle group to be targeted. The elastic bands support the shoe placed above the ground and may provide different levels of resistance appropriate for individual users.

FIG. **1***b* shows a second embodiment of a two-level, multi-segment frame structure **150** connected by four vertical support members **151***a-d*. The frame structure **150** comprises a pair of horseshoe-shaped plates **152***a-b* separated by the four vertical support members **151***a-d*. Each of the four vertical support members **151***a-d* is coupled to a corresponding set of support feet **153***a-d* in which the lower horseshoe-shaped plates **152***b* are coupled there to position the lower horseshoe-shaped plates **152***b* about the ground.

A set of connection hooks **154***a-n* is cut through the horseshoe-shaped level support members plates **152***a-b* having attachment slots along an outer edge of the horseshoe-shaped level support members plates **152***a-b*. The connection hooks **154***a-n* couple the frame structure **151** to the shoe plate as described in FIG. **14** by using the elastic bands in the same manner disclosed above. The frame structure **150** may be used for exercise training in a similar manner as the frame structure of FIG. **1***a*.

FIGS. **2***a-b* illustrate top and side views of a first embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention. FIG. **2***a* shows a top view of the frame structure **110** having the various connection hook support members arranged to create the hexagon as disclosed above with respect to FIG. **1***a*. The set of four L-shaped tabs **201***a-d* is arranged along the outer edge of the frame structure **100** whereby the tabs **201***a-d* are arranged to place through holes in each of four L-shaped tabs **201***a-d* and arranged vertically to permit the entire frame structure **100** to be coupled to a floor, ground, or supporting surface.

FIG. **2***b* shows a side view of the frame structure in which the vertical support members **101***a-d* are coupled between the two hexagon frame elements **202***a-b*. The side view of FIG. **2***b* shows one side of the frame structure having the long 3-connection hook segments **103***a-b* oriented in the center of the side view. The keyhole-shaped slot of the various connection hooks is visible in the hexagon connection hook segments. The hexagon connection hook segments are typically made of metal and may be welded to each other to construct the pair of hexagon frame elements **202***a-b* as well as couple the vertical support members **101***a-d* to the two hexagon frame elements **202***a-b*.

FIGS. **3***a-c* illustrate multiple views of a vertical support member of the first embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention. FIG. **3***a* shows a diagonal perspective view of one of the vertical support members **101**. The vertical support member IOI is made of a hollow metal rod **301** having a defined length corresponding to the height between the pair of hexagon frame elements **202***a-b* of the frame structure **110**. FIG. **2***b* shows an end view of the hollow support member **301** and FIG. **2***c* shows a side view of the hollow support member **301**. In this embodiment, the hollow support member **301** is shown to be square in shape. One skilled in the art will recognize that other shapes, including round, oval, and rectangular, may be used to define the hollow support member **301**. Additionally, the hexagon frame elements **202***a-b* may be configured with different numbers of connection hook segments having different lengths to construct other shaped frame elements such as a square, rectangle, and an octagon as possible arrangements.

FIGS. **4***a-d* illustrate multiple views of a 3-hook long side member of the first embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention. FIG. **4***a* shows a top view of the 3-hook long segments **103***a-b*, **103***c-d* having a hollow side support member **401** with three straight slots of the connection hooks **402***a-c* being visible and having diagonal shaped ends **403**. FIG. **4***b* shows a side view of the long 3-hook long segments **103***a-b*, **103***c-d* having the hollow side support member **401** with three keyhole slots of the connection hooks **402***a-c* being visible. FIGS. **4***c-d* show opposite diagonal perspective views of the hollow side support member **401** with the connection hooks **402***a-c* being visible.

The diagonal ends of the hollow side support member **401** are shown to have a 60° angle between the edge of the end and the outer edge of the hollow side support member **401**. This angle corresponds to an angle of a hexagon.

FIGS. **5***a-d* illustrate multiple views of a front I-hook short side member of the first embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention. FIG. Sa shows a top view of the short I-hook segments **104***a-b*, having a first hollow short side support member **501** with a single straight slot of the connection hook **502** being visible and having a single diagonal-shaped end **503** at an end closest to the connection hook **502**. FIG. Sb shows a side view of the short I-hook segments **104***a-b* having the first hollow short side support member **501** with the single keyhole slot of the connection hook **502** being visible. FIGS. **5***c-d* show opposite diagonal perspective views of the first hollow short side support member **501** with the connection hook **502** being visible.

The diagonal ends of the hollow short side support member **501** are shown to have a 60° angle between the edge of the end and the outer edge of the first hollow short side support member **501**. This angle corresponds to an angle of a hexagon.

FIGS. **6***a-d* illustrate multiple views of a rear I-hook side member of the first embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention. FIG. **6***a* shows a top view of the short I-hook segments **105***a-b*, having a second hollow short side support member **601** with a single straight slot of the connection hook **602** being visible and having a single diagonal-shaped end **603** at an end closest to the connection hook **602**. FIG. **6***b* shows a side view of the short I-hook segments **105***a-b* having the second hollow short side support member **601** with the single keyhole slot of the connection hook **602** being visible. FIGS. **6***c-d* show opposite

diagonal perspective views of the second hollow short side support member **601** with the connection hook **602** being visible.

The diagonal ends of the hollow short side support member **601** are shown to have a 60° angle between the edge of the end and the outer edge of the second hollow short side support member **601**. This angle corresponds to an angle of a hexagon.

FIGS. **7***a-d* illustrate multiple views of a I-hook long side member of the first embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention. Similarly, FIGS. **8***a-d* illustrate multiple views of a rear 1-hook side member of the first embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention. These segments provide the top and bottom segments of the frame structure **101** at its open end. The connection hooks are located at slightly different positions as the top and bottom parts of the frame structure **101** may utilize slightly different arrangements as desired.

FIGS. **9***a-d* illustrate multiple views of a rear I-hook side member of the first embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention. FIG. **9***a* shows a top view of the long I-hook segments **102***a-b*, having a center hollow short side support member **901** with a single straight slot of the connection hook **902** being visible and having diagonal shaped ends **903***a-b*. FIG. **9***b* shows a side view of the long I-hook segments **102***a-b* having the center hollow long center support member **901** with the single keyhole slot of the connection hook **902** being visible. FIGS. **9***c-d* show opposite diagonal perspective views of the hollow long center support member **901** with the connection hooks **902***a-b* being visible.

The diagonal ends of the hollow long center support member **901** are shown to have a 60° angle between the edge of the end and the outer edge of the hollow long center support member **901**. This angle corresponds to an angle of a hexagon.

FIGS. **10***a-c* illustrate multiple views of an L-shaped tab **201***a-d* of the first embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention. The L-shaped tab **201** comprises a vertical surface **202** and a horizontal surface **203** joined at a right angle along each side of the two surfaces of the L-shaped tab **201**. A through hole **204** is located in the center of the horizontal surface **203**. An outer side of the vertical surface **202** of the L-shaped tab **201** is coupled to the outer edge of the lower hexagon connection hook segment **202***b*, positioning the through hole **204** along a floor, ground, or support surface.

FIGS. **11***a-b* illustrate top and side views of a second embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention. The second embodiment of the frame structure **150** comprises a pair of U-shaped frame members **152***a-b* coupled to each end of 4 vertical support members **151***a-d*. A set of support feet **153***a-d* are coupled to a lower end of the 4 vertical support members **151***a-d* below the lower U-shaped frame member **152***b*. Similar to the first embodiment of the frame structure **110**, the second embodiment of the frame structure **150** comprises a set of L-shaped connection slots **122***a-k* for attaching a stretchable cord as shown in FIGS. **13***a-d* to the shoe foot plate **120** of FIG. **15**. The set of L-shaped connection hooks **122***a-k* are spaced about the U-shaped frame members **152***a-b* to provide connection hooks on all sides of the shoe plate **120**.

FIGS. **12***a-c* illustrate multiple views of a vertical support member of the second embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention. FIGS. **12***a-b* show a pair of opposing diagonal perspective views of one of the vertical support members **151**. The vertical support member **151** is made of a solid support member **162** having a defined length corresponding to the height between the pair of horseshoe-shaped frame elements **152***a-b* of the frame structure **150**. FIG. **12***c* shows an end view of the solid support member **162** having a threaded hole of accepting a screw (not shown) used to couple the vertical support member **151** to the horseshoe-shaped frame elements **152**-*b*. FIG. **12***c* shows a side view of the solid support member **162**. In this embodiment the solid support member **162** is shown to be a round rod in shape. One skilled in the art will recognize other shapes, including square, oval, and rectangular, may be used to define the solid support member **162**.

FIGS. **13***a-d* illustrate a plurality of different strength stretchable cords for connecting the shoe support member to the first and second embodiments of an article of manufacture providing a lower leg and ankle exercise device according to the present invention. FIGS. **13***a-d* each show a set of elastic bands **140** for connecting the shoe support plate **120** of FIG. **15** to the frame structures **100**, **150**. Each of the sets of elastic bands **140** provides a different amount of resistance to a user when exercising by stepping upon the shoe support plate **120**. The different sets of elastic bands **140** may be marked using different color band material or may have different markings to visually identify a resistance level provided by use of a particular set of elastic bands **140**.

In a preferred embodiment, the elastic bands may be provided is different colors. These colors include yellow, red, green, blue, black, silver, and gold. An amount of resistance provided by each colored elastic band may be different to easily inform users of the strength of the elastic bands being used at any given time. One embodiment of elastic bands provides the resistance is pounds as recited in Table 1.

TABLE I

Thera-Band Color Progression

Resistance in Pounds

% Elongation	Yellow	Red	Green	Blue	Black	Silver	Gold
25%	1.1	1.5	2.0	2.8	3.6	5.0	7.9
50%	1.8	2.6	3.2	4.6	6.3	8.5	13.9
75%	2.4	3.3	4.2	5.9	8.1	11.1	18.1
100%	2.9	3.9	5.0	7.1	9.7	13.2	21.6
125%	3.4	4.4	5.7	8.1	11.0	15.2	24.6
150%	3.9	4.9	6.5	9.1	12.3	17.1	27.5
175%	4.3	5.4	7.2	10.1	13.5	18.9	30.3
200%	4.8	5.9	7.9	11.1	14.8	21.0	33.4
225%	5.3	6.4	8.8	12.1	16.2	23.0	36.6
250%	5.9	7.0	9.6	13.3	17.6	25.3	40.1

Each elastic band **140** comprises a length of elastic material **141***a-d* and a pair of elastic band connection ends **142***a-d* on each end of the length of elastic material **141***a-d*. The elastic band connection end **142***a-d* is sized to fit within the keyhole slots of the hexagon connection hook segments as described above. An inner edge of the elastic band connection ends **142***a-d* is larger than the straight slots in the hexagon connection hook segments permitting the elastic band connection ends **142***a-d* to engage the inner surface of the straight slots in the hexagon connection hook segments

when coupling the shoe support plate **120** to the frame structure **110**, **150**. The elastic band connection ends **142***a-d* are inserted into the keyhole slot in the hexagon connection hook segments and slid inward towards the shoe support plate **120**. When the inner surface of the straight slots in the hexagon connection hook segments engages the inner edge of the elastic band connection, the elastic band **140** is forced against the inner end of the straight slot in the hexagon connection hook segments as the elastic band is stretched to engage connection slots **122***a-l* in the shoe support plate **120**. The forces generated by elastic bands **140** on opposite sides of the shoe support plate **120** coupled to opposing sides of the frame structure TOO, **150** creates a retention force that keeps the elastic bands **140** within the straight slots in the hexagon connection hook segments. This same retention force also keeps the elastic bands within the connection slots **122***a-l* of the shoe support plate **120**. The connection slots **122***a-l* are wide enough to permit the stretchable cords of FIGS. **13***a-d* to pass long ways through the connection slots.

FIGS. **14***a-e* illustrate multiple views of an elastic band connection end of the first embodiment of an article of manufacture providing a lower leg and ankle exercise device according to the present invention. In a preferred embodiment, the elastic band connection end **175** comprise a cylindrical shaped element **176** having through hole **177** lengthwise through the element **176**. The outer circumference of the cylindrical shaped element **176** is sided to be wider than the set of connection hooks **122***a-l* in the shoe plate **120** and the set of connection hooks in the support frames **110**, **150**. The stretchable cords **141***a-d* are coupled to an inner surface of the through hole **177** as the stretchable cords **141***a-d* are arranged to run out of and away from the cylindrical shaped element **176**. A cylindrical shaped element **176** is coupled to each end of the stretchable cords **141***a-d* to permit the stretchable cords **141***a-d* to be coupled between the shoe plate **120** and the frame structure **110**, **150**.

The stretchable cords **141***a-d* are secured within the through hole **177** in each of the cylindrical shaped element **176** by a pin (not shown) inserted into a hole **178** through the side of the cylindrical shaped element **176** and connecting to the stretchable cords **141***a-d*. The cylindrical shaped element **176** also includes a set of mounting holes **179***a-c* to connect a pair of bushings to the top **152***a* and bottom **152***b* of the cylindrical shaped element **176**.

FIG. **15** illustrates a top view of a shoe support member of the first and second embodiments of an article of manufacture providing a lower leg and ankle exercise device according to the present invention. The shoe support member **120** comprises a flat plate member **121** configured to correspond to a user's shoe when using the frame structures **110**, **150** to perform rehabilitation and exercise functions with the present invention. A thinner end of the shoe plate **120** is made for a heel of the user and the longer fatter section of the shoe plate **120** is made for the toe of the user, with apertures **124***a* centrally located at both the thinner end and longer fatter section. A leather strap (not shown) may assist a user to secure a shoe or foot to the shoe plate **120** by placing the leather strap **125**, as shown in FIGS. **16***a-c*, through the slots **123***a* and *b* in the shoe plate **120** and around the user's shoe (not shown).

FIGS. **16***a-c* illustrate multiple views of first and second embodiments of an article of manufacture in use providing a lower leg and ankle exercise device according to the present invention. FIGS. **16***a-b* show the lower leg and ankle exercise device of the first embodiment in which the shoe plate **120** is coupled to the frame structure **110** by a plurality of stretchable cords **141***a-d*. The leather strap **125** is visible restraining the user's shoe to the shoe plate **120** allowing the user to move the foot and shoe in various directions pushing and pulling against the resistance forces provided by the stretchable cords **141***a-d* coupling the shoe plate **120** to the frame structure **110**. The user may move the shoe plate in any direction including up and down as well as twisting from side to side. By moving the shoe plate **120** against the resistance of the stretchable cords **141***a-d*, the user may exercise the lower leg and ankle as needed.

FIG. **16***c* shows a side view of the lower leg and ankle exercise device **100** in use. The shoe plate **120** is visible under the user's shoe and held in place by the leather strap **125**. A plurality of stretchable cords **141***a-d* are positioned about the lower leg and ankle exercise device **100** to connect the shoe plate **120** to the second embodiment of the frame structure **150**. As described above, the user may exercise the lower leg and ankle by moving the shoe plate **120** against the resistance of the stretchable cords **141***a-d* in various directions.

FIGS. **17***a-b* illustrate multiple views of stretchable cord arrangements with the first embodiment of an article of manufacture in use providing a lower leg and ankle exercise device according to the present invention. FIGS. **17***a-b* show different arrangements of the stretchable cords **129***a-d* that are connecting the connection slots **122***a-l* in the shoe plate **120** to the connection slots **127***a-j* in the top frame members **101***a-b*-**105***a-b* and a separate arrangements of the stretchable cords **130***a-d* that are connecting the connection slots **122***a-l* in the shoe plate **120** to the connection slots **128***a-j* in the bottom frame members **101***c-d*-**105***c-d*. FIG. **17***a* shows 4 stretchable cords **129***a-d* connecting the shoe plate **120** to the frame structure **110** and 4 stretchable cords **130***a-d* connecting the shoe plate **120** to the frame structure **110**. Similarly, FIG. **17***b* shows 6 stretchable cords **129***a-f* connecting the shoe plate **120** to the frame structure **110** and 6 stretchable cords **130***a-f* connecting the shoe plate **120** to the frame structure **110**. These various stretchable cords may be arranged in any number of configurations as shown in FIG. **17***a-b* to exercise various parts of a lower leg and ankle.

Even though particular combinations of features are recited in the present application, these combinations are not intended to limit the disclosure of the invention. In fact, many of these features may be combined in ways not specifically recited in this application. In other words, any of the features mentioned in this application may be included in this new invention in any combination or combinations to allow the functionality required for the desired operations.

No element, act, or instruction used in the present application should be construed as critical or essential to the invention unless explicitly described as such. Further, the phrase "based on" is intended to mean "based, at least in part, on" unless explicitly stated otherwise.

What is claimed is:

1. A lower leg and Achilles tendon exercise device, comprising:

a top frame structure having a first plurality of connection hooks about a perimeter;

a bottom frame structure oriented parallel to the top frame structure having a second plurality of connection hooks about a perimeter;

a plurality of vertical support members coupled between the top frame structure and the bottom frame structure;

a shoe support member having a plurality of connection hooks positioned about an outer edge of the shoe support member; and

a plurality of stretchable cords configured to couple the shoe support member to the top frame structure and the

bottom frame structure, the plurality of stretchable cords being received in either the first plurality of connection hooks of the top frame structure or the second plurality of connection hooks of the bottom frame structure, and the plurality of connection hooks of the shoe support member so as to locate the shoe support member in a suspended position above the bottom frame structure and below the top frame structure.

2. The exercise device according to claim **1**, wherein the connection hooks of the first and second plurality of connection hooks each comprise a keyhole end terminating at an inner end configured to retain an end of a stretchable cord of the plurality of stretchable cords.

3. The exercise device according to claim **2**, wherein each stretchable cord of the plurality of stretchable cords comprises a stretchable band having opposing ends and an elastic band connection end coupled to each opposing end, the elastic band connection end being configured to engage a surface of the top or bottom frame structures with a first opposing end and to engage a surface of the shoe support member with a second opposing end when the stretchable band is disposed within a connection hook of the plurality of connection hooks of the shoe support member and a corresponding connection hook of first and second plurality of connection hooks of the top frame structure or bottom frame structure.

4. The exercise device according to claim **3**, wherein each of the stretchable bands have a resistance corresponding to a color marking of the stretchable bands between 1.1 lbs. and 7.9 lbs. when stretched to an elongation of 25% of its length.

5. The exercise device according to claim **4**, wherein each of the stretchable bands have a resistance corresponding to a color marking of the stretchable bands between 2.9 lbs. and 21.6 lbs. when stretched to an elongation of 100% of its length.

6. The exercise device according to claim **5**, wherein each of the stretchable bands have a resistance corresponding to a color marking of the stretchable bands between 5.9 lbs. and 40.1 lbs. when stretched to an elongation of 250% of its length.

7. The exercise device according to claim **4**, wherein the colored markings comprise one or more of the following: a yellow, a red, a green, a blue, a black, a silver, and a gold marking.

8. The exercise device according to claim **2**, wherein the top frame structure and the bottom frame structure comprise an identical set of straight members arranged in a hexagon shape, the hexagon shape having an open end and a closed end.

9. The exercise device according to claim **8**, wherein each of the straight members have at least one connection hook.

10. The exercise device according to claim **9**, wherein each of the straight support members has a rectangular shape with a hollow center.

11. The exercise device according to claim **8**, wherein the set of straight members are welded together.

12. The exercise device according to claim **2**, wherein the top frame structure and the bottom frame structure each comprise a U-shaped frame member, the first and second plurality of connection hooks being located about an outer edge of the perimeter of the U-shaped frame members.

13. The exercise device according to claim **12**, wherein the first and second plurality of connection hooks on opposing sides of the U-shaped frame members are located in identical positions from an open end.

14. The exercise device according to claim **2**, wherein the shoe support member comprises connection hooks of the plurality of connection hooks positioned on opposing sides of the shoe support member.

15. The exercise device according to claim **2**, wherein the top frame structure and the bottom frame structure are made of steel.

* * * * *