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(54) Title: DEVICE AND METHOD FOR ENHANCING AND FACILITATING CORRECT SPINAL ALIGNMENT

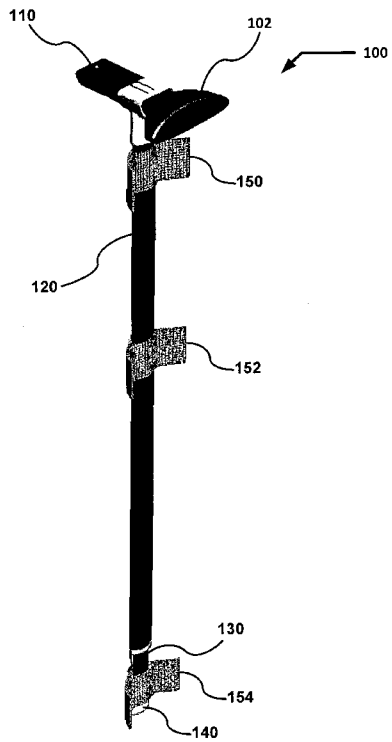

FIG. 1

(57) Abstract: A device for enhancing and facilitating correct spinal alignment comprising a flat or rounded bar and a series of removable pads, contoured to rest below the base of the skull, i.e., at the first vertebra of the cervical spine (or atlas vertebra), with the lower end of the bar placed at the lumbar region of a user. The dimensions of the pad in use are determined by the degree of cervical alignment required and are adjustable. The device may be worn on the body held in place with straps, affixed in clothing, backpacks, vests, or any other wearable garment or accessory, or attached to a bracket that may be attached or affixed to another object, such as a car seat, chair, etc. In use, the device encourages simultaneous physical contact of the user's atlas vertebra, thoracic spine, and lower lumbar spine with the flat or rounded bar.

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DEVICE AND METHOD FOR ENHANCING AND FACILITATING CORRECT SPINAL ALIGNMENT

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CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the priority to United States ("U.S.") Provisional Patent Application Serial Number 62/143,010, entitled "Device and Method for Enhancing and Facilitating Correct Spinal Alignment," filed on June 3, 2015, to inventors Wayne Daniels, Alii R. Ontiki, and George W. Cranford IV, the disclosure of which is incorporated by reference herein in its entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The invention relates generally to devices and methods that enhance a person's health and well-being, and more particularly, to devices and methods that operate to improve and properly maintain a person's posture.

2. Description of the Related Art

[0003] Today, many individuals have poor posture which may adversely affect their physical and mental health. For example, poor posture is generally unattractive. Many people perceive individuals with upright posture as interested and alert, while individuals who slouch or stoop may be viewed as lazy, awkward, or frail. These perceptions influence whether others positively or negatively view a person's work or mental condition. In addition to being socially undesirable, poor posture can cause various health problems. With continual poor posture, these health problems can include curvature of the spine and a chronic stooping condition.

[0004] Poor posture is posture that results from certain muscles tightening up or shortening while others lengthen and become weak, which often occurs as a result of one's daily activities. The different factors that can impact a person's posture include occupational activities as well as biomechanical factors such as force and repetition. In general, computer use is problematic concerning posture because a person using a computer, either at work or for personal pleasure, may sit at a computer without proper posture for extended periods of time, that is, slouched and hunched over, peering at a computer monitor, perhaps while sitting cross-legged or with legs curled under seats.

[0005] Other sources of poor posture are repetitive motion without frequent breaks and also sitting with poor posture for long periods without interruption. If one spends a substantial part of one's day in a certain position without frequent reprieves, the spine tends to orient itself to that position. For example, if someone is constantly leaning over to pick up objects, gradually the spine will start to develop a more exaggerated forward curve of the thoracic spine. In other words, poor posture may be caused either by prolonged periods of repeated motions, or by remaining fixed in one particular position for prolonged periods.

[0006] From the foregoing it is evident that poor posture is at present a common affliction suffered by many people and thus there is a need for a device and methods of using the device that will enable a person to improve his or her posture. Such a device should be able to be worn by the user for extended periods of time, while undertaking various activities throughout the day, and should be lightweight, comfortable and adjustable to the user's changing posture.

SUMMARY

[0007] Devices and methods of correcting, improving, and properly maintaining a person's posture and spinal alignment are disclosed. Such a device in accordance with the invention may include a flat or rounded metal or plastic Atlas bar and a removable, adjustable Atlas pad affixed to a top end of the Atlas bar, where the Atlas pad is contoured to rest below the base of the skull, *i.e.*, at the first vertebra of the cervical region of the spine (or Atlas vertebra), of a user. Being removable, Atlas pads of varying dimensions may be changed as required to accommodate a user's particular need. Additionally, an Atlas bar may be configured to be adjustable relative to the Atlas bar. The bottom end of the Atlas bar rests upon the lumbar region of the user, where this bottom end may also include a pad or padding to make the device more comfortable to the user.

[0008] The Atlas bar may be worn on the body and held in place by two or more straps, which may take the form of a vest or corset comprised of lightweight nylon webbing or other like materials, and worn on the body in the form of clothing with quick-release fasteners. The webbing or the like may also be attached by way of brackets to backpacks, office desks, car seats, *etc.*, or other stationary objects.

[0009] In use, the Atlas bar encourages simultaneous physical contact of the Atlas vertebra, the thoracic region of the spine, and lower lumbar region of the spine of the user. When used in various settings, the device facilitates correct spinal posture, creates proprioceptive awareness and recruitment of suboccipital muscles, and increases spinal tension and adaptability in movement. As the user's spinal posture improves, the dimensions of the Atlas pad may change. That is, the distance between the center of the arc where the Atlas pad rests on the Atlas vertebra and the Atlas bar itself decreases as the posture improves, as the misalignment of the spine decreases.

[0010] The device is intended for use in all types of settings and for extended periods of time. For example, the device may be used while working in an office or at a computer for several hours, working in an occupation that requires physical movement and labor, or while exercising or participating in sporting activities.

[0011] Other systems, methods, features and advantages of the invention will be or will become apparent to one with skill in the art upon examination of the following figures and detailed description. It is intended that all such additional systems, methods, features and advantages be included within this description, be within the scope of the invention, and be protected by the accompanying claims.

BRIEF DESCRIPTION OF THE FIGURES

[0012] The examples of the invention described below can be better understood with reference to the following figures. The components in the figures are not necessarily to scale, emphasis instead being placed upon illustrating the principles of the invention. In the figures, like reference numerals designate corresponding parts throughout the different views.

[0013] FIG. **1** shows a perspective view of an example implementation of an assembled Atlas bar device in accordance with the invention.

[0014] FIG. **2A** shows a perspective view of the Atlas bar sheath of the assembled Atlas bar device of FIG. **1**.

[0015] FIG. **2B** shows a perspective view of the Atlas bar of the assembled Atlas bar device of FIG. **1**.

[0016] FIG. **2C** shows a perspective view of the Atlas pad of the assembled Atlas bar device of FIG. **1**.

[0017] FIG. **2D** shows a perspective view of the Atlas pad holder of the assembled Atlas bar device of FIG. **1**.

[0018] FIG. **2E** shows a perspective view of the bottom Atlas bar holder of the assembled Atlas bar device of FIG. **1**.

[0019] FIG. **3A** shows a top plan view of an example implementation of an Atlas pad in accordance with the invention.

[0020] FIG. **3B** shows a top plan view of an Atlas pad similar to that shown in FIG. **3A** but with different dimensions.

[0021] FIG. **3C** shows a top plan view of another Atlas pad similar to that shown in FIG. **3A** but with different dimensions.

[0022] FIG. **4A** shows a top plan view of a sketch of another example implementation of an Atlas pad in accordance with the invention that illustrates one dimension of an Atlas pad.

[0023] FIG. **4B** shows a top plan view of a sketch of the Atlas pad shown in FIG. **4A** that illustrates a changed dimension of an Atlas pad.

[0024] FIG. **4C** shows a top plan view of a sketch of the Atlas pad shown in FIG. **4A** that illustrates another changed dimension of an Atlas pad.

[0025] FIG. **4D** shows a top plan view of a sketch of the Atlas pad shown in FIG. **4A** that illustrates yet another changed dimension of an Atlas pad.

[0026] FIG. **5** shows an exploded perspective view of yet another example implementation of an Atlas pad holder and an Atlas pad in accordance with the present invention.

[0027] FIG. **6** shows a perspective view of the Atlas pad holder and the Atlas pad of FIG. **5** placed against the Atlas vertebrae of a user.

[0028] FIG. **7A** shows a front perspective view of an example implementation of an assembled Atlas bar device in accordance with the invention together with an example of an embodiment of straps that may be used to attach the assembled Atlas bar device to a user.

[0029] FIG. **7B** shows a rear perspective view of the assembled Atlas bar device and embodiment of straps shown in FIG. 7A.

[0030] FIG. **8A** shows a front elevational view of another example implementation of an assembled Atlas bar device in accordance with the invention together with another example of an embodiment of straps that may be used to attach the assembled Atlas bar device to a user.

[0031] FIG. **8B** shows a rear elevational view of the assembled Atlas bar device and embodiment of straps shown in FIG. **8A**.

[0032] FIG. **8C** shows a front perspective view of the assembled Atlas bar device and embodiment of straps shown in FIG. **8A**.

[0033] FIG. **8D** shows a rear perspective view of the assembled Atlas bar device and embodiment of straps shown in FIG. **8A**.

[0034] FIG. **8E** shows a top plan view of the assembled Atlas bar device and embodiment of straps shown in FIG. **8A**.

[0035] FIG. **9** shows a front elevational view of yet another example implementation of an Atlas bar device in accordance with the invention together with another example of

an embodiment of straps that may be used to attach the assembled Atlas bar device to a user.

DETAILED DESCRIPTION

[0036] In the following description of the preferred and various alternative embodiments, reference is made to the accompanying drawings that form a part hereof, and in which is shown by way of illustration a specific embodiment in which the invention may be practiced. It is to be understood that other embodiments may be utilized and various structural changes may be made without departing from the spirit and scope of this invention.

[0037] FIG. **1** shows a perspective view of an example implementation of an assembled Atlas bar device **100** in accordance with the invention. In FIG. **1**, an Atlas pad **102** is shown inserted into an Atlas pad holder **110**. The Atlas pad holder **110** is then placed onto the top of Atlas bar sheath **120**. Inside the Atlas bar sheath **120**, the Atlas bar **130** is movably inserted such that the Atlas bar **130** may be adjusted to the height of the user. At the bottom of the Atlas bar **130**, a bottom Atlas bar holder **140** may be placed over the end of the Atlas bar **130**, such that the bottom Atlas bar holder **140** may contact the lower lumbar region of the spine of the user.

[0038] Also shown in FIG. **1** are portions of straps or webbing referred to as an upper strap **150**, a middle strap 152, and a lower strap **154**. These straps are attached to either the Atlas bar sheath **120** or the Atlas bar **130**, and may be part of a vest or corset-type of clothing (not shown) that may be worn by a user of the assembled Atlas bar device **100**.

[0039] Turning to FIG. **2A**, a perspective view of the Atlas bar sheath **120** is shown, with the Atlas bar sheath **120** having a top end **122** and a bottom end **124**. The Atlas bar sheath **120** also has a cylindrical cavity **128** running along its entire length, where the cylindrical cavity **128** is configured to receive the Atlas bar **130**, a perspective view of which is shown in FIG. **2B**. The Atlas bar **130** also has a top end **132** and a bottom end **134**. The Atlas bar **130** may also include a plurality of holes **150**, evenly spaced along the bottom of the Atlas bar **130**, which holes together with push-button **144** (see FIG. **2A**) allow the Atlas bar **130** to be adjustable within the Atlas bar sheath **120**.

[0040] FIG. **2C** shows a perspective view of the Atlas pad **102** of the assembled Atlas bar device **100** of FIG. **1**. The Atlas pad **102** may include a flange **104**, which adjustably fits into slot **112** of the Atlas pad holder **110** that is shown in FIG. **2D**. The Atlas pad

holder **110** may also include a cavity **114**, which may be fitted over the top end **122** of the Atlas bar sheath **120**.

[0041] FIG. **2E** shows a perspective view of the bottom Atlas bar holder **140** of the assembled Atlas bar device **100** of FIG. **1**. The bottom Atlas bar holder **140** may include a slot **142**, through which the bottom end **134** of the Atlas bar **130** is adjustably inserted. Once inserted and adjusted to its desired position, the Atlas bar **130** may be held in place by a spring-loaded push-button **144**.

[0042] FIG. **3A** shows a top plan view of another example implementation of an Atlas pad **300** in accordance with the invention. In this particular implementation, the Atlas pad **300** is configured to fit over a rounded Atlas bar (not shown) having a diameter of approximately ¾", and accordingly, there is a hole **302** having the approximately the same diameter in Atlas pad **302**.

[0043] The Atlas pad **300** has a width **304** of approximately 3½" and a length **306** of approximately 3". The most significant dimension of the Atlas pad **300** is the dimension **310**, which is the distance between the center of the arc that touches and is contoured to rest at the Atlas vertebra of a user, and the point of contact with the Atlas bar. In Atlas pad **300**, this dimension **310** is 1".

[0044] Turning to FIGs. **3B** and **3C**, Atlas pads **320** and **340**, respectively, are shown. The Atlas pad **320** has a width **324** of approximately 3½" and a length **326** of approximately 3". The Atlas pad **340** has a width **344** of approximately 4" and a length **346** of approximately 3¾". In Atlas pad **320**, the dimension **330** is 1½", and in Atlas pad **340**, the dimension **350** is 2". Accordingly, as noted above, Atlas pads **320** and **340** are each respectively used by a user with a greater degree of posture misalignment; as the distance between the center of the arc that touches the Atlas vertebra of a user, and the point of contact with the Atlas bar, increases in each embodiment. In general, this distance may be between and including 1" to 6".

[0045] As for the Atlas bar itself, it may be circular or rounded, elliptical, or flat. The Atlas bar may be made of metal, wood, plastic (*i.e.*, ultra-high molecular weight polyethylene, polypropylene, polytetraflouroethylene, high-density polyethylene, and

polyurethane), fiberglass, carbon fiber, foam (high-, medium-, or low-density, *i.e.*, EVA/polyolefin, polyurethane), *etc.*

[0046] The Atlas pads may be made of metal, rubber, wood, foam (high-, medium-, or low-density, *i.e.*, EVA/polyolefin), plastic (*i.e.*, ultra-high molecular weight polyethylene, polypropylene, polytetraflouroethylene, high-density polyethylene, low-density polyethylene, and polyurethane), leather, *etc.*, and the like.

[0047] FIG. **4A** shows a top plan view of a sketch of another example implementation of an Atlas pad **400** in accordance with the invention that illustrates one dimension of an Atlas pad. In FIG. **4A**, radius **402** represents a radius of 2", which defines the arc of the Atlas pad that touches and is contoured to rest at the Atlas vertebra of a user. Likewise, FIGs. **4B**, **4C**, and **4D** show Atlas pads **410**, **420**, and **430**, respectively, with radius **412** equal to 3", radius **422** equal to 3", and radius **432** equal to 5", respectively. In general, as the radius increases, the depth of the arc decreases.

[0048] Turning to FIG. **5**, yet another example implementation of an Atlas pad holder and an Atlas pad in accordance with the present invention is shown. Atlas pad **502** is shown with a slot **512**, which is configured to receive the flange **510** of the Atlas pad holder **504**. When the flange **510** is inserted into the slot **512**, the Atlas pad **502** may be held in place by a locking mechanism (not shown) in the Atlas pad **502**. The Atlas pad holder **504** may then be attached to an Atlas bar sheath as shown in FIG. **1**.

[0049] FIG. **6** shows a perspective view of the Atlas pad holder **504** and the Atlas pad **502** of FIG. **5** placed against the Atlas vertebrae of a user **600**. In FIG. **6**, the assembly of the Atlas pad holder **504** and the Atlas pad **502** is shown attached to an Atlas bar **610**, which in turn is attached to the user by means of a vest comprising straps. Portions of the vest are shown as straps **620** in FIG. **6**.

[0050] FIG. **7A** shows a front perspective view of an example implementation of an assembled Atlas bar device **700** in accordance with the invention together with an example of an embodiment of straps that may be used to attach the assembled Atlas bar device to a user. In FIG. **7A**, a right shoulder strap **720** and a left shoulder strap **722** are shown attached to an X-shaped brace **740**, which supports the Atlas bar device **700** on the torso of a user.

[0051] Turning to FIG. **7B**, which shows a rear perspective view of the assembled Atlas bar device **700** shown in FIG. **7A**, Atlas pad **702** is shown attached to Atlas bar **710**, with Atlas pad **702** shown in place at the Atlas vertebra of the user. Also shown are upper horizontal strap **730**, middle horizontal strap **732**, and lower horizontal strap **734**, which are fitted around the torso of the user. Upper horizontal strap **730** and middle horizontal strap **732** are both attached to the right shoulder strap **720** and the left shoulder strap **722**, while lower horizontal strap **734** fits around the waist of the user and includes a quick-fastener. All of these straps may include adjustment mechanisms (not shown), such as Velcro® fasteners, that allow the user to adjust each of the straps as needed.

[0052] FIG. **8A** shows a front elevational view of another example implementation of an assembled Atlas bar device in accordance with the invention, together with another example of an embodiment of straps that may be used to attach the assembled Atlas bar device to a user. In FIG. **8A**, a right shoulder strap **820** and a left shoulder strap **822** are shown attached to a V-shaped brace **840**, which is connected to upper horizontal strap **830** and which supports the Atlas bar device **800** on the torso of a user.

[0053] Turning to FIG. **8B**, which shows a rear perspective view of the assembled Atlas bar device **800** shown in FIG. **8A**, a cross brace **850** is shown attached to the right shoulder strap **820** and the left shoulder strap **822**, and also to the upper horizontal strap **830**. A lower horizontal strap **834**, which fits around the waist of the user, is also shown.

[0054] FIG. **8C** shows a front perspective view of the assembled Atlas bar device and embodiment of straps shown in FIG. **8A**. Turning to FIG. **8D**, which is a rear perspective view of the assembled Atlas bar device and embodiment of straps shown in FIG. **8A**, Atlas pad **802** is shown attached to Atlas bar **810**, with Atlas pad **802** shown in place at the Atlas vertebra of the user. Also shown is lower horizontal strap **834**, which fits around the waist of the user and is attached to the bottom end of the Atlas bar **810**. FIG. **8E** shows a top plan view of the assembled Atlas bar device 800, where the right shoulder strap **820** and the left shoulder strap **822** are connected to adjustment means **850**, which may be used to adjust the shoulder straps. These adjustment means may include Velcro® fasteners, side-release buckles, or fastener systems that allow the user to adjust each of the straps as needed.

[0055] FIG. **9** shows a front elevational view of yet another example implementation of an Atlas bar device **900** in accordance with the invention together with another example of an embodiment of straps that may be used to attach the assembled Atlas bar device to a user. The Atlas bar device **900** includes an Atlas pad **902** attached to Atlas bar **904**, which is shown inserted into Atlas bar sheath **910**. The Atlas bar sheath **910** is attached to the torso of the user by various straps, which may include a right shoulder strap **924** and a left shoulder strap **928**, which are shown attached to a bracket-shaped strap **920**. The bracket-shaped strap **920** is placed on the back of the user and held in place by a chest strap **930**, which goes around the chest of the user.

[0056] Atlas bar device **900** may also include a lumbar pad **934**, which fits into the lumbar region of the spine of the user and helps support and steady the Atlas bar device **900** on the torso of the user. Atlas bar device **900** may also include a waist strap **940**, which also helps support the Atlas bar device **900** on the user. The chest strap **930** and the waist strap **940** both are shown with side-release buckles, but other types of fasteners, such as Velcro®, may be used.

[0057] The foregoing description of one or more implementations has been presented for purposes of illustration and description. It is not exhaustive and does not limit the claimed inventions to the precise form disclosed. Modifications and variations are possible in light of the above description or may be acquired from practicing the invention.

CLAIMS

What is claimed is:

1. A device for enhancing and facilitating correct spinal alignment, the device comprising:

a flat or rounded Atlas bar configured to be placed in simultaneous physical contact with the Atlas vertebra, the thoracic region, and the lower lumbar region of the spine of a user, and having a top end and a bottom end;

an Atlas pad removably placed at the top end of the Atlas bar, contoured to rest at the Atlas vertebra of the user, and adjustable dependent on a degree of misalignment of the head and the spine of a user; and

an attachment means for affixing the Atlas bar and the Atlas pad to the back of the user.

2. The device for enhancing and facilitating correct spinal alignment of claim 1, wherein the attachment means comprises a plurality of shoulder straps and a plurality of horizontal straps.

3. The device for enhancing and facilitating correct spinal alignment of claim 2, wherein the shoulder straps and the horizontal straps are made from nylon or polypropylene webbing.

4. The device for enhancing and facilitating correct spinal alignment of claim 1, wherein the Atlas pad comprises:

a front surface contoured to conform to the Atlas vertebra of the user;

a distance between the front surface and the Atlas bar dependent on a degree of misalignment between the head and the spine of a user; and

attachment means for attaching the Atlas pad to the Atlas bar.

5. The device for enhancing and facilitating correct spinal alignment of claim 1, further comprising an Atlas bar sheath having a cylindrical cavity positioned along a length of the Atlas bar sheath and configured to receive and enclose the Atlas bar.

6. The device for enhancing and facilitating correct spinal alignment of claim 5, further comprising an Atlas pad holder having a cavity configured to fit securely over the top end of the Atlas bar.

7. The device for enhancing and facilitating correct spinal alignment of claim 6, where the Atlas pad further comprises a flange configured to securely fit into a slot of the Atlas pad holder.

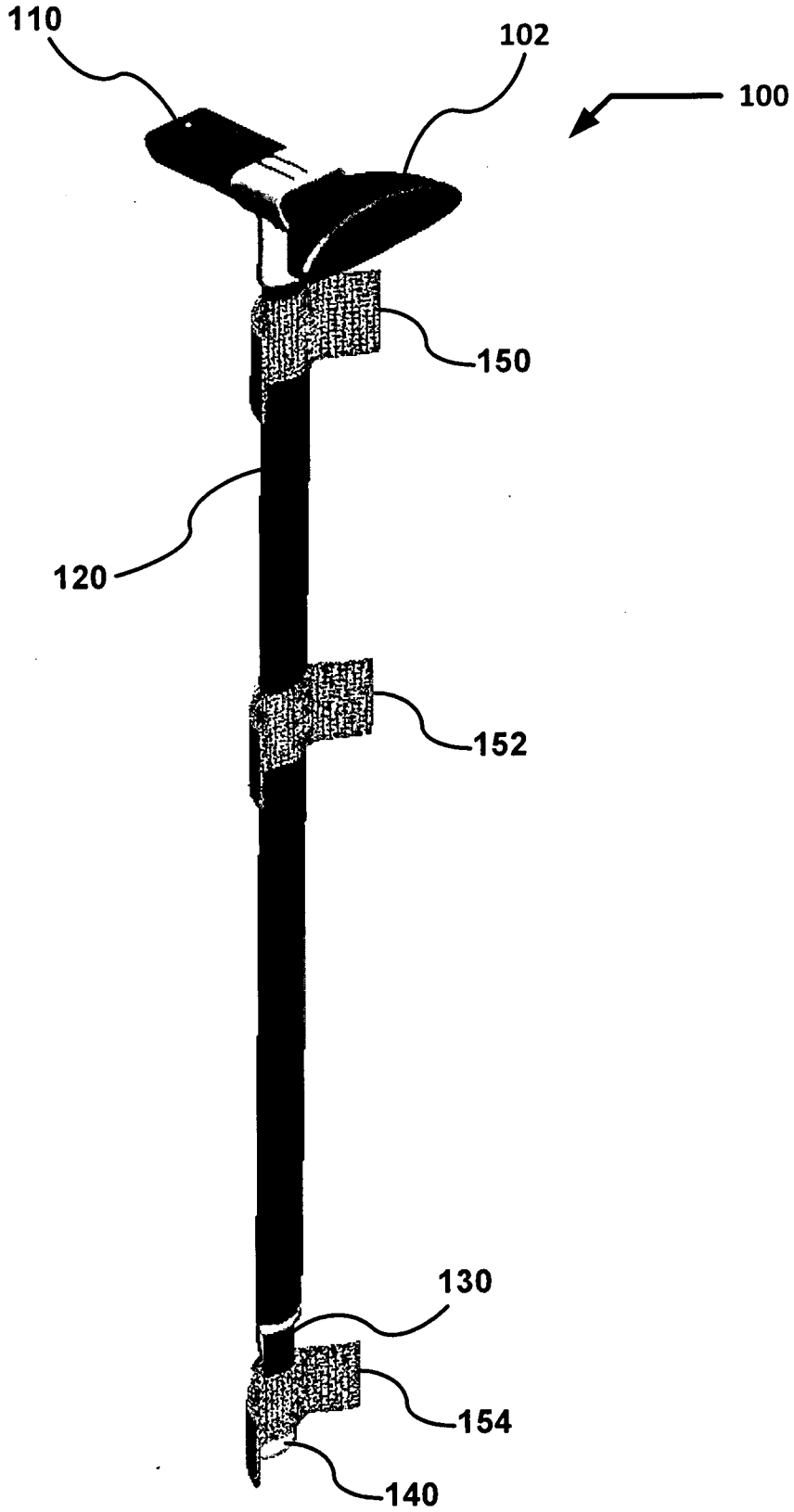


FIG. 1

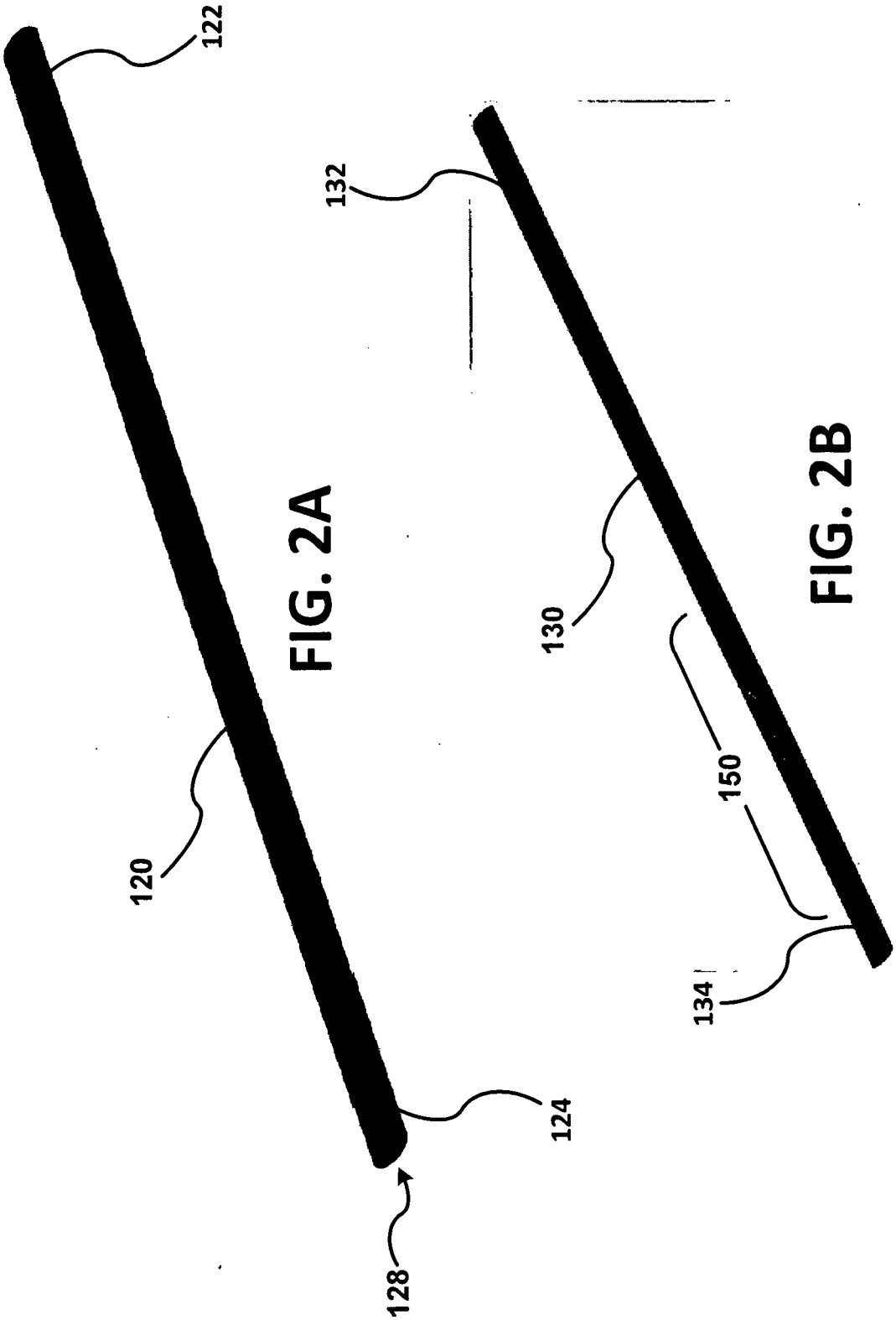


FIG. 2A

FIG. 2B

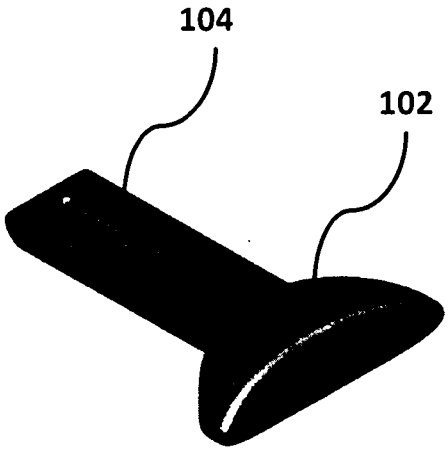


FIG. 2C

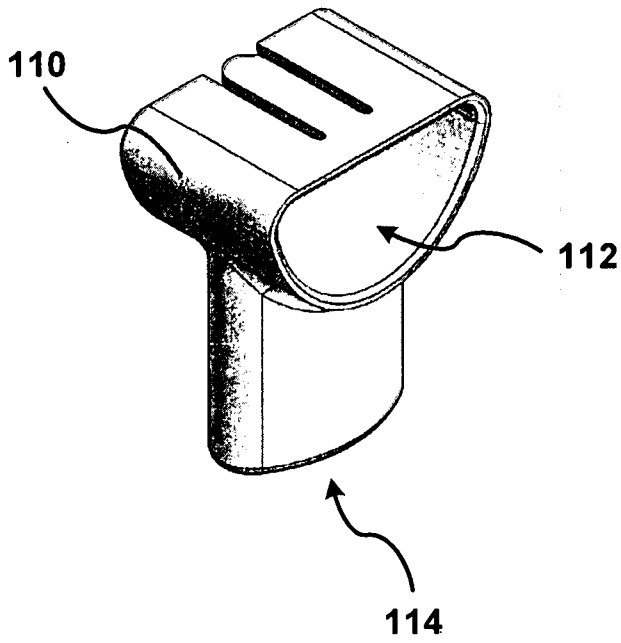


FIG. 2D

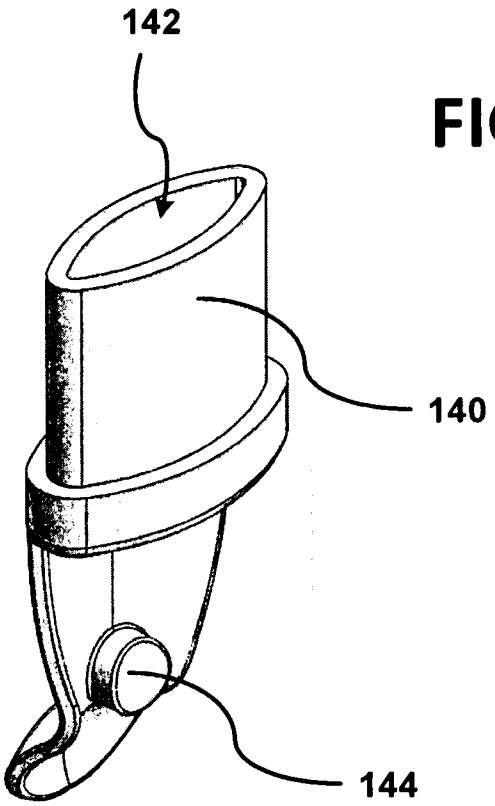


FIG. 2E

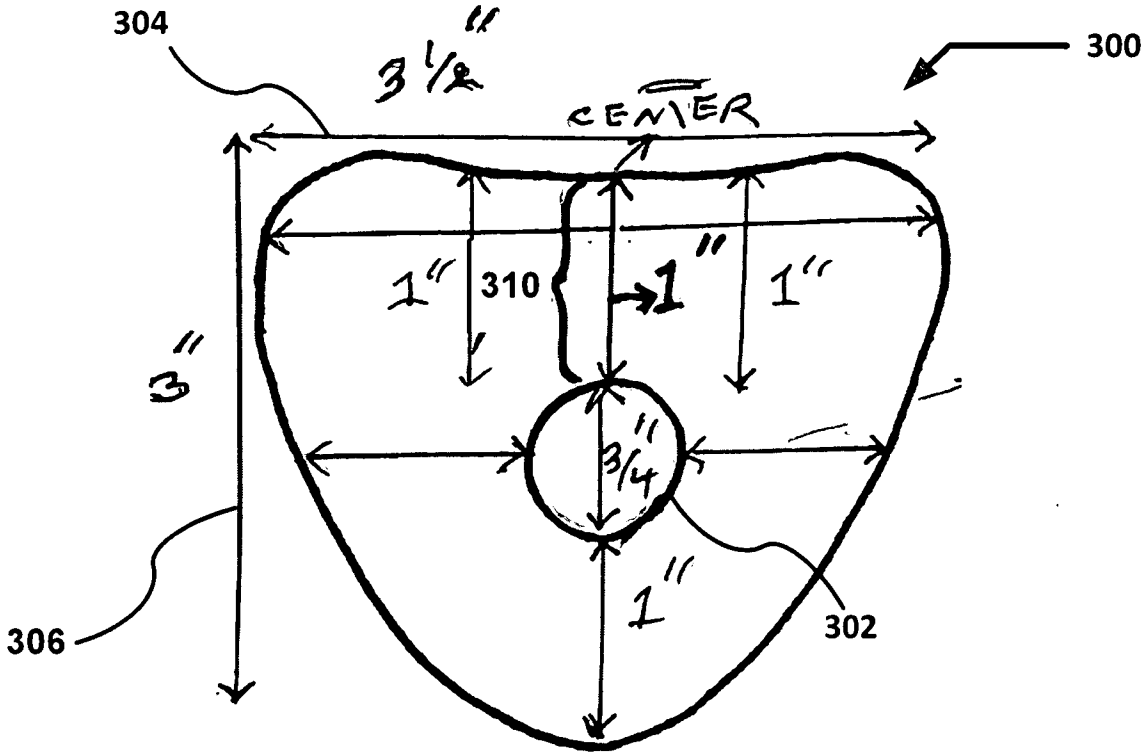

304
300
3 1/2"
CENTER
1"
310
1"
1"
3"
3/4"
1"
306
302

FIG. 3A

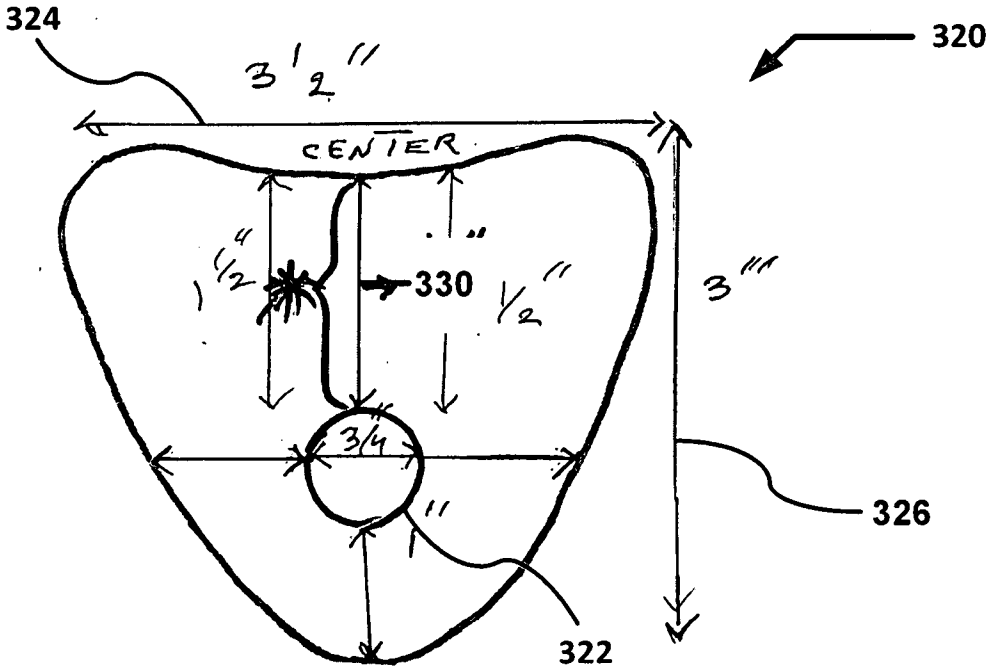

324
320
3 1/2"
CENTER
1 1/2"
330
1/2"
3"
3/4
326
322

FIG. 3B

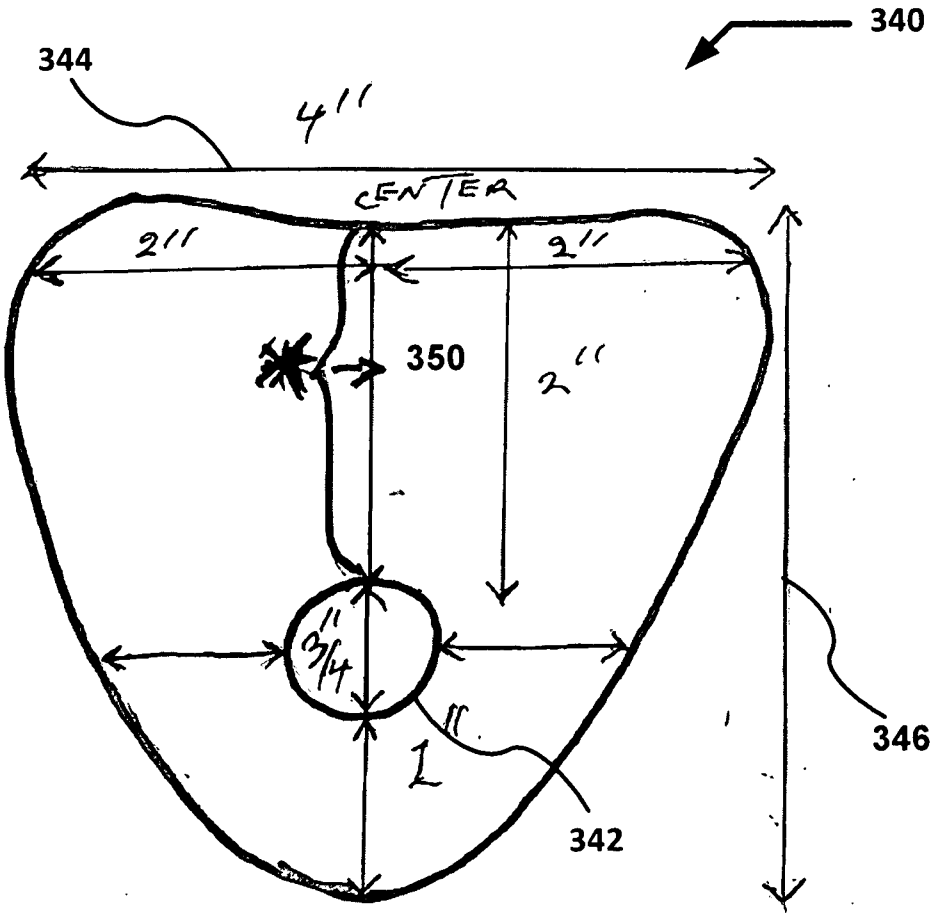


FIG. 3C

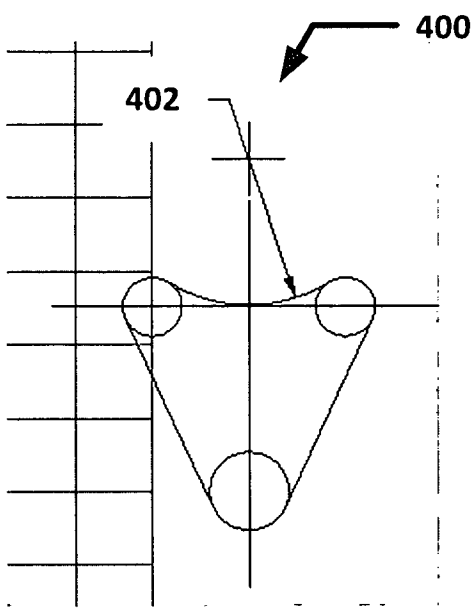


FIG. 4A

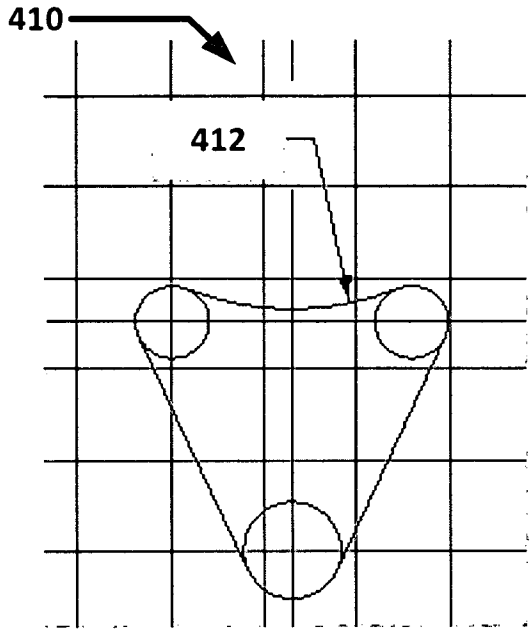


FIG. 4B

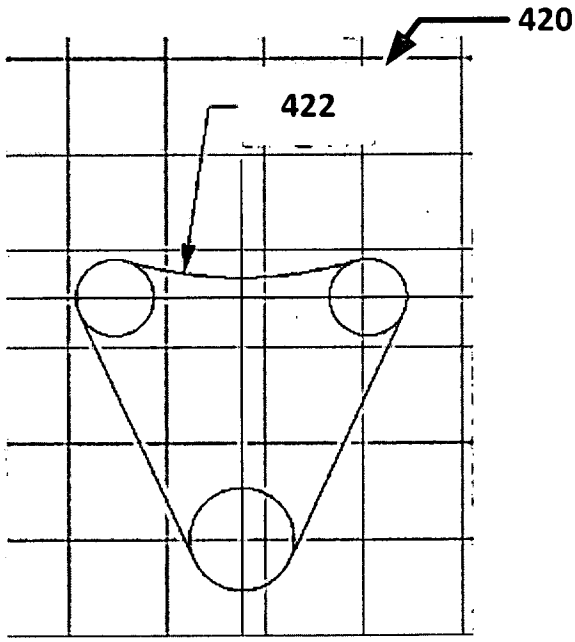


FIG. 4C

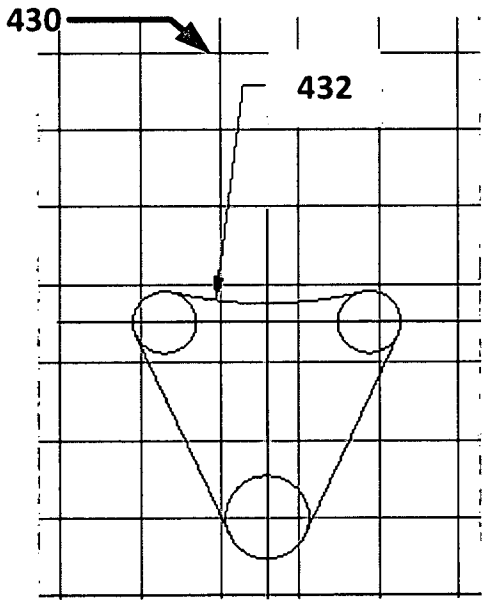


FIG. 4D

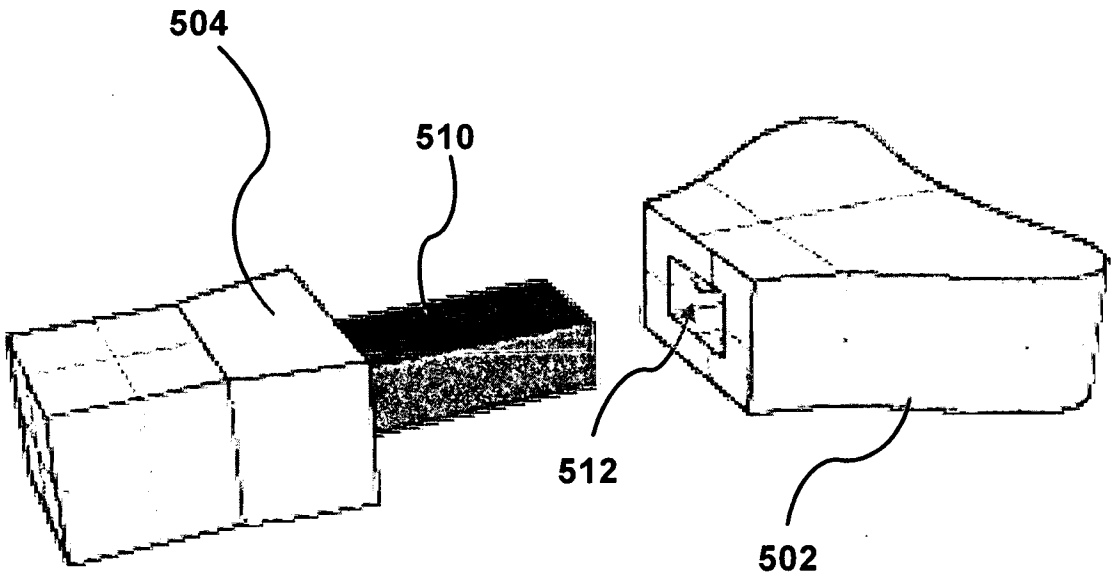


FIG. 5

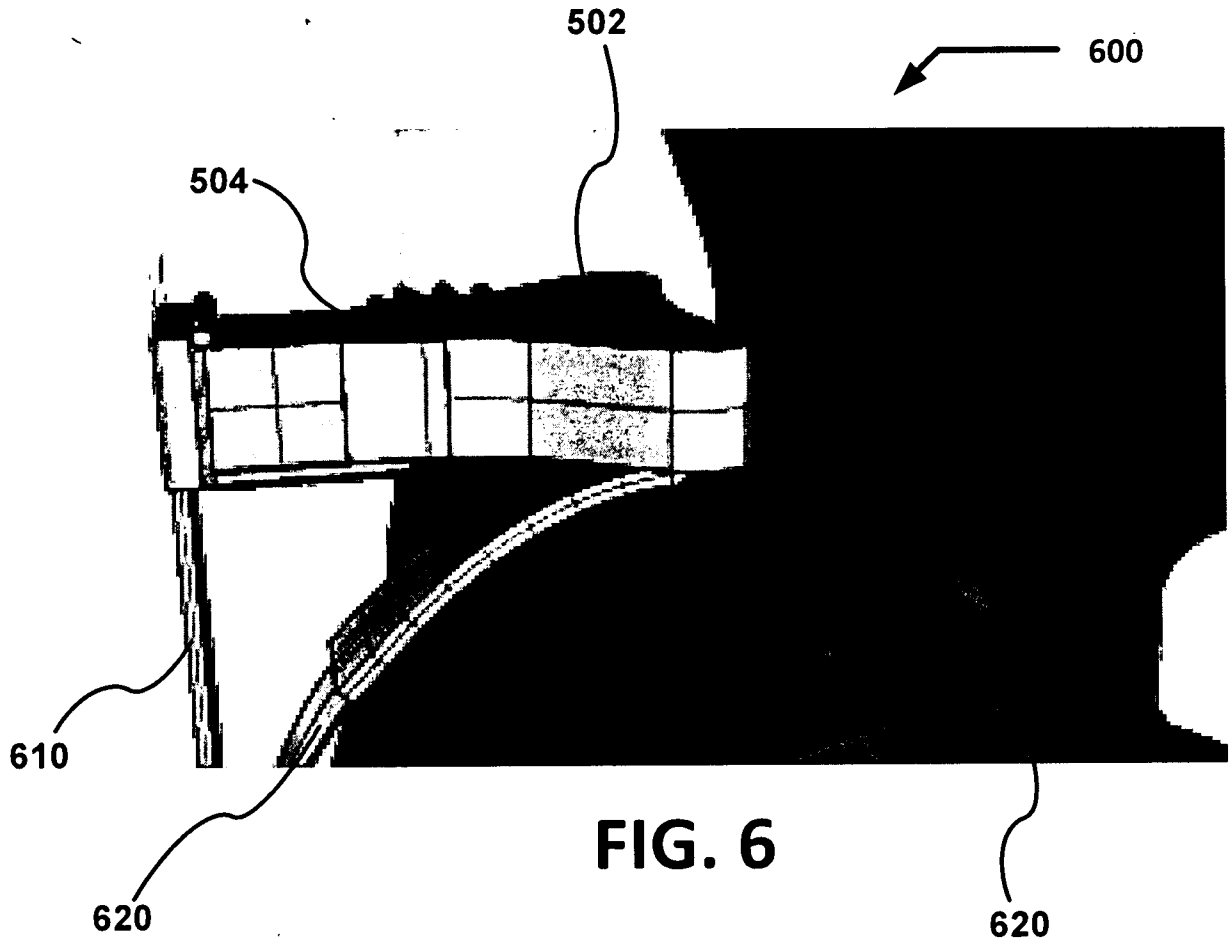


FIG. 6

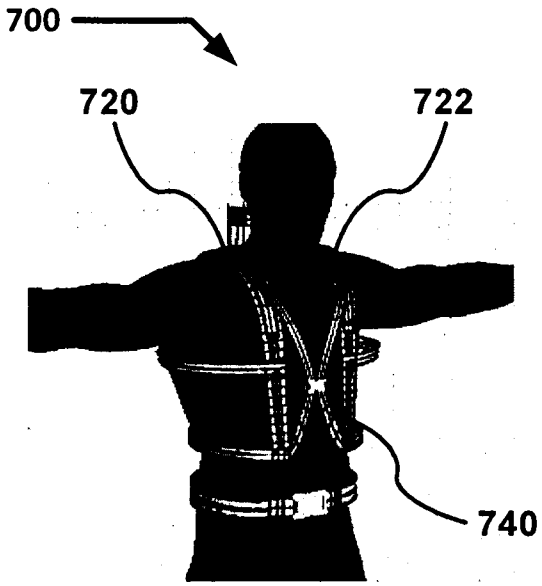


FIG. 7A

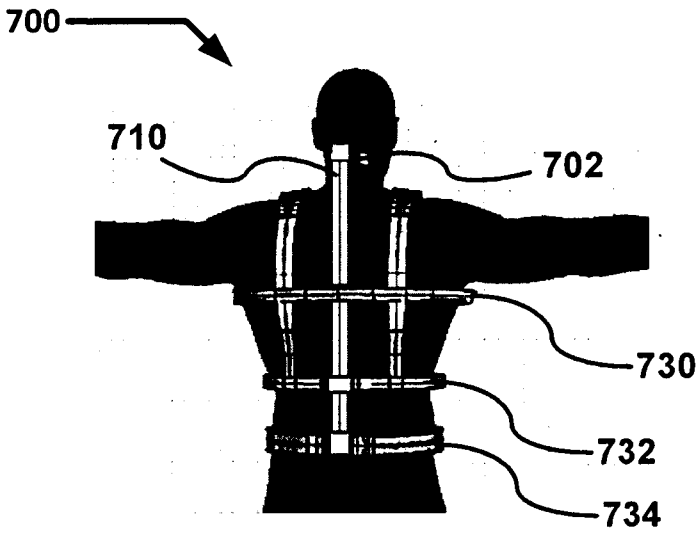


FIG. 7B

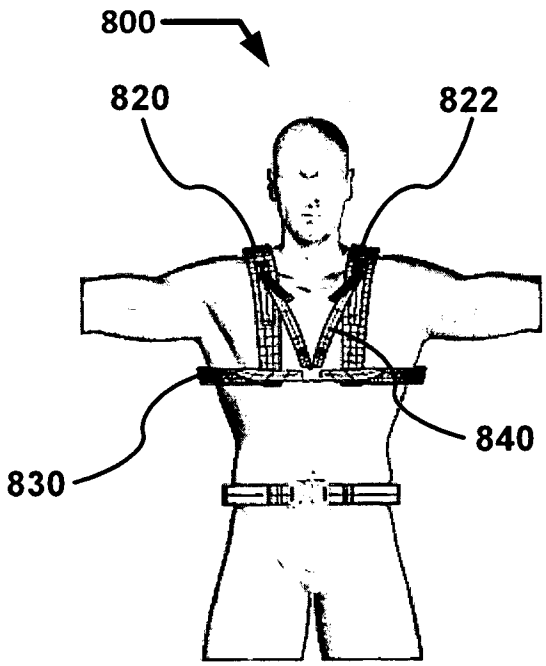


FIG. 8A

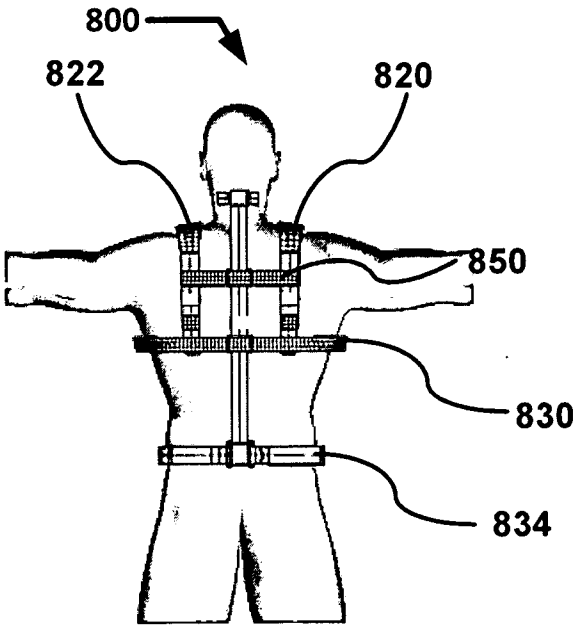


FIG. 8B

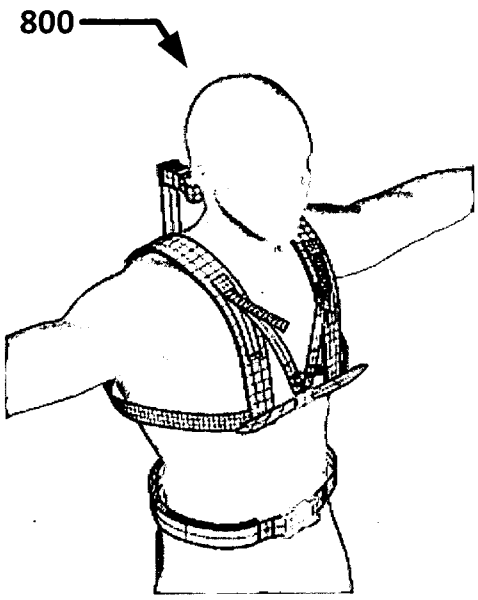


FIG. 8C

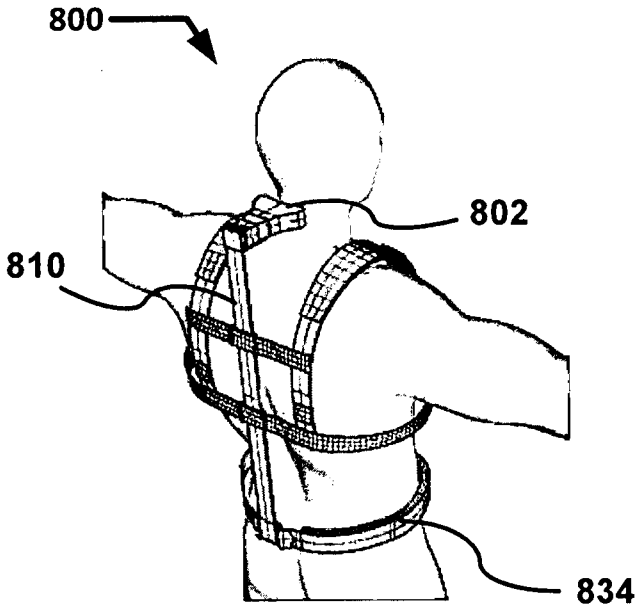


FIG. 8D

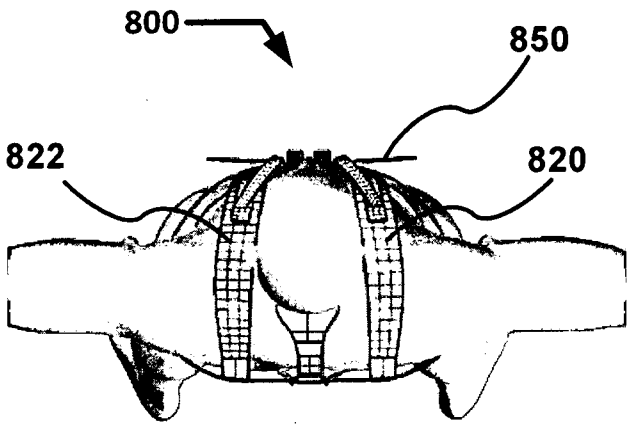
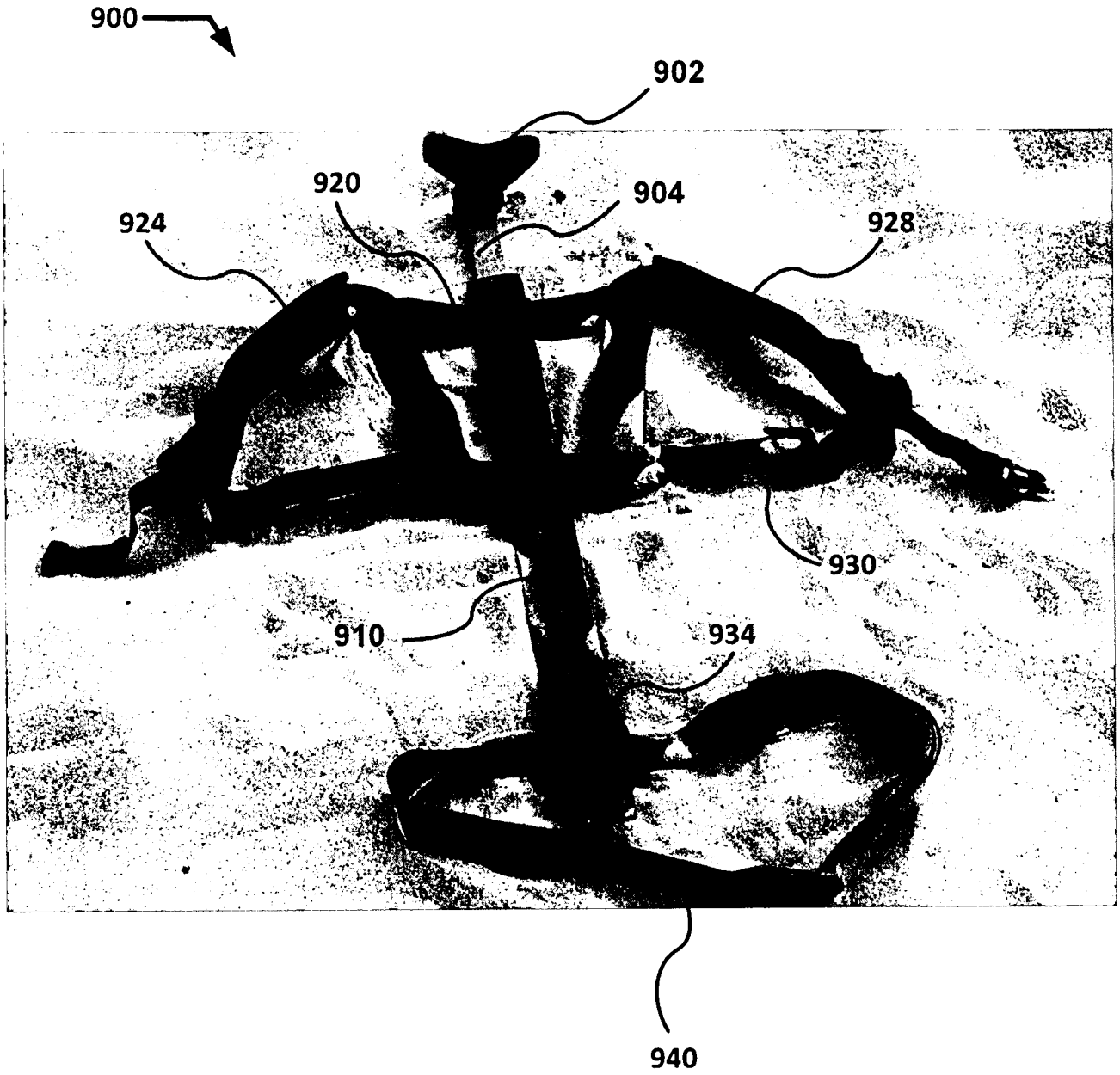


FIG. 8E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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 16/25941

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - A61F 5/00, A61F 5/01, A61F 5/02 , A61H 1/00 (2016.01)
CPC - A61F 5/00, A61F 5/01, A61F 5/02, A61F 5/024, A61F 5/026
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8): A61F 5/00, A61F 5/01, A61F 5/02 , A61H 1/00, A61F 5/02 (2016.01)
CPC: A61F 5/00, A61F 5/01, A61F 5/02, A61F 5/024, A61F 5/024, A61F 5/026, A61F 5/028, A61H 1/*, A61H 2001/*

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 602/18, 602/5

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Patbase, Google (Web, Patents, Scholar, Images)
Bar, brace, corset, lumber, atlas, vertebrae, C1, cervical, neck, head, back, align, straps, adjust, implement, spine, thoracic, contoured, rest, orthopedic, removable, nylon, cavity, sheath,

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 954,005 A (Roth) 05 April 1910 (05.04.1910) entire document, especially figs. 1-2, pg 1, ln 8 -10, pg 2, ln 11-40, 84-127, pg 3, ln 3-10.	1-7
Y	US 2015/0080994 A1 (Ito) 19 March 2015 (19.03.2015) entire document, especially figs. 4-9, para [0030].	1-7
Y	US 8,708,834 B1 (Domangue) 29 April 2014 (29.04.2014) entire document, especially Abstract, fig. 4, col 5, ln 45-58.	2-3
Y	US 2002/0033626 A1 (Yoo) 21 March 2002 (21.03.2002) entire document, especially Title, Abstract, fib, 1A-1B, para [0039]	6-7
A	US 3,945,376 A (Kuehnegger) 23 March 1976 (23.03.1976) entire document.	1-7
A	US 6,626,494 B2 (Yoo) 30 September 2003 (30.09.2003) entire document.	1-7
A	US 4,383,523 A (Schurman) 17 May 1983 (17.05.1983) entire document.	1-7
A	US 7,967,767 B2 (Ogilvie) 28 June 2011 (28.06.2011) entire document.	1-7
A	DE 20204936 U1 (Leinung) 12 September 2002 (12.09.2002) entire document	1-7
A	US 5,411,038 A (Mollendorf et al.) 02 May 1995 (02.05.1995) entire document.	1-7
A	US 4,951,655 A (MacMillan et al.) 28 August 1990 (28.08.1990) entire document.	1-7

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
02 June 2016 (02.06.2016)	12 JUL 2016
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (January 2015)