



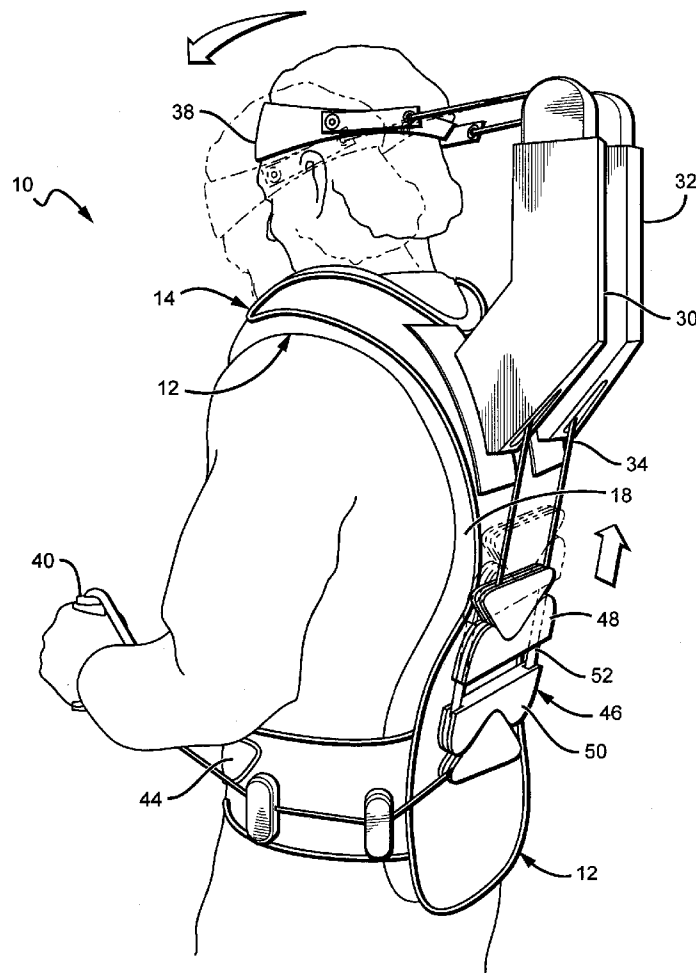
US 20100292051A1

(19) **United States**(12) **Patent Application Publication**
Benumof et al.(10) **Pub. No.: US 2010/0292051 A1**(43) **Pub. Date: Nov. 18, 2010**(54) **USER OPERABLE NECK ISOMETRIC AND
ISOKINETIC EXERCISE DEVICE AND
METHOD****Publication Classification**(51) **Int. Cl.**
A63B 23/025 (2006.01)(52) **U.S. Cl.** **482/10**(57) **ABSTRACT**

A compact and easy-to-use isometric and isokinetic exercise apparatus that is particularly applicable to exercising the neck to improve strength and flexibility and to help alleviate neck pain. Different embodiments provide different arrangements that allow the user to control the level of exercise resistance to meet the tolerance or desires of the user. In all embodiments, the apparatus allows for controlled and graded resistance to the neck that allows the user to regulate the amount of resistance in an incremental manner. One embodiment of a neck exercising apparatus according to the present invention comprises an attachment mechanism for attaching to a user's head. Actuating mechanisms can also be included that allow the user to provide a movement force to the apparatus, wherein the movement force is transferred to said attachment mechanism. The apparatus is arranged such that movement from the actuating mechanisms in one direction causes movement of the attachment mechanism in a different direction.

(75) **Inventors:** **Benjamin Benumof**, San Clemente,
CA (US); **Kevin Kroes**, Mission
Viejo, CA (US); **Brian A. Babson**,
Long Beach, CA (US)

Correspondence Address:

KOPPEL, PATRICK, HEYBL & DAWSON
2815 Townsgate Road, SUITE 215
Westlake Village, CA 91361-5827 (US)(73) **Assignee:** **NECKRX, INC.**(21) **Appl. No.:** **12/761,309**(22) **Filed:** **Apr. 15, 2010****Related U.S. Application Data**(60) **Provisional application No. 61/177,509, filed on May
12, 2009.**

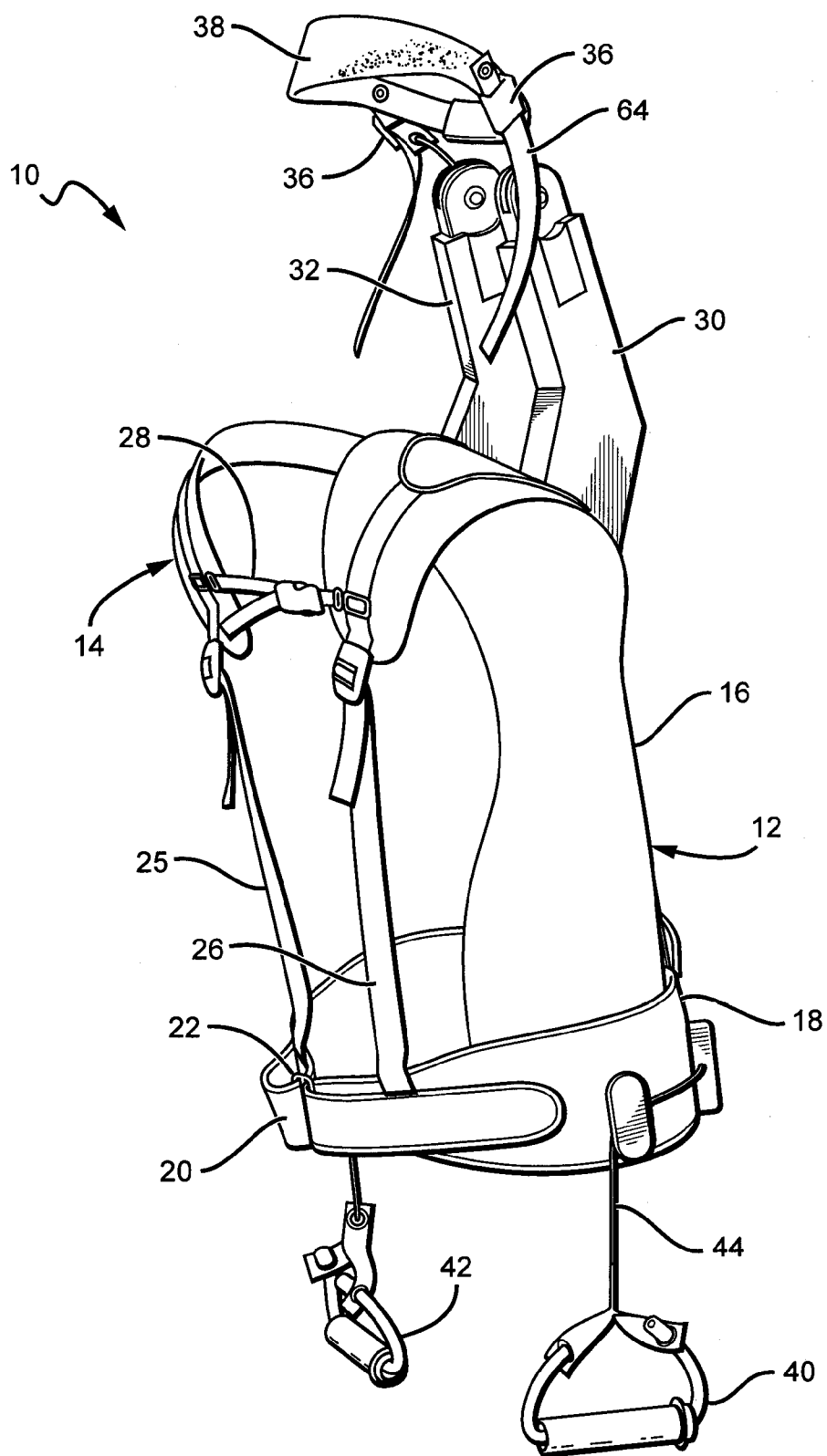


FIG. 1

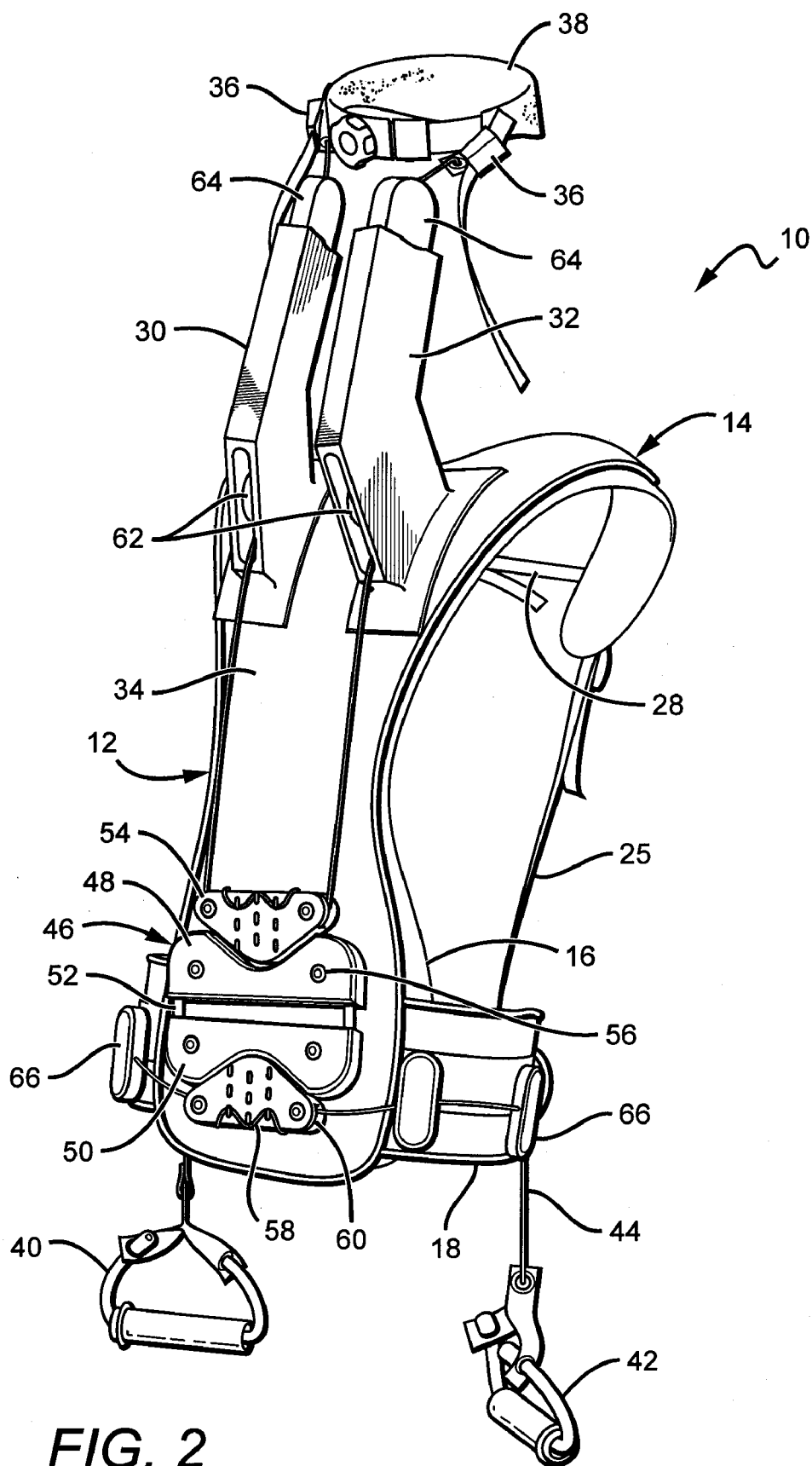


FIG. 2

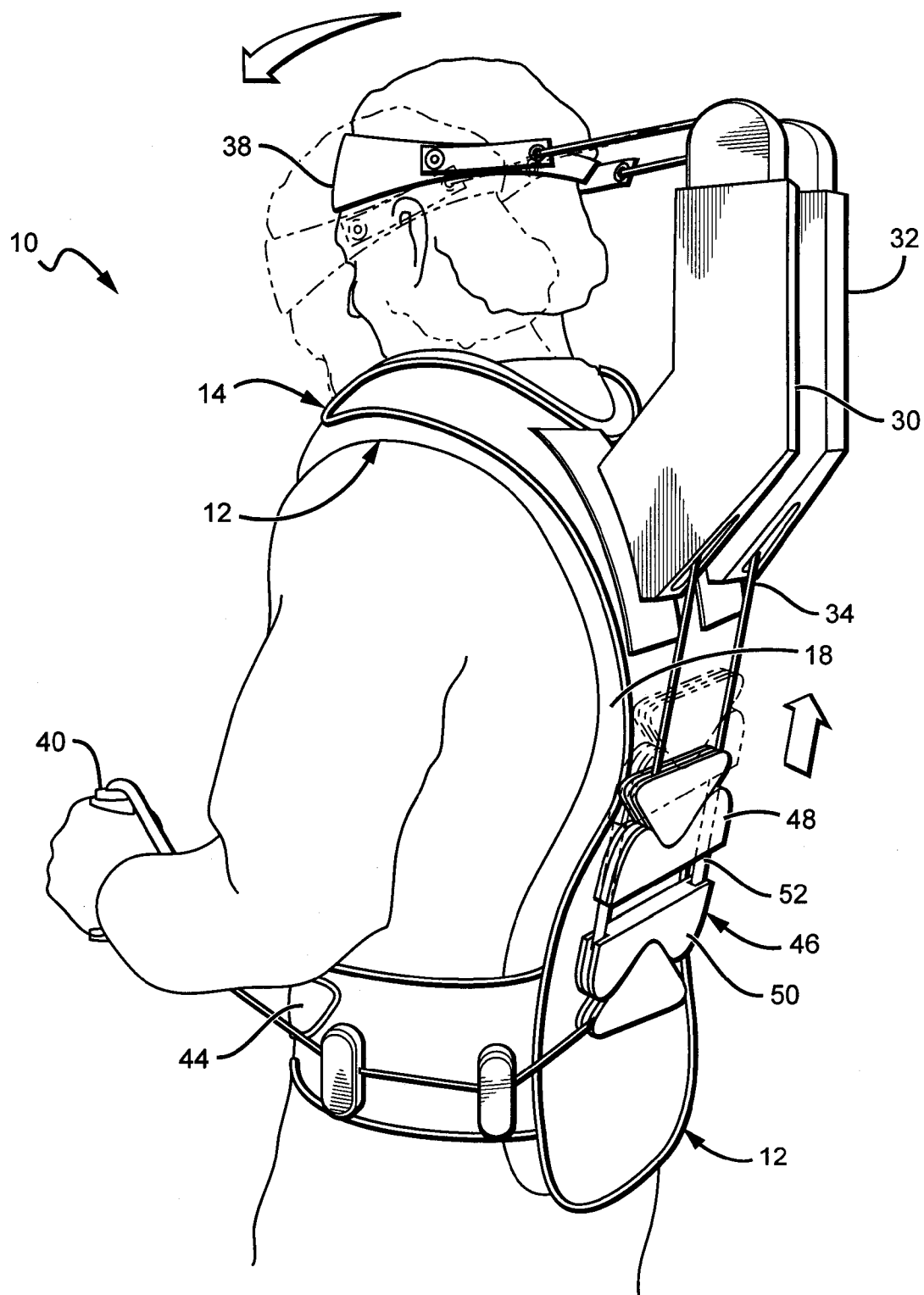


FIG. 3

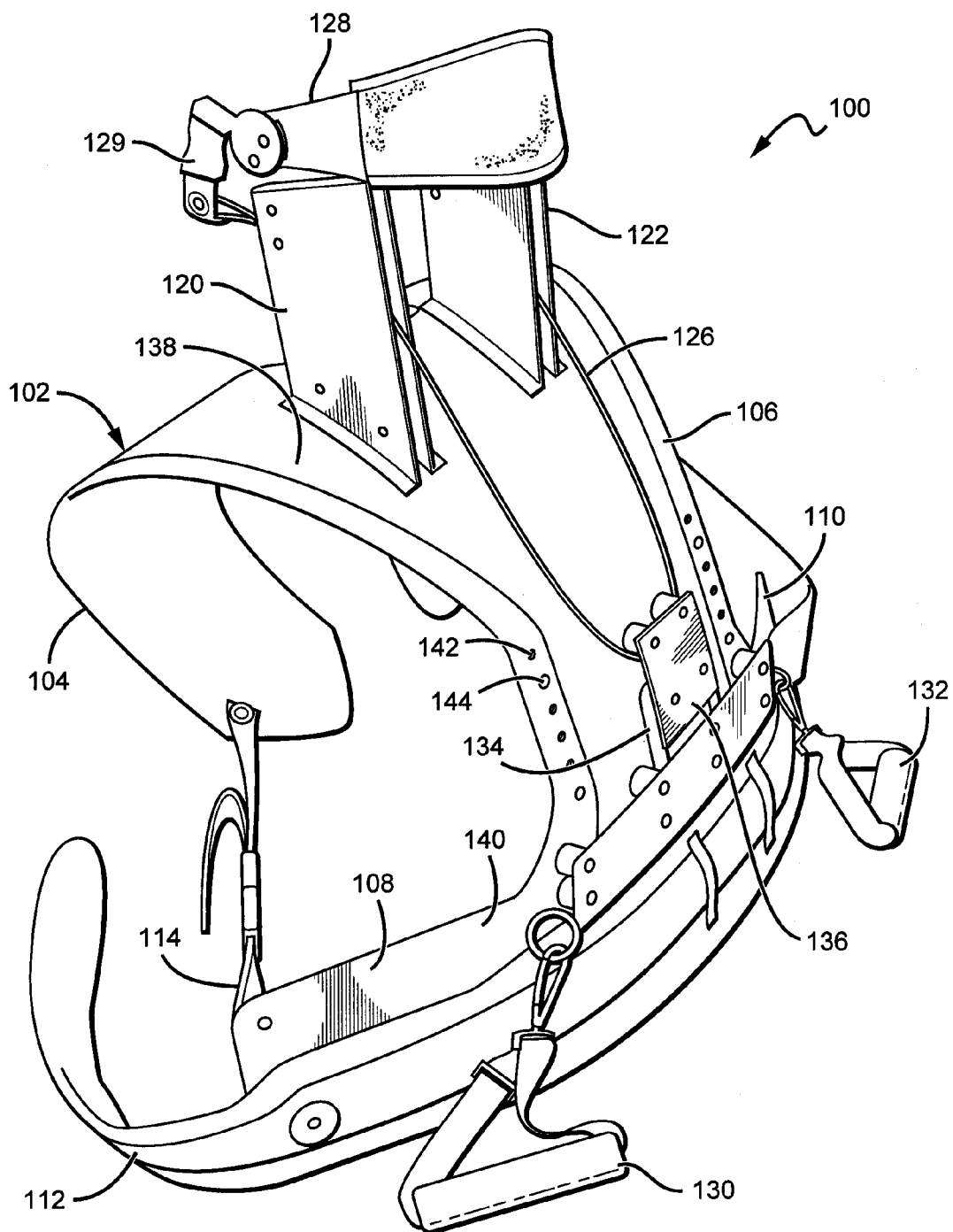
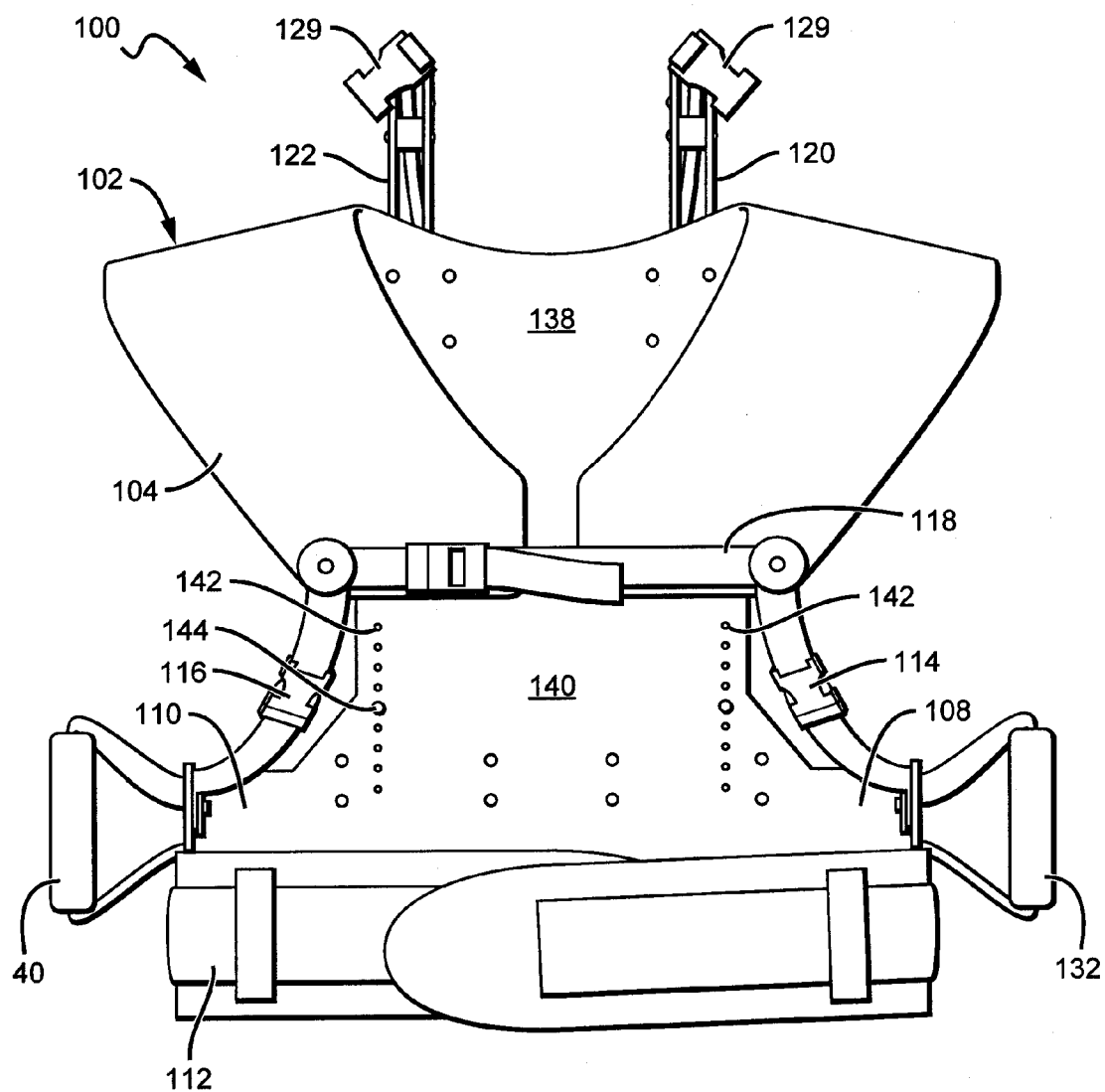


FIG. 4

FIG. 5



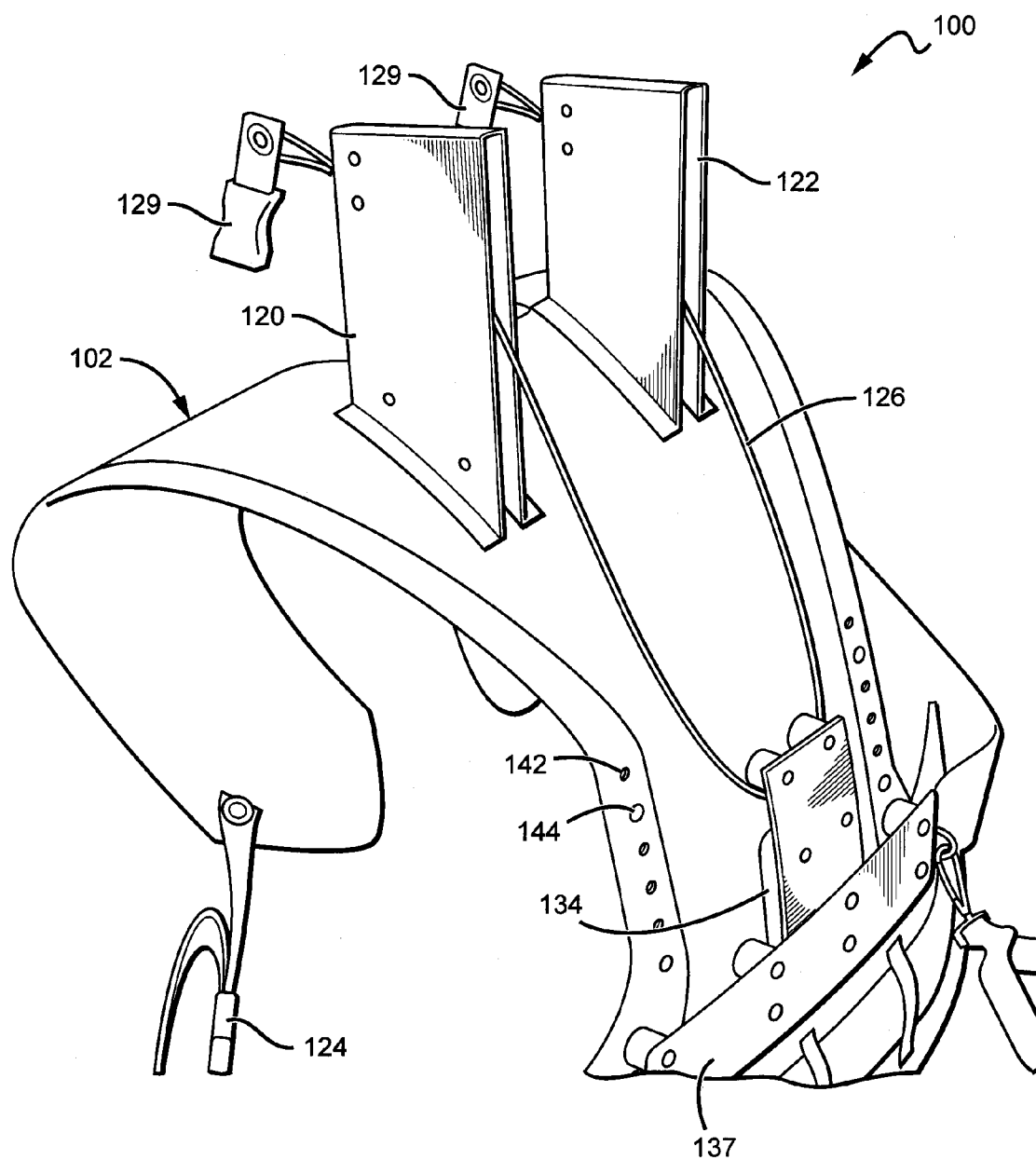


FIG. 6

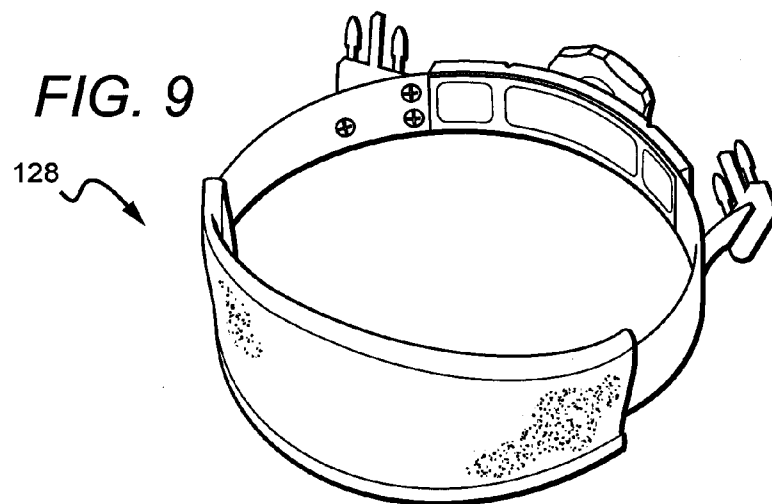
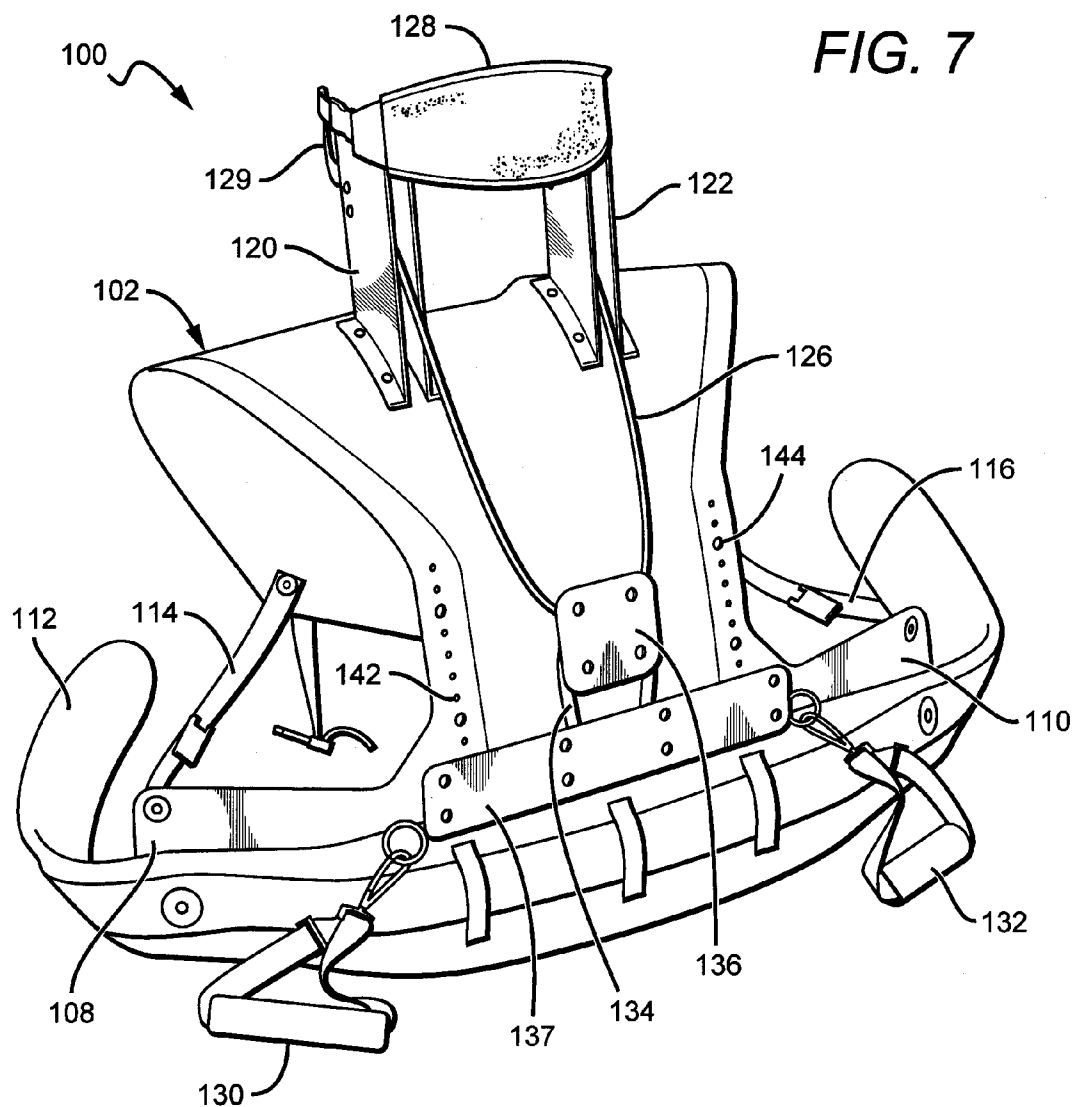


FIG. 8

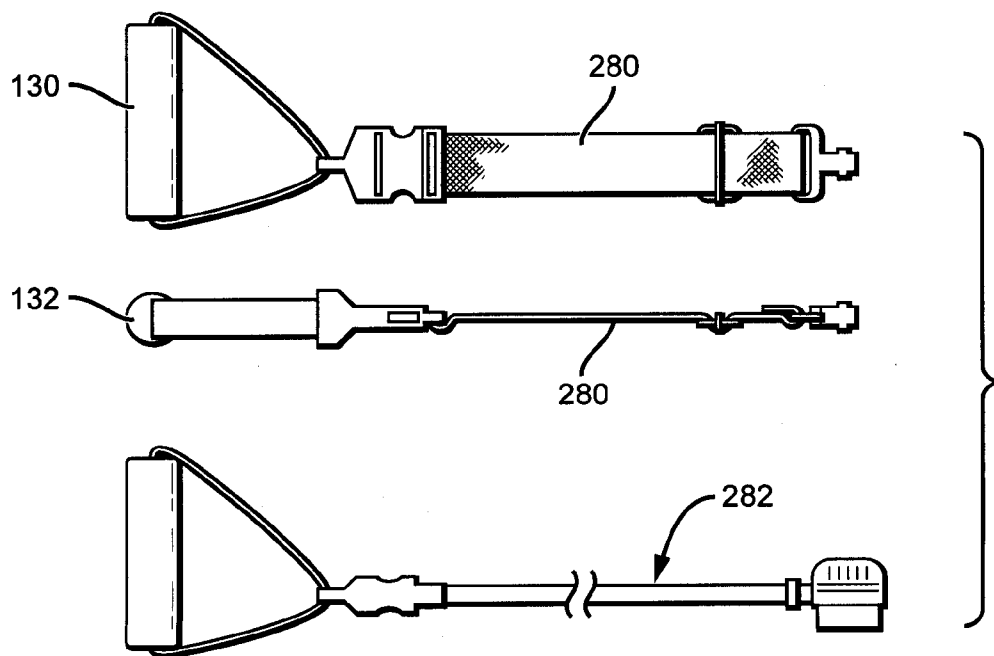
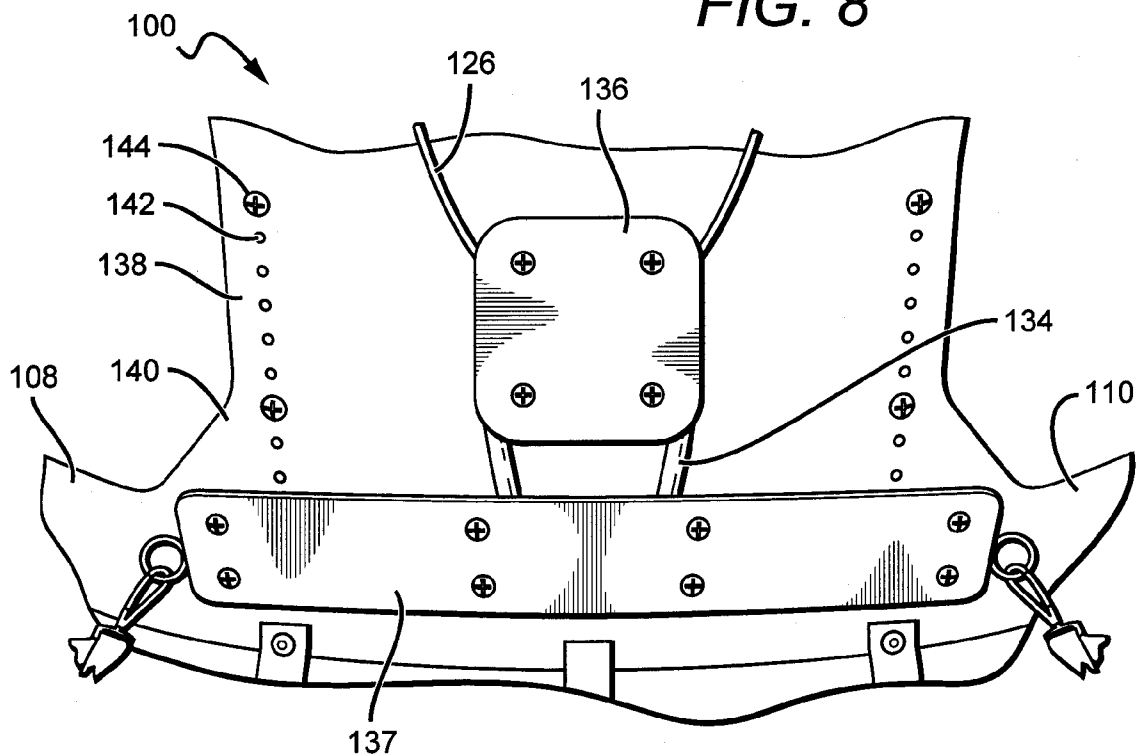
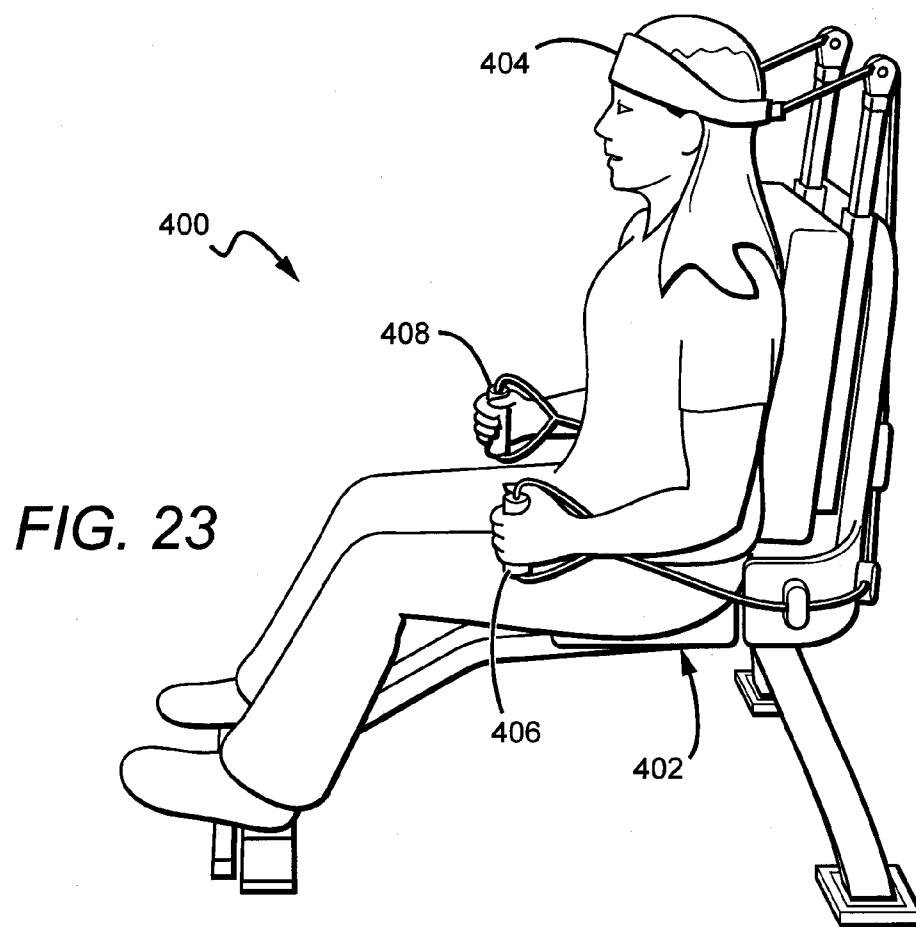
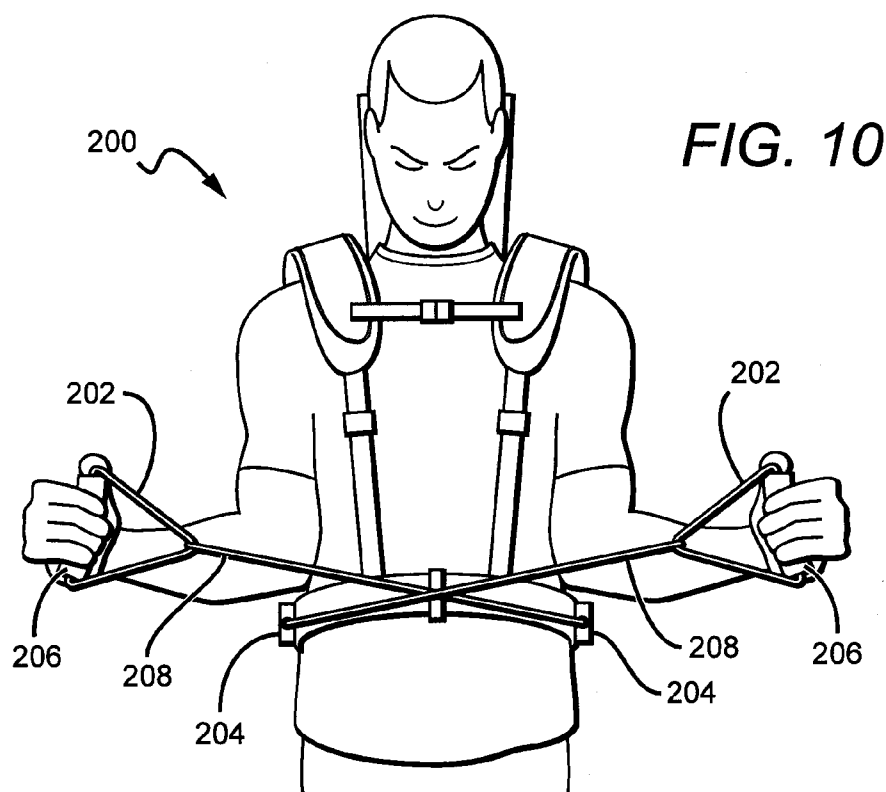


FIG. 17



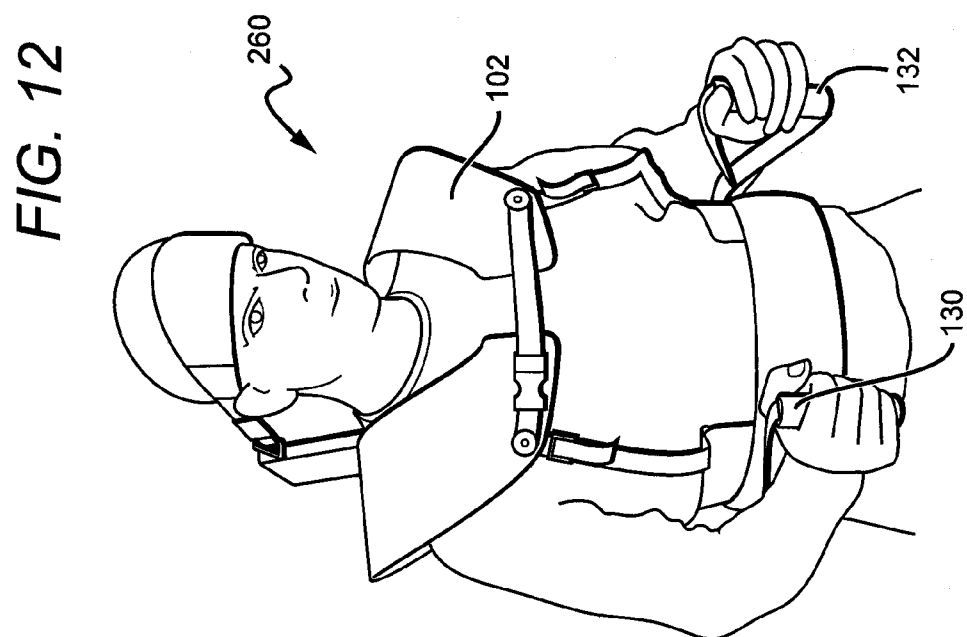
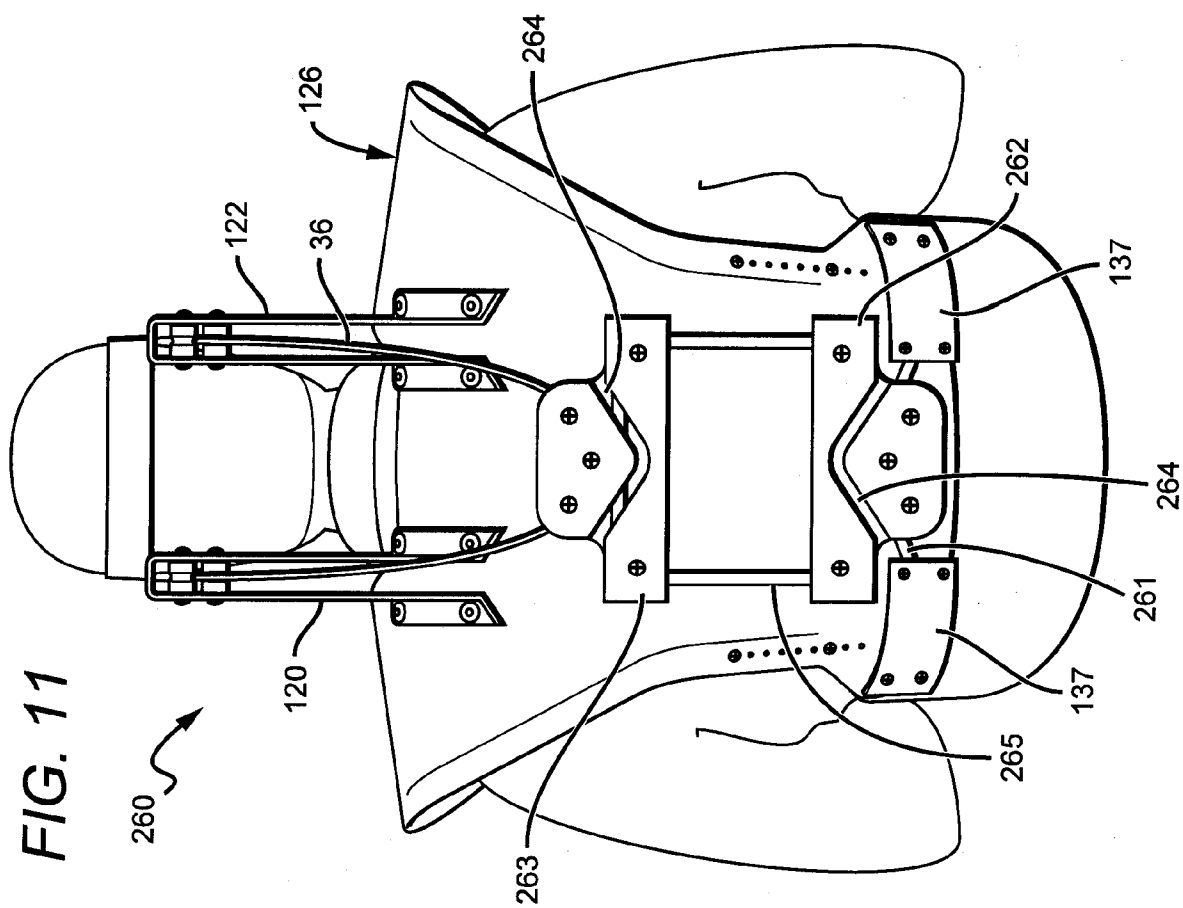


FIG. 13

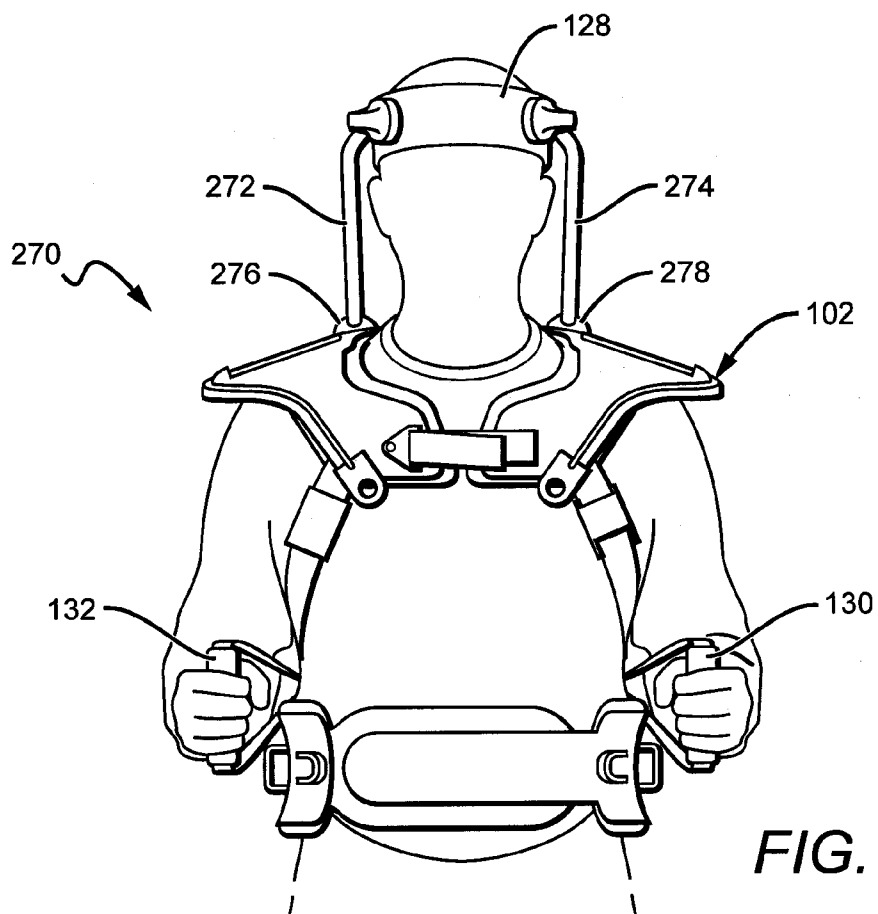
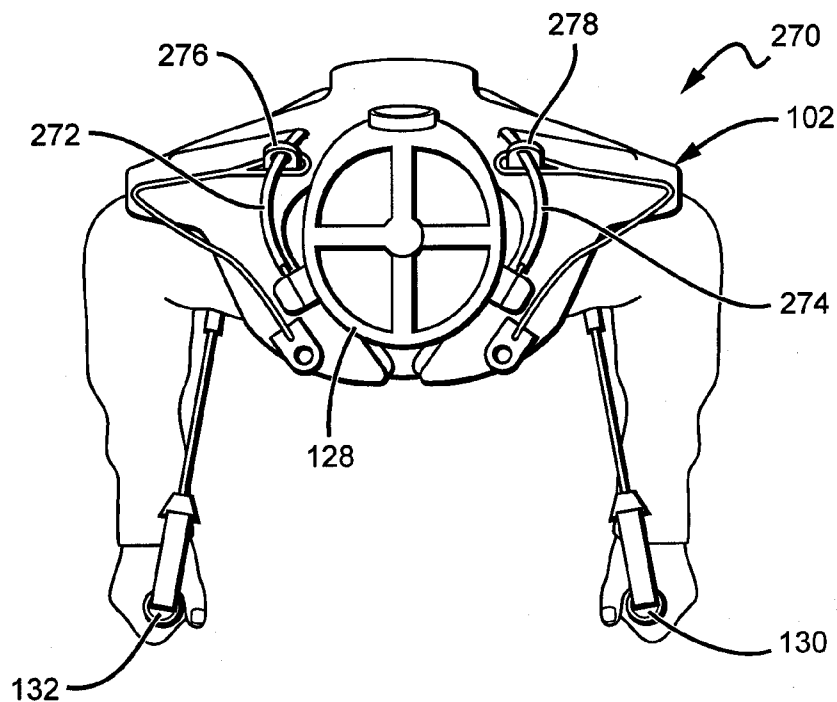


FIG. 14

FIG. 15

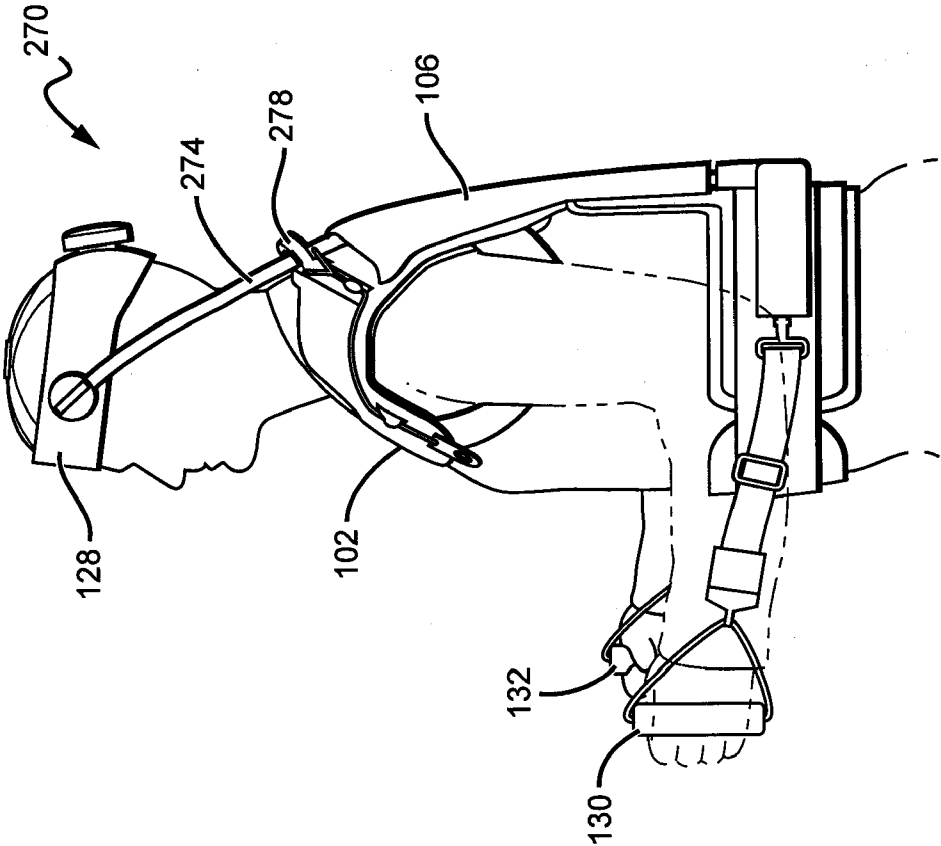


FIG. 16

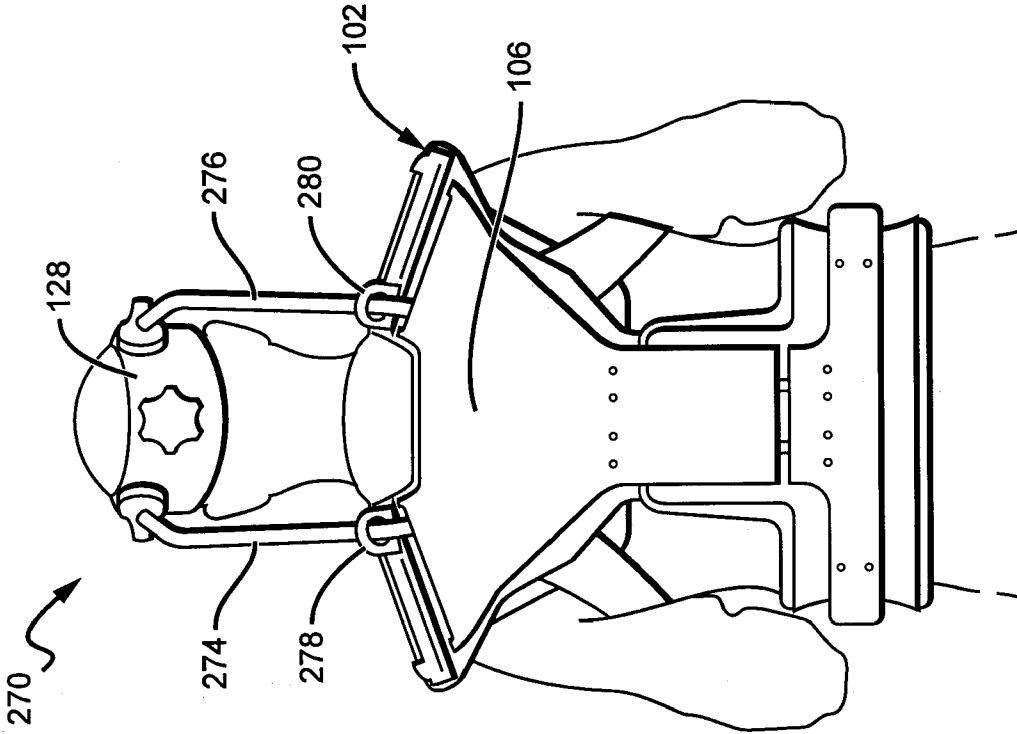


FIG. 18

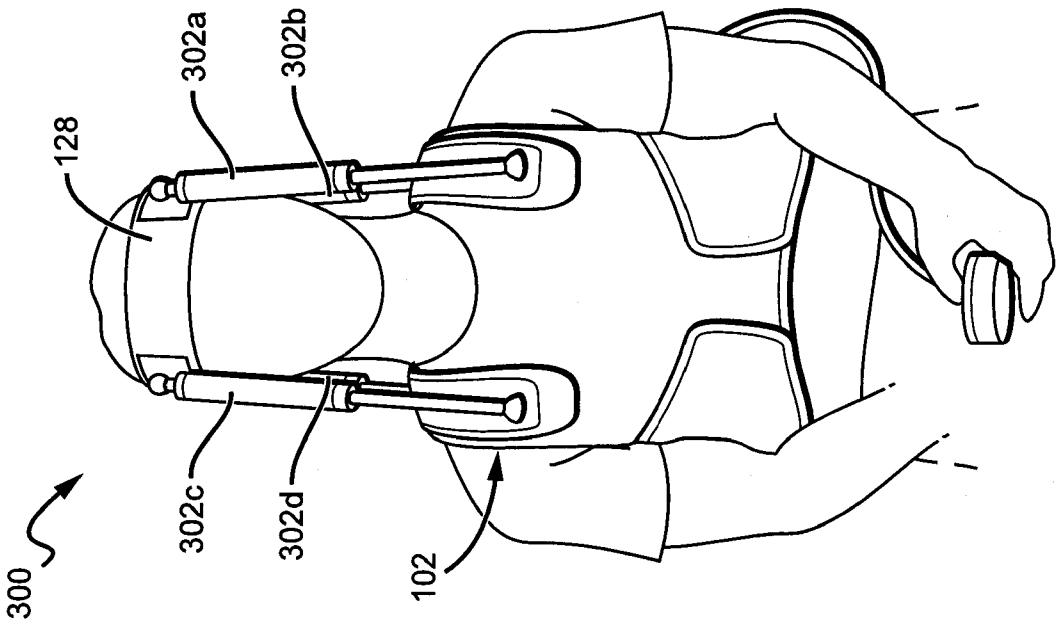
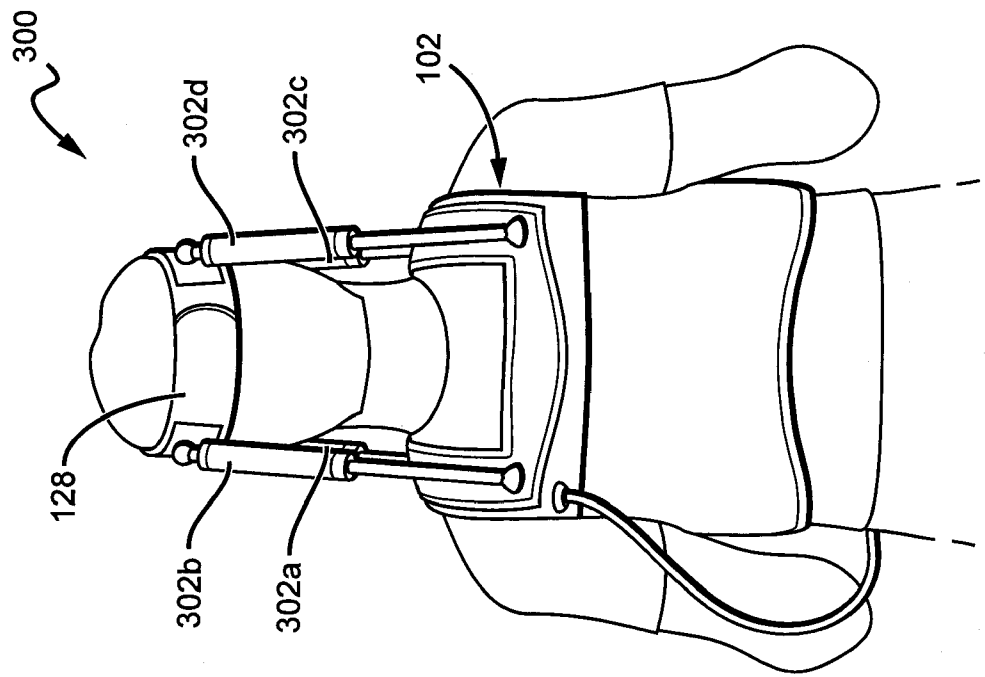


FIG. 19



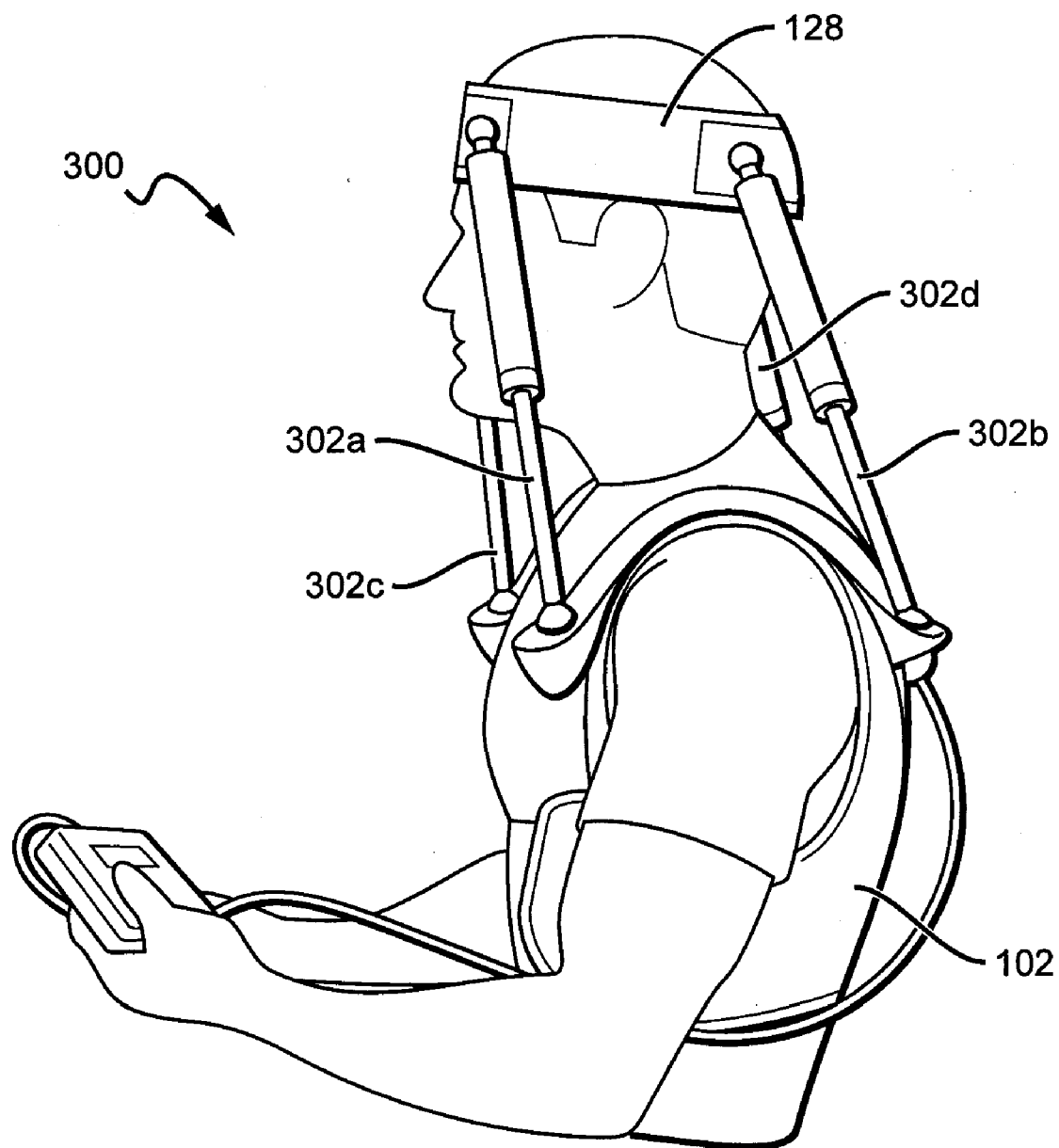


FIG. 20

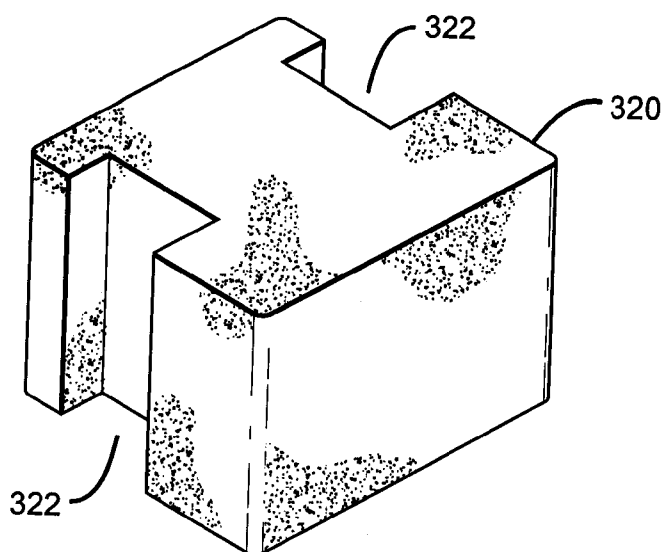


FIG. 21

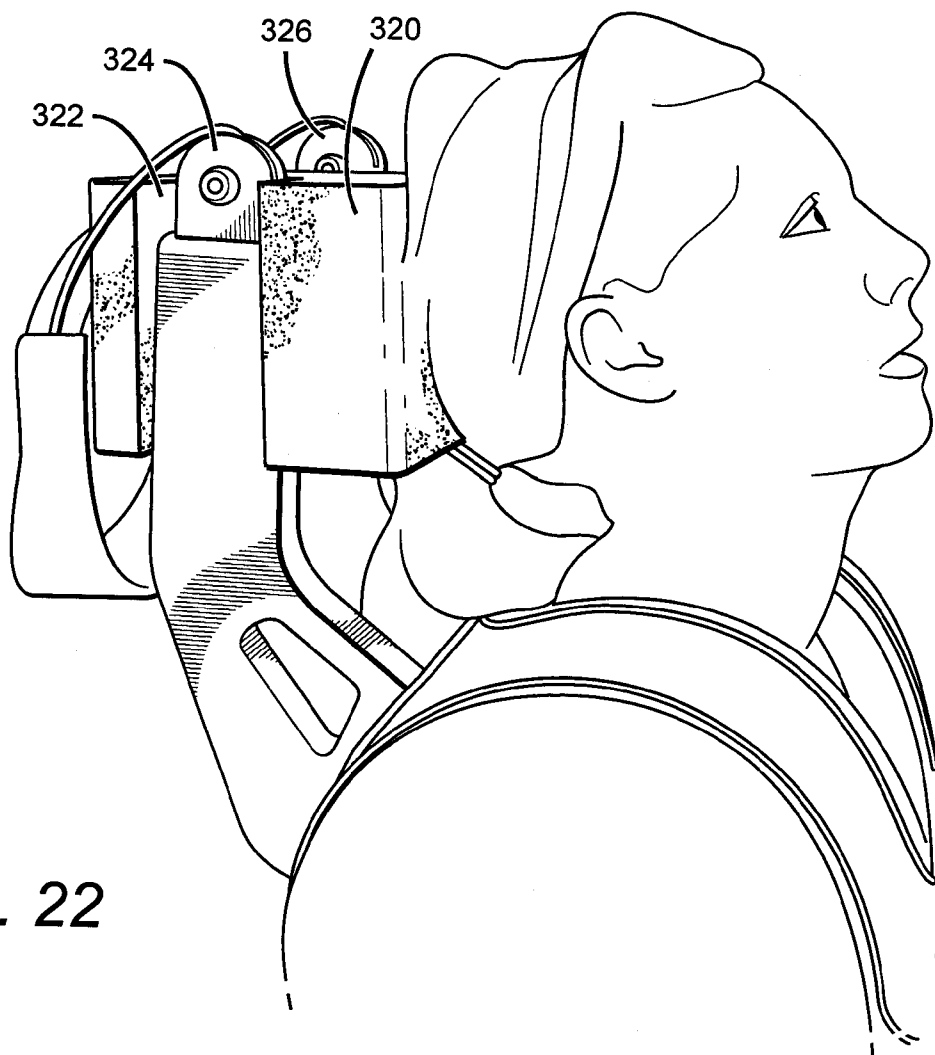


FIG. 22

USER OPERABLE NECK ISOMETRIC AND ISOKINETIC EXERCISE DEVICE AND METHOD

[0001] This application claims the benefit of U.S. Provisional Application Ser. No. 61/177,509 to Kroes et al., filed on May 12, 2009.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] This invention relates to exercise devices and in particular a self-contained user operable isometric and isokinetic neck exercise device and methods of exercising.

[0004] 2. Description of the Related Art

[0005] There is an ongoing problem with individuals suffering from neck pain, stiffness or weakness that can be treated using different methods, some of which provide limited effectiveness and often offer no long term relief. One way to treat neck pain is by applying topical lotions, creams or gels to the neck area that can contain pain relieving compounds or heat generating compounds to heat the muscles in the neck area. In other methods, pain relieving or muscle relaxing compounds can be taken orally, such as by consuming pills or solutions. These topical and oral products, however, often are only effective for a limited amount of time and can have certain side effects. These treatments are also met with a certain level of apprehension from the public, as many people avoid taking or using any type of medication, whether topical or oral.

[0006] Another way to treat neck pain is to exercise, strengthen, or stretch the paraspinal muscles, ligaments, and vertebrae of the neck. One method is by the use of traction devices that can be arranged to pull on the head to lengthen the spine and relieve pressure on the different spinal vertebrae. Another way is by engaging in isometric and isokinetic exercises that stretch and strengthen the paraspinal muscles of the neck, as well as increase the neck's range of motion. "Isokinetic exercise" refers to exercise performed with a specialized apparatus that provides variable resistance to a movement, so that no matter how much effort is exerted, the movement takes place at a constant speed. Such exercise is used to test and improve muscular strength and endurance, often after injury. "Isometric exercise" refers to a form of exercise involving the static contraction of a muscle without any visible movement in the angle of the joint. This is reflected in the name; the term "isometric" combines the prefix "iso" (same) with "metric" (distance), meaning that in these exercises the length of the muscle does not change. When properly utilized, traction devices and isometric and isokinetic exercises can effectively reduce neck stiffness and pain. However, one problem with most traditional neck exercise devices—whether aimed at isometric or isokinetic exercise—is that they can be bulky, complicated and difficult to use. In addition, they can involve bulky weights, chains, pulleys, springs, or heavy elastic bands, or can often require attachment to a wall. These machines and devices are often relegated to use in a gym, chiropractic office, or physical therapy facility. Furthermore, because many of these require connection to a wall, they cannot be easily moved or transported and usually require substantial space to operate.

[0007] Neck pain and stiffness can also be treated through chiropractic manipulation or through massage. In extreme cases neck pain is treated with neck surgery to repair damaged

or deteriorated portions of the spine or paraspinal muscles and ligaments or to relieve areas of pain and pressure.

[0008] U.S. Pat. No. 5,336,139 to Miller, entitled "Isotonic Cervical Exercise Device" discloses an apparatus for exercising the muscles surrounding the neck area. It comprises a belt adapted to be secured about the waist of a person, and includes frontal and posterior portions. A pair of suspenders connects at their frontal ends to opposing frontal portions of the belt. They also extend to the shoulders of the person, and connect at their posterior ends to opposing portions of the belt. A chin cup is included and is adapted to fit around the person's chin, and a head band is included that is adapted to fit around the person's head, including frontal and posterior portions. A first elastic strap provides a tensile load between the chin cup and the frontal portion of the belt and a plurality of elastic straps provide tensile loads between the frontal portion of the head band, across the person's head, and the posterior portion of the belt or suspenders.

SUMMARY OF THE INVENTION

[0009] The present invention comprises a compact, self-contained, comfortable, portable, and easy-to-use isometric and isokinetic exercise apparatus that is particularly applicable to exercising the neck to improve strength and flexibility and to help alleviate neck pain. Different embodiments provide different arrangements that allow the user to control the level of exercise resistance to meet the tolerance or desires of the user. In all embodiments, the apparatus allows for controlled and graded resistance to the neck that allows the user to regulate the amount of resistance in an incremental manner.

[0010] One embodiment of an isometric and isokinetic neck exercising apparatus according to the present invention comprises an attachment mechanism for attaching to a user's head. Actuating mechanisms can also be included that allow the user to provide a movement force to the apparatus, wherein the movement force is transferred to said attachment mechanism. The apparatus is arranged such that movement from the actuating mechanisms in one direction causes movement of the attachment mechanism in a different direction.

[0011] One embodiment of a portable isometric and isokinetic neck exercising apparatus according to the present invention comprises a means for mounting to the upper body of a user. An attachment mechanism is included that is attached to the means for mounting with the attachment mechanism capable of being mounted to the user's head. Handles are included that are attached to the means for mounting, with the handles arranged for grasping by the user. The apparatus is also arranged such that movement of the handles causes a movement force to the attachment mechanism, wherein the attachment mechanism is moveable against the force of the handles to provide the isometric and isokinetic neck exercise.

[0012] One method for providing isometric and isokinetic neck exercise according to the present invention comprises providing a movement force from a user's hands in a first direction. The method also includes transferring the hand movement force to the user's head in a second direction that is different from the first direction. The second direction force provides the isometric and isokinetic neck exercise force to the user's head.

[0013] These and other aspects and advantages of the invention will become apparent from the following detailed

description and the accompanying drawings which illustrate by way of example the features of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] FIG. 1 is a front left perspective view of one embodiment of an isometric and isokinetic exercise apparatus according to the present invention;

[0015] FIG. 2 is a back view of the apparatus shown in FIG. 1;

[0016] FIG. 3 is a back view of the apparatus shown in FIG. 1 during operation of the device;

[0017] FIG. 4 is a back left perspective view of one embodiment of an isometric and isokinetic exercise apparatus according to the present invention;

[0018] FIG. 5 is a front view of the apparatus shown in FIG. 4;

[0019] FIG. 6 is a left side perspective view of the apparatus shown in FIG. 4;

[0020] FIG. 7 is a back left perspective view of the apparatus shown in FIG. 4;

[0021] FIG. 8 is a back elevation view of the apparatus shown in FIG. 4;

[0022] FIG. 9 is a perspective view of one embodiment of a head band that can be used in the apparatus shown in FIG. 4;

[0023] FIG. 10 is a front view of another embodiment of an exercise apparatus according to the present invention;

[0024] FIG. 11 is a back elevation view of another embodiment of an isometric and isokinetic exercise apparatus according to the present invention;

[0025] FIG. 12 is a front right perspective view of the apparatus shown in FIG. 11;

[0026] FIG. 13 is a top view of another embodiment of a isometric exercise apparatus according to the present invention;

[0027] FIG. 14 is a front elevation view of the apparatus shown in FIG. 13;

[0028] FIG. 15 is a left side elevation view of the apparatus shown in FIG. 13;

[0029] FIG. 16 is a back elevation view of the apparatus shown in FIG. 13;

[0030] FIG. 17 includes views of grip and extensions that can be used in the apparatus shown in FIG. 13;

[0031] FIG. 18 is a front view of still another embodiment of an isometric and isokinetic exercise apparatus according to the present invention;

[0032] FIG. 19 is a back elevation view of the apparatus shown in FIG. 18;

[0033] FIG. 20 is a left side elevation view of the apparatus shown in FIG. 18;

[0034] FIG. 21 is a perspective view of an exercise attachment according to the present invention;

[0035] FIG. 22 is perspective view of the attachment shown in FIG. 21 used with an apparatus according to the present invention; and

[0036] FIG. 23 is perspective view of another embodiment according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0037] The present invention is designed with the recognition that isometric and isokinetic exercises are an acknowledged therapeutic technique in the treatment of musculoskeletal conditions. The present invention is particularly adapted to devices and methods for providing isometric and

isokinetic exercises for treatment of pain, stiffness or weakness of the paraspinal area of the neck. Isometric and isokinetic exercise devices according to the present invention are also designed to be comfortable, easy-to-use, versatile and portable. The present invention can be used virtually anywhere and can be comfortably used without the need or hindrance of external weights, chains, pulleys, springs, plastic bands, or attachments to walls. The device is designed to be used in a doctor's office, chiropractic office, physical therapy center, hospital, gym, and/or the comfort of one's own home.

[0038] Isometric and isokinetic exercise devices according to the present invention can be arranged in many different ways, and in more than one embodiment the device rests primarily on the shoulders and back of the user by a partial vest that passes over the shoulders and extends partially down the front and back of the user, similar to a backpack. A waist band is attached to the partial vest and secures around the user's waist to secure the partial vest in place. A head band is arranged to be secured on the user's head and attached to each side of the head band is a resistance strap/band, each of which runs down the back of the partial vest, preferably out of view. The resistance straps are attached to hand grips that extend from the back of the vest, near the intersection of the vest and waist band, toward the front of the user in such a way that permits the user to comfortably grasp each of the hand grips, one in the right hand and one in the left hand. Movement by either of the hands is transferred through the hand grips to the resistance straps and the head band, causing a movement force to be applied to the head band.

[0039] Isometric and isokinetic exercises according to the present invention can be used in many ways to perform many different exercises. In more than one embodiment, the user can sit in a neutral, upright position, with one of the hand grips in each hand. By moving each hand forward, a movement force is created on (i.e., transferred to) the head, which the user can statically maintain for a certain amount of time, such as 10 seconds. This creates an isometric force against the cervical and paraspinal muscles. Alternatively, in more than one embodiment, the user can isokinetically exercise the neck by incrementally moving each hand forward, thereby gradually providing variable resistance to the neck in a controlled, graded fashion, and flexing their head forward, obliquely, to the left, to the right, and through rotation. The user can also measure the amount of resistance, either through the use of a resistance measuring device or strain gauge, or by choosing resistance bands of different elasticity and strength grades (e.g., light, medium, heavy).

[0040] In addition, the user can stretch the cervical and paraspinal neck muscles by moving the hand grips back, thereby releasing the forward pressure on the hand grips, and releasing all force on the head band. The user can then stretch the neck forward without resistance. Each of the above sequences can then be repeated through a wide range of motions, including but not limited to forward flexion, rotation, left lateral flexion, and right lateral flexion. With each exercise the user can attempt to strengthen and stretch the neck muscles further than the last exercise session, and for each session the sequence can be repeated three to four times. Further, the user can exercise the shoulder and upper back muscles by attaching two supplemental hand grips with attached resistance bands to the left and right sides of the waist band and performing various shoulder and upper back exercises.

[0041] The present invention is described herein with reference to certain embodiments, but it is understood that the invention can be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. In particular, the different isometric exercise devices can be arranged in different ways, can have different features, can be adjustable in many different points, and can be configured to exercise other parts of the body beyond the neck. The different embodiments of methods according to the present invention can be performed in many different ways, with different numbers of steps performed in different orders. It is also understood, that the different embodiments and components are described with reference to certain materials, but that different materials can be used for the different components and that the different components can have different shapes and sizes.

[0042] It is understood that when an element or component is referred to as being “on” another element, it can be directly on the other element or intervening elements may also be present. Furthermore, relative terms such as “inner”, “outer”, “upper”, “above”, “lower”, “beneath”, and “below”, and similar terms, may be used herein to describe a relationship of different features or components. It is understood that these terms are intended to encompass different orientations of the device in addition to the orientation depicted in the figures.

[0043] Although the terms first, second, etc. may be used herein to describe various elements or components, these elements or components should not be limited by these terms. These terms are only used to distinguish one element or component from another element or component. Thus, a first element or component could be termed a second element or component without departing from the teachings of the present invention.

[0044] Embodiments of the invention are described herein with reference to view illustrations that may be schematic in nature. As such, variations from the shapes of the illustrations as a result, for example, of manufacturing techniques and/or tolerances are expected. Embodiments of the invention should not be construed as limited to the particular shapes of the elements or components but are to include deviations in shapes that result, for example, from manufacturing. Thus, the elements or components illustrated in the figures are schematic in nature and their shapes are not intended to illustrate the precise shape of a region of a device and are not intended to limit the scope of the invention.

[0045] FIGS. 1 through 3 of one embodiment of an isometric and isokinetic exercise apparatus 10 according to the present invention that comprises a partial vest 12 that is shaped to fit over the user's shoulders and having a front portion 14 that extends from the shoulders down the front of the user, and a back portion 16 that extends from the shoulders down the back of the user. The partial vest also includes a lap belt portion 18 that is attached to the back portion 16 and extends from the back portion 16 around the user's waist. The lap portion 18 is arranged to fit around the user's waist to help hold the apparatus to the user's body. The lap belt portion 18 is preferably made of a flexible material that can fit different waist shapes and sizes and preferably comprises a closing mechanism 20 that allows the lap belt portion to be closed around different waist sizes. It is understood that many different closing mechanisms can be used such as hooks, snaps, buttons, straps, ties, etc. In the embodiment shown, the closing mechanism a loop 22 on one side of the lap portion 18 and an extension 24 that feeds into loop and folded back on itself.

Mechanisms for holding the extension to the desired folded position can include different mechanisms such as snaps and hooks, with one suitable embodiment comprising a hook and loop arrangement commercially known as Velcro®.

[0046] It is understood that other embodiments according to the present invention can be provided with other ways and arrangement for mounting to the user beyond a partial vest. This can include any combination of straps, closing mechanisms and flexible material that can be arranged to provide the necessary support.

[0047] The apparatus 10 further comprises first and second side straps 25, 26, each of which extends from the partial vest's front portion 14 to a respective one of the lap belt portion 18. A cross strap 28 can be included across the opening in the front portion 14. It is understood that in different embodiments more or fewer straps can be used, with all or some of the straps being adjustable or having clips or snaps that allow them to separate. In the embodiment shown, the first and second side straps 25, 26 have clips to allow separation and are also adjustable to be shorter or longer. The cross strap is also adjustable, and many different adjustment mechanisms can be used, with the embodiment shown using a conventional loop back arrangement. By having adjustable straps 25, 26, 28 and lap portion 18, the apparatus 10 can be sized to fit most users and by having the side straps separable, the apparatus can more easily be mounted on a user, with the straps then closed and adjusted following mounting.

[0048] The apparatus 10 also comprises first and second risers 30, 32, each of which is mounted to the vest 12 on a respective one of the vest shoulders on either side of where the user's head would be located when the apparatus is properly mounted to the user. A first flexible upper loop 34 extends from the first riser 30, down the back of the partial vest 12, and then back up to the second riser 32. The risers 30, 32 can be at least partially hollow, with one end of the loop 34 extending through the first riser 30, and the other end of the loop 34 extending through the second riser 32. A respective attachment mechanism 36 is included at each end of the loop 34 and a head band 38 is included that attaches to the ends of the loop 34 by attachment mechanisms 36. This attachment arrangement allows the head band 38 to be mounted above the risers 30, 32 and allow for movement of the head without interfering with the risers 30, 32. The head band 38 is mounted to the user's head with the apparatus 10 mounted to the user, and to allow for different user head sizes, the head band 38 can also be adjustable. The head band can be adjustable using many different mechanisms, with the embodiment shown using a conventional knob adjustment mechanism as shown. The apparatus 10 is arranged to exercise the neck without the use of a chin strap, with can result in greater user comfort during exercising.

[0049] The risers according to the present invention can be arranged in many different ways and can have many different shapes and sizes. The risers 30, 32 in the apparatus 10 have sections extending at different angles, with the lower portion of the risers 30, 32 extending out from the vest 12. The upper portion of the risers extends upward, with the top of the risers 30, 32 located adjacent to the user's head. This arrangement places the headband 38 in the proper location adjacent to the user's head, while still leaving enough room between the user's head and the riser 30, 32 to allow for the desired range of motion during operation.

[0050] The apparatus 10 further comprises first and second hand grips 40, 42, each of which is attached to the ends of a

second flexible loop **44** that extend between the hand grips with the loop **44** extending around the user's back portion **16**. The handles can be attached to the second loop **44** using many different attachment mechanisms and in some embodiment the length between the grips **40, 42** can be changed to fit users of different sizes.

[0051] The first and second loops **34, 44** can be made of many different materials that can be flexible and in some embodiments not stretchable along their length. In one embodiment the first and second loops **34, 44** can be made of a flexible cable that is not stretchable along its length and in one embodiment they can comprise a coated metal cable similar to those commonly found in weight lifting machines. In other embodiments, one or both of the loops **34, 44** can comprise a resistance band or surgical (resistance) tubing. Resistance tubing can provide the advantage of not imparting instant and full resistance to the head band when the hands are moved. Instead, the tubing provides resistance that gradually increases as the hands are moved further away from the body.

[0052] As best shown in FIGS. 2 and 3, the first and second loops **36, 44** are held together at the back of the partial vest **12** by a coupling **46**. The coupling **46** can be arranged in many different ways and can have many different shapes and sizes. In the embodiment shown, the coupling **46** comprises upper and lower sections **48, 50** that are held together by one or more resistance bands **52**. The first loop **34** is mounted to the upper section **48** by a first linking member **54** that connects to the upper section with a space between the two for the first loop to pass. Upper section wheels **56** can be included on the inside of the linking member **54**, with the loop riding on the wheels **56**. The wheels **56** are capable of turning during operation to allow for smooth movement of the loop during operation. Similarly, the second loop **44** is mounted to the lower section **50** by a second linking member **58** that connects to the lower section **50** with a space between the two for the second loop **44** to pass. Lower section wheels **60** can be included on the inside of the linking member **58** to allow for smooth movement of the loop **44** during operation. The resistance bands **52** can comprise many different materials, with one embodiment comprising surgical tubing. In different embodiments, the resistance bands **52** can be removable and replaceable, which allows for the use of different resistance bands with different stretching tensions. In other embodiments, the coupling **46**, or the upper and lower sections **48, 50**, can be removable and replaceable to allow for the interchanging of different ones with different sizes or different resistance bands having different stretching tensions. By using different resistance bands, different movement forces can be applied to the head through the headband **38** in response to movement of the handles **40, 42**.

[0053] Lower riser wheels **62** can also be included in the inside lower portion of the risers **30, 32**, and upper riser wheels **64** can be included in the inside lower portion of the risers, all of which provide for smooth and reliable movement of the first loop **34** through the risers during operation. Likewise, lap wheels **66** can be included on the lap portion **18** to provide for smooth and reliable movement of the second loop **44** during operation.

[0054] In some embodiments, the apparatus **10** can include a number of adjustments to allow for use by different sized users. It is understood that the apparatus **10** can include many additional features beyond those described above, and the features above can be arranged in different ways. As further described below, different attachments can be included to

provide additional exercise points. For example, in different embodiments there can be hand grips with flexible extensions (e.g. surgical tubing) that can be attached at different positions on the vest **12** to provide resistance points for certain exercises. In one embodiment that attachment point can be the chest and can provide a resistance point for exercising the chest muscles and/or doing neck extension exercises when the attachment is connected from the chest to the head band **38**. Similar connection points can be provided for exercising other muscles, such as the deltoid or bicep muscles. In other embodiments the risers **30, 32** can have an adjustable height or can be movable along the vest's shoulder line or movable forward or backwards. In still other embodiments, the risers **30, 32** can be removable.

[0055] It is also understood that the first loop **34** can be connected at more than two points on the head band **38** and can be connected at different points to the head band **38** to allow for different types of exercises. The head band can also be connected to different points to allow for different exercises, such as by having an elastic connection (e.g. surgical tubing) between the side of the head band **38** and the vest **12** to allow for lateral flexion exercises.

[0056] The components of the apparatus can be made of many different materials. For example, in the embodiment shown the vest **12** can be made of a rigid material, such as plastic, that is covered by padding and or other materials, or combinations of materials to be aesthetically and to provide comfort to the user. The vest can also be fully or partially made of durable flexible material such as nylon fabric or neoprene. It is also understood that the components can have many different sizes, and in some embodiments the vest can cover a much smaller area of the user.

[0057] Operation of the apparatus **10** is best shown in FIG. 3. The apparatus **10** is mounted to the user with the straps **25, 26, 28**, and the loop **22** and extension **24** of the lap portion **18** (all shown in FIG. 2) are closed at the desired position to fit the waist of the user. The user then fits the head band **38** to the size of his/her head, and the user grabs the handles **40, 42**. When the apparatus is fully fitted to the user, the coupling will typically be positioned above the user's waist. It is understood, however, that in other applications the coupling can be in other locations.

[0058] During operation, the force to the headband **38**, and the head, is generated when the user pushes the handles **40, 42** out from the body. This in turn results in a downward force on the lower portion **50** of the coupling **46**. The greater the outward pushing force at the handles **40, 42**, the greater the force that is exerted on the lower portion **50**. As the user moves his/her head forward (i.e., chin towards chest) the force of the movement is applied to the upper portion **48** of the coupling, through the headband **38** and loop **34**. This head movement causes an upward force to be applied to the upper portion **48**, which causes the lower and upper portions **50, 48** to separate by stretching of the resistance bands **52**. This separation, in turn, puts tension on the chosen resistance bands **52**, with the tension typically increasing with increased separation between the upper and lower sections **48, 50**. In some embodiments, the range of forces that can be applied to the user's head during operation can be between 1 and 30 pounds, but it is understood that in other embodiments forces above 30 pounds can also be realized. The force generated by the movements described above can depend on different factors the tension of the resistance bands used and how far the resistance bands are stretched. As mentioned above, the appa-

ratus can have interchangeable resistance bands to allow for use of resistance bands that require greater force on the upper and lower portion 48, 50 to cause separation. In some embodiments, multiple resistance bands can be available having differing tensions, such as light, medium light, medium heavy and heavy. These different resistance bands can provide different tensions at the same distance of separation between the upper and lower portions 48, 50. For example, when the light and heavy resistance bands are stretched to the same separation distance between the upper and lower portion 48, 50 the light resistance band can produce as little as 3 pounds of force, while the heavy resistance band can produce as much as 25-30 pounds of force or more.

[0059] The use of the desired resistance bands, the movement of the hands to produce the desired force to the head, and the movement of the head against this force provides the desired isometric and isokinetic exercising of the neck. This exercising can improve strength and flexibility of the neck and to help alleviate neck pain.

[0060] FIGS. 4 through 9 show different features of another embodiment of an isometric and isokinetic exercise apparatus 100 according to the present invention that also comprises a partial vest 102 that is shaped to fit over the user's shoulders. The vest 102 can also comprise a front portion 104 that extends from the shoulders down the front of the user, and a back portion 106 that extends from the shoulders down the back of the user. The partial vest also includes a first side extension 108 that extends from the back portion 106 around left side of the user's waist, and a second side extension 110 that extends from the back portion 106 around the right side of the user's waist. A waist strap 112 is mounted to the lower part of the back portion 106, along the first and second side extensions 108, 110, and around the front side of the user's waist where it can be closed to hold the partial vest 102 in place on the user. Many different closing mechanisms can be used, with suitable ones being hooks, snaps, buttons, straps, ties, etc. In the embodiment shown, the closing mechanism comprises a hook and loop arrangement commercially known as Velcro®.

[0061] Like the embodiment above, the apparatus 100 further comprises first and second side straps 114, 116, each of which extends from the partial vest's front portion 104 to a respective one of the first and second side extensions 108, 110. A cross strap 28 can be included across the opening in the front portion 104. It is understood that in different embodiments more or fewer straps can be used, with all or some of the straps being adjustable or having clips or snaps that allow them to separate. Similar to the embodiment above, the first and second side straps 114, 116 have clips to allow separation and are also adjustable to be shorter or longer. The cross strap 118 is also adjustable. By having adjustable straps, the apparatus can be sized to fit most users and by having the side straps separable, the apparatus can more easily be mounted on a user, with the straps then closed and adjusted following mounting.

[0062] The apparatus 100 also comprises first and second risers 120, 122, each of which is mounted to the vest 102 on a respective one of the vest shoulders on either side of where the user's head would be located when using the apparatus 100. A first flexible upper loop 126 extends from the first riser 120, down the back of the partial vest 102, and then back up to the second riser 122. The ends of the loop 126 extend through a respective one of the risers 120, 122 with an attachment mechanism 129 at each end of the loop 126. A head band

128 is included that attaches to the end of the loop 126, so that the head band 128 is above the risers 120, 122. To adjust for different user head sizes, the head band 128 can also be adjustable such as by using a knob adjustment mechanism as shown.

[0063] The apparatus 100 further comprises first and second hand grips 130, 132, each of which is attached to the ends of a second flexible loop 134 that extend between the hand grips with the middle portion of the second loop 134 extending partially up the partial vest's back portion 106. The handles can be attached to the second loop 134 such that the length between the grips and the loop ends can be changed to fit users of different sizes.

[0064] The first and second loops 126, 134 can be made of many different materials that can be flexible and stretchable along their length. In one embodiment the first loop 126 can be made of a flexible cable that is not stretchable along its length, and the second loop 134 can be flexible and stretchable along its length. In one embodiment the first loop 126 can comprise a coated metal cable similar to those commonly found in weight lifting machines, and the second loop can comprise resistance bands or surgical (resistance) tubing. Resistance tubing can provide the advantage of not imparting instant and full resistance to the head band when the hands are moved. Instead, the tubing provides resistance that gradually increases as the hands are moved further away from the body.

[0065] As best shown in FIG. 8, the first and second loops 126, 134 are held together at the back of the partial vest 102 by a coupling 136. The coupling 136 can be arranged in many different ways and can have many different shapes and sizes. In the embodiment shown, the coupling 136 comprises two square shaped plates mounted together by posts, with a space between the plates for the loops 126, 134 to run through wheel or pulleys. The loops are held in the space between the plates by the posts.

[0066] Referring still to FIG. 8, the apparatus 10 can include a back plate 137 with the second loop 134 running between the back plate 137 and the partial vest's back portion 106 to guide the second loop 134 laterally along the back portion to the hand grips 130, 132. Wheels, pulleys, or similar devices, can be included between the back plate 137 and back portion 106 to allow smooth movement of the second loop 134 when extending the hand grips 130, 132. In other embodiments, the first and second loops 126, 134 can be connected by a cable that runs along a slot in the back portion 106. Like the embodiment above, as the hand grips 130, 132 are extended away from the body, the second loop 132 pulls down on the first loop 126, causing a resistance on the head band 128, and as a result the user's neck.

[0067] As mentioned above, the apparatus 100 can include a number of adjustments to allow for use by different sized users. As shown in FIGS. 4, 5 and 8, the partial vest can comprise an upper portion 138 and a lower portion 140, with the upper portion 138 comprising an upper portion of the front and portions 104, 106 (shown best in FIGS. 4 and 5), and the lower portion comprising the lower part of the back portion 106 and the first and second lateral extensions 108, 110. Both the upper and lower portions 138, 140 have adjustment holes 142 that align so that a conventional nut and screw or rivet 144 can pass through the aligned holes to mount the upper and lower portions together. By providing a plurality of adjustment holes 142 the lower portion 140 can be mounted to the upper portion 138 at different heights to allow for the lower

portion to adjust to the size of the user. That is, the lower portion **140** can be raised or lowered to meet the size of the user.

[0068] It is understood that the apparatus **100** can include many additional features beyond those described above, and the features above can be arranged in different ways. In some embodiments, different attachments can be included to provide additional exercise points. For example, in different embodiments there can be hand grips with flexible extensions (e.g. surgical tubing) that can be attached at different positions on the vest **102** to provide resistance points for certain exercises. In one embodiment that attachment point can be the chest and can provide a resistance point for exercising the chest muscles and/or doing neck extension exercises when the attachment is connected from the chest to the head band **128**. Similar connection points can be provided for exercising other muscles.

[0069] FIG. **10** shows another embodiment of an apparatus **200** according to the present invention with additional handle/resistance attachments **202** that can be attached to the attachment points **204** at the lower portion of the vest. The handles **206** can be moved in different directions, with the stretching tension of the resistance bands or tubing providing resistance against the movements. This in turn can exercise different muscles depending on the direction of movement, including shoulder, rotator cuff, deltoid, bicep and back muscles.

[0070] Referring again to FIGS. **4-9**, some embodiments the risers **120, 122** can have an adjustable height or can be movable along the vest's shoulder line or movable forward or backwards. In still other embodiments, the risers **120, 122** can be removable. It is also understood that the first loop **126** can be connected at more than two points on the head band **128** and can be connected at different points to the head band **128** to allow for different types of exercises. The head band **128** can also be connected to different points to allow for different exercises, such as by having an elastic connection (e.g. surgical tubing) between the side of the head band **128** and the vest **102** to allow for lateral flexion exercises.

[0071] Like the embodiment above, the components of the apparatus can be made of many different materials. For example, in the embodiment shown the vest **102** can be made of a white colored plastic, but other materials, or combinations of materials can also be used having different colors or the materials can be clear. The vest can also be fully or partially made of durable flexible material such as nylon fabric or neoprene. It is also understood that the components can have many different sizes, and in some embodiments the vest can cover a much smaller area of the user.

[0072] FIGS. **11** and **12** show another embodiment of isometric and isokinetic neck exercising apparatus **260** according to the present invention having many of the same features as the apparatus **100** described above, and for similar features the same reference numbers will be used herein and subsequent embodiments with the understanding that the description above also applies to this embodiment. The apparatus **260** comprises a different arrangement for transferring the force created by the user's movement of the handles **130, 132** to the user's head. Instead of the handles **130, 132** connected to the apparatus **260** by resistance bands or tubing, they are connected by a non-elastic lower cable **261** that runs along the waste strap **112** between the handles **130, 132**. The apparatus **260** further comprises upper and lower sliding couplings (cars) **262, 263**, each of which has a slot **264** that allows either a resistance band to be inserted into the groove of the respec-

tive car and positioned around wheels or pulleys attached to cars **262, 263** that facilitate movement (elongation) of the tube or band. As shown, the lower cable **261** is inserted into the slot **264** of the lower car **263** and is positioned and channeled in its cable groove by wheels in car **263**. Similarly, the upper loop **126** is inserted in the slot **264** of the upper car **262** and is positioned and channeled in its cable groove by wheels in car **262**. A circular resistance band or tubing **265** runs between the upper and lower cars **262, 263** with the resistance band or tubing **265** being mounted to each of the cars **262, 263** by passing the resistance band **265** through each slot **264**. More specifically, the resistance band **265** can be positioned within each slot **264** around two wheels in each of the cars **262, 263**, allowing, as described immediately below, opposing forces to be generated when opposite forces are applied by the hands to car **262** and the head to car **263**.

[0073] Like the apparatus **10** described above and shown in FIGS. **103**, as the user moves the handles **130, 132** outward away from the user's body, the lower cable **261** pulls the lower car **263** down. This in turn causes a downward pulling force on the resistance band **265** that is transferred to the upper car **262**. This causes the upper car to move down, thereby providing a moving force that is transferred by the loop **126**, through the risers **120, 122** to the user's head. As the user pushes out incrementally with the hand grips, the force to the head is gradually increased as the resistance band is stretched by movement of upper and lower cars **262, 263**.

[0074] This embodiment provides the advantage of increased flexibility in the type and elasticity strength of the resistance band used in the apparatus **260**. The band can be easily removed from the cars **262, 263** by sliding the band out of the slot **264**. Different bands can then be mounted to the cars **262, 263** by sliding the desired band through the slots **264** in the cars **262, 263**. This allows for the apparatus to have a pulling force that is customized for the particular user. The cars **262, 263** can also be mirror images of each other, which can provide the advantage of decreased manufacturing costs by only needing one fabrication device or tool (e.g. injection mold) to produce the cars. It is understood, however, that other embodiments of apparatus according to the present invention can have upper and lower cars that do not mirror each other.

[0075] FIGS. **13** through **17** show another embodiment and an isometric and isokinetic neck exercising apparatus **270** according to the present invention having many of the same features as the apparatus **10** and **260** described above. In this embodiment, instead of having an upper loop and a lower loop, left and right cables **272, 274** are provided with the left cable **272** running from the left side of the head band **128**, along the left side of the back portion **106** of the vest **102** and is connected to the first hand grip **130**. Similarly, the right cable **274** runs from the right side of the head band **128**, along the right side of the back portion **106**, and is connected to the second hand grip **132**. In this embodiment the right and left cables **272, 274** can run under the outside shell of the back portion **106** such that they are substantially hidden, with smooth movement of the cable provided by a series of wheels or pulleys that can also be under the outside shell. In this embodiment, the left and right cables **272, 274** can be moved simultaneously or independently to provide forward flexion, rotation, left lateral and right lateral flexion exercises.

[0076] The apparatus **270** also does not have risers on the shoulders of its partial vest **102**, but instead has left and right eyelets **276, 278** that can be movable along the shoulder to the

vest **102** to provide different angles of resistance for the right and left cables **272**, **274**. Referring now to FIG. **17**, the apparatus can also include hand grips **130**, **132** that are attached to an adjustable length **280** of flexible material such as conventional nylon webbing. In other embodiments, the adjustable length can comprise an elastic band or surgical tubing as described above that provides increasing resistance as the hands are moved away from the user's body. A separate hand grip and extension **282** can be provided that is arranged to be connected to the vest **102** to allow exercise of other muscles. The grip and extension **282** is particularly adapted for connection to connection point **284** to allow for exercise of the deltoid muscles. As mentioned above, different connection points can be provided to allow for exercise of other muscles using the grip and extension **282**.

[0077] FIGS. **18** through **20** show still another embodiment of a neck isometric exercise device **300** according to the present invention also comprising a partial vest **102**. In this embodiment, however, there are no user operable hand grips that control the resistance to the head band **128**. Instead, a plurality of air or hydraulic cylinders **302a-d** are included that are mounted between the head band **128** and the partial vest **102** with the user moving the head band **128** against the compression pressure of the cylinders **302a-d** to exercise the neck muscles. The compression pressure of the cylinders **302a-d** can be controlled in different ways, and in one air cylinder embodiment the pressure can be controlled by the use of a hand pump that can be connected to all cylinders **302a-d** so that they maintain the same compression pressure. The user can go through different exercise routines with the cylinders pressurized at different levels to provide different levels of exercise resistance.

[0078] In other embodiments, the cylinder compression pressure can be electronically controlled using conventional electronic control circuits and software. In one embodiment, the electron controls can be provided with a user readable display that shows the pressure in the cylinders **302a-d**, and in some embodiment the electronic controller can be hand-held. This arrangement allows for the user to provide different levels of resistance pressure by using the electronic controller to adjust the cylinder compression pressure in each cylinder differently or with the same pressure in all cylinders. With different pressures in each, the apparatus **100** can be used for different exercise neck movements. The controller can allow the user to manually control the pressure in each or can allow the cylinder pressure to go through a preprogrammed routine. The controller can also include a display showing the level of isometric movement for the neck as well as which movement or pressure will be coming next.

[0079] The pressure in the cylinders need not be preprogrammed, but may be manually set using the pump or electronic controller to meet the tolerance or desire of the user. The cylinders **302a-d** can be connected between the head band **128** and vest using many different known connection mechanisms. In one embodiment, they can be connected through ball and socket joints that can provide for greater range of motion through the isometric exercises.

[0080] The embodiments above are generally described with providing isometric and isokinetic neck exercising the muscles in the front (or side) portion of the neck. It is understood, however, that the different embodiments can be provided with different features or attachments that also exercise the muscles in back of the neck. These additional features and attachments can be provided while still allowing the appara-

tus to remain lightweight, portable, and easy to use. FIGS. **21** and **22** show one embodiment of an attachment **320** that can be used with embodiments of the present invention having risers as described above. It can be made of a material that holds its shape yet can be compressed in response to a pushing force. The material should also return to its original shape once the pushing force is removed. The attachment can be made of many different materials such as commercially available foam.

[0081] The attachment **320** can have many different shapes and sizes and in the embodiment shown it is generally cube shaped and comprises channels **322** on opposite sides. The channels **322** are sized and arranged so that that the attachment can fit between the risers **324**, **326** (described in the embodiments above) with the risers **324**, **326** in the channels **322**. The user can then extend his/her head back to compress the attachment **322**, with the force necessary to cause compression providing the desired exercise resistance for the muscles in the back of the neck. It is understood that different attachments can be provided that are made of different materials requiring different forces for compression. This allows for different attachments to be used when different exercising resistance is desired. It is also understood that many different attachments or feature can be used beyond the embodiment shown, including but not limited to different strap, spring, or pulley arrangements that in some embodiments can also be operated by movement of the hands.

[0082] The embodiments above have been described as being lightweight and portable. In different embodiments portions of the apparatus can be folded to reduce its size thereby making it easier to pack. It is understood that the present invention is equally applicable to arrangements that are not designed to be lightweight and portable. FIG. **23** shows another embodiment of an apparatus **400** according to the present invention that has many of the same features as the embodiments described above. In this embodiment, however, the apparatus is part of a bench or chair **402** that is similar to exercise benches or chairs that can be found in a gym, chiropractors office or physical therapy office. The apparatus **400** is operated in much the same way as the embodiments above, but instead of being provided as a vest that is fitted to the user, the user sits on the bench. The headband **404** is fitted to the user and the user manipulates the handles **406**, **408** as described above to provide the desired neck exercise. It is understood that the apparatus can be provided as a retrofit to existing benches or chairs or can be provided as its own stand-alone machine.

[0083] Although the present invention has been described in detail with reference to certain preferred configurations thereof, other versions are possible. Therefore, the spirit and scope of the invention should not be limited to the versions described above.

1. An isometric and isokinetic neck exercising apparatus, comprising:

an attachment mechanism for attaching to a user's head; actuating mechanisms that allow the user to provide a movement force to the apparatus, wherein the movement force is transferred to said attachment mechanism, wherein said apparatus is arranged such that movement of the actuating mechanisms in one direction causes movement of the attachment mechanism in a different direction.

2. The apparatus of claim 1, mountable to the upper body of a user and wherein said actuating mechanisms comprise one or two handles that can be actuated by one or both hands.

3. The apparatus of claim 2, wherein said handles can be moved away from the front of the user's body to provide a force to the attachment mechanism toward the back of the user's body.

4. The apparatus of claim 2, wherein the movement of said handles causes movement of the attachment mechanism through one or more cables.

5. The apparatus of claim 2, wherein the movement of handles causes movement of the attachment mechanism through one or more cables running along the back of the user.

6. The apparatus of claim 1, comprising one or more risers.

7. The apparatus of claim 1, comprising one or more resistance bands between said handles and said attachment mechanism.

8. The apparatus of claim 7, wherein the movement force applied to said attachment mechanism is at least partially dependent upon the stretching tension of said resistance bands.

9. The apparatus of claim 7, wherein movement of the actuating mechanisms or said attachment mechanism can stretch said resistance bands.

10. The apparatus of claim 7, wherein said resistance bands are removable and replaceable to allow for the use of resistance bands having different stretching tensions.

11. The apparatus of claim 1, comprising a vest mountable to a user, said vest having adjustment points to fit the size of the user.

12. The apparatus of claim 1, having points that allow for connection of exercise attachments.

13. The apparatus of claim 1, comprising an exercise attachment that allows for isometric and isokinetic neck exercising force in a direction opposite the force provided by said actuating mechanisms.

14. A portable isometric and isokinetic neck exercising apparatus, comprising:

a means for mounting to the upper body of a user;

an attachment mechanism attached to said means for mounting, said attachment mechanism capable of being mounted to the user's head;

handles attached to said means for mounting, said handles arranged for grasping by the user, said apparatus arranged such that movement of the handles causes a movement force to said attachment mechanism, wherein

said head mechanism is moveable against the force of said handles to provide said isometric and isokinetic neck exercise.

15. The apparatus of claim 14, wherein said means for mounting comprises a partial vest.

16. The apparatus of claim 14, wherein said handles can be moved away from the front of the user's body to provide a force to the attachment mechanism toward the back of the user's body.

17. The apparatus of claim 14, wherein the movement of said handles causes movement of the attachment mechanism through one or more cables.

18. The apparatus of claim 14, wherein the movement of handles causes movement of the attachment mechanism through one or more cables running along the back of the user.

19. The apparatus of claim 14, comprising one or more risers, the movement force of said handles transferred to said attachment mechanism through said risers.

20. The apparatus of claim 14, comprising one or more resistance bands between said handles and said attachment mechanism.

21. The apparatus of claim 20, wherein the movement force applied to said attachment mechanism is at least partially dependent upon the stretching tension of said resistance bands.

22. The apparatus of claim 20, wherein said resistance bands are removable and replaceable to allow for the use of resistance bands having different stretching tensions.

23. The apparatus of claim 14, having points that allow for connection of exercise attachments.

24. A method for providing isometric and isokinetic neck exercise, comprising:

providing a movement force from a user's hands in a first direction;

transferring said hand movement force to the user's head in a second direction that is different from said first direction, said second direction force providing said isometric and isokinetic neck exercise force to the user's head.

25. The method of claim 24, wherein said first direction is opposite said second direction.

26. The method of claim 24, wherein said first direction is away from the front of the user's body, wherein said second direction is toward the back of the user.

27. The method of claim 24, comprising the further step of providing movement of the user's head against said hand force transferred to the users' head.

* * * * *