US 20070004571A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2007/0004571 A1

Gonzalez (43) Pub. Date: Jan. 4, 2007

(54) JOINT ALIGNMENT AND COMPRESSION ASSEMBLY AND METHOD FOR PERFORMING A REHABILITATIVE TREATMENT REGIMEN

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(21) Appl. No.: **11/223,863**

(22) Filed: **Sep. 9, 2005**

Related U.S. Application Data

(60) Provisional application No. 60/608,215, filed on Sep. 9, 2004.

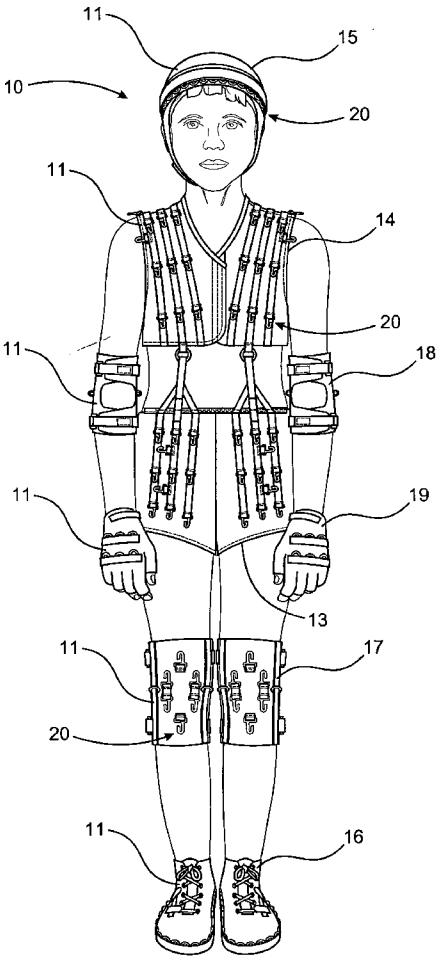
Publication Classification

(51) **Int. Cl.**
A63B 21/02 (2006.01)

(52) **U.S. Cl.** **482/124**

(57) **ABSTRACT**

A joint alignment and compression assembly including a plurality of alignment members structured to be removably secured to a patient in an operative configuration, the plurality of alignment members being interconnected via a plurality of adjustable uniform compression members. At least one of the alignment members comprises a pelvic alignment member having at least one pair of interconnection members arranged in a horizontal arrangement and structured to facilitate stabilization of the patient's hips when interconnected by adjustable uniform compression members. The assembly also provides for a foot alignment member having a foot securing element, a foot supporting element, and a toe securing element. In addition, a head alignment member is provided to permit alignment and compression of the joints in the patient's head and neck region. A method for performing a rehabilitative treatment regimen utilizing a joint alignment and compression assembly is presented.



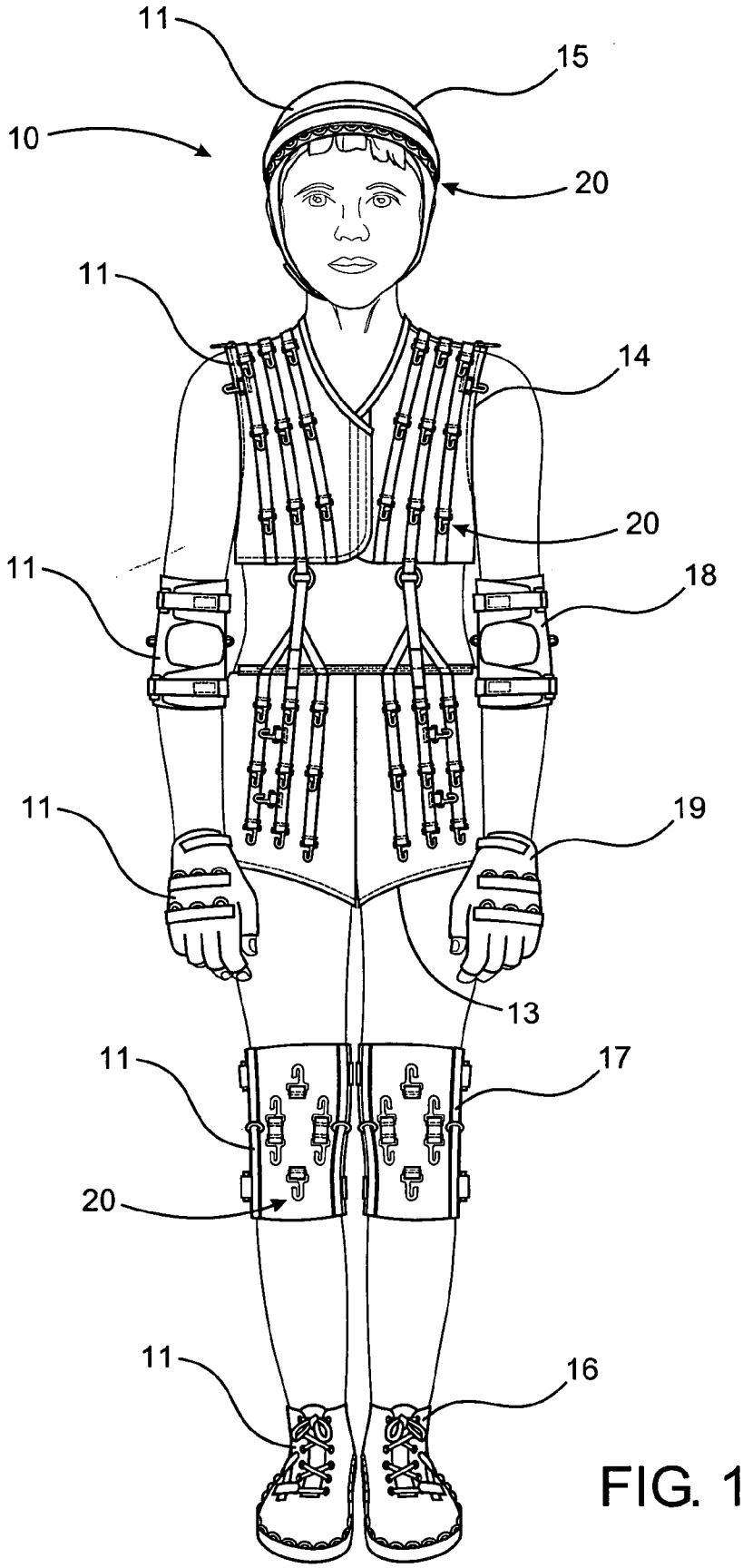


FIG. 1

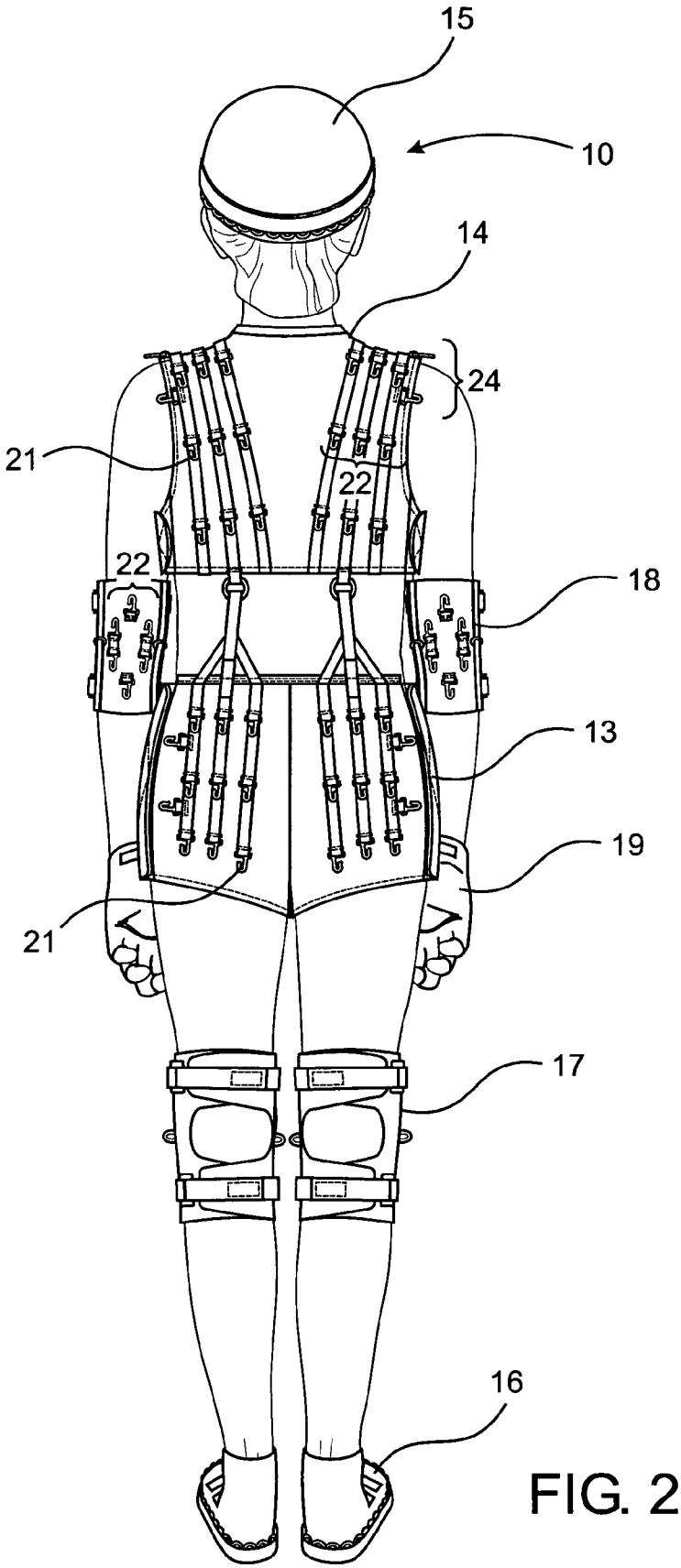


FIG. 2

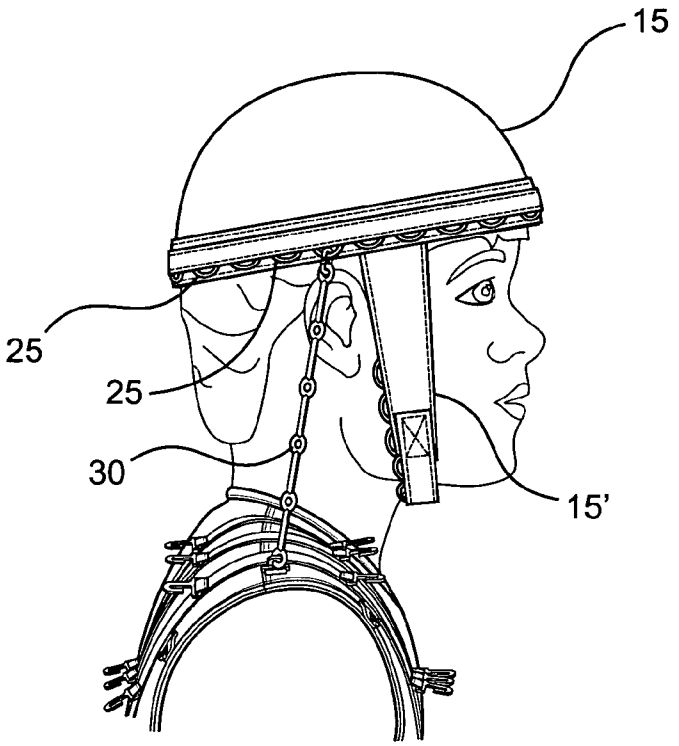


FIG. 3

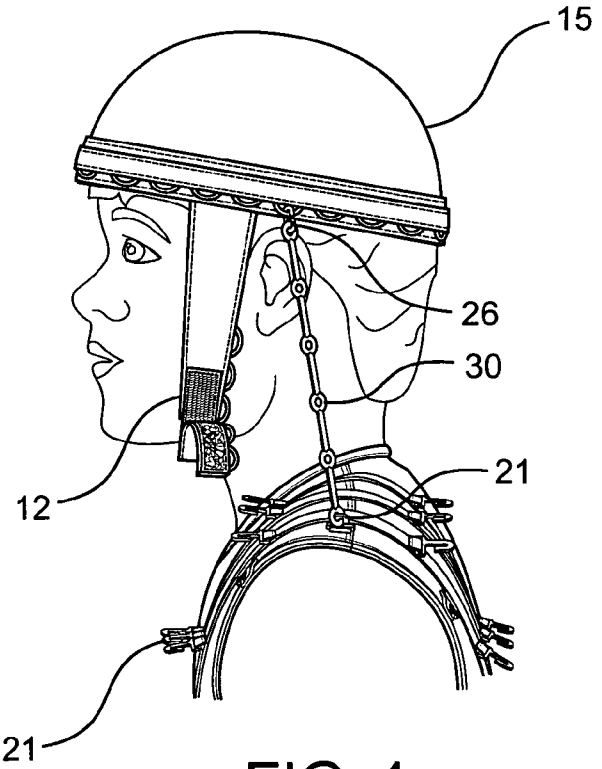


FIG. 4

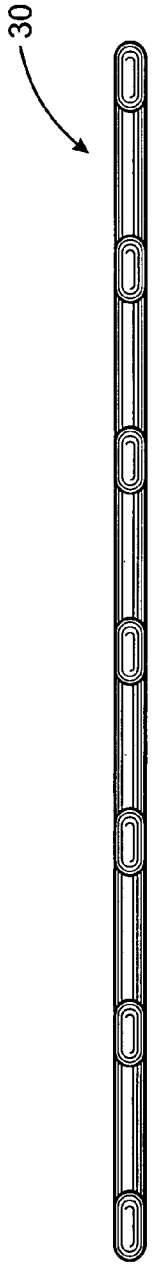


FIG. 5A

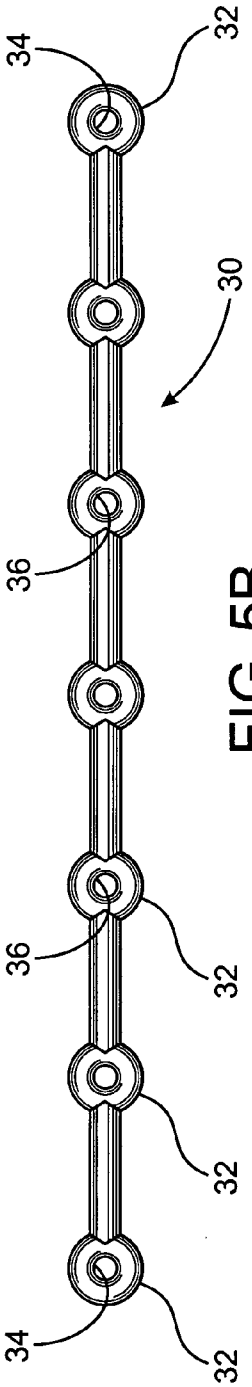


FIG. 5B

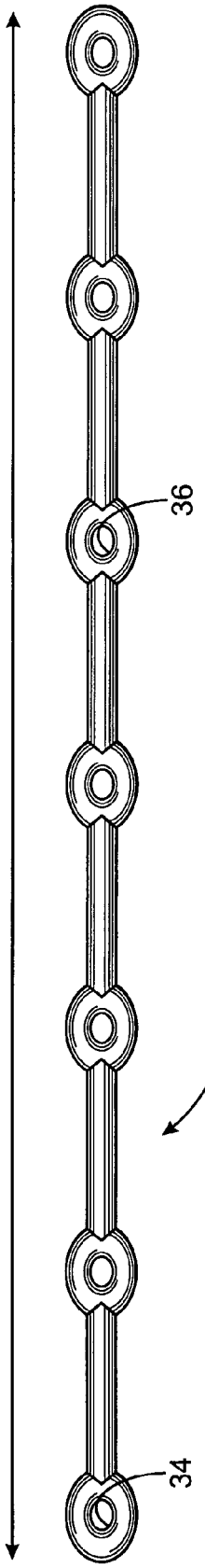


FIG. 5C

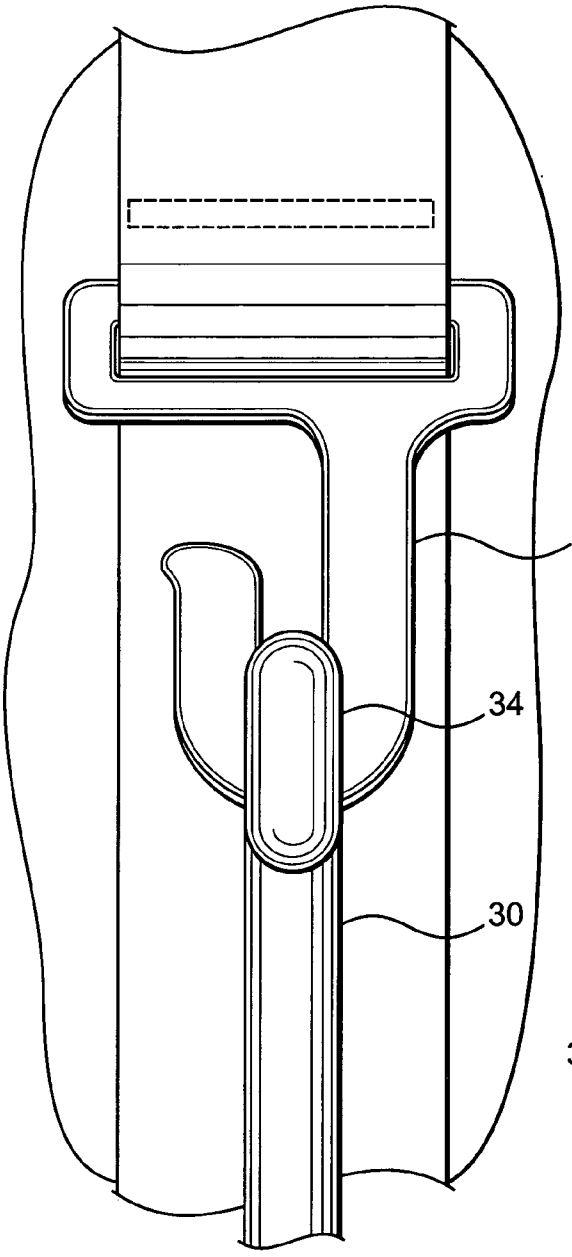


FIG. 6

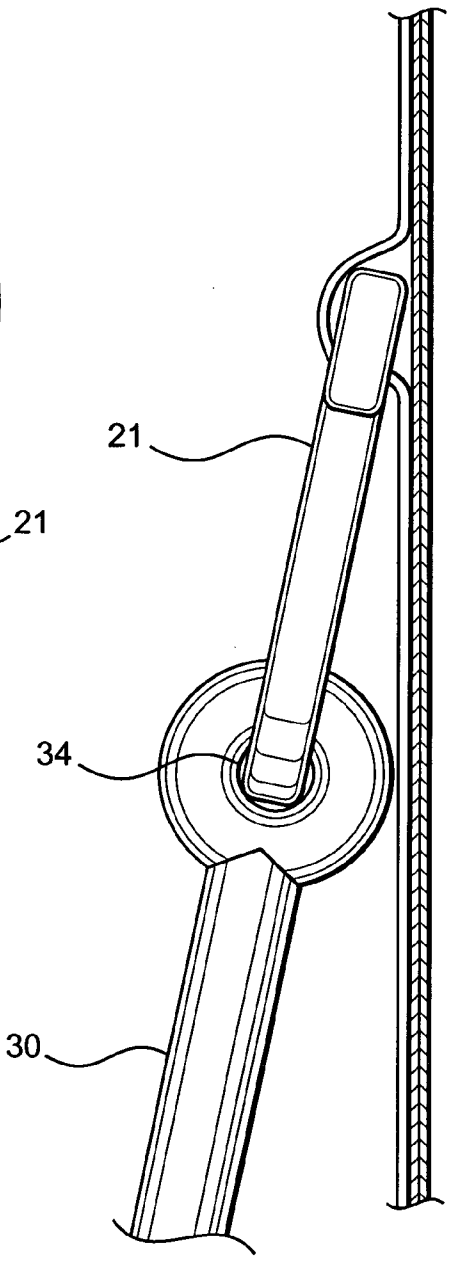


FIG. 7

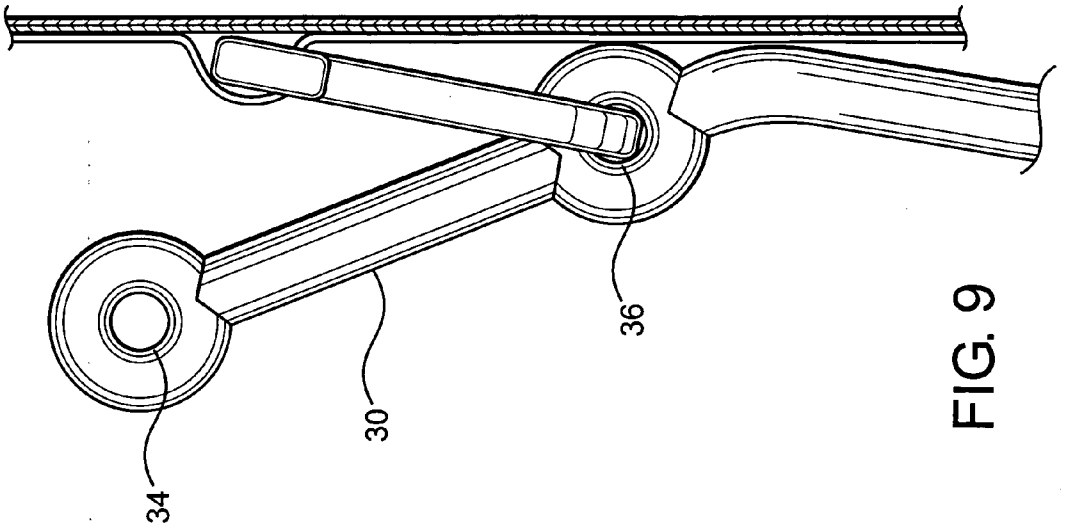


FIG. 9

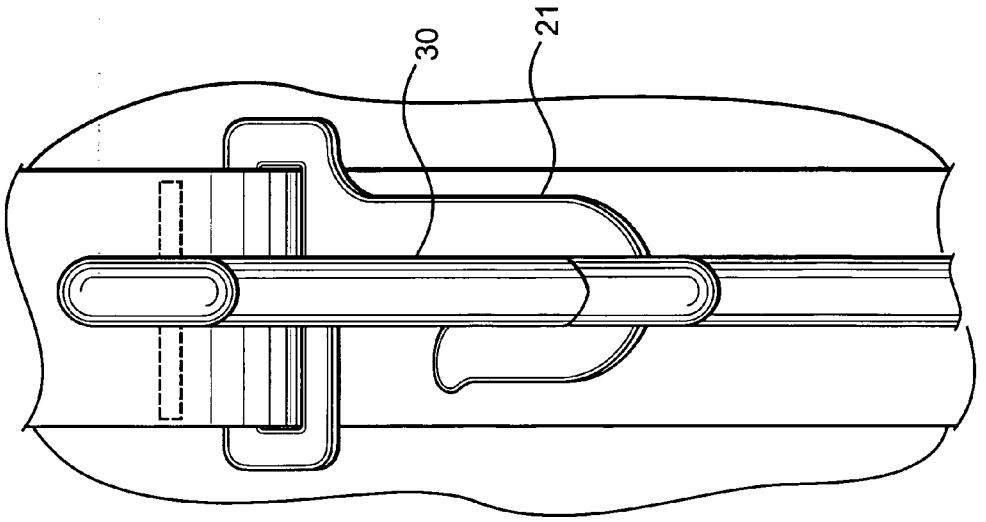


FIG. 8

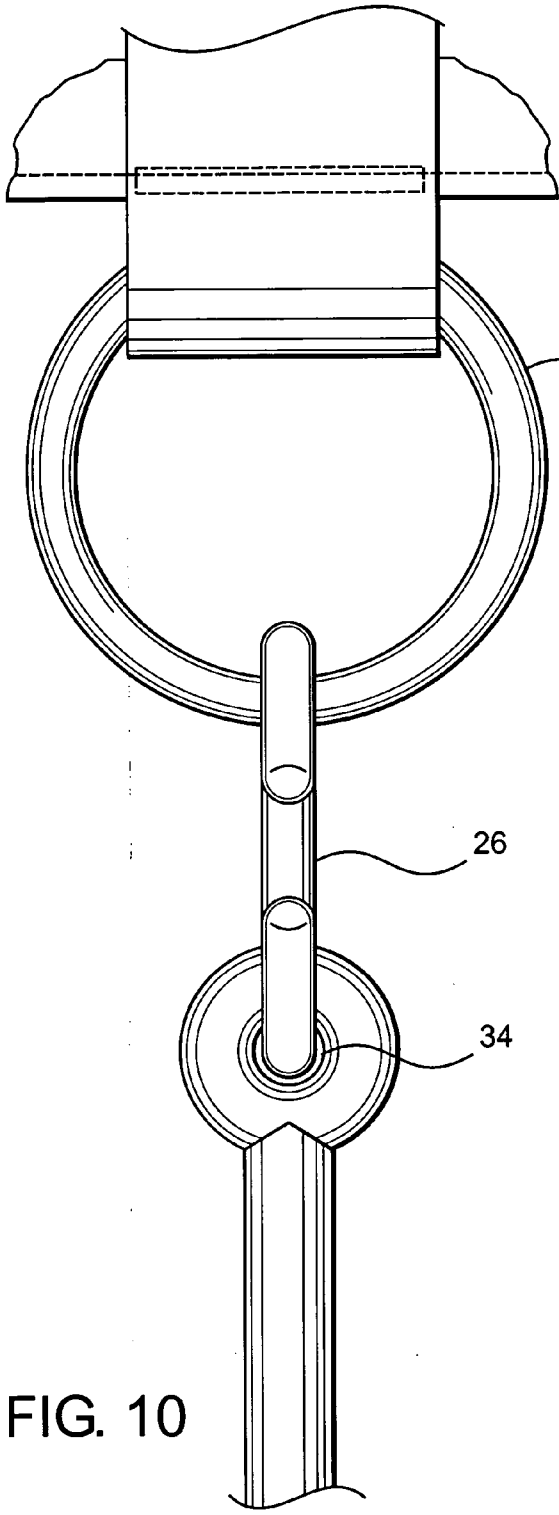


FIG. 10

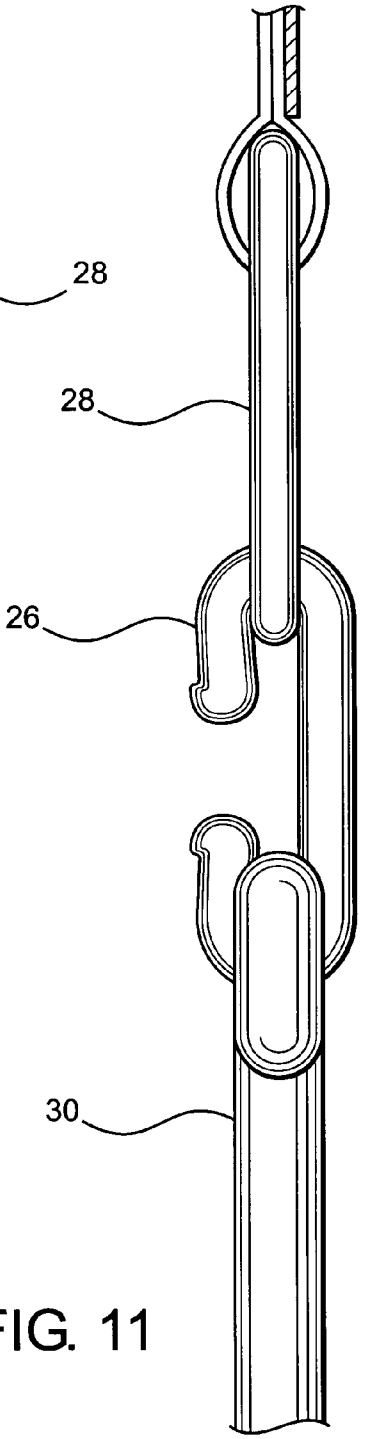


FIG. 11

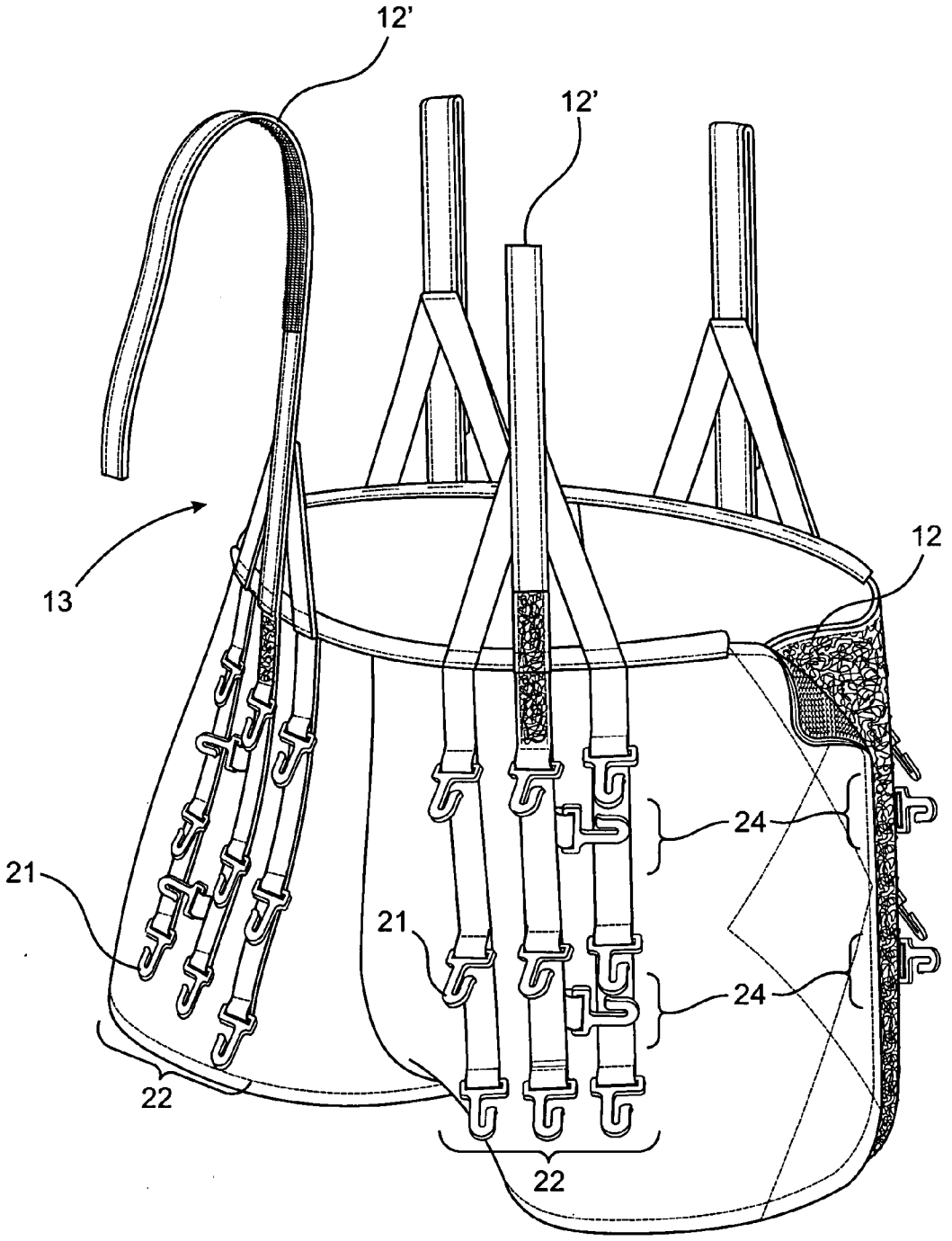


FIG. 12

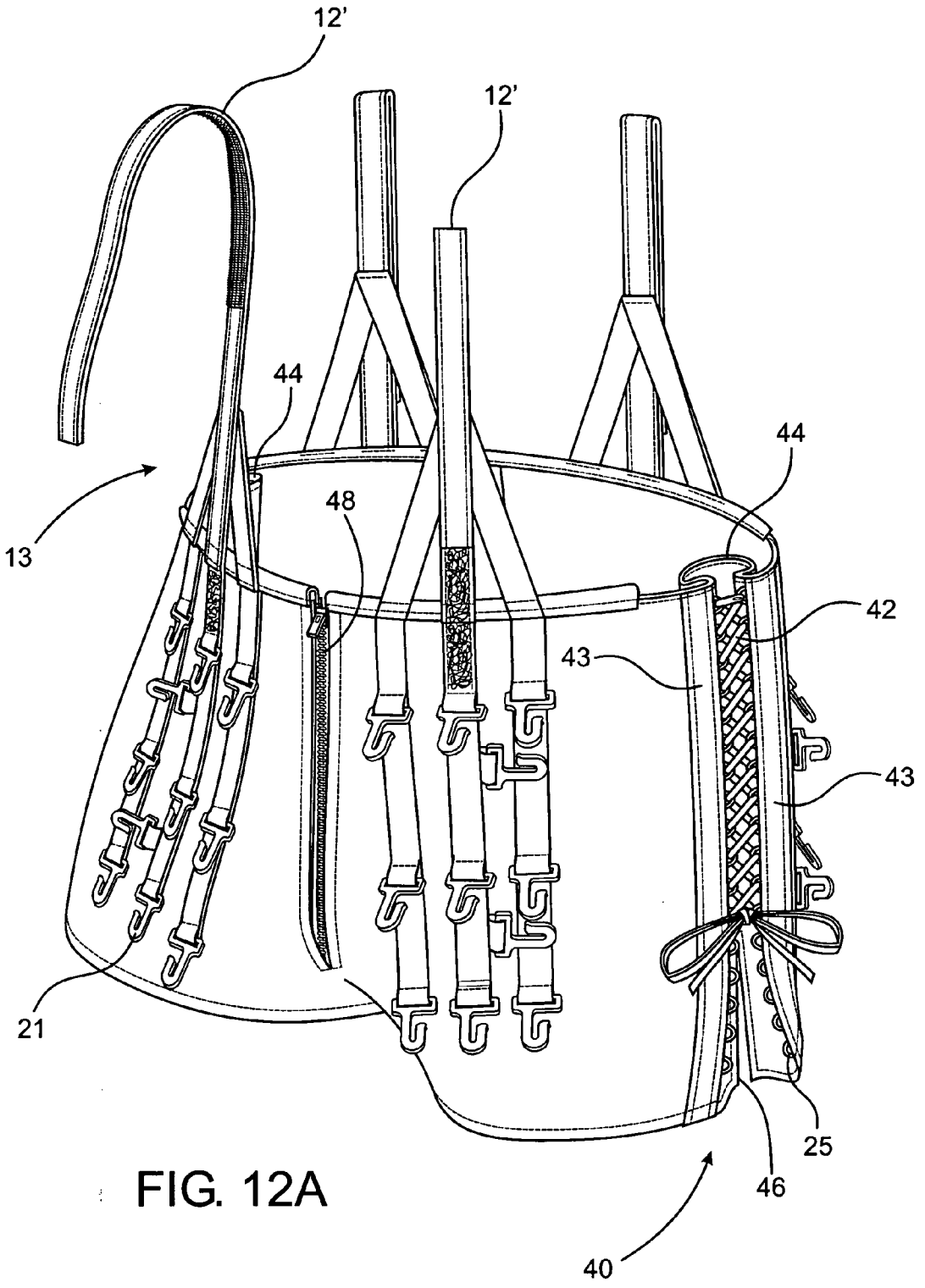


FIG. 12A

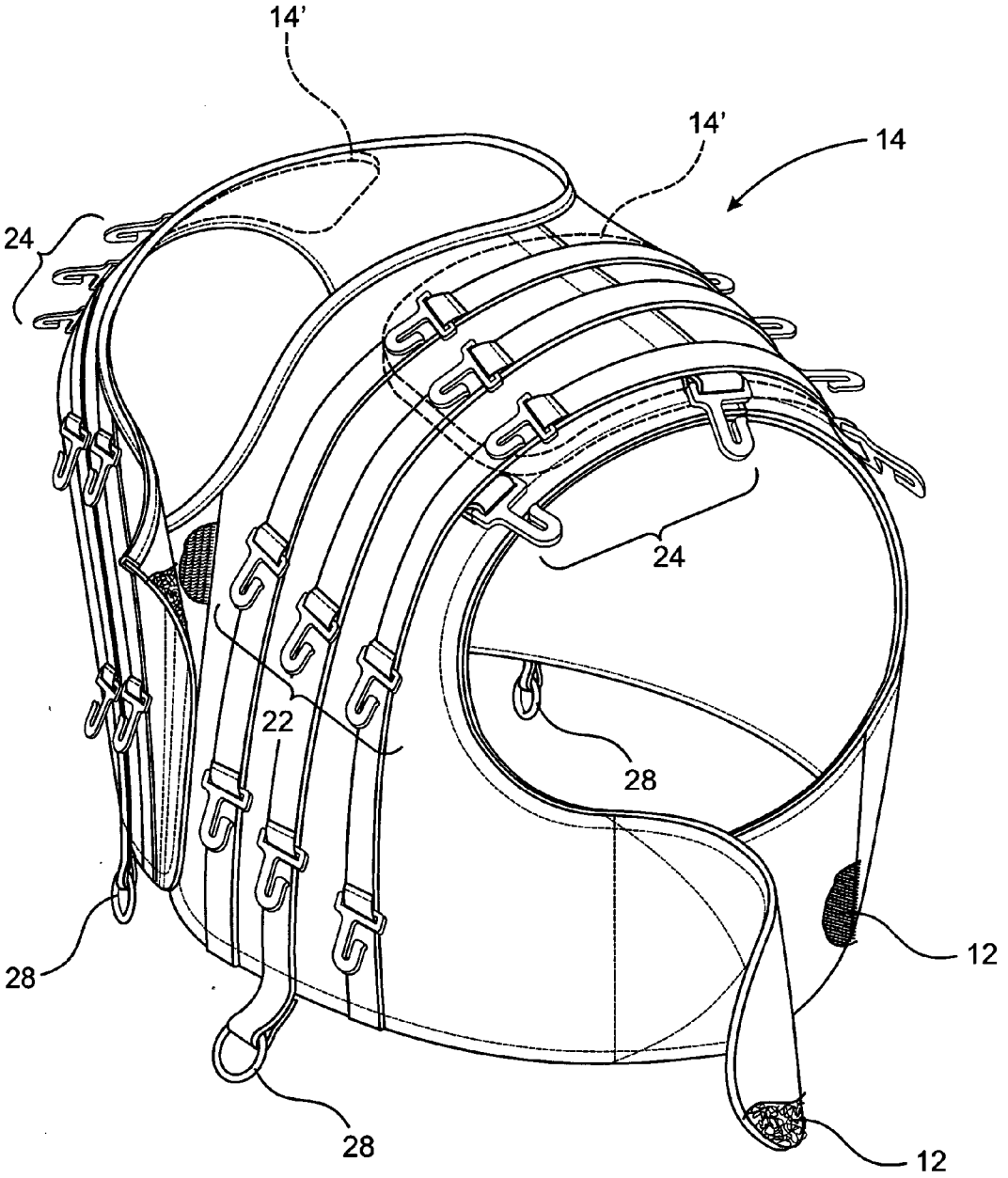


FIG. 13

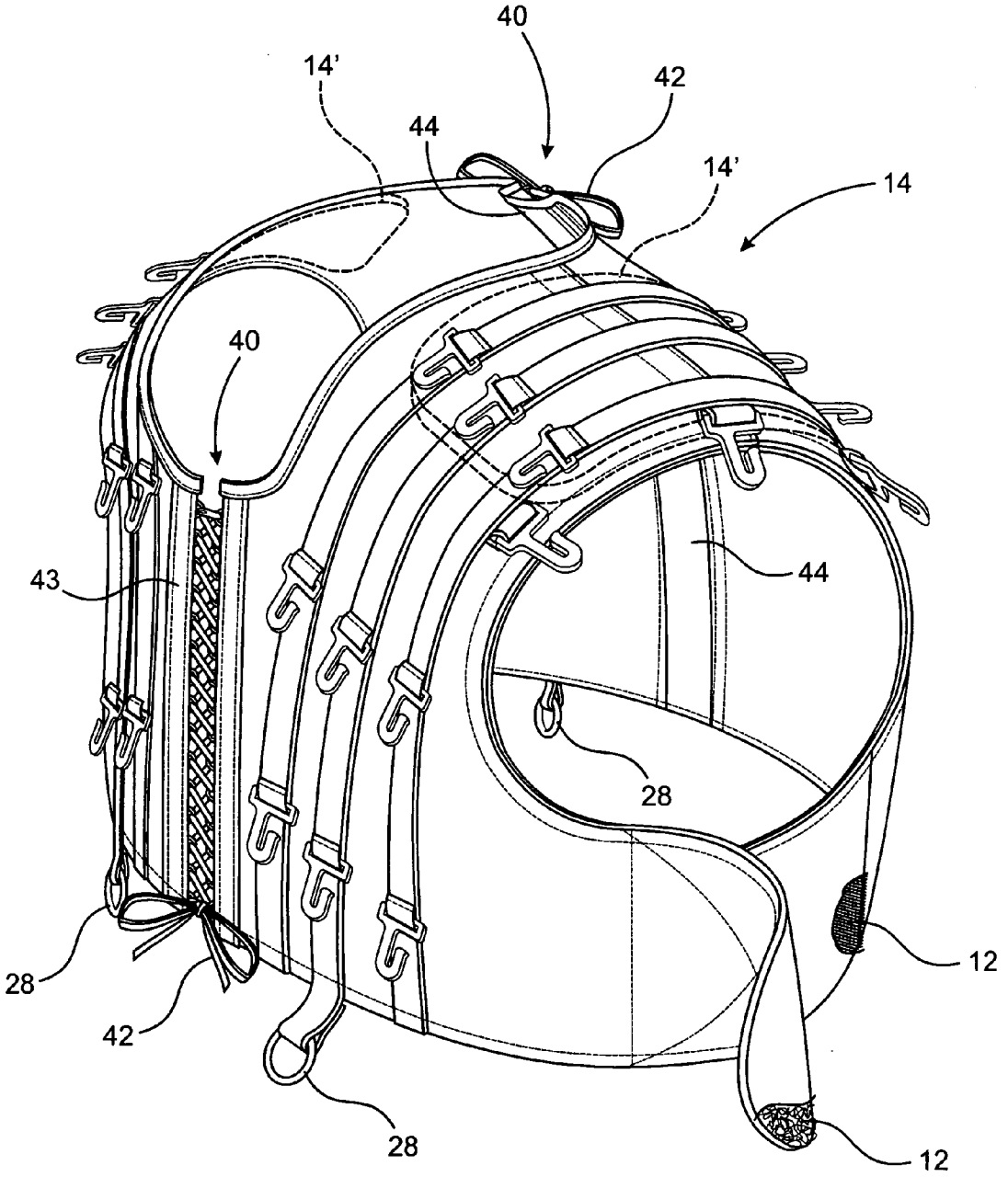


FIG. 13A

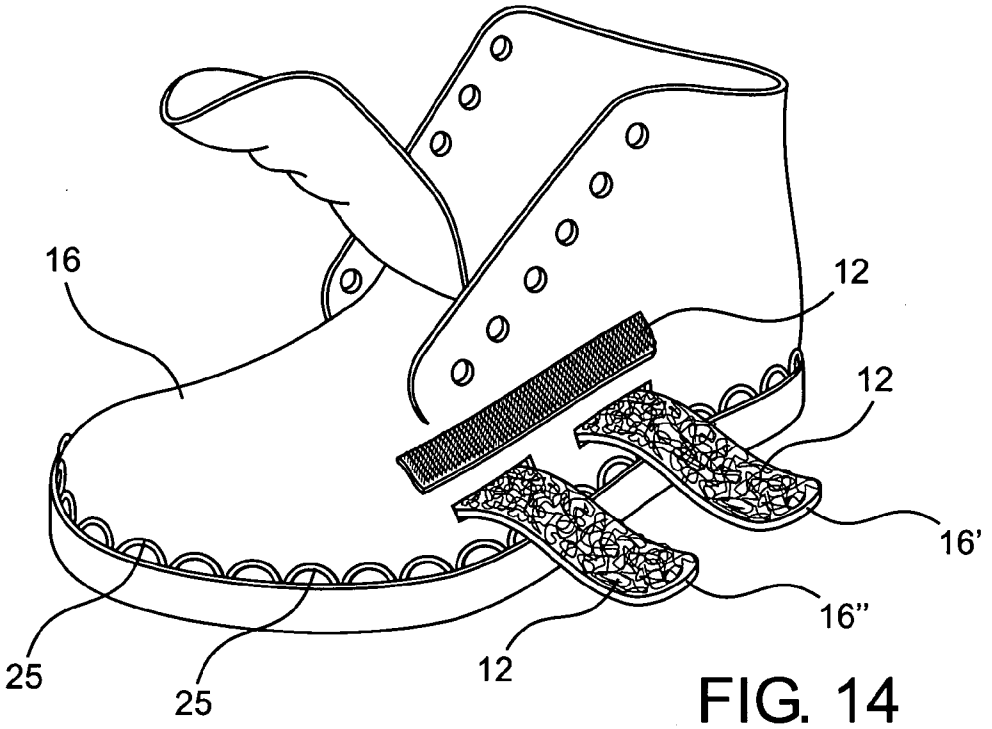


FIG. 14

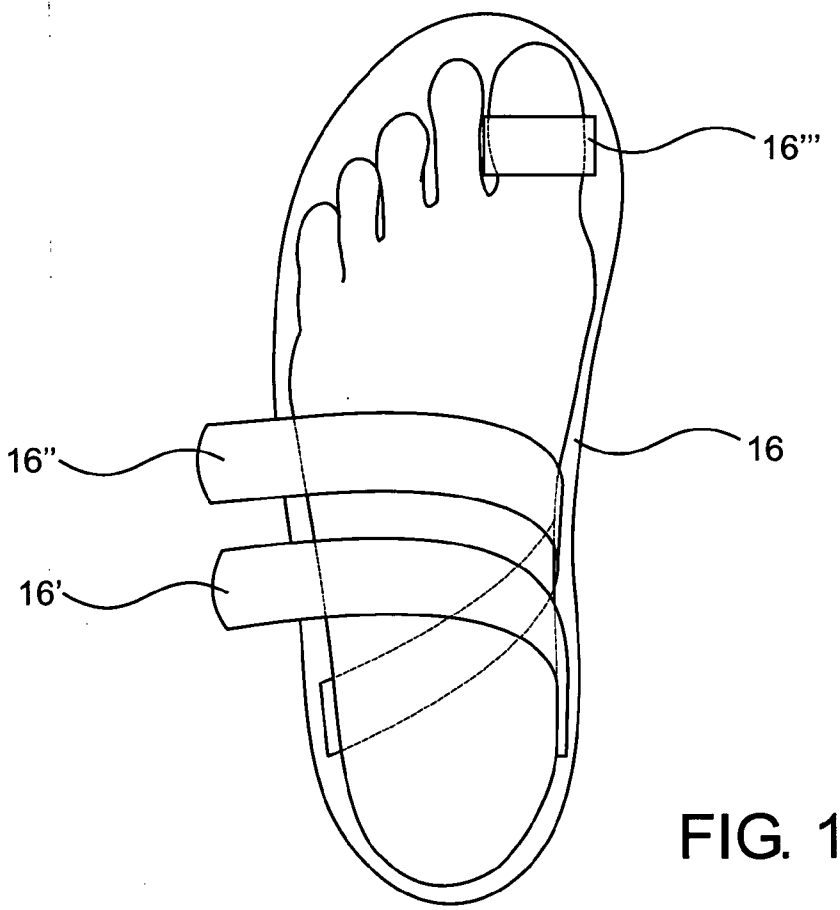


FIG. 15

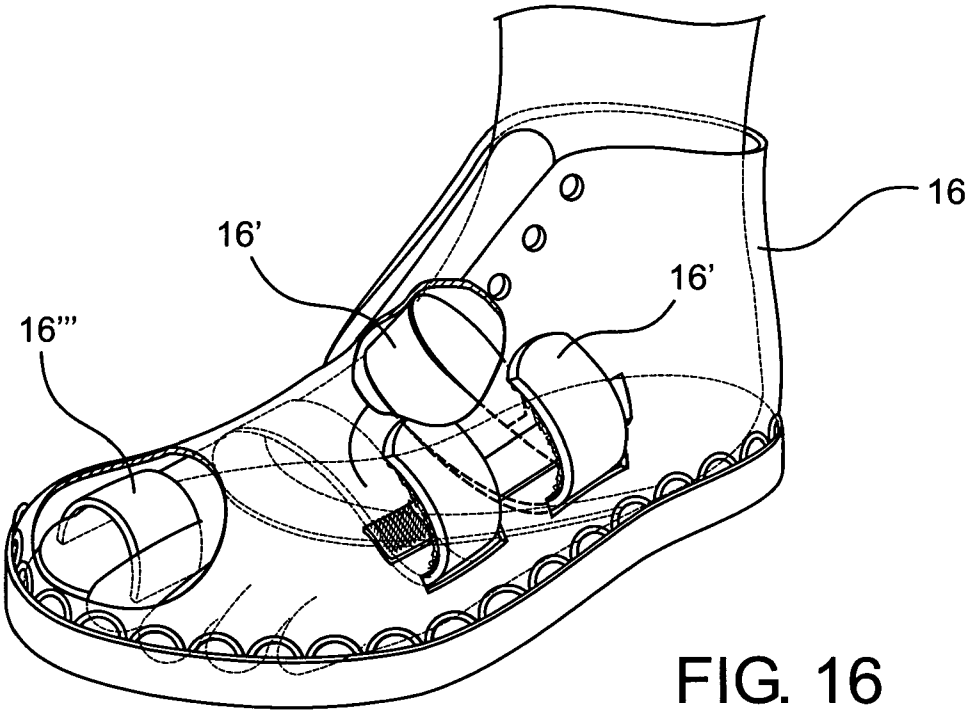


FIG. 16

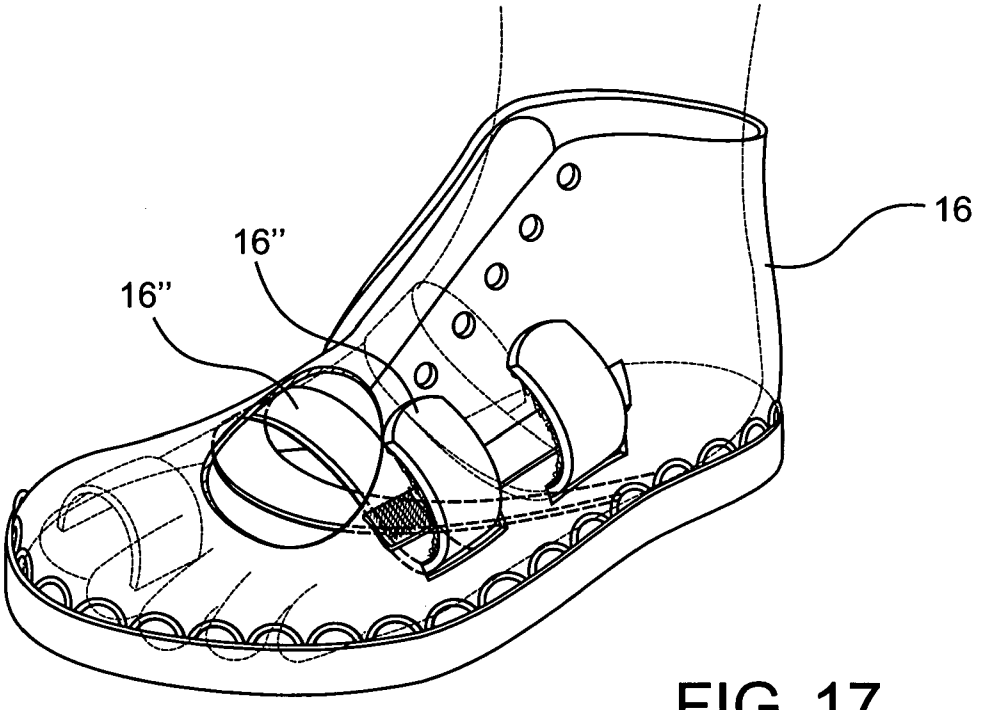


FIG. 17

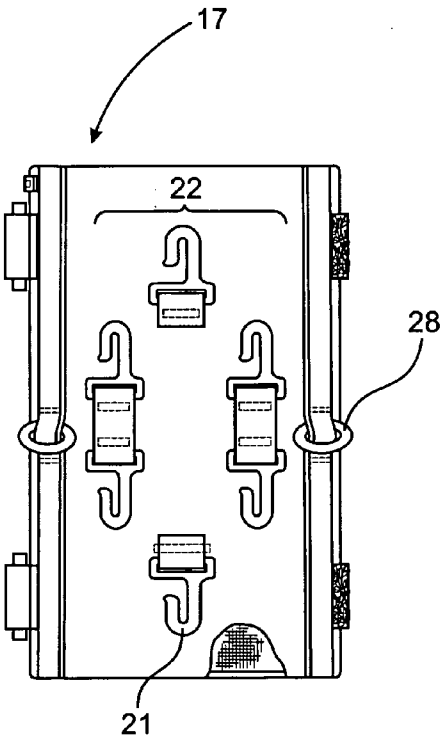


FIG. 18A

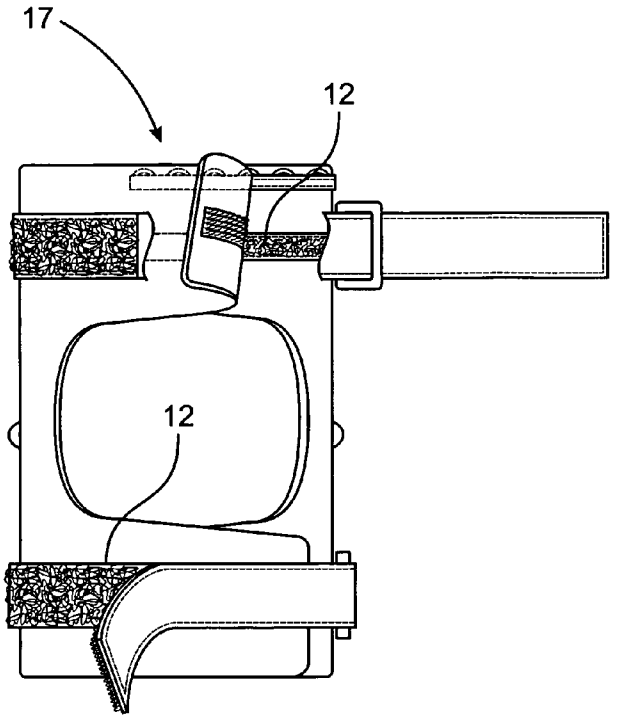


FIG. 18B

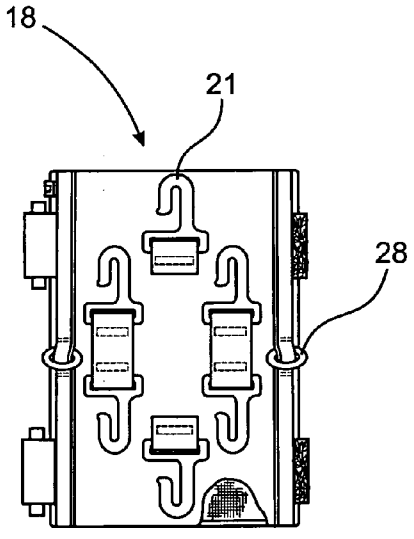


FIG. 19A

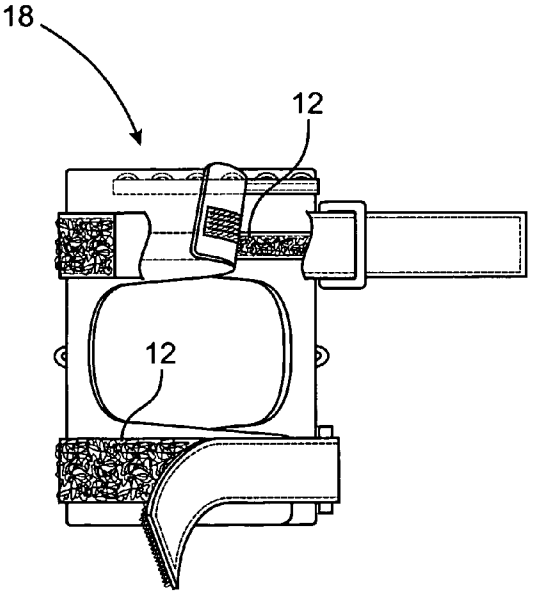


FIG. 19B

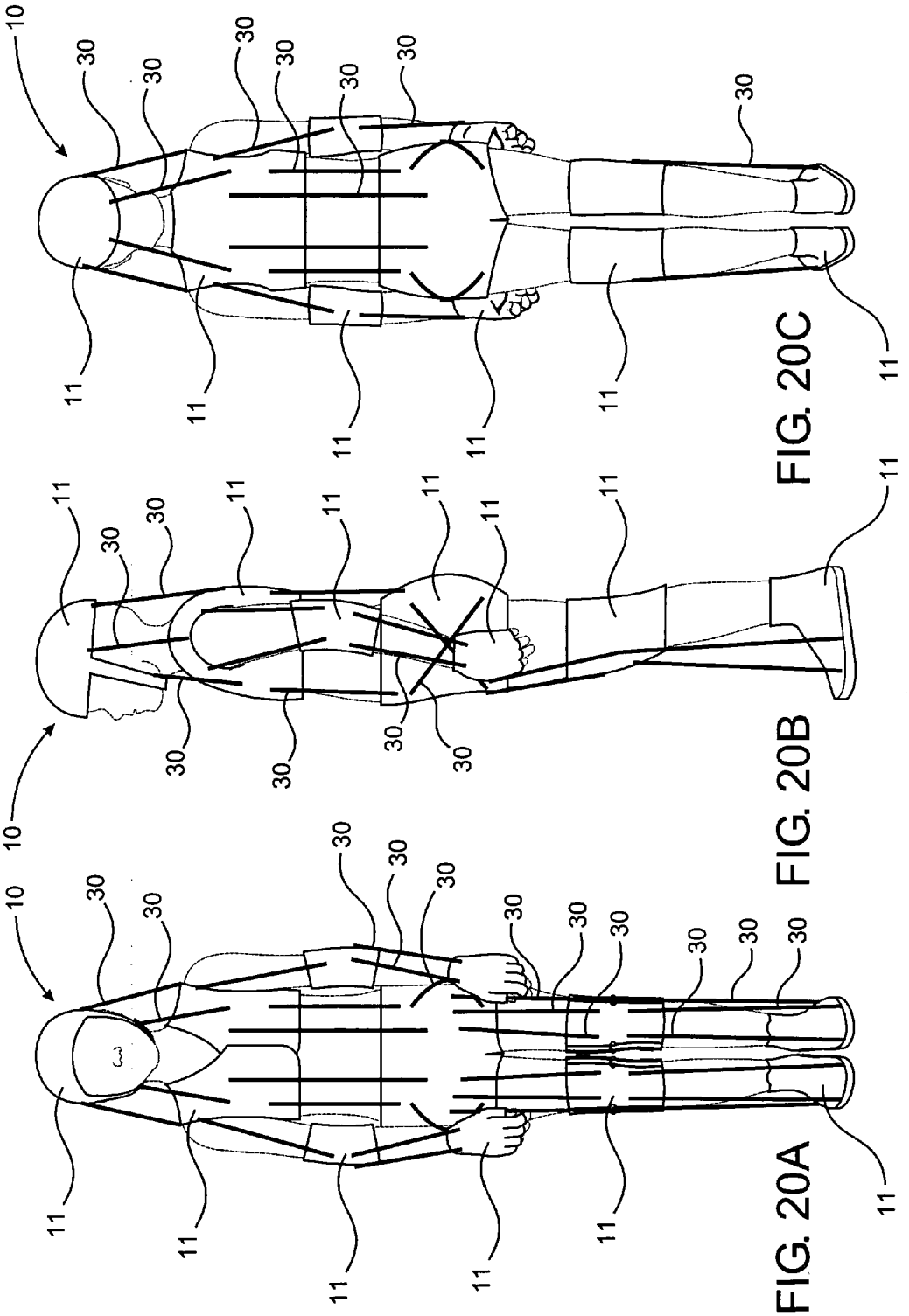


FIG. 20C

FIG. 20B

FIG. 20A

JOINT ALIGNMENT AND COMPRESSION ASSEMBLY AND METHOD FOR PERFORMING A REHABILITATIVE TREATMENT REGIMEN

CLAIM OF PRIORITY

[0001] The present application is based on and a claim to priority is made under 35 U.S.C. Section 119(e) to provisional patent application currently pending in the U.S. Patent and Trademark Office having Ser. No. 60/608,215, and having a filing date of Sep. 9, 2004.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] An assembly comprising a plurality of alignment members structured to be worn by a patient in an operative configuration. Each alignment member is operatively interconnected to at least one other alignment member by one or more adjustable uniform compression members in such a manner so as to properly align the patient's joints, to the extent possible, as well as to provide a uniform compressive force to the patient's joints to facilitate a therapeutic effect of a rehabilitative treatment regimen while the assembly is worn by the patient. A method for performing a rehabilitative treatment regimen utilizing a joint alignment and compression assembly is also provided.

[0004] 2. Description of the Related Art

[0005] A number of rehabilitation programs are structured to address various physical and/or psychological disorders or a person. It is common for a physical rehabilitation program to include a series of repetitive physical actions or exercises structured to develop or redevelop certain physical attributes of a person's body, often times employing specialized equipment to facilitate the impact of a particular exercise.

[0006] In the case of a person with a neurological disorder which subsequently affects their ability to function physically, for example, persons having cerebral palsy, multiple sclerosis, developmental delays, as well as victims of stroke and brain trauma, exercises may be structured to train or retrain the person's motor responses to improve the person's ability to physically function. One way to accomplish this training or retraining of the person's motor responses is by having the person perform a series of repetitive exercises while the associated joints and muscles are maintained in a properly aligned orientation and a resistive force is applied which the person must overcome while performing the exercise. Although a number of devices are available which provide resistive force for exercising various portions of the body, only a few devices are know which further attempt to effect proper alignment of the associated joints and muscles.

[0007] One such device employs a plurality of supports which a person wears about various portions of their body, at least one of the supports being a cup-shaped shoulder harness. The support members are interconnected by elastic tie members which may be made of rubber, plastic, or metallic springs, and are arranged on the body in accordance with the anatomical arrangement of the skeletal muscles. One end of each tie member is connected to a tension adjuster which comprises a band, the adjuster being held in a lock which is fastened to one of the supports. This arrangement requires consideration of the elastic nature of both the tie member and the adjuster in order to apply a desired force to a corresponding joint and/or muscle. In addition, due to the potentially diverse elastic properties of the tie members and the adjusters, an uneven force is likely to be applied along the joint and/or muscle. This device does not provide for any support or resistive force about the head and neck of the user.

[0008] One other device includes at least a vest and a pant garment each having a plurality of hooks attached to them. The vest and pant garment are secured about a patient and are interconnected by a plurality of elastic bands which extend between them. The elastic bands may include a number of adjustment nodes or spaced openings such that the tension may be adjusted by securing the different nodes or openings to corresponding hooks on the vest and/or pant garment. This device may include a cap which may be interconnected to the vest portion by the elastic bands, as well as knee and shoe supports which may be interconnected to one another or to the pant garment, once again, via the elastic bands.

[0009] This device may include hook and loop type connectors to facilitate securing the various supports to the person's body, the supports being made of a thin layer of substantially non-elastic, and non-breathable material. As a result, the supports are often uncomfortable for the patient, who may be required to wear the device for extended periods of time during treatment, as a result of restricting airflow to the body. Additional discomfort may result from the pressure of the hooks against the patient's body through the thin layer of material as the elastic bands are secured in place. In addition, this device employs a number of hooks and clips to attach the elastic bands, the hooks and clips being made of a polypropylene material which is prone to drying and breakage. Also, the openings of the hooks and clips for this device are small relative to the elastic bands thus making it difficult to properly secure the plurality of elastic bands as required for proper treatment.

[0010] Neither of aforementioned devices provide for hip stabilization, which may be a critical aspect as a person's bones are often compromised and weakened either as a direct result of a medical ailment, or as a result of prolonged inactivity. In addition, these devices do not provide adequate means for proper alignment of joints of a person's foot or about the head and neck regions.

[0011] As such, it would be helpful to provide an assembly which may be utilized to quickly and easily align and uniformly compress a patient's joints to facilitate a therapeutic effect from a rehabilitative treatment regimen. More in particular, it would be beneficial to provide such an assembly comprising adjustable uniform compression members structured to removably interconnect different ones of a plurality of alignment members such that a uniform force may be applied along a patient's joints and muscles requiring rehabilitation. A further benefit may be realized by providing one or more alignment members with at least one expandable attachment member structured to provide a form-fitting relationship with a patient's body when the alignment member is donned by the patient in an operative configuration. Additionally, it would be preferable to provide an assembly including alignment members comprising a soft breathable material to assure the comfort of a patient who may be required to wear the assembly for prolonged

periods of time throughout the course of a rehabilitative treatment regimen. Also, it would be beneficial for such an assembly to comprise a waterproof material such that water based rehabilitative treatment regimens may be conducted. It would also be extremely beneficial for such an assembly to provide for the stabilization of a patient's hips during a rehabilitative treatment regimen. Further, any such assembly should provide for proper alignment of the joints of a patient's foot, as well as to permit alignment of a patient's head and neck region. Also, it would be helpful to provide a method for positioning such an assembly on a patient in an operative configuration, as well as for conducting a rehabilitative treatment regimen.

SUMMARY OF THE INVENTION

[0012] The present invention is directed to a joint alignment and compression assembly and a method for performing a rehabilitative treatment regimen utilizing such an assembly. In particular, the joint alignment and compression assembly of the present invention includes a plurality of alignment members structured to be removably secured to a patient in an operative configuration. Each of the plurality of alignment members, in one embodiment, comprise at least one adjustable quick release fastener to facilitate removably securing each alignment member to the patient. In at least one further embodiment, one or more of the alignment members comprise at least one expandable attachment member structured to provide a form-fitting relationship with a patient's body when the alignment member is donned by the patient in an operative configuration. Additionally, each of the plurality of alignment members includes a plurality of interconnection members securely fastened thereto and disposed in a spaced relation with one another.

[0013] A plurality of adjustable uniform compression members are provided in the present invention, each of the adjustable uniform compression members may be removably interconnected between different ones of the plurality of interconnection members. Each adjustable uniform compression member includes a plurality of adjustment nodes being generally equally spaced along a length of the member. Each adjustment node comprises an aperture sized such the adjustable uniform compression members may be removably interconnected to a portion of at least one of the alignment members by way of the corresponding interconnection members. In addition, the adjustment nodes allow the compressive force applied along any particular portion of the patient's body to be adjusted based upon the adjustment nodes selected to removably interconnect the adjustable uniform compression member to one or more alignment members.

[0014] At least one of the plurality of alignment members comprises a pelvic alignment member structured to substantially encircle the patient's waist and pelvic area when disposed in an operative configuration. The pelvic alignment member includes at least one corresponding pair of interconnection members disposed in a horizontal arrangement along each side of the pelvic alignment member to facilitate stabilization of the patient's hips when the adjustable uniform compression members are removably interconnected between the interconnection members disposed in the horizontal arrangement. In at least one embodiment, the pelvic alignment member comprises an expandable attachment portion disposed along either side each being structured to provide a form-fitting relationship about the patient's pelvic region while the pelvic alignment member is disposed in an operative configuration. In one further embodiment, the pelvic alignment member may comprise one or more expansion notches to further provide for a form-fitting relationship with the patient's body.

[0015] In addition, one of the plurality of alignment members may comprise a head alignment member structured to substantially encircle at least a portion of the patient's head when disposed in an operative configuration. The head alignment member comprises a plurality of interconnection members disposed in a spaced apart relation such that they are disposed about the patient's head, as well as along a chin strap, to permit proper alignment and compression of the joints in the patient's head and neck region.

[0016] Also, one of the alignment members comprises a chest alignment member structured to substantially encircle the patient's chest area when disposed in an operative configuration, the chest alignment member comprising at least one interconnection member disposed in a horizontal arrangement along each shoulder to facilitate alignment of the patient's arm, elbow, and hand regions. In at least one embodiment, the chest alignment member comprises an expandable attachment portion disposed along the front and back, each of which are structured to provide a form-fitting relationship about the patient's chest while the chest alignment member is disposed in an operative configuration.

[0017] A further embodiment of the joint alignment and compression assembly of the present invention also comprises at least one foot alignment member. The foot alignment member is structured to substantially encircle one of the patient's feet when disposed in an operative configuration. In addition, the foot alignment member includes a foot securing element structured to be secured overtop a corresponding one of the patient's ankles when disposed in the operative configuration. The foot alignment member also comprises a foot supporting element structured to be disposed underneath a corresponding one of the patient's arches when disposed in the operative configuration to facilitate alignment of the patient's foot. Also, the foot alignment member comprises a toe securing element structured to substantially encircle one of the patient's great toes when disposed in the operative configuration to facilitate alignment of the patient's foot.

[0018] Additional alignment members which the joint alignment and compression assembly of the present invention may comprise include, for example, a knee alignment member, an elbow alignment member and/or a hand alignment member.

[0019] The present invention further comprises a method for performing a rehabilitative treatment regimen utilizing a joint alignment and compression assembly. Specifically, the method includes removably securing a plurality of alignment members to a patient in an operative configuration, and removably interconnecting corresponding ones of the plurality of alignment members to one another via a plurality of adjustable uniform compression members. In addition, the method provides for positioning each of the plurality of adjustable uniform compression members to align the joints of the patient in an operative orientation, and adjusting the tension of each of the plurality of adjustable uniform compression members to provide a preselected compressive

force to the joints of the patient. In addition, the method of the present invention includes executing a predetermined exercise schedule structured to produce a desired therapeutic effect while the plurality of alignment members are disposed in the operative configuration and the plurality of adjustable uniform compression members are adjusted to provide the preselected compressive force to the joints of the patient.

[0020] These and other objects, features and advantages of the present invention will become apparent when the drawings as well as the detailed description are taken into consideration.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] For a fuller understanding of the nature of the present invention, reference should be had to the following detailed description taken in connection with the accompanying drawings in which:

[0022] FIG. **1** is a front elevation of a plurality of alignment members of one preferred embodiment of a joint alignment and compression assembly of the present invention removably secured to a patient in an operative configuration.

[0023] FIG. **2** is a rear elevation of the embodiment of FIG. **1**.

[0024] FIG. **3** is a right side elevation of one embodiment of a head alignment member of the present invention.

[0025] FIG. **4** is a left side elevation of the head alignment member of FIG. **3**.

[0026] FIG. **5**A is an elevation of one preferred embodiment of an adjustable uniform compression member of the present invention.

[0027] FIG. **5**B is a plan view of the embodiment of the adjustable uniform compression member of FIG. **5**A disposed in a relaxed disposition.

[0028] FIG. **5**C is a plan view of the embodiment of the adjustable uniform compression member of FIG. **5**A in an elongated disposition.

[0029] FIG. **6** is a partial front elevation of an adjustable uniform compression member securely interconnected via a terminal adjustment aperture.

[0030] FIG. **7** is a partial side elevation of the embodiment of FIG. **6**.

[0031] FIG. **8** is a partial front elevation of an adjustable uniform compression member securely interconnected via an intermediate adjustment aperture.

[0032] FIG. **9** is a partial side elevation of the embodiment of FIG. **8**.

[0033] FIG. **10** is a partial front elevation of an adjustable uniform compression member securely interconnected via a loop, a free hook, and a hoop.

[0034] FIG. **11** is a partial side elevation of the embodiment of FIG. **10**.

[0035] FIG. **12** is a perspective view of one preferred embodiment of a pelvic alignment member of the present invention.

[0036] FIG. **12**A is a perspective view of one further preferred embodiment of a pelvic alignment member illustrating an expandable attachment portion disposed along one side.

[0037] FIG. **13** is a perspective view of one preferred embodiment of a chest alignment member of the present invention.

[0038] FIG. **13**A is a perspective view of one further preferred embodiment of a chest alignment member illustrating an expandable attachment portion disposed along the front.

[0039] FIG. **14** is a perspective view of one preferred embodiment of a foot alignment member of the present invention.

[0040] FIG. **15** is a cutaway plan view of the foot alignment member of FIG. **14** illustrating a foot securing element, a foot supporting element, and a toe securing element disposed in respective operative configurations.

[0041] FIG. **16** is a partial cutaway view the foot alignment member of FIG. **14** illustrating one preferred embodiment of a foot securing element.

[0042] FIG. **17** is a partial cutaway view the foot alignment member of FIG. **14** illustrating one preferred embodiment of a foot supporting element.

[0043] FIG. **18**A is a front elevation of one preferred embodiment of a knee alignment member of the present invention. FIG. **18**B is a rear elevation of the embodiment of FIG. **18**A illustrating a plurality of adjustable quick release fasteners.

[0044] FIG. **19**A is a front elevation of one preferred embodiment of an elbow alignment member of the present invention.

[0045] FIG. **19**B is a rear elevation of the embodiment of FIG. **19**A illustrating a plurality of adjustable quick release fasteners.

[0046] FIG. **20**A is a schematic representation of a front elevation of one embodiment of a joint alignment and compression assembly of the present invention illustrating one arrangement of a plurality of adjustable uniform adjustment members relative to a plurality of alignment members.

[0047] FIG. **20**B is a schematic representation of a side elevation of the embodiment of FIG. **20**A.

[0048] FIG. **20**C is a schematic representation of a rear elevation of the embodiment of FIG. **20**A.

[0049] Like reference numerals refer to like parts throughout the several views of the drawings.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0050] As previously indicated, the present invention is directed to a joint alignment and compression assembly, generally as shown at **10** throughout the figures. More in particular, the joint alignment and compression assembly **10** of the present invention is structured to facilitate the performance of specific rehabilitative treatment regimens to provide therapeutic benefits to persons suffering from a wide variety of debilitating conditions including, but by no means

limited to, cerebral palsy, multiple sclerosis, brain trauma, developmental delays, and post stroke conditions. Specifically, the joint alignment and compression assembly **10** of the present invention permits a therapist to properly align a patient's joints, to the extent possible, and to apply a preselected compressive force along portions of the patient's body, to effect training or retraining of the patient's motor responses by way of a rehabilitative treatment regimen, as discussed more fully below.

[**0051**] To begin, the joint alignment and compression assembly **10** of the present invention includes a plurality of alignment members, generally as shown at **11**, each structured to be removably secured to a patient in an operative configuration, wherein the operative configuration is at least partially defined by a substantially encircling disposition about at least one portion of the patient's body such as, by way of example only, the patient's chest, pelvic region, head, feet, elbows, knees, etc., by a corresponding one of the plurality of alignment members **11**. At least some of the alignment members **11** are constructed of a plurality of layers of a stretchable and breathable material, such as cotton or a cotton blend, to assure the comfort of the patient who may be required to wear the alignment members **11** for extended periods of time in a specific rehabilitative treatment regimen. In at least one embodiment, the alignment members **11** comprise a waterproof or water resistant material of construction, such as, by way of example only, synthetic material as is utilized to fabricate wet suits and the like, to facilitate usage of the joint alignment and compression assembly **10** of the present invention to perform water based rehabilitative treatment regimens.

[**0052**] In one embodiment of the present invention, each of the plurality of alignment members **11** comprise at least one, but preferably a plurality of adjustable quick release fasteners **12**, as illustrated throughout the figures, to facilitate removably securing each of the plurality of alignment members **11** to the patient. In one preferred embodiment, the adjustable quick release fastener **12** comprises a hook and loop type fastener, such as Velcro, however, it is understood to be within the scope and intent of the present invention to utilize other adjustable quick release fasteners **12** such as, snaps, zippers, laces, ties, and/or clips, just to name a few.

[**0053**] In addition to one or more adjustable quick release fasteners **12**, each alignment member **11** includes a plurality of interconnection members, generally as shown at **20**, at least some of which are securely fastened to an outer surface of the alignment member **11** to permit adjustable interconnection of the plurality of alignment members **11** to one another, as discussed below. In one preferred embodiment, at least some of the plurality of interconnection members **20** are disposed in a spaced relation with one another along the outer surface of the corresponding alignment member **11**. More specifically, the spaced relation is at least partially defined by an array of interconnection members **20** disposed in a generally vertical arrangement **22** as illustrated in the figures. At least some of the interconnection members **20** comprise a fixed hook **21** securely fastened to the outer surface of the alignment member **11**. As illustrated in the figures, the fixed hooks **21** comprise a generally open end to facilitate interconnection of the alignment members **11**, as discussed below, and may be constructed of any sufficiently rigid material so as to withstand the preselected compressive forces applied to the assembly **10** under normal usage without bending or breaking.

[**0054**] In one preferred embodiment, the fixed hooks **21** are constructed of Nylon **66** which is dyed to trap moisture, thereby decreasing breakage or complete failure due to drying and cracking. In addition, in a further preferred embodiment, the fixed hooks **21** are between approximately 0.14 and 0.15 inches thick and between approximately 0.90 to 1.00 inches wide. Of course, other materials of construction and/or dimensions may be utilized within the scope and intent of the present invention provided the foregoing requirements with regard to bending and/or breaking under the compressive forces of normal usage are met.

[**0055**] A plurality of adjustable uniform compression members, generally as shown at **30** throughout the figures, are also provided in the present invention. Each of the adjustable uniform compression members **30** may be removably interconnected between different ones of the plurality of interconnection members **20** which are securely fastened to different ones of the plurality of alignment members **11**, thereby permitting interconnection of the plurality of alignment members **11** to one another. Furthermore, the adjustable uniform compression members **30** are interconnected between the different ones of the plurality of interconnection members **20** in such a manner so as to guide the joints of the patient into a proper alignment, at least to the extent possible without causing undue discomfort to the patient. As is clearly illustrated throughout the figures, and specifically with reference to FIGS. **20**A through **20**C, the plurality of interconnection members **20** may be disposed along the various alignment members **11** to permit any of a large number of arrangements of the plurality of adjustable uniform compression members **30** to guide a patient's joints into proper alignment regardless of the degree of misalignment with which the patient may be afflicted. As will be seen below, however, in one preferred embodiment, the adjustable uniform compression members **30** are securely fastened to the same alignment member **11**, specifically to stabilize the patient's hips.

[**0056**] Each adjustable uniform compression member **30** includes a plurality of adjustment nodes **32** which are generally equally spaced along a length of the compression member **30**. Each adjustment node **32** comprises an aperture sized such the adjustable uniform compression members **30** may be securely yet removably interconnected to a portion of at least one of the alignment members **11** by way of the corresponding interconnection members **20**. More in particular, the adjustment nodes **32** include a pair of oppositely disposed terminal adjustment apertures **34** and, in at least one preferred embodiment, a plurality of intermediate adjustment apertures **36** being equally spaced along the length of the compression member **30** between the oppositely disposed terminal adjustment apertures **34**, as shown best in FIGS. **5**A through **5**C.

[**0057**] The adjustable uniform compression members **30** are constructed so as to provide a uniform elasticity along the length of the compression member **30**, whether the compression member **30** is disposed in a relaxed disposition, as in FIG. **5**B, or in an elongated disposition, as illustrated in FIG. **5**C, such as when interconnected between interconnection members **20** to apply a preselected compressive

force therebetween. The uniform elasticity facilitates an even application of compressive forces along portions of the patient's body as may be required by various rehabilitative treatment regimens, as discussed in further detail below. In one preferred embodiment, the adjustable uniform compression members **30** are constructed of a vulcanized rubber material. It is, however, within the scope and intent of the present invention for the adjustable uniform compression members **30** to comprise any material having the desired property of uniform elasticity along its length regardless of whether the compression member **30** is in a relaxed disposition or an elongated disposition.

[**0058**] The plurality of adjustment nodes **32** allow the compressive force applied along any particular portion of the patient's body to be readily adjusted based upon the specific combination of adjustment nodes **32** and interconnection members **20** selected for removably interconnecting the adjustable uniform compression member **30** to one or more alignment member **11**. Specifically, interconnecting an adjustable uniform compression member **30** between different ones of the interconnection members **20** via the terminal adjustment apertures **34** located at its opposite ends, as partially illustrated in FIGS. **6** and **7**, provides a minimum amount of compressive force to the portion of the patient's body between the corresponding interconnection members **20**. Conversely, removably interconnecting the adjustable uniform compression member **30** between different ones of the interconnection members **20** via intermediate adjustment apertures **36** which are directly adjacent to one another provides a maximum amount of compressive force to the portion of the patient's body between the corresponding interconnection members **20**. It is readily apparent that a wide range of compressive forces may be preselected and provided to various portions of the patient's body by simply selecting adjustment nodes **32** which are closer or farther apart from one another along the length of the adjustable uniform compression member **30**.

[**0059**] Looking now in further detail to the plurality of alignment members **11**, at least one of the alignment members **11** comprises a pelvic alignment member **13** structured to substantially encircle the patient's waist and pelvic area when disposed in an operative configuration about the patient. The pelvic alignment member **13** includes at least one corresponding pair of interconnection members **20** disposed in a generally horizontal arrangement **24** along each side, as illustrated in FIG. **2** and FIG. **12**. Specifically, the corresponding interconnection members **20** disposed in the generally horizontal arrangement **24** provide a means for horizontal hip stabilization for the patient when an adjustable uniform compression member **30** is removably interconnected between the corresponding interconnection members **20** disposed in the horizontal arrangement **24**. This is an important consideration as often times the patient's muscles are weakened as a result of their ailment or because they are not a physically active as they would be under normal circumstances, and as a result, the bones are often in a compromised and weakened condition, which puts patient's at greater risk for bone fractures. Thus, the present invention specifically provides for corresponding pairs of fixed hooks **21** disposed in such a generally horizontal arrangement **24** to reinforce the stability and integrity of the hip joints, thus making the joint alignment and compression assembly **10** of the present invention safer for the patient to use relative to other devices. As illustrated in FIG. **12**, in one preferred embodiment, the pelvic alignment member **13** comprises a plurality of elongated adjustable quick release fasteners **12'** to facilitate secure interconnection with a chest alignment member **14**, as discussed more fully below.

[**0060**] In one further preferred embodiment, as illustrated in FIG. **12**A, the pelvic alignment member **13** further comprises at least one expandable attachment portion, as at **40**. The expandable attachment portion **40** provides for a substantially form-fitting relationship of the pelvic alignment member **13** about the patient's pelvic region while the pelvic alignment member **13** is disposed in an operative configuration. It will be appreciated by one of ordinary skill in the art that a form fitting garment provides a significantly greater degree of comfort, which is very important for a patient who must don the joint compression and alignment assembly **10** for extended periods of time, versus a "one-size-fits-all" garment. It will further be appreciated that given the specialized nature of the alignment members **11** of the present invention, and the significant expense associated in the manufacture therewith, the ability to utilize a single alignment member **11** for a broad range of patients will result in a more affordable treatment regimen which will likely result in greater utilization of the invention by those who may benefit from it.

[**0061**] More specifically, the expandable attachment portion **40** comprises at least one adjustable fastener **42** structured to draw oppositely disposed segments **43** of the expandable attachment portion **40** towards one another as the adjustable fastener **42** is tightened. As illustrated in the figures, the adjustable fastener **42** may comprise an elongated tie or lace threaded through a plurality of loops **25** affixed along the edge of each oppositely disposed segment **43**. As will be appreciated, by tightening the adjustable fastener **42**, the oppositely disposed segments **43** of the expandable attachment member **40** will be drawn closer to one another, providing a snugger, secure fit, as may be required by some patients. Alternatively, by loosening the adjustable fastener **42**, the oppositely disposed segments of the expandable attachment member **40** may be spread apart from one another, as may be required by other patients having larger waists and/or thighs. It will be appreciated that the use of a tie or lace threaded through a plurality of loops **25** is merely illustrative of an adjustable fastener **42**, and that alternate types of fasteners may be employed within the scope and intent of the present invention including, as just one example, a hook and loop type of fastener, as described above.

[**0062**] FIG. **12**A also illustrates the expandable attachment member **40** further comprising an expansion panel **44**. More in particular, the expansion panel **44** is attached to each of the oppositely disposed segments **43** of the expandable attachment member **40**, preferably along a length of each. As such, the expansion panel **44** prevents the oppositely disposed segments **43** of the expandable attachment member **40** from becoming completely detached from one another, and at least partially defines a maximum range of expansion of the member **40**. In addition, the expansion panel **44** provides a buffer between the patient's body and the adjustable fastener **42**, for the patient's further comfort. At least one embodiment of the expandable attachment member **40** of the present invention does not comprise an expansion panel **44**, as discussed in greater detail below.

[0063] At least one embodiment of the pelvic alignment member **13** comprises a plurality of expandable attachment members **40**, preferably along either side of the member **13**, thus providing even greater flexibility to form-fit the pelvic alignment member **13** about the body of the patient in an operable configuration. In yet one further preferred embodiment, the pelvic alignment member **13** of the present invention comprises at least one expansion notch **46** disposed along the bottom of each side, as illustrated in FIG. **12**A, which, as above, provides further flexibility for form-fitting the pelvic alignment member **13** to a plurality of patients having different physical configurations. FIG. **12**A also illustrates that in at least one embodiment, the pelvic alignment member **13** may further comprise a closure member **48**, for example, a zipper, which serves to aid patients in donning and removing the member **13**, as well as for allowing patients access to relieve themselves without requiring removal of the entire pelvic alignment member **13**.

[0064] As illustrated in FIG. **13**, and noted above, at least one embodiment of the present invention also comprises a chest alignment member **14** structured to substantially encircle the patient's chest area when disposed in an operative configuration. A plurality of adjustable quick release fasteners **12** are provided along the front and under each arm to facilitate removably securing the chest alignment member **14** to the patient. The chest alignment member **14** preferably includes a V-shaped neckline to facilitate patients requiring external devices, such as a tracheotomy connection. In one preferred embodiment, the chest alignment member **14** comprises at least one interconnection member **20** disposed in a horizontal arrangement **24** along each shoulder to facilitate interconnection to alignment members **11** disposed along the patient's arms, in particular, the patient's elbows and hands, as discussed in greater detail below. In one further preferred embodiment, the chest alignment member **14** comprises a plurality of interconnection members **20** disposed in a horizontal arrangement **24**, such as, for example, one (1) interconnection member **20** anterior to the patients shoulder and two (2) interconnection members **20** positioned posterior to the patients shoulders when the chest alignment member **14** is disposed in an operative configuration.

[0065] Additionally, the chest alignment member **14** comprises a pair of integral shoulder pads **14'** structured to further provide a comfortable fit to the patient, as well as to eliminate potential entanglement with one or more of the adjustable uniform compression members **30** which may be interconnected thereto. Also, as illustrated in FIG. **13**, the chest alignment member **14** includes a plurality of hoops **28** to facilitate additional interconnection with the pelvic alignment member **13** via the elongated adjustable quick release fasteners **12'** affixed thereto.

[0066] FIG. **13**A illustrates a preferred embodiment of a chest alignment member **14** further comprising a plurality of expandable attachment members **40**. Specifically, the chest alignment member **14** of FIG. **13**A comprises an expandable attachment member **40** disposed along each of the front and back of the member **14**, generally along the center of each. The expandable attachment members **40** disposed on the chest alignment member **14** are similar in structure and function as the members **40** described above with respect to the pelvic alignment member **13**, thereby permitting the chest alignment member **14** to be disposed about the patient in an operative configuration about the patient's chest area in a substantially form-fitting relationship. In at least one embodiment, as illustrated in FIG. **13**A, the expandable attachment member **40** disposed along the front of the chest alignment member **14** does not comprise an expansion panel **44** thereby allowing the oppositely disposed edges **43** to be opened a substantially greater distance from one another without limitation by an expansion panel **44**, to further facilitate the donning and removal of the chest alignment member **14** by a patient.

[0067] At least one embodiment of the present invention comprises a head alignment member **15**, as best illustrated in FIGS. **3** and **4**, structured to substantially encircle at least a portion of the patient's head when disposed in an operative configuration. The head alignment member **15** comprises a chin strap **15'** to facilitate removably securing the head alignment member **15** to the patient in the operative configuration. As further illustrated in FIG. **4**, the chin strap **15'** comprises an adjustable quick release fastener **12** to facilitate removably securing the head alignment member **15** to the patient in the operative configuration.

[0068] FIGS. **3** and **4** also illustrate a further embodiment of an interconnection member **20** of the present invention. Specifically, the interconnection members **20** of the head alignment member **15** comprise a plurality of loops **25** affixed along the periphery of the head alignment member **15**, as well as along one side of chin strap **15'**, as illustrated in the figures. The adjustable uniform compression members **30** are interconnected to one or more of the loops **25** via a free hook **26**, the free hook **26** preferably comprising a C-shaped configuration. One end of the "C" of the free hook **26** is interconnected through one of the apertures **34** or **36** of the adjustable uniform compression member **30**, and the other end of the "C" is interconnected through one of the plurality of loops **25** disposed on the head alignment member **15**. As with the fixed hooks **21**, in one preferred embodiment, the free hooks **26** are constructed of Nylon 66 which includes a dye to entrap moisture to prevent drying and cracking. Once again, however, it is understood that the free hooks **26** may comprise any material that will resist bending and/or breaking under normal compressive forces associated with use of the assembly **10** of the present invention.

[0069] As will be appreciated, the plurality of loops **25** around the periphery of the head alignment member **15**, as well as along the chin strap **15'**, provide total control of the alignment and compressive forces applied about the head and neck regions of the patient, via interconnection of one or more adjustable uniform compression members **30** between the head alignment member **15** and the chest alignment member **14**, while the head alignment member **15** and the chest alignment member **14** are disposed in their respective operative configurations about the corresponding portions of the patient's body.

[0070] A further embodiment of the joint alignment and compression assembly **10** of the present invention also comprises at least one foot alignment member **16**, as best illustrated in FIGS. **14** through **17**. In one preferred embodiment, the assembly **10** of the present invention comprises a pair of foot alignment members **16**. The foot alignment member **16** is structured to substantially encircle one of the patient's feet when disposed in an operative configuration.

In addition, the foot alignment member **16** includes a foot securing element **16'** structured to be disposed overtop a corresponding one of the patient's ankles, as illustrated best in FIGS. **15** and **16**, and to securely maintain the foot alignment member **16** in the operative configuration about the patient's foot. The foot alignment member **16** may also comprise a foot supporting element **16"** structured to be disposed underneath a corresponding one of the patient's arches, as illustrated best in FIGS. **15** and **17**, to facilitate proper alignment of the patient's foot as well as to further secure the foot alignment member **16** about the patient's foot in the operative configuration. Additionally, the foot alignment member **16** comprises a toe securing element **16'"** structured to substantially encircle one of the patient's great toes, as in FIG. **15**, to further facilitate alignment of the patient's foot and secure the foot alignment member **16** to the patient's foot in the operative configuration.

[**0071**] Additional alignment members **11** which the joint alignment and compression assembly **10** of the present invention may comprise include, for example, knee alignment members **17**, elbow alignment members **18** and hand alignment members **19**. As illustrated in FIGS. **18**A and **18**B, the knee alignment member **17** comprises a plurality of adjustable quick release fasteners **12** to facilitate removably securing the knee alignment member **17** about the patient's knee region in an operative configuration. Additionally, the figures show that in one preferred embodiment, the knee alignment member **17** comprises a hoop **28** on either side. The hoop **28** is positioned to facilitate interconnection of a foot alignment member **16** to the pelvic alignment member **13** with the adjustable uniform compression member **30** passing through the hoop **28** to prevent entanglement with the patient, or other components of the assembly **10**.

[**0072**] Similarly, the elbow alignment member **18** illustrated in FIGS. **19**A and **19**B also comprises a plurality of adjustable quick release fasteners **12** to facilitate removably securing the elbow alignment member **18** about the patient's elbow region in an operative configuration. The elbow alignment member **18** may also include hoops **28** along each side to facilitate interconnection of a hand alignment member **19** to the chest alignment member **14**, in the manner described above with regard to the knee alignment member **17**.

[**0073**] The present invention further comprises a method for performing a rehabilitative treatment regimen utilizing a joint alignment and compression assembly **10**. Specifically, the method includes removably securing a plurality of alignment members **11** to a patient in an operative configuration, such as is illustrated, for example, in FIG. **1**. The method further provides for removably interconnecting corresponding ones of the plurality of alignment members **11** to one another via a plurality of adjustable uniform compression members **30**, as illustrated in FIGS. **20**A through **20**C. In addition, the method provides for positioning each of the plurality of adjustable uniform compression members **30** to align the joints of the patient in an operative orientation. More in particular, positioning the plurality of adjustable compression members **30** to interconnect the plurality of alignment members **11** so as to place the patient's joints in proper alignment, to the extent possible without causing undue discomfort to the patient, at least partially defines the operative orientation.

[**0074**] Additionally, the method of the present invention provides for adjusting the tension of each of the plurality of adjustable uniform compression members **30** to provide a preselected compressive force to the joints of the patient. As indicated above, the compressive force exerted by any of the adjustable uniform compression members **30** may be readily adjusted to provide a preselected compressive force by interconnecting the compressions member **30** to the interconnection members **20** via the terminal adjustment apertures **34**, to provide less compressive force, or via the intermediate adjustment apertures **36**, to provide varying degrees of increased compressive force.

[**0075**] In addition, the method of the present invention includes a patient executing a predetermined exercise schedule structured to produce a desired therapeutic effect while the plurality of alignment members **11** are disposed in the operative configuration and the plurality of adjustable uniform compression members **30** are adjusted to provide the preselected compressive force to the joints of the patient. In one preferred embodiment of the rehabilitative treatment regimen, the predetermined exercise schedule includes a daily exercise period of between substantially about 1 to 4 hours per day for 5 days per week. In addition, in this preferred embodiment, the predetermined exercise schedule requires that the daily exercise period 5 days per week is maintained for a period of between substantially about 3 to 4 weeks. Of course, it is understood to be within the scope and intent of the present invention to utilize any of a variety of predetermined exercise schedules allowing longer or shorter daily exercise periods, as well as the overall duration of the rehabilitative treatment regimen, as may be required by the specific needs, limitations, and/or abilities of any particular patient.

[**0076**] The rehabilitative treatment regimen of the present invention, when executed utilizing the joint alignment and compression assembly **10**, provides an increased weight bearing load distributed across the patient's body, as well as providing resistance to specific muscle groups. As is apparent from the foregoing, the load and/or resistance may be readily varied as required to target the patient's specific weaknesses via placement of the adjustable uniform compression members **30**. The rehabilitative treatment regimen aids in the training or retraining of the patient's motor functions by providing greater body awareness and increased strength, while the patient's joints are maintained in proper alignment.

[**0077**] Specifically, the rehabilitative treatment regimen of the present invention is structured to provide improved normal alignment of the patient's body. In addition, the preselected compressive forces applied to the patient via the joint alignment and compression assembly **10** builds strength to specific muscle groups of the patient's body, and the increased weight bearing on the patient's body improves the patient's body awareness, strength, and motor function. Specifically, the rehabilitative treatment regimen acts to train or retrain the patient's brain to move in a corrected manner by maintaining the patient's joints in correct alignment while increasing strength and gaining a better awareness of how their body is moving in space, as well as learning new motor patterns in the brain through repetitive exercises. Additionally, pathological reflexes are reduced as a result of the weight bearing load distributed across the patient's body.

[0078] Since many modifications, variations and changes in detail can be made to the described preferred embodiment of the invention, it is intended that all matters in the foregoing description and shown in the accompanying drawings be interpreted as illustrative and not in a limiting sense. Thus, the scope of the invention should be determined by the appended claims and their legal equivalents.

[0079] Now that the invention has been described,

What is claimed is:

1. A joint alignment and compression assembly comprising:

a plurality of alignment members structured to be removably secured to a patient in an operative configuration, at least some of said plurality of alignment members having a plurality of interconnection members securely fastened thereto and disposed in a spaced relation with one another,

at least one adjustable uniform compression member structured to be removably interconnected to different ones of said plurality of interconnection members, each of said different ones of said plurality of interconnection members being secured to a different one of each of a corresponding pair of said plurality of alignment members, and

said adjustable compression member structured to provide a uniform compression along a length thereof when disposed in an elongated disposition.

2. The assembly as recited in claim 1 wherein said operative configuration is at least partially defined by said plurality of alignment members removably secured about the patient in a spaced apart arrangement.

3. The assembly as recited in claim 1 wherein at least some of said plurality of alignment members are constructed of a plurality of layers of a stretchable and breathable material.

4. The assembly as recited in claim 1 wherein at least some of said plurality of alignment members are constructed of a water resistant material structured to facilitate implementation of a water based rehabilitative treatment regimen.

5. The assembly as recited in claim 1 wherein at least some of said plurality of alignment members comprise an adjustable quick release fastener to facilitate removably securing said alignment member about the patient in said operative configuration.

6. The assembly as recited in claim 5 wherein said adjustable quick release fastener comprises a hook and loop fastener.

7. The assembly as recited in claim 1 wherein said plurality of alignment members comprises a chest alignment member structured to substantially encircle the patient's chest area when disposed in said operative configuration.

8. The assembly as recited in claim 7 wherein said chest alignment member comprises at least one expandable attachment member structured to provide a substantially form-fitting relationship of said chest alignment member about the patient's chest area when disposed in said operative configuration.

9. The assembly as recited in claim 7 wherein said plurality of alignment members comprises a pelvic alignment member structured to substantially encircle the patient's pelvic area when disposed in said operative configuration.

10. The assembly as recited in claim 9 wherein said pelvic alignment member comprises at least one expandable attachment member structured to provide a substantially form-fitting relationship of said pelvic alignment member about the patient's pelvic area when disposed in an operative configuration.

11. The assembly as recited in claim 9 wherein said plurality of alignment members comprises a head alignment member structured to substantially encircle at least a portion of the patient's head when disposed in said operative configuration.

12. The assembly as recited in claim 9 wherein said plurality of alignment members comprises at least one elbow alignment member structured to substantially encircle one of the patient's elbows when disposed in said operative configuration.

13. The assembly as recited in claim 9 wherein said plurality of alignment members comprises at least one hand alignment member structured to substantially encircle one of the patient's hands when disposed in said operative configuration.

14. The assembly as recited in claim 9 wherein said plurality of alignment members comprises at least one knee alignment member structured to substantially encircle one of the patient's knees when disposed in said operative configuration.

15. The assembly as recited in claim 9 wherein said plurality of alignment members comprises at least one foot alignment member structured to substantially encircle one of the patient's feet when disposed in said operative configuration.

16. The assembly as recited in claim 15 wherein said foot alignment member comprises a foot securing element structured to be secured overtop a corresponding one of the patient's ankles when disposed in said operative configuration.

17. The assembly as recited in claim 15 wherein said foot alignment member comprises a foot supporting element structured to be positioned underneath a corresponding one of the patient's arches when disposed in said operative configuration to facilitate alignment of the patient's foot.

18. The assembly as recited in claim 15 wherein said foot alignment member comprises a toe securing element structured to substantially encircle one of the patient's great toes when disposed in said operative configuration to facilitate alignment of the patient's foot.

19. A joint alignment and compression assembly comprising:

a plurality of alignment members structured to be removably secured to a patient in an operative configuration,

at least some of said plurality of alignment members having a plurality of interconnection members securely fastened thereto and disposed in a spaced relation with one another,

at least one of said plurality of alignment members comprising a pelvic alignment member structured to substantially encircle the patient's pelvic area,

said pelvic alignment member comprising at least one expandable attachment portion to provide a substantially form-fitting relationship of said pelvic alignment member about the patient's pelvic area when disposed in said operative configuration,

a plurality of adjustable uniform compression members each structured to be removably interconnected between at least two different ones of said plurality of interconnection members,

at least some of said plurality of adjustable uniform compression members structured to interconnect corresponding ones of said plurality of alignment members when disposed in said operative configuration, and

said pelvic alignment member having at least one corresponding pair of interconnection members disposed in a horizontal arrangement along each side of said pelvic alignment member to facilitate stabilization of the patient's hips when one of said plurality of adjustable uniform compression members is removably interconnected thereto.

20. The assembly as recited in claim 19 wherein said plurality of alignment members comprises a chest alignment member structured to substantially encircle the patient's chest area when disposed in said operative configuration, said chest alignment member comprising a pair of oppositely disposed shoulders each having at least one interconnection member disposed in a horizontal arrangement secured thereto.

21. The assembly as recited in claim 20 wherein said chest alignment member comprises a pair of integral shoulder pads structured to provide a comfortable fit to the patient.

22. The assembly as recited in claim 20 wherein said chest alignment member comprises at least one expandable attachment member structured to provide a substantially form-fitting relationship of said chest alignment member about the patient's chest area when disposed in said operative configuration.

23. The assembly as recited in claim 20 wherein said plurality of alignment members comprises a head alignment member structured to substantially encircle at least a portion of the patient's head when disposed in said operative configuration, said head alignment member comprising a plurality of loops to facilitate interconnection with at least one of said interconnection members disposed in a horizontal arrangement and secured to one of said shoulders of said chest alignment member via at least one of said adjustable uniform compression members.

24. The assembly as recited in claim 23 further comprising at least one free hook to facilitate interconnection of said at least one of said adjustable uniform compression members to at least one of said plurality of loops.

25. The assembly as recited in claim 19 wherein said plurality of alignment members comprises at least one foot alignment member structured to substantially encircle at least a portion of one of the patient's feet when disposed in said operative configuration, said foot alignment member comprising a plurality of loops to facilitate interconnection to at least one other of said plurality of alignment members via at least one of said adjustable uniform compression members.

26. The assembly as recited in claim 25 further comprising at least one free hook to facilitate interconnection of said at least one of said adjustable uniform compression member to at least one of said plurality of loops.

27. The assembly as recited in claim 19 wherein at least some of said plurality of interconnection members are constructed of a nylon material.

28. The assembly as recited in claim 27 wherein said nylon material comprises a dye structured to prevent drying and cracking of said plurality of interconnection members.

29. The assembly as recited in claim 19 wherein at least some of said plurality of adjustable uniform compression members comprise a vulcanized rubber material structured to provide a uniform compression along a length thereof when disposed in an elongated disposition and a memory such that each of said plurality of adjustable uniform compression members returns to an original shape when disposed in a relaxed disposition.

30. The assembly as recited in claim 19 wherein said pelvic alignment member comprises at least one expansion notch structured to facilitate disposing said pelvic alignment member about the waist and pelvic region of a different one of each of a plurality of patients having different physical configurations in a form-fitting relationship when disposed in said operative configuration.

31. A method for performing a rehabilitative treatment regimen utilizing a joint alignment and compression assembly comprising the steps of:

removably securing a plurality of alignment members to a patient in an operative configuration,

removably interconnecting corresponding ones of the plurality of alignment members to one another via a plurality of adjustable uniform compression members,

positioning each of the plurality of adjustable uniform compression members to align the joints of the patient in an operative orientation,

adjusting the tension of each of the plurality of adjustable uniform compression members to provide a preselected compressive force to the joints of the patient, and

executing a predetermined exercise schedule structured to produce a desired therapeutic effect while the plurality of alignment members are disposed in the operative configuration and the plurality of adjustable uniform compression members are adjusted to provide the preselected compressive force to the joints of the patient while aligned in the operative orientation.

32. The method as recited in claim 31 further comprising the step of executing the predetermined exercise schedule including a daily exercise period of between substantially about one to four hours per day.

33. The method as recited in claim 32 further comprising the step of executing the predetermined exercise schedule including a daily exercise period on each of five days per week.

34. The method as recited in claim 33 further comprising the step of executing the predetermined exercise schedule including a daily exercise period on each of five days per week for a period of between substantially about three to four weeks.

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