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Heikes

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[54] **AMBULATORY ORTHOPEDIC TRACTION APPARATUS**

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Related U.S. Application Data

[63] Continuation of Ser. No. 154,941, June 21, 1971, abandoned.

[52] **U.S. Cl.** **128/75,** 128/78

[51] **Int. Cl.** **A61h 1/02**

[58] **Field of Search** ..... 128/75, 78, 80, 84, DIG. 23

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[57] **ABSTRACT**

This disclosure relates to traction apparatus designed particularly for the treatment of afflictions of the spinal column. It provides a resilient bowed member adapted to be connected between a belt-like harness to be worn about the lower torso of a patient to be treated and another harness which is also worn by the patient in a region upwardly spaced from the other harness element. The second harness may be at various locations and is so located that when the bowed member of resilient form is attached there will be exerted a tractive force between the two harness members thereby continually to maintain the tractive effect on the wearer. The resilient harness holder with its bowed shape pulls the two harness elements in opposite directions and while providing the force essential to maintain the tractive effect nevertheless assures that the wearer may have mobility without any sacrifice of the usefullness of the apparatus or any significant reduction in the curing effect thereof.

9 Claims, 12 Drawing Figures

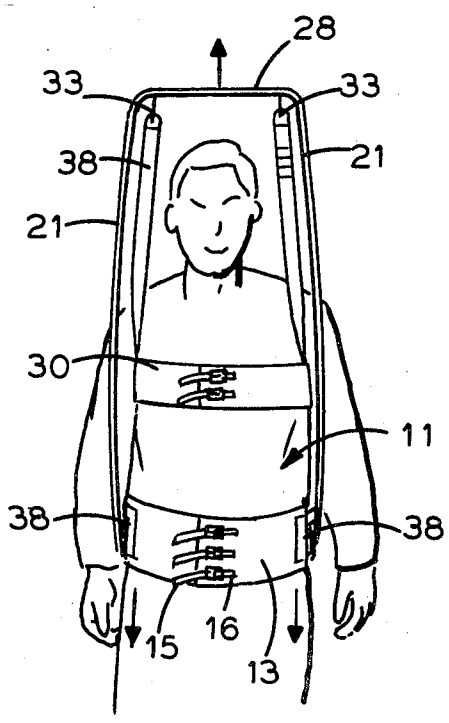


FIG. 1

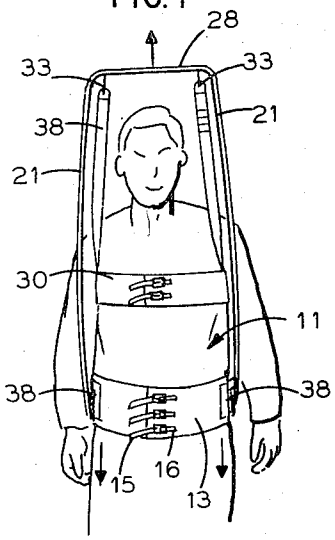


FIG. 2

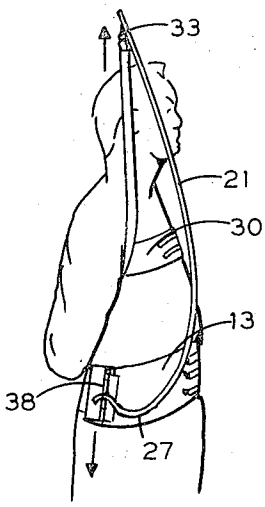


FIG. 3

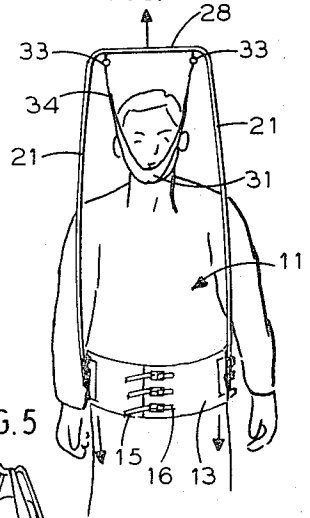


FIG. 4

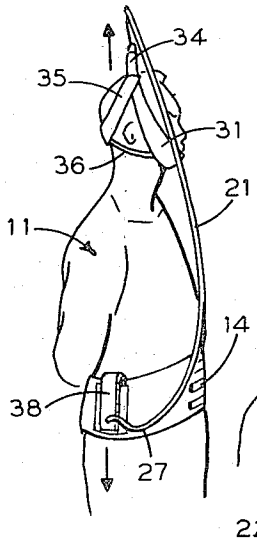


FIG. 6

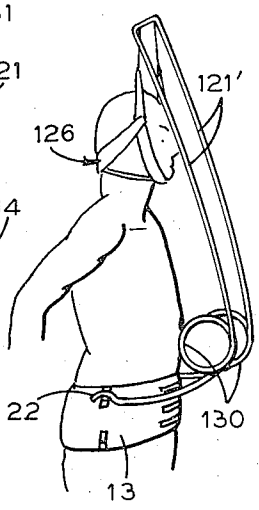


FIG. 5

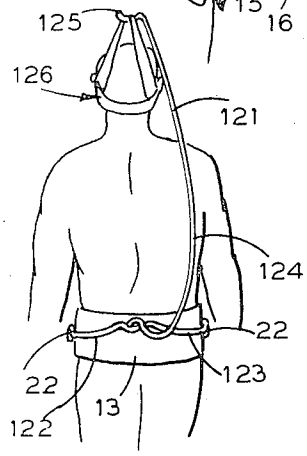
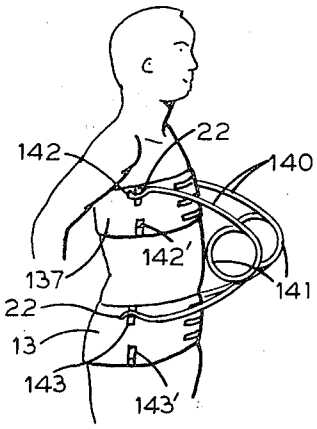


FIG. 7



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FIG. 8

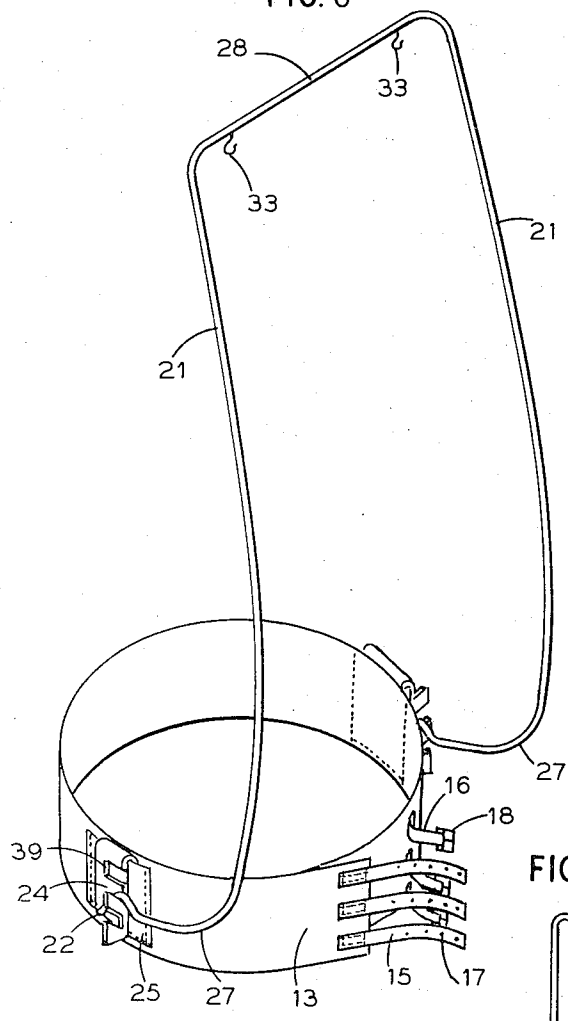


FIG. 10

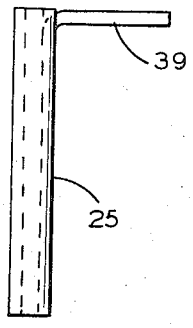


FIG. 11

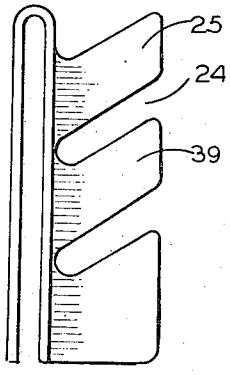


FIG. 12

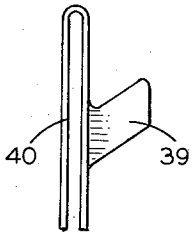
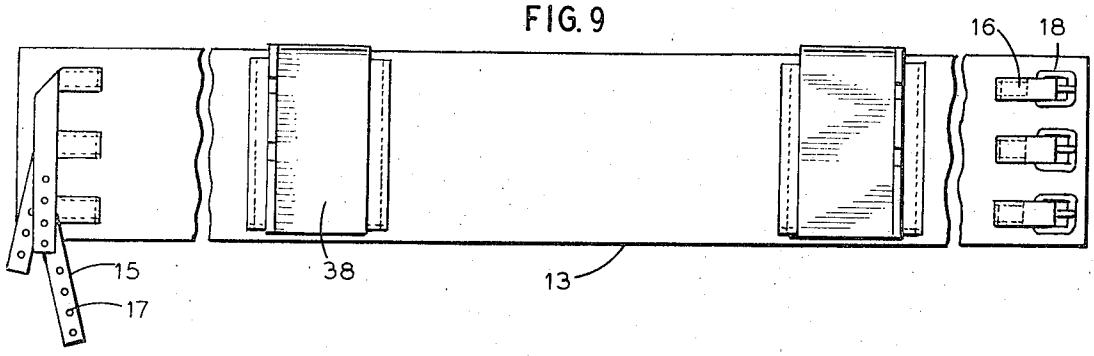


FIG. 9



AMBULATORY ORTHOPEDIC TRACTION APPARATUS

This is a continuation of application Ser. No. 154,941, filed June 21, 1971 now abandoned.

This invention relates to orthopedic traction apparatus and particularly to that of the so-called ambulatory type so that a party having a back affliction which requires stretching of the spinal column for its treatment can use the apparatus herein to be described and still not be completely immobilized during the required period of treatment.

In such apparatus it is always essential that there be some suitable arrangement whereby it is possible to maintain the spinal column in a state of uniform traction in order that the condition to be treated can be effectively controlled and yet the patient shall not be confined to bed-rest traction or any other form of treatment utilizing traction or any other form of immobilization which will require that the patient be fully confined to a bed-rest status. A large majority of patients who suffer from moderate back trouble do not usually require full immobilization. In such cases it is frequently preferable to permit as much freedom of movement as can be confortably tolerated during traction. This has been found to preclude muscular spasms which frequently accompany muscular immobilization.

One of the most difficult problems to date has been that at the present state of the art the form of traction apparatus used is generally cumbersome and actually requires at least partially immobilizing the patient.

In the common forms of such apparatus which are in use today, where bed-traction is used there is usually placed about the patient a head harness (or in some cases such harness may be placed about the patient's chest) and a second harness is placed about the lower abdomen or hips, or even the ankles of the patient. In apparatus of such variety the desired and useful tensile force or stress on the back is achieved by pulling the two harnesses in opposite directions through the use of weights and pulleys which are usually secured by suitable structural members to the bed or to the wall.

In instances where the patient can be held in a sitting position there is usually a single head or chest harness upon which the desired force is achieved by means of a ceiling or wall pulley acting in conjunction with appropriate weights. In this case the harness is lifted in opposition to the body weight, thus creating tension in the spine.

There have been some ambulatory forms of traction apparatus but these are normally of the form that have been relatively rigid linkages and are limited to use in respect of neck traction needs. An example of such type would be a form of saddle or yoke which is supported by the shoulders of the party to be treated. Such apparatus and structure then is use to support the head by means of a bowl, sling, or the equivalent, which fits under the chin and back of the head (as occipital). Then, the tension is obtained through the use of a spongy or springy form of padding at the supporting points, or by means of a pneumatically actuated linkage. This has a great disadvantage in that the lack of mobility and unnatural muscular strains which are produced in the shoulders are often actually harmful to the patient and cause, or at least aggrevate, muscular strains, spasms and discomfort in some individuals. In any case, such devices are applicable only to cervical traction.

The apparatus which is to be described herein is of a form which can be worn over the clothing of the patient (if desired) and can be used for cervical, total spine, or lower spinal regions, commonly termed the lumbar and dorsal. It is a form of apparatus which does not in any respect restrict the user to a particular location or position, and the user is free to sit, stand, lie on his back or side, walk, stoop, and bend in any direction within limits of his physical condition, as would normally be imposed, without materially affecting the tractive force. This makes it possible to utilize or wear the apparatus under a wide variety of conditions and circumstances, as well as for long periods, without any significant strain or fatigue.

In principle the apparatus with which this invention is concerned and which will be described herein is broadly of the type or forms which embody the same broad feature of providing what might be termed a tension bow that comprises a generally curved and elongated flexible or elastic member having such a configuration that any force tending to decrease the distance between its extremeties will vary in inverse proportion to that distance. The patient's or user's spinal column, or a portion thereof, is then placed between the extremities of the said member having the elastic or resilient characteristics by means of suitable harness and fitting means.

In one form of the invention such tension is applied along the length of the spine above the hips and is exerted between a generally conventional form of head or cervical harness and a generally conventional hip or pelvic harness to make the tractive force effective along the spine between the hips and the head of the wearer. In another form of the apparatus it is possible to limit the tension effect to the lumber and dorsal regions by means of a pelvic or hip harness and a chest or thoracic harness.

The tensioning force according to this invention is achieved by the use of one or more generallly bowed, spring-like resilient members interposed between the two harness members or elements and then by arranging for the suitable force to be supplied through controlling the amount of deformation of the spring-like or resilient member or members. Such a spring-like or resilient member is fastened at its lower end in the pelvic harness or belt worn by the patient to be treated and is positioned slightly above or at the hips. Then, the upper or other end of the springlike or resilient member can be secured to the upper harness (either thoracic or cervical) by means of adjustable straps or cords which can be shortened until that degree of force essential to achieve the desired result is obtained. In some instances that member may be set to different positions in the harness elements, while in other instances the spring-like force may be varied by the actual rigidity of the member used. No matter how the desired forces are attained it is the use of a generally bowed resilient member between two stabilized and generally fixed support points that achieves the degree of traction force which will be supplied along the spine.

In principle, this may be regarded as somewhat analagous to an archer's bow where the degree of deformation of the bow determines the tension on the bowstring. The tension provided is in inverse proportion to the distance between the ends of the bow. Similarly, in

the present invention the bowed resilient member which has its ends secured to the fixed supports will determine both the positioning of the ends and by the positioning of the ends and the degree of resilience of the resilient member that force which can be applied as a tractive force.

Thus, within the scope of this invention, it will be apparent that the actual apparatus can assume different forms provided that the principle of obtaining the desired spinal tractive force is achieved through the use of a bowed resilient member which has its ends anchored and which, according to the degree of deformation obtained, will achieve the desired tension between the points of anchoring. This, then, provided a bow-shape element in which the springy or resilient effect is suitably controlled to establish the desired degree of tension and wherein that degree of deformation which is provided in the springy or resilient member can be controlled.

With the foregoing in mind constituting a general recitation of the apparatus it becomes a principal object of the present invention to provide a form of traction apparatus in which the tension created is dependent upon one or more generally bowed resilient members whose ends are anchored at appropriate points or regions of the user in such a way that no immobilization occurs, although the traction effect is continually maintained.

Another object of the invention is that of providing apparatus for exerting tension along the spinal column or vertabrae of the wearer by the use of a suitable bowed resilient member or members having the end sections anchored in harness members members which are spaced apart and the exerted force is determined by the extent to which the bowed resilient members are deformed.

Many other and further objects and advantages of the invention will become apparent from the description of a preferred form which will follow, as well as the claims which will describe and define the invention when these claims are read in conjunction with the description and the accompanying drawings which illustrate certain preferred forms by which the invention may be practiced.

In the drawings:

FIG. **1** is a front view using the combination of a lower torso harness or belt and an upper chest harness with a bowed U-shaped resilient member connecting them and establishing tension therebetween;

FIG. **2** is a side view of the FIG. **1** structure which shows particularly the general bowed shape of the resilient member;

FIG. **3** is a frontal view of a slightly modified form of the structure to show the general features of FIG. **1** but using a head or cervical harness to replace the upper chest harness, and is particularly adapted for cervical and upper dorsal or full back traction;

FIG. **4** is a side view of the FIG. **3** construction and also shows both the bowed shape of the resilient member and the adjustment of the member as it is attached to the lower or pelvic harness;

FIG. **5** represents a modification of the form of resileint member connecting the forms of harness members of FIG. **3**;

FIG. **6** is a similar form of construction providing a modified type of resilient member;

FIG. **7** is a further modification of the resilient member as applied to the chest harness type of structure for lower dorsal or lumbar traction;

FIG. **8** shows the general form of structure of FIGS. **1** to **4** removed from the wearer and lacking either the head harness or the chest belt which are shown by FIGS. **1** to **4**;

FIG. **9** is a hip harness member and shows it in expanded form with the fastening sections for the resilient members particularly exhibited, as well as the fastening means for the harness member; and

FIGS **10** through **12** show a suitable fastening element structure for attachment to the pelvic harness.

Now making reference to the drawings for a further understanding of the invention consideration is first given to the showing of FIGS. **1** and **2** where the patient (or wearer) is provided with a conventional harness member **13** which is arranged to fit approximately about the hips. This harness is tightly fastened by suitable fastening straps **15** and **16** about the torso. The straps (see also FIG. **9**) are provided with a plurality of openings **17** with which the buckle members **18** of the other straps are adapted to engage (note also FIG. **8**).

As depicted particularly by FIG. **8,** the upper section of the apparatus is in the form of a generally U-shaped spring bow **21.** It has two support hooks **22** at the bottom. These hooks engage slots **24** of the fitting **25** placed in pockets **38** on the hip harness. This permits the hooks to be securely held, but it still permits a rotation through several degrees of freedom about the points of contact as a fulcrum or pivot point.

So constructed, the sides of the U-shaped resilient member **21** are observed to bow, with the bowed portion greatest near the lower end, as in the region **27.** This has an advantage both from the standpoint of connecting the member **21** to the fitting **25** and also in the use of the device, notwithstanding the fact that other configurations can be used within the scope of the invention.

The upper part of the U-shaped spring bow, as in FIGS. **1** through **4,** as well as in FIG. **8,** connect by a cross member **28** which forms the bottom of the U. It is to this part of the resilient members **21** that the upper harness, such as the head harness **31** (see FIGS. **3** and **4**) are attached by suitable hooks. These are schematically shown at **33.**

The head harness per se is of conventional form and will not be discussed in great detail even though it forms one element of the inventive concept. Suffice it to state that it normally has support straps **34** which attach to the hooks **33** and which may be adjustable in length. The chin strap **31** which attaches to or fits below the chin of the wearer attaches to the support strap **34.** An occipital band **35** is also carried from the support strap **34** and fits behind the head of the wearer. The lower parts of the head band connect between the lower region of the strap and the chin strap by way of the band or the like **36.**

The chest or thoracic harness **30** (see FIGS. **1** and **2** particularly) is generally similar to the pelvic harness **13,** except that it fastens to to the support hooks **33** by way of flexible straps **38** which are adjustable in length so that an upward tractive effect or force may be exerted upon harness member **30.**

Reverting now to the structure of the hip harness, it will be apparent that the main and significant departure

from what is known in this type of component is the provision of the support elements **38** into which there is placed the extensions of the slotted fittings **25** that have the outstanding ears **39** into which fit the hooked ends **22** of the resilient member. Such fitting, as is clearly shown by FIG. **2** generally comprises a metal strap **40** which is bent into a form approaching a closed U from the outer leg of which, at its inner end, there are extensions **39** which fit into the slotted regions **24.** The inner leg of the element fits into the pocket **38.**

The support elements can be of various forms, such as O-rings or "D" rings secured at appropriate locations on the harness, since the main and important consideration is to achieve points of support for the lower extremities of the resileint member which will permit relative freedom of motion. While the use of several vertically displaced supports will permit adjustment of the tension, this may also be achieved in other ways, as, for instance, by adjusting the lengths of the support straps of the upper harness.

In the case of the slotted support elements, in one instance where a one-quarter inch diameter stainless steel round rod was used, it was possible to realize tension variations of 10, 20 and 30 pounds using the three different slots **24,** respectively.

From the foregoing it will become apparent that the element **21** forms a spring bow having its lower end anchored in the hip harness and the upper portion extended above the head of the wearer or patient. The tension is set by the separation between the lower and upper supports and is maintained by the bow effect of element **21** tending to increase the spacing between the hooks **33** that are fastened to the U-section and the lower support **38.** The spring effect of the bowed tension members **21** holds this distance always at a maximum. This exerts tension between the two harnesses. However, even substantial changes in the position of the wearer or patient will be found to have minimal effect on the exerted tension or tractive force.

It should be borne in mind also that the initial adjustment to fit the particular physical portions of the individual to use the apparatus may be achieved by altering the lengths of the parallel legs **21** of the U-section **11** or bending it to change the degree of curvature of the bow or by adjusting the lengths of the suspending straps **34** or **38,** or changing the slot into which the lower hooked end of the side members attach.

By the modifications of FIGS. **5** and **6** it will be understood and observed that there is a change in the number or configuration of tensioning members or bows. By FIG. **5** a single bow **121** extending upwardly behind the back of the user is depicted, but this element could also be placed in front of the user or wearer. This member **121** has a forked lower section **122** and **123** and terminates in hooks, similar to the hooks **22** of FIG. **8,** which attach to the fastening elements of belt **13** in the fashion already described. This member is also bowed, as at **124,** and terminates at its upper end in another hook **125,** which supports an upper element **126** used as a head harness or a chest harness (as in FIGS. **1** and **2**) except that in this case the upper harness is suspended from a single point. Tension is determined by the extent to which the bow **121** is curved and the spacings between the anchoring hooks, as already described.

FIG. **6** sets out a further modification in which greater effective bow length is achieved with less variation in tension with adjustment or deformation. This is accomplished by adding one or more loops to the lower end of the structure **121'**, which is generally similar to element **121** of FIG. **5.** These additional loops are depicted at **130.** This structure is adaptable to either a single or a multiple bow structure and the attachments are made as already described.

In a case where one is concerned primarily with lower dorsal or lumbar traction, recourse may be had to a structure of the form shown by FIG. **7.** This form of the device or apparatus utilizes an upper chest harness **137** in combination with the lower belt **13,** as previously described. Between these two members tension bow members **140** are attached. The attaching method is preferably similar to that described in connection with FIGS. **1** through **4.** Usually one such tension bow **140** is arranged at each side of the patient and, like the FIG. **6** structure, uses a single or multiple turn loop **141** between its ends. In this instance the tension bow members are not joined together at their upper ends. The loop tends to increase the effectiveness in length of the element and thus its resilience.

Adjustment of this tension is accomplsihed by hooking the ends of the bowed element **140** in various slots or rings in the belts **137** or **13,** such as at **142** or **142'** in the upper harness, or **143** or **143'** in the lower harness. Otherwise, tension may be changed by means of adjustable support straps in the manner already explained.

Various other modifications are possible without in any way departing from the spirit or scope of the invention and the claims to follow should be interpreted broadly to cover all described forms and any reasonable modifications thereof unless specifically limited to one particular embodiment.

Having now described the invention what is claimed is:

1. Traction apparatus for the treatment of back afflictions and for maintaining the spinal column of the wearer in a state of traction, comprising

a lower belt harness member adapted for positioning and fastening about the torso of the wearer,

a second harness member adapted for positioning and fastening substantially fixedly to the wearer at a region spaced normally upwardly from the lower belt harness member,

a rod-like member of high resilience and elasticity having an undistorted length between its ends which is greater than the spacing of the aforesaid harness members, and

means to fasten the said rod-like member with one end connected directly to the lower harness member and the other end adapted for connection through a fixed length connector to the second harness member so that due to the greater normal length of the rod-like member compared to the spacing of the said harness members and said rod-like member is forced into a generally bowed formation approaching a generally U-shaped configuration upon fastening and connecting, and because of the resilience and elasticity of the rod-like member normally tending to restore the rod-like characteristic a high degree of tension is produced along the imaginary straight line path between the connections to the harness members and a substantiallly constant traction force is maintained along the spinal column of the wearer whose normal spi-

nal column approximately parallels the said imaginary line and the spinal column of the wearer is held in tension and free from dependence upon positional changes.

2. The apparatus as claimed in claim **1** wherein the second harness member is a head-harness member connected to the resilient member and adapted for fitting about the head of the user-patient for providing traction to the upper portion of the spinal column.

3. The apparatus as claimed in claim **1** wherein the belt-like harness member adapted to be secured about the torso of the user includes

means located upon the said belt-like harness member for anchoring the rod-like resilient means pivotally at one end, thereby to hold the end of said resilient means in a fixed location with respect to the belt-like harness member.

4. Apparatus for maintaining the spinal column of a wearer in tension, which comprises

a lower harness member adapted for securement and support substantially about the pelvic region of the wearer,

an upper harness member adapted for fastening and connecting to a portion of the body of the wearer which is spaced upwardly from the lower harness member in the direction of the head of the wearer,

a pair of rod-like and elongated highly resilient traction-producing members each having in its unstressed condition a straight line separating distance between its extremities which is greater than the separating distance between the two said harness members,

means to connect each of the tension producing resilient members at one end to the lower harness member so that the resilient members normally extend in a direction of and beyond the upper harness member,

means to connect the other end of the resilient members transversely together at substantially the same distance from the lower connecting points transversely and thereby form the resilient members into a generally U-shaped formation, and

means to connect the upper harness member to the joined rod-like members in such manner as to increase the rod curvature and shorten the straight-line distance between their extremities so that tension is created between the said extremities, thereby producing a substantially constant condition of traction to the spine of the wearer and freedom to move without affecting the traction force.

5. The apparatus as claimed in claim **4** wherein the highly resilient members are substantially parallel and provide a plurality of spaced legs extending upwardly and outwardly from their connecting points on the lower belt-like harness member about the pelvic region of the wearer-user,

hook means to positively secure each of the said spaced rod-like members to the belt harness member when it is positioned about the pelvic region and torso of the wearer,

connection element means between the upper and outer ends of the plurality of resilient members to provide a generally U-shaped high resilience tensioning element, and

means of adjustable length to attach the connection element means to the second and upper harness member.

6. The apparatus as claimed in claim **5** comprising, in addition, coiled loop means along the resilient bowed means to supplement the tension control exerted by the said resilient means.

7. A device for applying spinal traction to a wearer, comprising

a generally U-shaped structure formed of a pair of substantially uniformly spaced and equally separated highly resilient rod-like side arm members,

a lower torso belt-like harness member adapted to be secured and fastened about the torso of the wearer to form a lower harness member,

an upper harness member adapted to be secured to the wearer at a region upwardly spaced from the lower harness member in the direction of the head of the wearer, said upper and lower harness meembers being closer together than the undistorted length of the side arm members,

means for connecting the lower ends of each of the resilient side arm members of the U-shaped member to the lower harness member,

means for attaching the upper harness member to the transverse portion of the U-shaped member which joins the upper ends of the pair of rod-like arms, the said connecting points being spaced apart a distance less than the normal straight-line distance between the extremities of the rod-like members so that the rod-like side members are deliberately bowed to create tension between the connecting points, and

means for changing the connecting points of the lower ends of the rod-like side members to provide an adjustment of tensioning force effect which is available between the connecting points to provide a controllable tractive force upon the spine of the wearer.

8. The apparatus as claimed in claim **7** wherein the upper head-harness is adapted to be fitted beneath the chin and about the head of the wearer and means attached to the connecting portion of the outer end of the rod-like members which form the sides of the U-section for providing traction to the upper part of the spinal column through the head and neck of the wearer.

9. Traction apparatus for back treatment of a patient and for maintaining the spinal column of such patient in tension, comprising

a lower belt harness member adapted for positioning about the torso of a patient to be treated,

a second harness member adapted to be attached to the patient to be treated at a region spaced upwardly from the lower belt harness member,

a resilient expansive bowed means of a length at least corresponding to the separation of the harness members connected at its ends to the harness member, and

loop structure means between the ends of the bowed means to provide increased resiliency of the bowed means, thereby reducing the variation of the tractive force resulting from variations in the distance between the ends of the bowed means.

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