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McFarland

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[54] **DYNAMIC CERVICAL SUPPORT**

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[52] **U.S. Cl.** **128/75,** 128/DIG. 23

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

[58] **Field of Search** ..... 128/75, DIG. 23, 128/87, 83, 84, 88, 85

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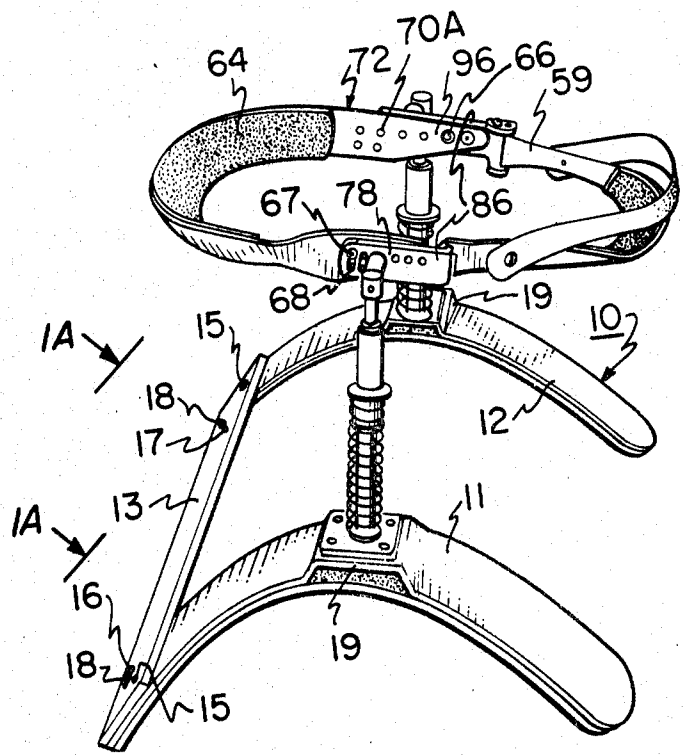
[57] **ABSTRACT**

An improved dynamic cervical support supplying constantly sustained traction to a patient's head, yet insuring essentially full normal mobility of the head. The shoulder harness of the device include rigid shoulder straps or arcuate shoulder members which, though made of rigid material, can be adjusted about points of attachment to accommodate a variety of shoulder configurements. The head frame or support itself is of hinged construction and can be easily altered as to longitudinal dimension for the comfort of the user. Compression spring means provides the needed traction, and spring guides and/or mounts maintain ball-and-socket connection to their mountings, to insure axial deflection of the compression springs used in an advantageous manner. Larger spring members journal interior support structure and provide for a degree of lateral flexibility, as well as offering a restoring force to such interior support structure. Articulative joints at selected points in the structure insure wide versatility of use and mobility even though traction is constantly maintained. A side hinge and hook construction provide for selective opening and closure of the lower jaw member of the head frame to the rear head support thereof.

8 Claims, 8 Drawing Figures



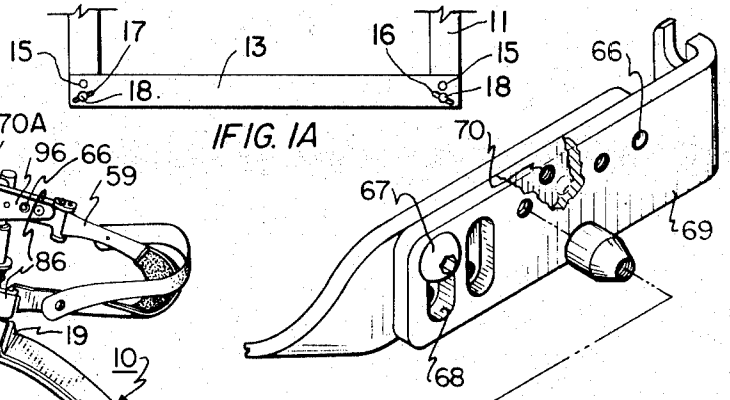


FIG. 1A

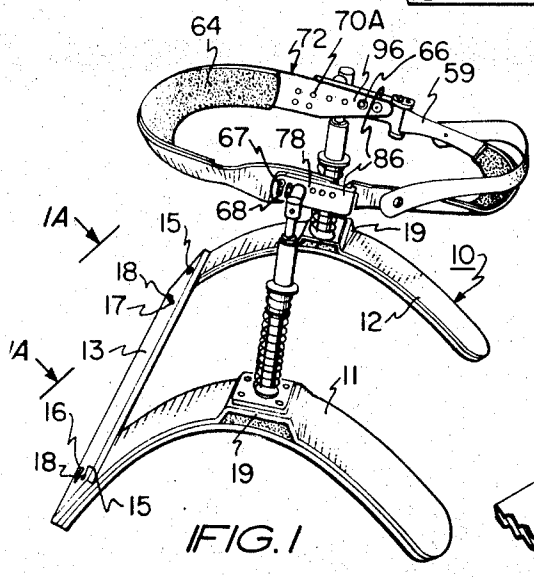


FIG. 1

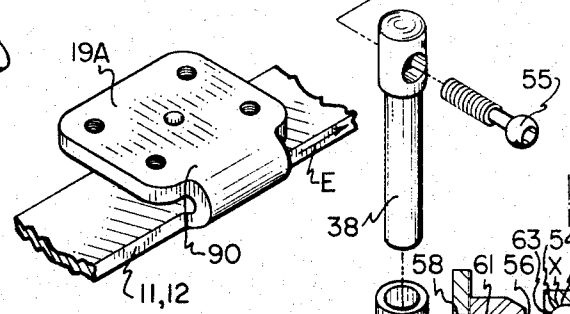


FIG. 5

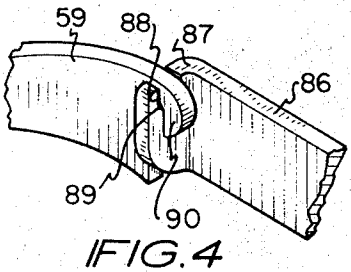


FIG. 4

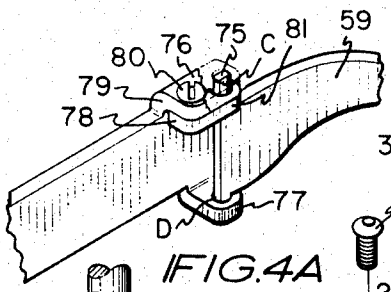


FIG. 4A

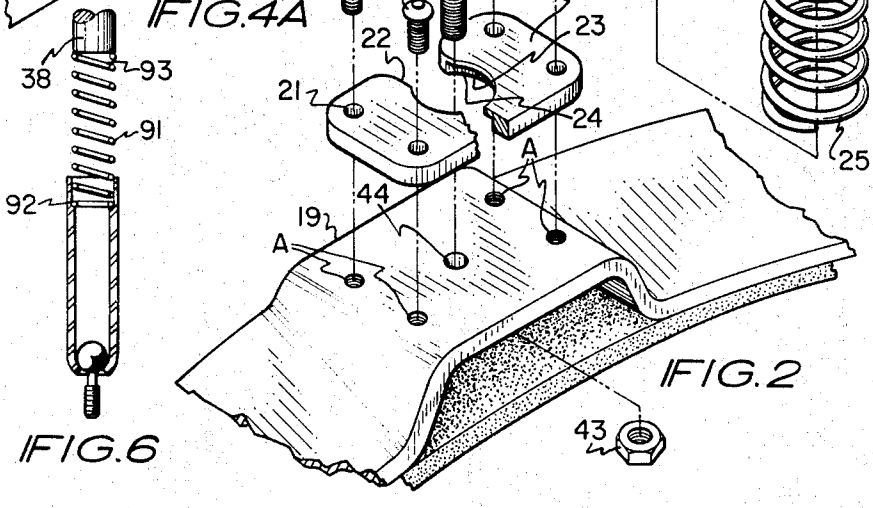


FIG. 2

FIG. 6

DYNAMIC CERVICAL SUPPORT

The present invention relates to cervical supports and, more particularly, to a new and improved cervical support providing a variety of advantages over other supports known in the field.

The present invention generally relates to cervical supports to be used to supply traction to the upper spinal column by giving raised support to the head relative to the shoulders.

While it is quite common to supply a compressive spring-type traction force to head support structures, difficulty has been encountered in connection with designing suitable traction structure for the head which insures full mobility of the head while yet maintaining the needed traction for all head orientations.

The present invention provides, on opposite sides of the head frame supported by the shoulder brace, novel support means comprising an outer spring, serving to supply both "give" and also a gentle restoring force in those instances at which the patient has turned his head either to the right or to the left. Pivot mounts joined the head frame of the upstanding support so that up-and-down, back-and-forth movement of the head is facilitated. Importantly, second spring means disposed interiorly of the first spring mentioned, is provided for supplying the desired upward tension to the head frame. Such second spring means enjoy an effective, articulative mount in the form of a ball-and-socket, articulative joint relative to the support structure of the shoulder harness. In this way, new orientation or deflections from the normal vertical axis of the support structure are provided, this to insure that the inner spring, generally having a reduced spring constant relative to the outer spring, may always maintain a straight, axial positionment, regardless of the turning or deflection of the head. This maintains spring life and, importantly, insures the application of normal forces to the head frame whatever its momentary position. Likewise, the full traction effect of the springs is maintained since such springs are always normally applied to the post structures of a head frame, and this along essentially the entire length of such spring means.

Such a cervical brace, as about to be described in detail, will be extremely effective in the treatment of patients who may have become accident victims or who have incurred chronic, degenerative diseases of the spine and/or neck.

Accordingly, a present object of the present invention is to provide a new and improved cervical neck brace.

A further object is to provide a cervical neck brace wherein rigid shoulder members of the shoulder harness thereof may be adjusted to accommodate a variety of patients as to the slope of their shoulders.

An additional object is to provide an improved cervical brace allowing for a wide degree of head freedom, even though traction is constantly maintained.

A further object is to provide a cervical neck brace having a head frame of hinged construction.

An additional object is to provide a cervical brace, a head frame that can be adjusted as to longitudinal dimension.

An additional object is to provide a cervical neck brace wherein a maximum number of degrees of freedom are enjoyed by the user, and this throughout constant application of traction.

An additional object is to provide an improved cervical brace which can be assembled in a minimum of time.

An important object of the invention is to provide a cervical neck brace having traction-producing spring means which are kept oriented in a direction essentially normal to the head frame of the brace whatever disposition the latter may temporarily enjoy due to patient or other movement.

A further object is to provide a cervical neck brace having traction producing spring means guided by, extending to, or terminating in an articulative joint designed such that the spring means may be kept longitudinally positioned throughout essentially their entire length, and this normal to the head frame which they urge upwardly, whatever the temporary or other positionment of the head frame at any particular time.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims.

The present invention, both as to its organization and manner of operation, together with further objects and advantages thereof, may best be understood by reference to the following description, taken in connection with the accompanying drawings in which:

FIG. 1 is a perspective view in reduced scale of the improved cervical brace of the present invention.

FIG. 1A is a fragmentary rear view of the cross brace structure and is taken along the line 1A—1A in FIG. 1.

FIG. 2 is an enlarged exploded view of the support structure of the improved cervical neck brace, the same extending from a shoulder strap or arcuate shoulder member of a shoulder brace of the device, upwardly to the head frame of the brace.

FIG. 3 is an assembly view of one-half of the support structure of the cervical brace of the present invention and is shown in vertical section.

FIG. 4 is an enlarged, fragmentary detail illustrating the hooking engagement of the jaw support member of the head support of the brace to its adjoining structure.

FIG. 4A is a fragmentary enlarged detail illustrating the hinged connection between the jaw support member of the head frame and its adjoining structure such that the chin area of the head structure may be opened and closed to accommodate the user.

FIG. 5 is an enlarged, fragmentary perspective view of an optional medial portion of a representative, arcuate shoulder member that can be utilized in mounting the traction support structure to the shoulder brace.

FIG. 6 is a fragmentary view, shown in reduced scale and in section, of an alternate form of the invention wherein the articulative joint of the traction spring is disposed remote from the spring end proper.

In FIG. 1 the cervical brace of the present invention is shown to include the shoulder harness **10**. Shoulder harness **10** includes downwardly concave, arcuate shoulder members **11** and **12** which are joined together by cross brace **13** secured thereto as by welding, riveting releasable attachments, and so forth. If desired Allen-type screws **15** may be used as pivot screws for joining the arcuate shoulder members to cross brace **13**. In such event, slotted apertures **16** and **17** may be provided to accommodate adjustment screws **18**. These latter thread into the respective arcuate shoulder member **11** in threaded apertures (not shown). Thus, the slotted apertures **16** and **17** provide for an adjustment such that the respective arcuate shoulder member **11**

may be pivoted about pivot screws **15**, this to accommodate a variety of slop-configurements of shoulders of the user.

In the embodiment shown in FIG. **1**, each of the arcuate shoulder members advantageously includes a medial portion that can be raised as indicated and, in any event, includes threaded apertures A, see FIG. **2**, for receiving Allen screws B. The latter are employed to secure to respective medial portion **19** a base member **20**. Accordingly, machine screws or Allen screws pass through apertures **21** to threadedly engage the apertures A of medial portion **19**. Base member **20** includes an open access aperture **22** contiguous with an undercut shoulder **23**. The enlarged base groove **24**, in effect, suitably serves as a seat for receiving the lower turn **25** of upstanding spring **26**. Thus, on assembly, the base member **20** is first installed upon medial portion **19**; subsequently the spring **26** is advanced so that the lower turn **25** is snapped into, and is thereby received by the groove or seat **24**.

Spring **26** receives at its outer extremity **27** a boss **28**, the latter including a head **29** of tapered configurement and a tapered shank **30**. An interior bore **31** is provided the boss **28**, and the latter receives sleeve **32**. Sleeve **32** includes one or more outer peripheral groove **33**, providing a seat for snap ring **34**, see FIG. **3**. Sleeve **32** is reciprocatingly journaled within boss **28**, as shown in FIG. **3**, and includes upper, transverse, threaded wall aperture **35** receiving set screw **36**. Set screw **36** also threads through bushing **37** which is pressed into sleeve **32** and engages and vertically positions post **38**. The bottom edge of bushing **37** serves as a stop abutment for the upper edge of tubular member **45** as, for example, when the user raises his shoulders to produce a positive traction effect.

An artulative ball-and-socket joint at **39** takes the form of a spherical mount member **40**, the latter including ball **41** and depending threaded stem **42**. The threaded stem engages a mounting nut **43** and is either disengaged from or threaded into aperture **44**.

Tubular member **45** is journaled within sleeve **32** and includes a spherically configured base **46** provided with aperture **47**. Aperture **47** receives the turned-down shank area **48** of artulated spherical member **40**.

Spring **50** engages at its opposite ends, respectively, the lower end **51** of tubular member **32** and also upper surface **53** of the representative, arcuate-shoulder-member medial portion **19**.

Post **38** includes an upper boss portion **52**, provided with a transverse aperture **53**. The same includes a spherically configured portion **54** which cooperates with the ball end **55** of articulative pivot screw **56**. The ball end or head **55** may, if desired, simply be spherically configured at X to correspond with the spherical configurement of the interior of the aperture **53** at this point (y). Shank **56** is threaded at **57** and threads into aperture **58** of jaw support member **59**.

Spacer **60** likewise includes a threaded aperture at **61** and preferably includes an outer tapered end **62**. If desired, an aperture tapered area **63** may likewise be provided to accommodate the outwardly extending end **62** of the spacer or bushing previously referred to.

In FIG. **1** it is seen that the jaw support member **59** and the rear head support **64** are joined together, either directly or by the inclusion of medial adjoining members **86** and **78**. This may be accomplished by incorporation of machine pivot screws **66** and adjustment screws **67**. In this connection, slotted apertures **68** may be provided in the members **86** and **86'**. Additionally, a plurality of apertures **70** may be additionally provided in these members, as well as corresponding threaded apertures **70A** in the opposite sides of rear head support **64** to serve for the threaded reception of pivot screw **66**. Accordingly, by combination of pivot screw apertures, as at **70**, the over-all longitudinal length of the composited head support **72** may be made adjustable. Correspondingly, the provision of adjustment screws on **67** on opposite sides of the device enable a tilting of the jaw support member relative to the rear head support **64**. Accordingly, a variety of head configurements, that is jaw extension and angulation relative to the lower rear of the skull may be accommodated.

FIG. **3** illustrates that a hinge pin or hinge pin ears at **75** may be provided through the ear **76** and **77** of the medial member **78** joining the rear head support **64** to the forward jaw support member **59**. Of course, the hinge pin **75** may simply take the form of upper and lower pivot extensions C and D of jaw support member **59**. For ease of assembly, there may be provided an insert member **78** secured to upper flange **79** of machine screw **80** and provided with a hook type end **81**, not shown, which encompasses the raised tab or pivot **75**, see FIG. **3**.

Medial portion **86** includes an inwardly turned end **87** provided with slot **88**. The latter receives the neck **89** of head portion **90** of the jaw support member **59**, see FIG. **4**.

Rather than include the upstanding medial portion as at **19** on each side of the device, the device may include simply turned tabs **90** joined to the respective arcuate shoulder members **11** and **12** in a manner indicated in FIG. **5**. The structure of FIG. **5** has some advantages in that the mount **19A**, corresponding to medial portion **19**, may be bent upwardly and downwardly along the axis E so as to accommodate patients having different shoulder and neck structures.

FIG. **6** illustrates that, rather than include the exterior spring **50**, an interior spring **91** may be utilized. In the latter event, an interior shoulder **92** serves as a seat for spring **91**, whereas the upper portion at **93** of the spring may engage post **38** or its collar **37**, see FIG. **6**.

As to operation, a number of advantages may be seen in connection with the structure as described. Flexibility of the shoulder harness is insured through the use of the pivot screws **18** and slots **17**, this so that the shoulder strap or arcuate shoulder members may be tilted laterally such that the most comfortable position for the wearer may be assured. Note that such adjustments take place about the longitudinal axes of pivot screws **15** which, in part, secure cross brace **13** to the shoulder straps or arcuate shoulder members of the harness.

In the five piece construction of the head support or frame, namely, by virtue of the jaw support member **59**, rear head support **64**, and the side medial joining support members **86** and **78**, the longitudinal dimension of the over-all head support may be adjusted in accordance with the head contour of the user. Accordingly, different ones of the adjustment holes as seen in FIG. **1** and identified in FIG. **2** have been utilized. Further, the jaw support member **59** may be tilted upwardly or downwardly relative to rear head support **64**, simply by the use of the slotted holes at **58**, in FIG. **2**, with the tightening of screw **67**.

Of prime importance is the inclusion of a tubular base member as at **45** in FIG. 3 which form an articulative ball-and-socket joint with the ball member **40.** This provides for a free displacement or tilting of the axis F of each side support for the head support **72,** this so that the head may be rotated freely back-and-forth and also adjusted from side-to-side. Accordingly, a maximum of movement is enjoyed without detering the upward traction provided as by the opposite springs **50.** Note is to be had that springs **26** merely serve to provide a restoring force to the head support after the head, from its tilt position, is returned by the patient to forward orientation. It is the action of compression springs **91,** in FIG. **6,** or springs **50,** in FIG. **3,** which provide the upper tension or upward force of the neck region of the spinal column. Springs **26,** on opposite sides of the user, merely generally orient the head support **72** upwardly above the brace, and provide flexibility when the user turns his head to the right or to the left; additionally, such springs supply a gentle restoring force for the patient when his head is to be returned to the normal position. The ball-and-socket joint proximate ball **40,** in FIG. **3,** provides both for axial position of the spring **50,** as well as facilitates a deflection of the axis at spring **26** along essentially its entire length in accordance with the movement by the patient of his head.

Accordingly, what has been provided is a new and useful cervical brace support which offers adjustment features as to the shoulder harness thereof in connection with the back, shoulder and neck configurements of the individual patients, this for their maximum comfort while wearing the brace. Upper tension is applied by springs **50** whose longitudinal axes are deflectivle in accordance with the desires of the user through his head movement and as facilitated by the ball-and-socket joints at the base of the side support structures proximate ball **41.** Up and down tilting of the head is accomplished with a journal proximate areas **53** and **55** in FIG. **3.** The length adjustment is facilitated by intermediate members as before described and a hinged hook construction supplies needed releasible engagement of the head support proper.

While particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

I claim:

1. A cervical brace including, in combination, a pair of mutually spaced, downwardly concave, arcuate shoulder members, a cross brace, means pivotdisplacably securing said arcuate shoulder members to said cross brace, and means releasably fixing the selected disposition of said arcuate shoulder members relative to said cross brace, and wherein said cross brace overlaps said arcuate shoulder members and include askew slotted apertures, said releasably fixing means comprising attachment means respectively engaging said cross brace, passing through said askew apertures, and retentively engaging said arcuate shoulder straps.

2. A cervical brace including, in combination, a head frame, a shoulder harness, means coupled to said head frame and shoulder harness for springingly supporting said head frame above said shoulder harness, said head frame including a jaw support member, a rear head support, and means adjustably securing said jaw support member to said rear head support, whereby the length of said head frame can be adjusted to accommodate a variety of head sizes, and means hinging said jaw support member to said rear head support, said hinging means being hinged transversely outwardly relative to said jaw support member.

3. Structure according to claim **2** wherein said adjustably securing means comprise opposite-side medial members, at least one of said rear head support and a respective one of said medial members including longitudinally spaced apertures, and attachment means securing said rear head support to said respective medial member at a selected one of said longitudinally spaced apertures.

4. Structure according to claim **3** wherein one of said rear head support and a respective one of said medial members includes means enabling and providing tiltable adjustment of said rear head support relative to said respective medial member.

5. A cervical brace including, in combination, a head frame, a shoulder harness, and support means operably disposed between said head frame and said shoulder harness and comprising a pair of support structures respectively disposed on opposite sides of said head frame, each of said support structures comprising a post journalling said head frame thereto for movement of the latter about a horizontal axis, first spring means secured to said shoulder harness and including an upwardly disposed journal boss, a sleeve journaled in said journal boss and supporting said post, a cylinder having apertured, lower, spherical ball-and-socket end and disposed within said sleeve such that the latter may slide thereon, a ball mount comprising a ball portion nestled in said socket and a shank protruding downwardly through said apertured end to be retained proximate said shoulder strap and a traction-producing compression spring disposed between and engaging said shoulder harness and said sleeve.

6. A cervical brace including, in combination, a head frame, a shoulder harness, and support means operably disposed between said head frame and said shoulder harness and comprising a pair of support structures respectively disposed on opposite sides of said head frame, each of said support structures comprising a post journalling said head frame thereto for movement of the latter about a horizontal axis, first spring means secured to said shoulder harness and including an upwardly disposed journal boss, a sleeve journaled in said journal boss and supporting said post, a cylinder having an apertured, lower, spherical ball-and-socket end and disposed within said sleeve such that the latter may slide thereon, a ball mount comprising a ball portion nestled in said socket and a shank protruding downwardly through said apertured end to be retained proximate said shoulder straps, and a traction-producing spring operatively disposed between said cylinder and said post.

7. In a cervical brace construction including a shoulder harness, a head frame and mounting means springingly supporting said head frame above said shoulder harness; an improvement wherein said head frame comprises a rear head support, a lower jaw support, means hingedly connecting said lower jaw support on one side thereof to said rear head support at a corre-

sponding side, and means releasably retaining the remaining side of said lower jaw support to the remaining side of said rear head support, said hingedly connecting means being hinged transversely outwardly relative to said lower jaw support.

8. Structure according to claim **7** wherein said last mentioned means comprises hook means releasably interengagable as between said lower jaw support and said rear head support.

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