

Jan. 21, 1958

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2,820,455

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2 Sheets-Sheet 1

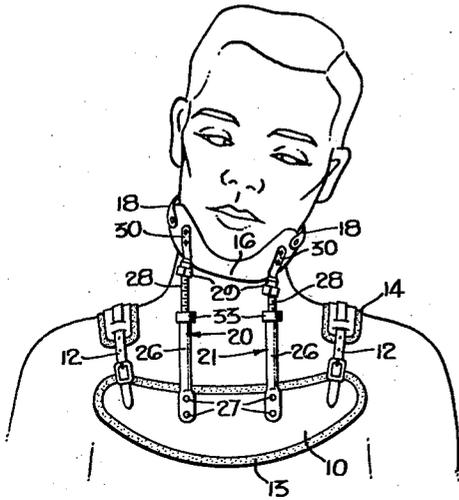


FIG. 1.

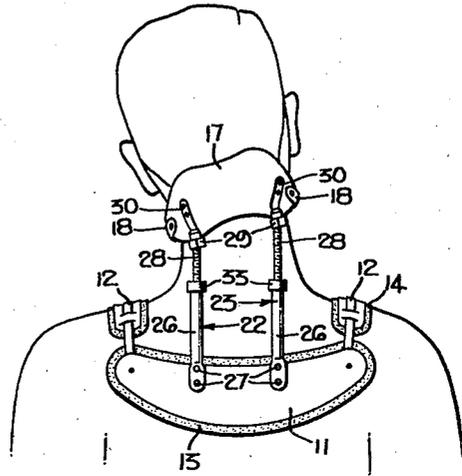


FIG. 2.

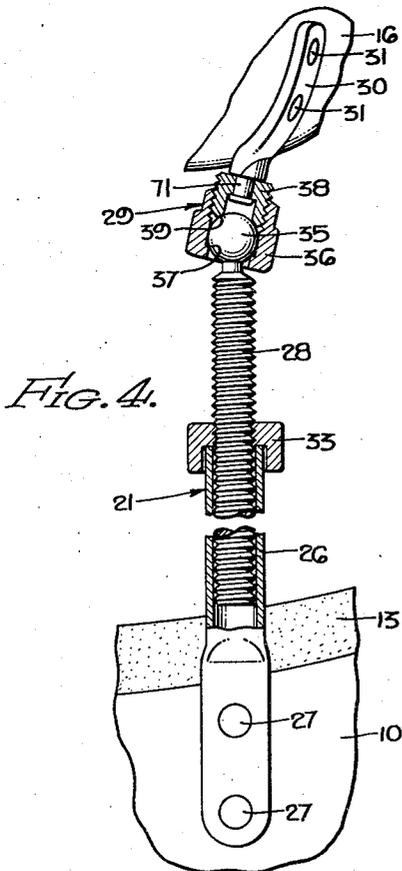


FIG. 4.

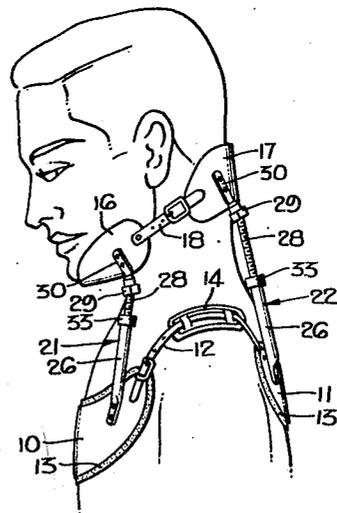


FIG. 3.

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2 Sheets-Sheet 2

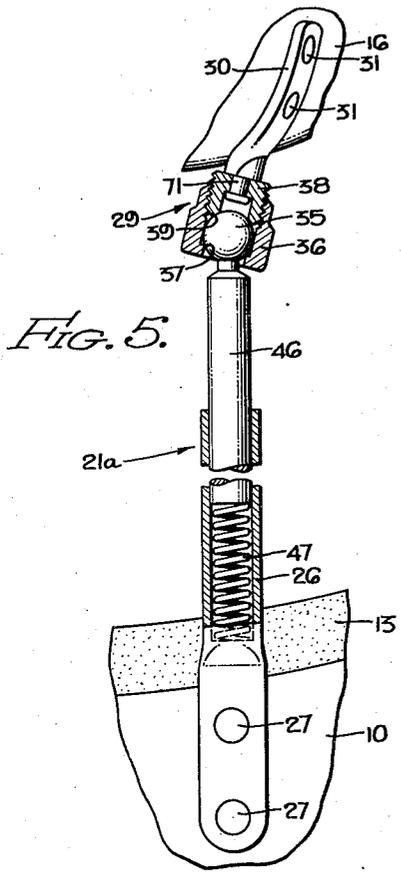


Fig. 5.

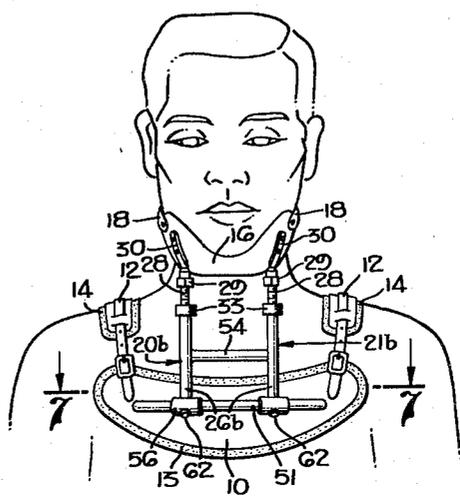


Fig. 6.

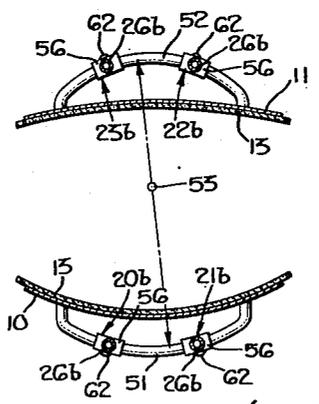


Fig. 7.

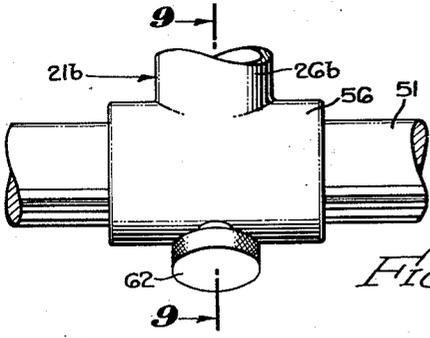


Fig. 8.

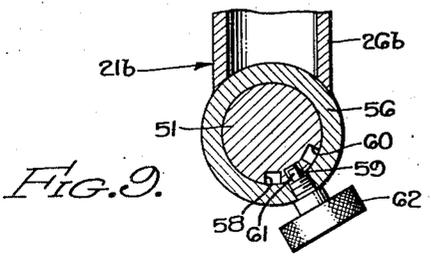


Fig. 9.

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7 Claims. (Cl. 128-87)

This invention relates to a neck brace, and particularly to a brace which is adjustable to hold the head of the wearer in any one of a number of tilted positions.

In conventional neck or cervical braces, that is to say braces for supporting the head and neck of a subject or patient during healing of a fracture or correction of a deformity, the construction is such that the head may be supported only in a forwardly facing untilted position. This, however, is highly undesirable since for many types of fractures and deformities it is necessary that the head be maintained permanently in a predetermined tilted position, the tilting being either to the side or to the front or back. Although these situations may be taken care of through use of special braces, such equipment is highly expensive and may prove unsatisfactory at a later date when it is desired to hold the head of the wearer in a different tilted position. A further deficiency in conventional neck braces is that they do not permit the wearer to turn his head, so that he may view an object to the right or left, for example, without turning or pivoting his entire torso.

In view of the above factors characteristic of the field of neck or cervical braces, it is an object of the present invention to provide a brace so designed that it will hold the head of a wearer in any one of an infinite number of forwardly, rearwardly or laterally tilted positions.

Another object of the invention is to provide a single neck brace which may be adapted to hold the head in a predetermined canted or tilted position for a certain length of time, and later to hold the head in a second canted or tilted position as may be required by the particular deformity or fracture being corrected or healed.

A further object of the invention is to provide a neck brace constructed to permit the wearer to turn his head when he desires to look to the right or left, yet which is operable to hold the neck in a predetermined upright or forwardly or backwardly extended position while the head is turned.

These and other objects and advantages of the invention will be more fully set forth in the following specification and claims considered in connection with the attached drawings to which they relate.

In the drawings:

Figure 1 is a front elevational view showing the neck brace as adjusted to hold the head of a wearer in a laterally tilted position;

Figure 2 is a rear elevational view of the showing of Figure 1;

Figure 3 is a side elevational view showing a brace as adjusted to hold the head of the wearer in a forwardly tilted position;

Figure 4 is an enlarged detail sectional view of a support post, and illustrating the lockable ball-and-socket joint of the invention;

Figure 5 is a view corresponding to Figure 4 but showing a second embodiment of the invention, in which the

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support posts are constructed to apply spring traction to the neck of the subject;

Figure 6 is a front elevational view of a third embodiment of the invention, in which slide and rail means are provided to permit the wearer to turn his head either to the right or to the left;

Figure 7 is a horizontal sectional view of the brace and taken along line 7-7 of Figure 6 to illustrate the curvatures of the supporting rails;

Figure 8 is an enlarged detail view of the slide or collar at the lower end of a front support post; and

Figure 9 is a transverse sectional view taken along line 9-9 of Figure 8 and showing the means for adjusting the brace to support the head and neck in a number of forwardly or rearwardly extended positions.

Referring first to the embodiment of the invention shown in Figures 1-4 of the drawings, the neck or cervical brace may be seen to comprise support means mounted on the body of the patient or subject, other support means mounted on the head of the patient, and a plurality of posts or connectors extending between the two support means to hold the head support means in a predetermined position relative to the support means on the patient's body. In the illustrated form of the invention, the support means on the body of the patient comprises a chest plate 10, a back plate 11, and shoulder straps 12 connected between the ends of the respective chest and back plates and adjustable to hold them at predetermined elevations relative to the patient's shoulders and head. The plates 10 and 11 are curved to conform to the contour of the subject's body and are provided with pads 13, for example of felt, to increase the comfort of the wearer. Similarly, the shoulder straps 12 are provided with pads 14 to prevent discomfort when downward force is exerted against the chest and back plates as will be described subsequently. Plates 10 and 11, and substantially all of the other components of the neck brace except for the straps, pads, etc., are preferably formed of a suitable light metal such as aluminum.

The support means on the head of the subject comprise a chin piece 16, an occiput piece 17, and adjustable straps 18 which extend along the sides of the neck of the subject to hold the chin and occiput pieces in the proper positions. The chin and occiput pieces are, of course, suitably contoured to provide maximum support and comfort to the chin, jaw and back of the head.

The posts or connectors, for associating the support means on the body of the subject with the head support means, comprise four posts 20-23 two of which, numbered 20 and 21, extend parallel to each other between chest plate 10 and chin piece 16, and the other two of which, numbered 22 and 23, extend parallel to each other between back plate 11 and occiput piece 17. It is to the construction and operation of the support posts 20-23, in order to permit the holding of the head of the subject in any one of an infinite number of tilted positions, that the invention is particularly directed.

Referring to Figure 4, in which post 21 is shown as illustrative of all four posts 20-23 which are substantially identical, there is illustrated a tubular sleeve 26 the lower end of which is flattened and is connected to chest plate 10 by means of pins or rivets 27, a threaded rod 28 slidably extended within sleeve 26, and a ball-and-socket joint 29 adapted to connect rod 28 with a curved mounting member 30 which is secured to chin piece 16 as by pins or rivets 31. The position of threaded rod 28 relative to the sleeve 26 may be adjusted by turning a hand nut 33 on the rod 28, the lower portion of the hand nut being recessed to seat on the upper end of sleeve 26. It may be seen that the turning of hand nut 33 in a given direction will cause the associated threaded rod

28 to shift upwardly relative to sleeve 26 and thus apply traction between chin piece 16 and chest plate 10. The turning of the nut 33 in the opposite direction, on the other hand, permits the rod 28 to shift back downwardly into sleeve 26 and effect a shortening in the overall post length to decrease the pressure or traction.

With previous constructions it was necessary to turn the hand nuts 33 of all four posts 20-23 in substantial synchronism in order to prevent the setting up of injurious stresses in the apparatus, as well as to prevent the chin and occiput pieces 16 and 17 from twisting and thereby biting into the patient's head. The present invention eliminates this difficulty by providing the ball and socket joints 29 which permit the posts to be of different lengths without setting up strains in the apparatus or causing the head pieces to break or cut into the subject's head. Because of the presence of the joints 29 it is possible to adjust the apparatus until the head of the patient is tilted either forwardly, rearwardly or laterally as may be necessary to correct the particular fracture or deformity in question.

Each of the ball-and-socket joints 29 comprises, as shown in Figure 4, a ball 35 integral or welded at the upper end of threaded member 28, a socket 36 mounted around the ball 35 and having a necked-down lower end portion 37 against which the ball seats, and a plug 38 threaded into the upper end of socket 36 and having a ball seat 39 at its lower end. The plug 38 is suitably secured to the mounting member 30 associated with chin piece 16, for example by means of the illustrated rivet connection 71. When the socket 36 is turned on its axis to partially unthread plug 38 and thus increase the distance between ball seat 39 and the necked-down portion 37 of the socket, the ball 35 may pivot freely in the socket to permit tilting of the chin and occiput pieces 16 and 17 to any position. However, when the socket 36 is turned in the other direction to cause threading of the plug 38 into the socket, the ball seat 39 and necked-down end 37 both press against the ball 35 to frictionally hold it against any pivoting or swiveling. A rigid connection may thus be effected between each rod 28 and mounting member 30 to hold the chin or occiput pieces 16 and 17 in predetermined positions relative to the chest and back plates.

In the operation of the embodiment of the invention shown in Figures 1-4, the chest and back plates 10 and 11 are first mounted in position, and the shoulder straps 12 adjusted until the plates are at the desired elevations. Similarly, the chin and occiput pieces 16 and 17 are mounted in position and their straps 18 are secured and suitably adjusted. Thereafter, all four ball and socket joints 29 of the posts 20-23 are adjusted so that the balls 35 may pivot or swivel freely in their sockets. The hand nuts 33 are then turned individually to cause shifting of threaded rods 28 out of sleeves 26 until the overall post lengths are as desired. If the injury or deformity makes it necessary to maintain the head of the patient in a forwardly tilted position, the front posts 20 and 21 are caused to be of equal lengths but substantially shorter than the lengths of rear posts 22 and 23, as shown in Figure 3. If, on the other hand, it is necessary to hold the head in a rearwardly tilted position, the front posts 20 and 21 are again of equal lengths but are in this instance caused to be substantially longer, and the rear posts 22 and 23 substantially shorter, than when the head is tilted forwardly. Similar relationships apply when the head is to be tilted laterally, for example to the left as shown in Figures 1 and 2. In the latter instance, the posts 20 and 23 are caused to be substantially longer than their corresponding posts 21 and 22. In any event, the ball and socket joints 29 permit the tilting action without stress to the chin and occiput pieces 16 and 17 or to other elements of the brace, and without discomfort to the wearer. After the proper tilting has been achieved, the socket members 36 of joints 29 are turned to draw the seats 39 and 37 against the balls 35 and thus lock

the joints against movement. The patient's head is in this way held in the desired tilted position, or in a forwardly facing untilted position, without danger that the elements will come out of adjustment. It is to be noted that when the joints 29 are locked, the threaded rods 28 are prevented from turning and thus shifting in position relative to their nuts 33.

Referring next to the embodiment of the invention illustrated in Figure 5, all of the elements are the same as in the previously described embodiment except that the threaded rod 28 is replaced by a shorter and unthreaded rod 46, the hand nut 33 is omitted, and a helical compression spring 47 is seated in sleeve 26 between the lower end of rod 46 and the flattened lower sleeve end portion. With the construction illustrated in Figure 5, a continuous traction is applied to the head of the patient, the amount of the traction depending upon the size and compression of spring 47. When it is desired that the head of the patient be held in a tilted position, the springs 47 in certain of the posts are caused to be longer or more powerful than the springs in the other posts. For example, to cause the head to assume the laterally tilted position shown in Figure 1, the springs 47 of posts 20a and 23a, beneath the right side of the head of the wearer, are caused to be longer or stronger than the springs 47 of posts 21a and 22a beneath the left side of wearer's head. In any event, the ball-and-socket joints 29 are first loosened, and then subsequently locked after completion of the operation, as in the embodiment previously described.

Proceeding next to a description of the third embodiment of the invention, shown in Figures 6-9 of the drawings, the construction is the same as in the embodiment shown in Figures 1-4 except that the lower post ends are not rigidly connected to chest and back plates 10 and 11, but instead are slidably associated with rails 51 and 52. Rails 51 and 52 are disposed in a horizontal plane and are respectively connected at their ends, for example by welding, to chest plate 10 and back plate 11. The rails 51 and 52 are arcuate in shape and are concentric about a center point 53 (Figure 7) which is located approximately at the neck bone of the average user.

Referring particularly to Figure 6, it will be noted that the sleeves 26b of front posts 20b and 21b are connected by means of a horizontal brace 54, so that the posts form, together with chin piece 16, a relatively rigid frame structure. Similarly, the sleeves 26b of rear posts 22b and 23b are connected by a cross brace, not shown. At the lower end of each sleeve 26b is mounted a transverse collar or slide 56 adapted to fit slidably over the associated rail 51 or 52 as best shown in Figure 9. When suitable lubrication is provided, the slides 56 will shift freely on the rails 51 and 52 to permit the patient to turn his head, and regardless of the position to which it is tilted.

In certain instances, the patient may have a curvature of the spine or other deformity such that his head is extended forwardly, or even rearwardly, from a normal position. To provide for such situations, the rails and slides are respectively formed cylindrical and tubular, and the rails are each provided with a plurality of longitudinal keyways 58-60, as shown in Figure 9. To selectively slide in the keyways 58-60, a key member 61 is provided on a hand screw 62 which is threaded through each of the slides 56. When the keys of all posts are inserted in the central keyways 59 as shown in Figure 9, after loosening of the associated hand screws 62 and rotation of the posts and slides relative to the rails, the posts are in the relatively vertical positions desired for a patient having a normal neck structure. When, however, the keys 61 are inserted in the keyways 58 or 60, the posts are tilted respectively forwardly and rearwardly from the vertical to adapt the brace for patients having spinal or neck curvatures. It is to be understood that the keyways on the forward and rear rails 51 and 52 correspond, so that the posts 20b-23b associated therewith may be corre-

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spondingly pivoted in accordance with the requirements of the situation. It is also to be understood that the ball-and-socket joints 29 operate, in connection with the present embodiment, the same as in the embodiment described in connection with Figures 1-5.

While the particular apparatus herein shown and described in detail is fully capable of attaining the objects and providing the advantages hereinbefore stated, it is to be understood that it is merely illustrative of the presently preferred embodiments of the invention and that no limitations are intended to the details of construction or design herein shown other than as defined in the appended claims.

I claim:

1. A brace for use in healing fractures and correcting deformities in the neck of a subject, which comprises chest and back plates adapted to be mounted, respectively, on the chest and back of said subject and to be connected with each other by means of straps extending over the shoulders, chin and occiput pieces adapted to be associated, respectively, with the chin occipital regions of said subject, first and second posts extending generally parallel to each other and connected between said chest plate and said chin piece, third and fourth posts extending generally parallel to each other and connected between said back plate and occiput piece, said posts being independently extensible to permit variation in the spacing of said chest and back plates from said chin and occiput pieces, and a plurality of ball-and-socket joints provided one in each of said posts, said joints permitting said posts to be extended in varying amounts to effect tilting of said chin and occiput pieces relative to said chest and back plates.

2. The invention as claimed in claim 1, wherein said ball-and-socket joints are each constructed to be locked in any pivoted position.

3. The invention as claimed in claim 1, wherein said posts each comprise a sleeve connected at its lower end to one of said chest and back plates, a threaded rod slidably extended into the upper end of said sleeve, a nut threaded over said rod and seated on said upper sleeve end, and a ball-and-socket joint provided at the upper end of said rod and connected with said rod and with one of said chin and occiput pieces.

4. The invention as claimed in claim 3, in which said ball-and-socket joint comprises a ball affixed to the upper end of said threaded rod, a socket mounted over said ball and having a ball seat adapted to engage the lower ball portion, and a plug threaded into said socket and having a ball seat adapted to engage the upper ball portion, said plug being rigidly connected to one of said chin and occiput pieces.

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5. The invention as claimed in claim 1, wherein said posts each comprise a sleeve connected at its lower end to one of said chest and back plates, a rod slidably extended into the upper end of said sleeve, a compression spring seated between the lower portions of said rod and sleeve, and a ball-and-socket joint provided at the upper end of said rod and connected with said rod and with one of said chin and occiput pieces.

6. A brace for use in healing fractures and correcting deformities in the neck of a patient, which comprises first support means adapted to be mounted on the body of said patient, second support means adapted to be mounted on the head of said patient, and a plurality of extensible and contractible posts connected between said first and second support means to hold the same apart, said posts each including a slide portion adapted to ride on a rail on said first support means to permit said patient to turn his head, each of said posts also including a universal joint connecting to said second support means to permit tilting of said second support means relative to said first support means when it is desired to hold the head of said patient in a tilted position.

7. A brace for use in healing fractures and correcting deformities in the neck of a patient, which comprises first support means adapted to be mounted on the body of said patient, second support means adapted to be mounted on the head of said patient, and a plurality of posts connected between said first and second support means to hold the same apart, said posts each including a slide portion adapted to ride on a rail on said first support means to permit said patient to turn his head, said rail being provided with a plurality of longitudinal keyways, and said slide portion of each of said posts being provided with a key selectively adapted to fit into one of said keyways to hold the associated post at a predetermined rotated position relative to said rail, whereby said second support means may be shifted forwardly and backwardly relative to said first support means to adapt the brace for patients having necks of various types.

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U. S. DEPARTMENT OF COMMERCE  
PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 2,820,455

January 21, 1958

Newton J. Hall

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 5, line 21, after "chin" insert --and--.

Signed and sealed this 1st day of April 1958.

(SEAL)

Attest:

KARL H. AXLINE

Attesting Officer

ROBERT C. WATSON  
Commissioner of Patents