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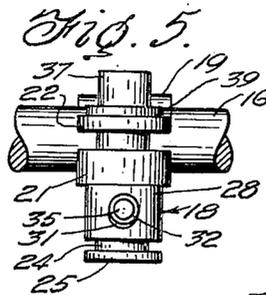
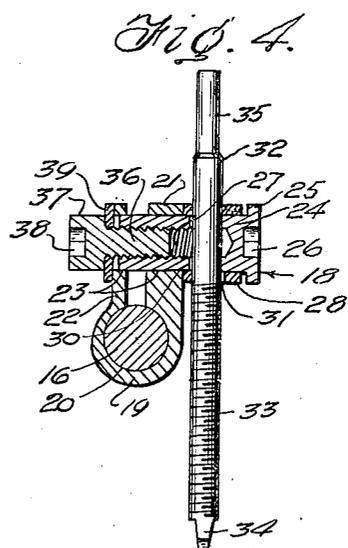
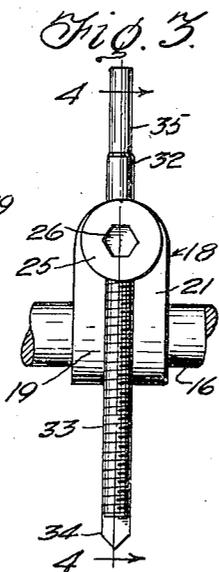
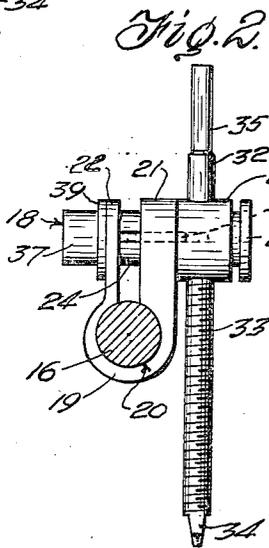
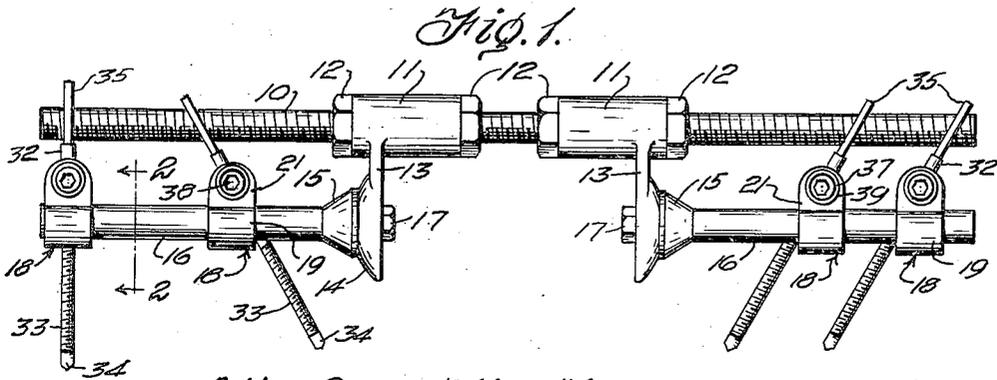
J. J. ETTINGER

2,391,693

SURGICAL SPLINT

Filed Dec. 9, 1943

2 Sheets-Sheet 1



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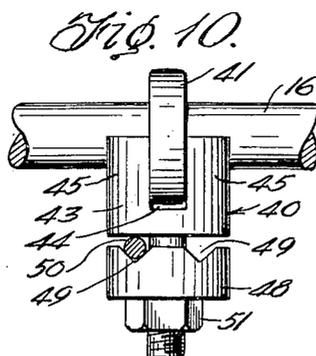
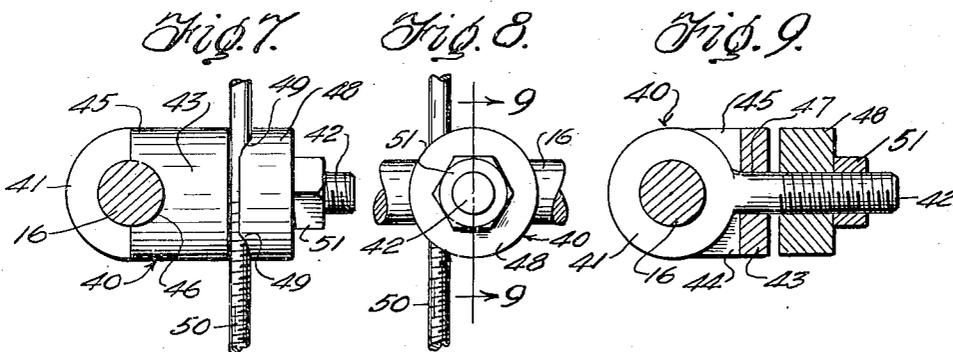
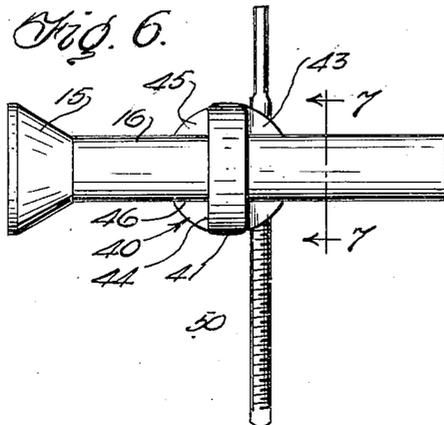
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SURGICAL SPLINT

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2 Sheets-Sheet 2



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# UNITED STATES PATENT OFFICE

2,391,693

## SURGICAL SPLINT

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Application December 9, 1943, Serial No. 513,513

3 Claims. (Cl. 128—84)

This invention relates to surgical splints of the ambulatory type and has special reference to improvements in the surgical splint shown and described in my copending application for patent on Surgical splint filed Feb. 12, 1943, and bearing the Serial Number 475,648.

One important object of the present invention is to provide an improved holder for the screws commonly used in this type of splint, the holder being so constructed that a single securing means is used to hold the screw in position of adjustment in intersecting.

A second important object of the invention is to provide a screw holder and support wherein the holder may rotate about the axis of support and also on its own axis, the construction being such that the tightening of a single threaded element serves to secure the screw holder in both positions of adjustment.

A third important object of the invention is to provide an improved screw holder and support wherein the screw holder is longitudinally movable along the support and wherein the screw holder may rotate about the axis of the support and on its own axis, the construction being such that the tightening of a single threaded element serves to secure the screw holder in all three positions of adjustment.

With the above and other objects in view, the invention consists in certain novel arrangement of details and combinations of elements herein-after fully described, illustrated in the accompanying drawings and particularly claimed.

In the accompanying drawings like characters of reference indicate like parts in the several views, and

Figure 1 is a side elevation of a complete surgical splint provided with one form of the improved screw holders.

Figure 2 is an enlarged section on the line 2—2 of Figure 1.

Figure 3 is an enlarged side elevation of a screw holder and a portion of its support, the view being taken from the opposite side to Figure 1.

Figure 4 is a section on the line 4—4 of Figure 3.

Figure 5 is a plan view of a screw holder and a portion of its support.

Figure 6 is a side elevation of a support carrying a second form of screw holder.

Figure 7 is a section on the line 7—7 of Figure 6.

Figure 8 is a side elevation opposite to that of Figure 6 but showing only a portion of the support.

Figure 9 is a section on the line 9—9 of Figure 8.

Figure 10 is a plan view of the arrangement shown in Figure 8.

In Figure 1 of the present invention a structure is shown which is generally in form like that shown in my aforesaid application. This structure is provided with a bar 10 threaded throughout its length and on this bar is mounted a pair of sleeves 11 which are slideable along the bar and held in spatial adjustment by pairs of nuts 12, each pair being located at opposite ends of the respective sleeves so that loosening one nut and tightening the other will effect movement of the sleeve along the bar. Depending from each sleeve is an arm 13 having a lower end 14 forming a segment of the ball of a ball and socket joint as in the copending application.

Seated on the convex surfaces of these heads are the hollow conical heads 15 of cylindrical bars 16 each forming a support for carrying certain screw holders presently to be described. The conical heads 15 constitute the socket members of the ball and socket joints permitting the supports to swing in any direction about the respective centers of the ball and socket joints, screws 17 being provided to secure the supports in desired adjusted position of swing.

Figures 1 to 5 show one form of the screw clamps of which one or more may be mounted on each bar or support 16, these clamps being each indicated in general at 18. In constructing these screw clamps or holders each is provided with a body 19 having an opening or bore 20 of such size as to fit snugly on the support 16 so that, unless gripped thereon, it may revolve on the axis of the support and may also slide longitudinally of said support. Extending upwardly from the body is a pair of spaced arms, the arm 21 being comparatively thick and the arm 22 being comparatively thin as is also the portion of the body from which this thin arm extends. These arms are so constructed that they diverge slightly from the body outwardly unless drawn toward each other and, when so diverging, the body is loose on the support 16 but when drawn toward each other the body is clamped firmly on the support and can neither slide nor rotate. These arms are provided with aligned bores 23 and fitted to slide and rotate in these openings is a stem 24 having at one end a head 25 and a wrench socket 26. Extending from the end of the stem is a threaded opening 27. Mounted on the stem 24 between the arm 21 and head 25 is a sleeve 28, a keg 29 being provided to prevent rotation of the sleeve on the stem. The stem 26 has a transverse open-

ing 30 and the sleeve 28 has a similar transverse opening 31, the key serving to prevent rotational disalignment of these transverse openings. Through the openings 30 and 31 extends the cylindrical body 32 of a bond engaging screw having a threaded portion 33 extending from one end of the body and provided with a drill point extremity 34. A shank 35, for engagement by a suitable driving means, extends from the other end of the screw body. The screw is of slightly less diameter than the openings 30 and 31 so that it may, with the openings in alignment, slide and rotate therein. However, if the sleeve be displaced longitudinally of the stem the openings will be so displaced that their remote segments will engage and grip the screw to prevent movement relative to the stem 16. In order to effect this displacement there is provided a screw 36 which enters the threaded opening 27. This screw has a head 37 provided with a wrench socket 38 and between the head 37 and the arm 22 is a washer 39.

It will be observed, from Figure 4, that there is a slight space between the stem 24 and the washer 39 so that the screw 36 may be screwed up thus tending to move the head 25 towards the arm 21, the sleeve 28 being short enough to permit such movement. As the screw is thus screwed up the end of the sleeve 28 engages the arm 21 and the stem 24 slides through the sleeve displacing the bores 30 and 31 thus gripping the bone screw and locking it against rotative and sliding movements. Also the engagement of the sleeve with the arm 21 frictionally holds the stem, which with the bolt loose was rotatable on the axis of the sleeve, against rotative movement. At the same time the arm 22 is forced towards the arm 21 and this effects gripping of the support by the body 19 so that the bone screw holder by this one operation of the bolt operates to prevent all movement of the bone screw relative to the support 16.

In the form of the improved bone screw holder shown in Figures 6 to 10 the same main parts of the splint are used but on each of these bars or supports 16 one or more bone screw holders 40 are used.

Each of these holders includes an eye-bolt whereof the eye 41 fits closely on the support 16, the fit being such that the eye may revolve on and slide longitudinally of the support 16 when it is desired to adjust the holder. The threaded stem 42 of the eye-bolt projects radially from the eye in the usual manner and on this stem is slidably mounted a support clamp 43 slotted as at 44 to provide a pair of arms 45 which lie on opposite sides of the eye. The ends of these arms are notched as at 46 to fit on the support 16 and the stem 42 extends through an opening 47 in the member 43. On the extending portion of the stem is rotatably and slidably mounted a bone screw clamp 48 having notches 49 in the face confronting the support clamp 43, these notches serving to engage on a bone screw 50 which is thus held between the members 43 and 48. On the outer end of the stem 42 is a nut 51 which when screwed up, engages against the member 48.

With the nut 51 loosened the eye-bolt is free to rotate and slide on the support 16 and the bone screw clamp 48 can rotate on the stem 42. Thus the bone screw may be adjusted longitudinally of the support, may be rotated to desired angular position about the axis of the support and may be rotated to desired angular position about the axis of the stem. When, however, the nut is screwed up the eye bolt will be clamped to the support and the screw will be simultaneously clamped between the members 43 and 48.

It is further to be noted that, in each form, the action of the bone screw holder effects clamping of the bone screw against unscrewing from the bone.

Having thus described the invention, what is claimed, is:

1. In a device of the kind described, a cylindrical supporting bar, a hollow segmento-cylindrical member mounted on said bar for rotation thereon and sliding movement there along, a pair of spaced arms extending from the ends of said member, threaded means for drawing said arms toward each other and thereby clamping said member on the bar, one of said means constituting a bone screw holder and clamping jaw holding a bone screw for rotation about the axis of said means in a plane parallel to the axis of said bar, said threaded means effecting clamping of itself from rotation in its axis when tightened and thereby effecting holding of the bone screw against rotation in said plane.

2. In a device of the kind described, a cylindrical supporting bar, a hollow segmento-cylindrical member mounted on said bar for rotation thereon and sliding movement there along, a pair of spaced arms extending from the ends of said member, threaded means for drawing said arms toward each other and thereby clamping said member on the bar, one of said means constituting a bone screw holder and clamping jaw holding a bone screw for rotation about the axis of said means in a plane parallel to the axis of said bar, said threaded means effecting clamping of itself from rotation in its axis when tightened and thereby effecting holding of the bone screw against rotation in said plane and on its own axis.

3. In a device of the kind described, a cylindrical supporting bar, a hollow segmento-cylindrical member slidable and rotatable on said bar, a pair of spaced arms extending from the ends of said member, a threaded clamp member extending through one of said arms and having a transverse bone screw receiving opening spaced from the arm through which the clamp member extends, a sleeve slidable on said clamp member and having bone screw receiving openings aligned with the opening in said member, and a second threaded member engaging the first threaded member and effecting movement of the arms toward each other and slight movement of the first member through said sleeve.

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