United States Patent [19]

Mueller et al.

[11] **3,833,211**

[45] **Sept. 3, 1974**

[54] **CLAMPING MECHANISM FOR ADJUSTING STIRRUP ON A MEDICAL EXAMINATION TABLE**

[75] Inventors: **Floyd F. Mueller,** Two Rivers; **Clarence J. Aulik,** Manitowoc, both of Wis.

[73] Assignee: **American Hospital Supply Corporation,** Evanston, Ill.

[22] Filed: **Feb. 5, 1973**

[21] Appl. No.: **329,452**

[52] **U.S. Cl.** **269/328,** 403/234

[51] **Int. Cl.** **A61g 13/00**

[58] **Field of Search** .... 269/130, 131, 132, 321 ME, 269/322, 328; 403/209, 233, 234, 236, 373

[56] **References Cited**

UNITED STATES PATENTS

2,804,362 8/1957 Spielberg 269/328

3,339,913 9/1967 Anderson 269/328

Primary Examiner—Roy Lake
Assistant Examiner—Mark S. Bicks
Attorney, Agent, or Firm—Dawson, Tilton, Fallon & Lungmus

[57] **ABSTRACT**

A clamping mechanism for the support rod of a stirrup includes a laterally extensible bar providing a bearing surface which engages the rod and a flexible metal strap extending from the distal end of the extension bar in partial wrapping engagement about the rod. A hand wheel draws the end of the strap toward the extension bar, thereby wedging the support rod in frictional engagement with the bearing surface and clamping the rod.

6 Claims, 7 Drawing Figures

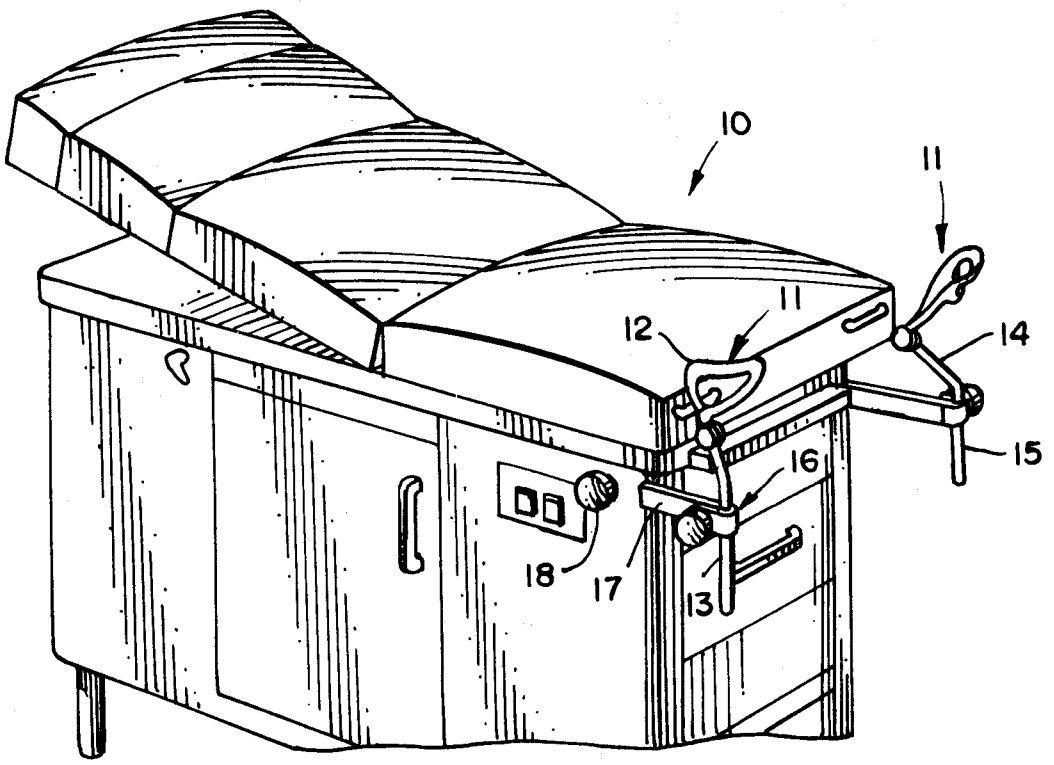


FIG. 1

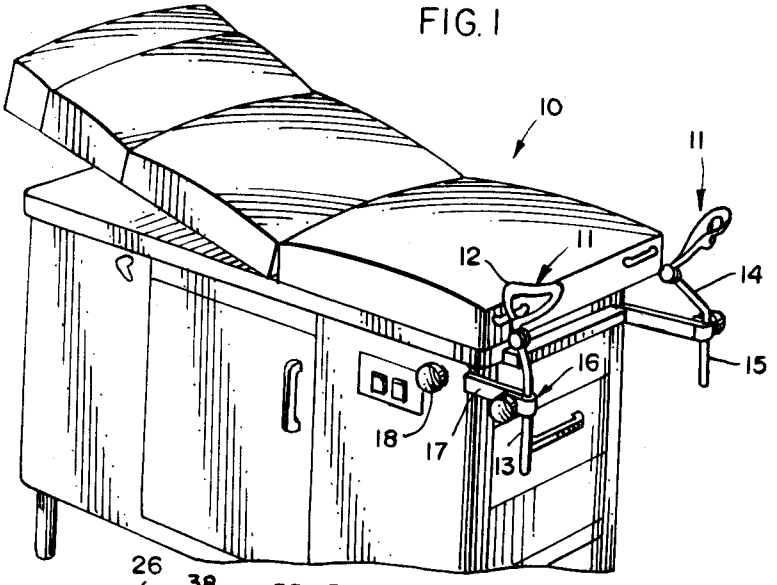


FIG. 2

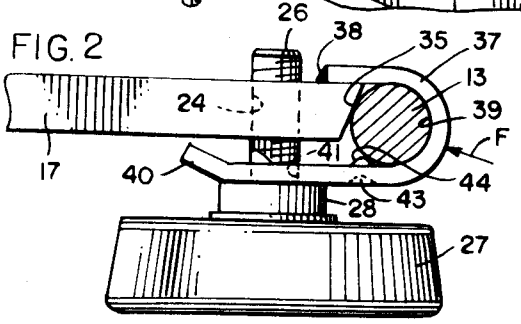


FIG. 4

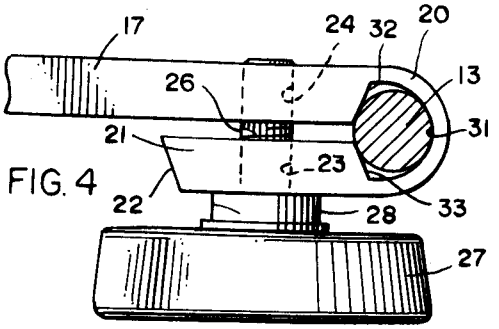


FIG. 3

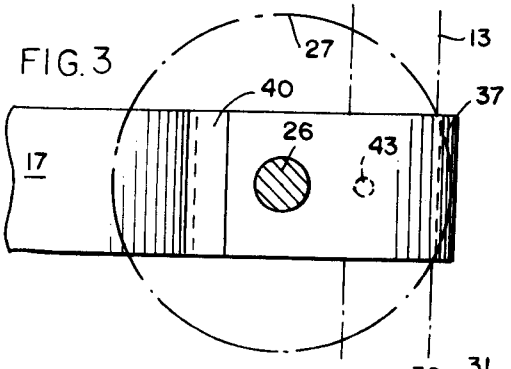


FIG. 5

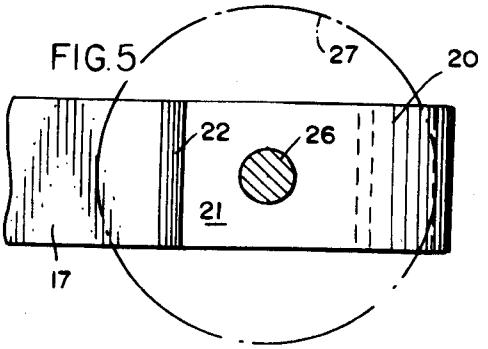


FIG. 6

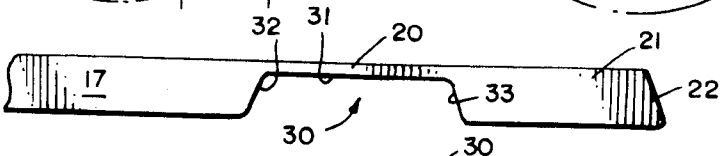
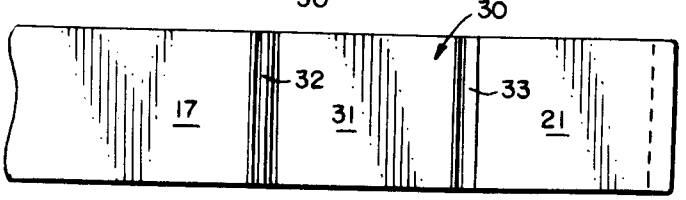


FIG. 7



CLAMPING MECHANISM FOR ADJUSTING STIRRUP ON A MEDICAL EXAMINATION TABLE

BACKGROUND AND SUMMARY

The present invention relates to a mechanism for securing a stirrup assembly for a medical examination table of the type which are particularly used during cynecological and urological examination and treatment. The locking mechanism which is currently being used includes a vertical aperture in a laterally extensible support bar and a hand wheel which is threadly received in the support bar adjacent the aperture. After the stirrup is adjusted in elevation and angular disposition, the hand wheel is tightened, and the butt end of the threaded portion of the hand wheel engages the rod to hold it.

There are a number of disadvantages in the current locking mechanism, principally in its unreliability in that the stirrup assembly will slip vertically or rotate if the hand wheel is not tightened sufficiently, and the amount of tightening that is required can be relatively large because the contact area between the rod and the butt end of the threaded portion of the hand wheel and between the rod and the horizontal extension bar is relatively small, thereby requiring a large normal force.

Another disadvantage in the current commercial locking mechanism is that the hand wheel must be turned a number of times between the locked position and the unlocked position in which the stirrup assembly is freely movable.

The present invention overcomes these problems by providing a mechanism which is not only simpler to use in that the movement of the hand wheel between the locked and unlocked positions is much less than heretofore has been required, but it is also more reliable because it provides a much larger area of engagement along the surface of the support rod for the stirrup assembly.

In the present invention, the horizontal extension bar is formed with an end bearing surface which extends in a vertical plane and engages the stirrup support rod. A U-shaped flexible metal strap has one end attached to the extension bar adjacent the bearing surface, and it extends around the support rod in partial wrapping engagement.

A hand wheel is provided for drawing the end of the strap toward the extension bar, thereby tensioning the strap and wedging the support rod into tight frictional engagement with the bearing surface of the extension bar. The strap engages the support rod for almost one-half of its circumferential area, thereby providing substantial contact area between the rod and the strap and reducing the normal force required to rigidly clamp the rod.

Further, the amount of movement of the strap relative to the bar to achieve a rigid clamping is small, and this minimizes the amount of turning of the hand wheel in order to achieve a rigid, reliable clamp of the support rod.

In a preferred embodiment, the U-shaped strap is formed by milling an intermediate portion of the extension bar and then forming it into a U-shape. This forms two separate bearing surfaces and provides an even more reliable clamping of the support rod.

Other features and advantages of the present invention will be apparent to persons skilled in the art from

the following detailed description of a preferred embodiment accompanied by the attached drawing wherein identical reference numerals will refer to like parts in the various views.

THE DRAWING

FIG. **1** is a fragmentary upper perspective view of a medical examination table incorporating the present invention;

FIGS. **2** and **3** are fragmentary top and side views respectively of a clamping mechanism incorporating the present invention;

FIGS. **4** and **5** are fragmentary top and side views respectively of a modification of the inventive clamping mechanism; and

FIGS. **6** and **7** are fragmentary top and side views of an extension bar prior to forming of the embodiment of FIGS. **4** and **5.**

DETAILED DESCRIPTION

Referring now to FIG. **1,** reference numeral **10** generally designates a conventional medical examination table equipped at its foot end with a pair of stirrup assemblies generally designated **11.** Each of the stirrup assemblies **11** is similar in structure and function except, of course, they are mirror images of each other for supporting the right and left feet of a patient being treated or examined.

Each stirrup assembly **11** includes a stirrup or foot receptacle **12** secured to a rod **13** having an inclined upper portion **14** and a vertical lower portion **15.** The stirrups **12** are adjusted in elevation and angular disposition relative to the patient by means of an adjustment mechanism generally designated **16** which will be described in more detail presently. The adjustment mechanism is associated with the distal end of a stirrup extension bar **17** which is horizontally extensible from the foot end of the table **10,** and clamped in its adjusted position by means of a conventional hand wheel **18.** Hence, each of the stirrups **12** is adjustable in extension, height, and angular disposition.

Turning now to FIGS. **4** and **5,** there is shown a preferred embodiment of the adjusting mechanism **16** for achieving vertical and angular adjustment of the stirrup support rod **13.** As seen there, the horizontal extension bar **17** has a rectangular cross section, with a greater height (FIG. **5**) than width.

At a location spaced slightly inwardly from the end of the bar **17,** it is formed into a thin strap **20** which is formed in the generally U-shape, as best illustrated in FIG. **4.** The distal end of the bar **17,** designated **21,** is of the same thickness as the main body of the extension bar, and its edge is beveled as at **22.** A clearance aperture **23** is formed in the end portion **21,** and a corresponding internally threaded aperture **24** is formed in the main body of the extension bar **17,** in alignment with the clearance aperture **23.**

A threaded stud **26,** provided with a hand wheel **27** is received in the clearance aperture **23** and threaded into the aperture **24** of the main body of the extension bar **17.** A plastic washer **28** is inserted between the hand wheel **27** and the end portion **21** of the extension bar to reduce friction and metal-to-metal contact as the hand wheel is turned.

Turning now to FIGS. **6** and **7,** there is shown the extension bar **17** as it exists just prior to being formed into the shape of FIGS. **4** and **5** in a preferred method of

forming. The strap is cut at an angle of about 25 degrees to form the beveled edge 22. This beveled edge not only enhances the appearance of the finished mechanism, but it also reduces the possibility of snagging clothing or the like during use.

The strap 20 is formed by milling a groove generally designated 30 through the strap 17 in the direction of its height. This also defines the end portion 21. The groove thus formed provides a first surface 31 for contacting the exterior surface of the rod 13 in partial wrapping engagement to provide a relatively large area of frictional contact for clamping the rod when the hand wheel is tightened. First and second interior beveled surfaces 32 and 33 are formed at the forward and rear sides of the groove 30. Each of these beveled edges 32, 33 provide a backing or stop surface for engaging the rod 13 at locations generally opposed to the frictional contact between the rod 13 and the contact area 31 on the interior of the strap 20.

After the clearance aperture 23 and threaded aperture 24 are formed, the strap 31 is then formed into the curved shape shown in FIG. 4 by bending it about an arbor, so as to bring the holes 23, 24 into the proper alignment and to form a receptacle for the rod 13.

Turning now to the embodiment of FIGS. 2 and 3, the horizontal extension bar is again designated 17, and it is of the same cross sectional shape as previously described. Further, it includes a threaded aperture 24 which receives a stud 26 provided with a hand wheel 27.

In this embodiment, however, the distal edge of the bar 17 is cut to form a beveled surface 35 which forms a stop or abutting surface for engaging the support rod 13.

A curved strap 37 is welded at 38 to the bar 17 adjacent the beveled edge 35 and is curved around it to form an interior contact surface 39 for engaging a substantial surface area of the rod 13 in opposing relation to the beveled edge 35. The strap 37 thence continues rearwardly and is bent inwardly toward the strap 17 as at 40 to reduce the possibility of snagging clothing. A clearance aperture 41 is formed in the strap 37 in alignment with the threaded aperture 24 in the bar 17, and a plastic washer 28 is again interposed between the hand wheel 27 and the movable portion of the clamping device (the free end of the strap 37 in this instance).

A detent 43 is formed in the strap 37, thereby causing a protuberance 44 on the interior of the strap and engaging the rod 13 to enhance the clamping of the rod.

In operation of the mechanism of FIGS. 2 and 3, as the hand wheel 27 is turned to thread the stud 26 into the aperture 24 of the extension bar 17, the strap 37 is brought into tight wrapping engagement around a substantial peripheral area of the stirrup rod 15—theoretically, the contact area extends about half the circumference of the stirrup rod 13. As the hand wheel is tightened, the strap 37 is tensioned, and draws the rod 13 into engagement with the beveled bearing surface 35 of the bar 17. Because the bearing surface 35 is thus inclined, there is a wedging action resisting inward motion of the rod 13, resulting in a rigid clamping of the stirrup rod with only a partial turn of the hand wheel. Correspondingly, of course, the stirrup rod 13 is loosened for adjustment both vertically and angularly by a partial counter turn of the hand wheel 27. The inclined surfaces 32 and 35 of the devices of FIGS. 4 and 2 respectively serve similar functions—namely, they provide a stop surface to prevent movement of the rod when the strap is tensioned, and they are preferably designed to extend perpendicularly to the application of the resulting force to the rod 13. Thus, for the example of FIG. 2, as the strap 37 is tensioned, it is bent around the rod into a more complete peripheral contact, and the resultant force on the rod is in the direction of the arrow F, passing through its center. The beveled bearing surface 35 is perpendicular to this resultant force and thereby is in an optimum position for resisting motion of the rod 13. This, in turn, permits inducing the required amount of frictional engagement between the curved surface 39 of the strap and the rod 13 in order to rigidly clamp the stirrup with a minimum turning of the hand wheel 27. The beveled surface 35 for the embodiment of FIG. 2 preferably forms an angle of about 20° with a true perpendicular to the direction of elongation of the bar 17 for a stirrup rod having a diameter of 0.570 in. The strap 37 is a flat wire having a thickness of one-eighth inch and a depth of 1 inch, and having round edges.

The bent end 40 of the wire 37 forms an angle of about 25°, as illustrated.

For the embodiment of FIG. 4, the beveled edges 32, 33 form a similar angle of 20° relative to a horizontal line passing left to right in FIG. 6. The thickness of the strap 20 in this embodiment is three thirty-seconds inch.

It will also be observed, particularly in the embodiment of FIG. 2 that when the strap 37 is welded to the bar 17, the distance between the center of the beveled surface 35 and the opposing location on the curved interior surface 39 of the strap 37 along a diagonal through the rod 13 is as close to the diameter of the rod as possible, as this has been found to result in an optimum clamping action with minimal motion of the hand wheel. Too great a distance results in a loss of clamping action. Although the angle formed by the beveled edge 35 is preferably 20 degrees, as has already been indicated, the exact angle is not critical, and this surface could even be concave, corresponding to the curve of the rod 13. However, by using the beveled surface as indicated, tolerances in the bend of the strap 37 are reduced, and the amount of turning of the hand wheel to achieve the desired applied clamping force is reduced. The protuberance 44 acts as a second wedging surface and has been found to improve the clamping action. It will therefore be appreciated that the embodiment of FIG. 4 provides still further clamping action due to the provision of two separate beveled stop surfaces 32, 33. That is to say, as the hand wheel is tightened for this embodiment, there is a bevel wedging action due to the two beveled surfaces which form a V stop surface for limiting movement of the rod 13 during tensioning of the strap 20. This embodiment has one further advantage in that it eliminates any dimensional changes of the structure which may have been produced by the heat of welding the strap in the embodiment of FIGS. 2 and 3. Both structures, however, have significant advantages over the prior art in facilitating adjustments of the stirrup support rod 13.

The term "hand wheel" has been used throughout the specification to refer to the hand-actuated rotary member 27 which, in the illustration given, has a generally circular periphery; however, it is to be understood

that the "wheel" need not necessarily be circular in shape. It may, for example, be oval, rectangular, polygonal, or any other suitable shape which facilitates manual operation.

Having thus described in detail two embodiments of the present invention, persons skilled in the art will be able to modify certain of the structure which has been illustrated and to substitute equivalent elements for those disclosed while continuing to practice the principle of the invention; and it is therefore, intended that all such modifications and substitutions be covered as they are embraced within the spirit and scope of the appended claims.

We claim:

1. In a medical examination table, an adjusting mechanism for a stirrup assembly having a support rod held by a horizontally extensible support bar wherein the improvement comprises: a curved, flexible metal strap extending from one edge of the distal end of said bar around the other edge thereof and forming a receptacle for receiving said support rod in partial wrapping engagement, said bar providing at said distal edge a generally planar bearing surface engaging said rod when thus received, said planar surface being inclined to face the axis of said rod, said strap being curved around and spaced from said bearing surface and including a free end spaced from said bar; and hand-actuated turn wheel means for drawing the free end of said strap toward said bar, thereby to bring the inner curved surface of said strap into partial wrapping engagement with a portion of said rod along a substantial contact area and forcing said rod into contact with said bearing surface along a narrow vertical contact area; whereby a minimum of turning of said hand wheel means in one direction will cause a wedging action of said rod into said bearing surface for tight frictional engagement and, alternatively, a minimum of turning of said hand wheel means in the opposite direction will release said rod along said vertical contact area and permit adjustment thereof.

2. The structure of claim **1** further comprising a detent on the free end of said strap for engaging said rod and providing additional gripping action.

3. The structure of claim **1** further comprising means on the free end of said strap providing a second bearing surface engaging said rod.

4. The structure of claim **3** wherein said second bearing surface is inclined to face the axis of said rod, said first and second bearing surfaces thereby forming a general V-shape to receive said rod.

5. The structure of claim **1** wherein said hand wheel means includes a threaded shaft provided with a hand wheel, said bar providing a threaded aperture extending transverse of the axis of said rod, the free end of said strap providing a clearance aperture aligned with said threaded aperture, said stud extending through said clearance aperture and being received in said threaded aperture.

6. In a medical examination table, an adjusting mechanism for a stirrup assembly including a support rod held by a horizontally extensible support bar comprising: a one-piece extension bar defining a thin, C-shaped strap bent 180° on itself and provided with an enlarged free end adjacent said strap, said strap providing a threaded aperture and said free end providing a clearance aperture aligned with said threaded aperture, said C-shaped strap partially defining a receptacle for said rod, said rod and said free end further providing inclined, generally planar bearing surfaces further defining said receptacle for said rod and engaging the same along respective narror vertical contact areas when said rod is received therein, said inclined surfaces forming a general V-shape; and a hand wheel with a threaded stud extending through said clearance aperture and received in said threaded aperture; whereby when said hand wheel is tightened, said strap is tensioned to engage said rod and force it into said inclined bearing surfaces for frictionally engaging and clamping said rod an extended peripheral surface of said strap and said narrow contact areas of said bearing surfaces.

* * * * *