Sept. 25, 1962 K. H. BURZLAFF 3,055,042

CASTER MECHANISM AND LOCKS THEREFOR

Filed Dec. 3, 1958 4 Sheets-Sheet 1

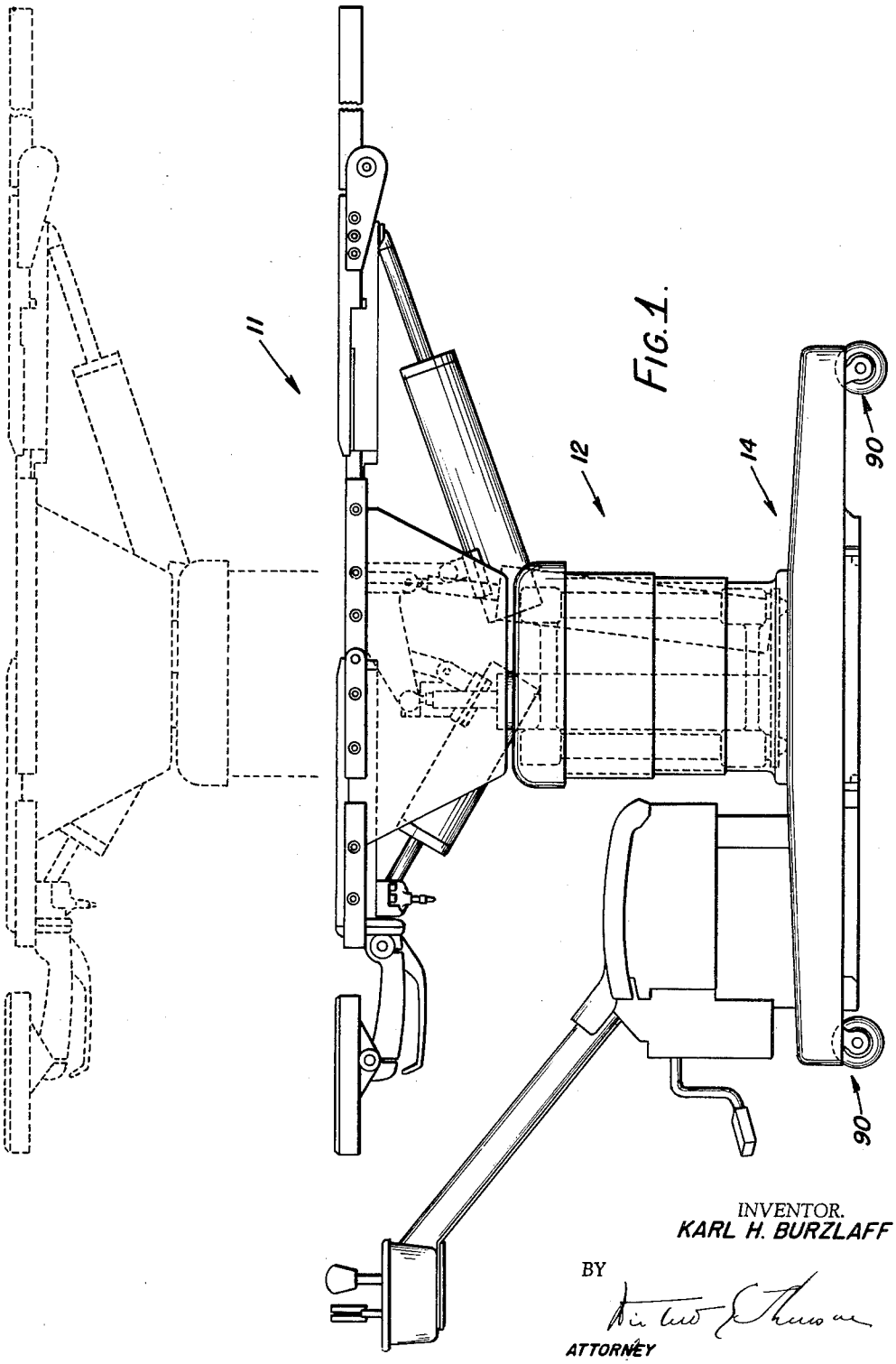


FIG. 1.

INVENTOR.
KARL H. BURZLAFF

BY

ATTORNEY

Sept. 25, 1962 K. H. BURZLAFF 3,055,042

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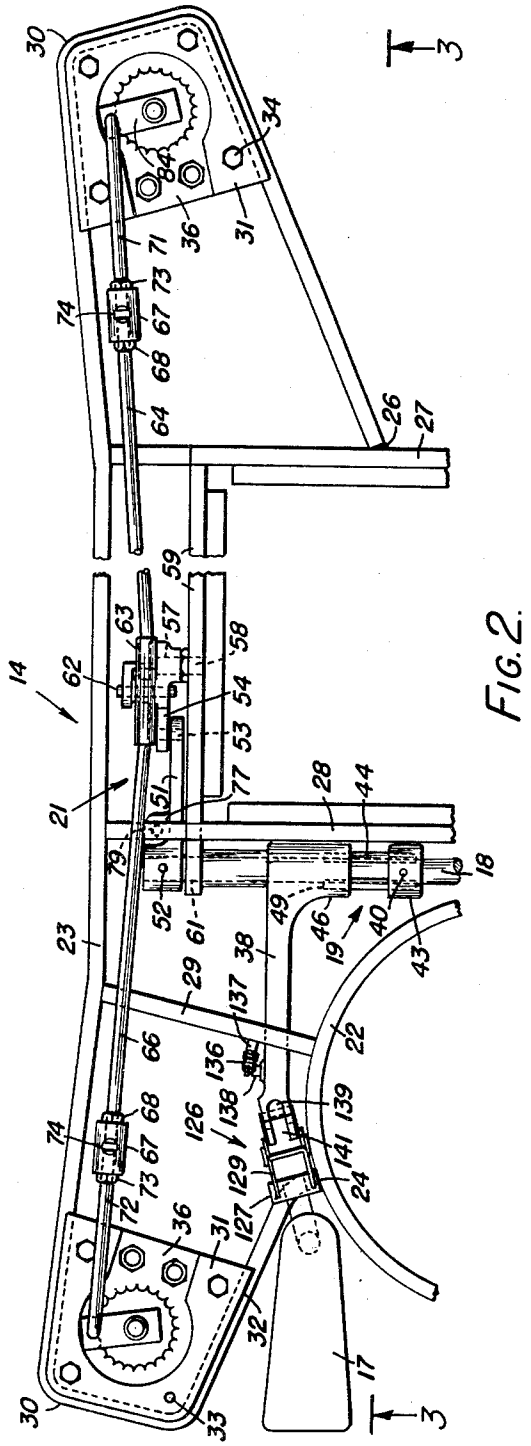


FIG. 2.

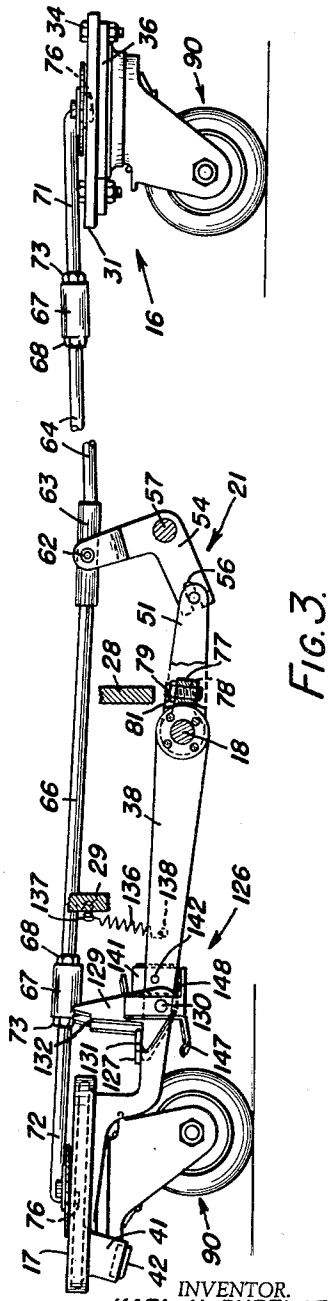


FIG. 3.

INVENTOR.
KARL H. BURZLAFF

BY

ATTORNEY

Sept. 25, 1962 K. H. BURZLAFF 3,055,042

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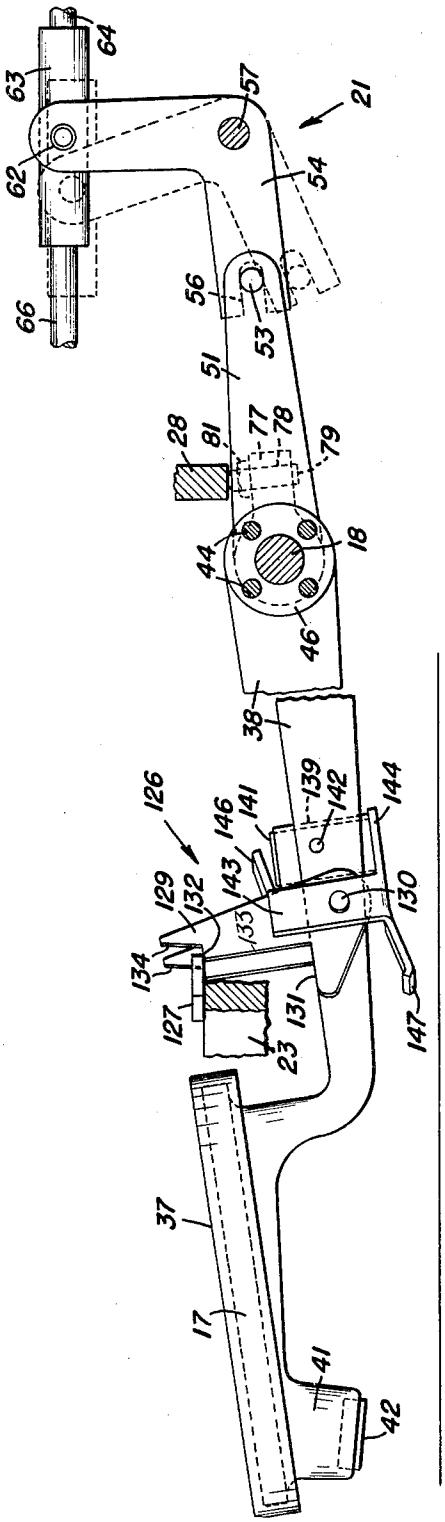


FIG. 4.

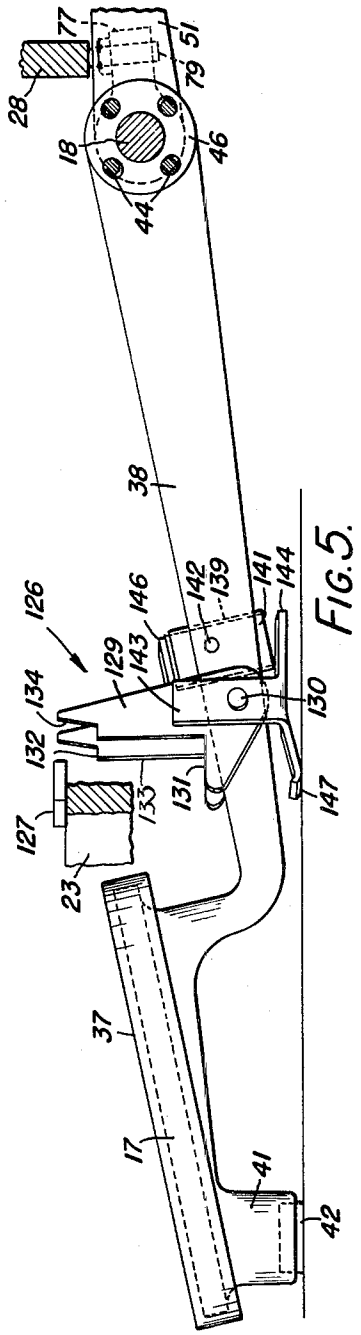


FIG. 5.

INVENTOR.
KARL H. BURZLAFF

BY

ATTORNEY

Sept. 25, 1962 K. H. BURZLAFF 3,055,042

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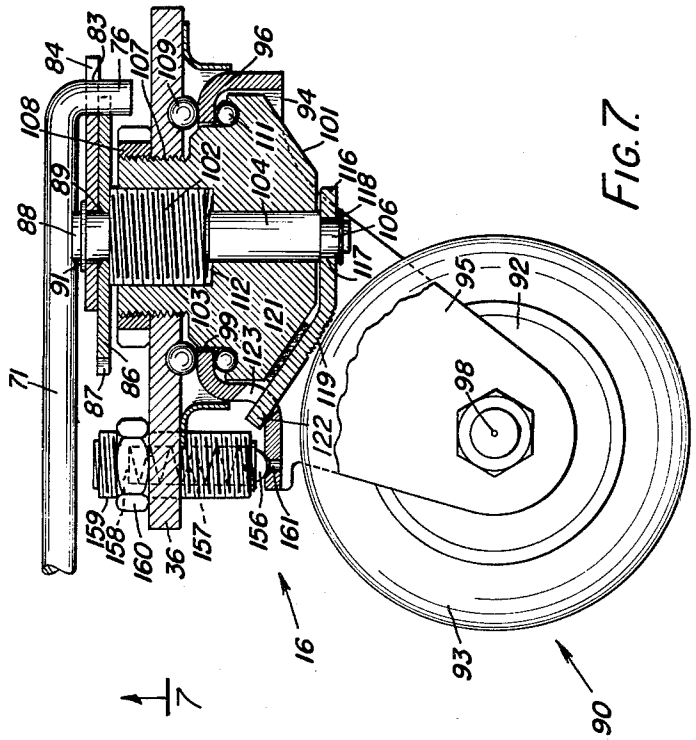


FIG. 7.

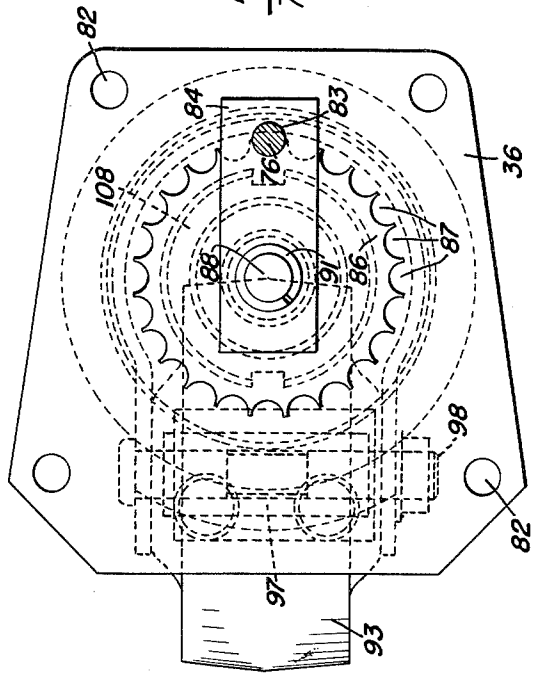


FIG. 6.

INVENTOR.
KARL H. BURZLAFF

BY

ATTORNEY

United States Patent Office

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3,055,042

CASTER MECHANISM AND LOCKS THEREFOR

Karl H. Burzlaff, Rochester, N.Y., assignor to Ritter Company, Inc., Rochester, N.Y., a corporation of Delaware

Filed Dec. 3, 1958, Ser. No. 777,870

9 Claims. (Cl. 16—35)

This invention relates to mobile units and more particularly caster mechanisms of mobile units, especially surgical tables. Reference is made to my copending application Serial No. 777,869, entitled, "Locking Mechanism For Mobile Units," filed December 3, 1958.

The invention has application to any wheeled unit whether power driven or manually pushed. The caster mechanism has been particularly designed for use in connection with means for locking the casters of surgical tables adapted to be rolled through the corridors of hospitals and about a surgical room thereof.

Surgical tables must be capable of being pushed through the corridors of hospitals; in bringing the patient from his room; moving the table from one surgery room to another; or shifting the table in an operating room. For this reason, the table is usually provided with an undercarriage or frame mounted on casters which are, of course, rotatable about both a vertical and a horizontal axis. While the table should be freely movable from place to place, it is still more important that it be capable for being firmly and positively locked against even slight movement during the performance of an operation. Moreover, the mechanism for locking the casters must be operable with a minimum of effort and fully fool-proof in its action. Any accidental shifting of the table while the surgeon is performing an operation could have extremely serious consequences.

An object of the invention is to provide a caster mechanism so constructed and arranged that it may be locked against rotational movement both about a horizontal and a vertical axis.

Another object of the invention is to provide a caster applicable to the two front wheels of a mobile unit in which means are provided for latching the caster against rotation about a vertical axis so that the unit may be pushed or propelled in a straight line.

My invention further contemplates a caster mechanism adapted to be used with the locking mechanism of the above mentioned application or equivalent so that upon a single operation of the locking mechanism the casters will be locked against rotation about both a horizontal and a vertical axis.

Other objects and advantages of this invention will be particularly set forth in the claims and will be apparent from the following description, when taken in connection with the accompanying drawings, in which:

FIG. 1 is a side elevation of a mobile unit or surgical table to which my invention may be applied;

FIG. 2 is a top plan view of approximately one-half of the base of the surgical table of FIG. 1;

FIG. 3 is a sectional view taken substantially on the line 3—3 of FIG. 2 in the direction indicated by the arrows and showing the position the parts occupy when the casters are free to rotate about both a vertical and a horizontal axis;

FIG. 4 is a view of a portion of FIG. 3 showing the position of the parts when the casters are locked;

FIG. 5 is a view similar to FIG. 4 showing the position of the parts when the casters are to be released;

FIG. 6 is a top plan view of one of the casters; and

FIG. 7 is a sectional view taken substantially on the line 7—7 of FIG. 6 in the direction indicated by the arrows.

While the invention of this application may be applied to any type of unit having wheels or casters for rendering the unit mobile, it has been particularly designed for application to a mobile surgical table. This application will describe the complete locking mechanism together with the unique caster lock employed. However, this application will claim only the unique caster locks. The locking mechanism and associated elements will be reserved for the above mentioned companion application.

As shown in FIG. 1, the surgical table to which the caster locking mechanism of my invention is applied comprises a table surface, generally indicated by the numeral 11; mechanism for raising and lowering the table surface and tilting or actuating portions of it, generally indicated by the numeral 12; and an undercarriage or frame, generally indicated by the numeral 14. The locking mechanism for the casters, generally indicated by the numeral 16, comprises a manually operated lever, in this case a foot pedal 17, a shaft 18, a torsion bar assembly, generally indicated by the numeral 19, through which the shaft 18 is rotated and linkage, generally indicated by the numeral 21, for transmitting the force applied by the foot pedal to the individual caster assemblies.

The undercarriage or frame 14 is comprised of a multiplicity of welded steel bar sections including a circular section 22. The circular section 22 is joined by weldments to two irregularly shaped bent sections 23 as shown at 24. The other ends of the irregularly shaped sections 23 are joined by welding, as shown at 26, to crossbars 27. The irregularly shaped sections are also joined by weldments to a crossbar 28 and to the circular section 22 by fixed bars 29. At each of the corners 30, formed by the irregularly shaped sections 23, caster support plates 31 are welded, as indicated at 32. The support plates are provided with bolt openings 33 adapted to receive bolts 34 which extend through corresponding openings formed in caster mounting plates 36. (See also FIGS. 6 and 7.)

Foot pedal 17 has a rubber padded surface 37 and is connected to a long bar or lever 38 pivotally mounted on shaft 18 which extends across the machine from one side to the other. The foot pedal also carries a boss 41 on its underside adapted to receive a rubber bumper 42 if the foot pedal strikes the floor when depressed.

The torsion mechanism may be of any suitable type but preferably comprises a torsion cage 43 rigidly secured to the shaft 18 by a pin 40. The torsion cage 43 in this case has four bores for the reception of four preferably steel torsion bars 44. A boss 46 on lever 38 is likewise bored, as indicated at 49, for the reception of the torsion bars 44. For the present, it is sufficient to state that when the foot pedal 17 is depressed a force is applied on the torsion bars 44 to rotate the torsion cage 43 and thereby rotate the shaft 18.

The connections between the shaft 18 and the caster locks on each side of the unit are the same so that a description of one side of the unit will suffice. The linkage 21 between the shaft 18 and the caster locking mechanism comprises a link 51 pinned to the shaft as shown at 52. The link 51 carries a pin 53 and operates a bell crank 54. For this purpose, the end of the bell crank is bifurcated, as shown at 56, to receive the pin 53. The bell crank 54 is pivotally mounted on a pivot pin 57 which is fixed, as shown at 58, to a longitudinal bar 59 welded to the frame crossbars 27, and 28. The longitudinal bars 59 each has an opening 61 forming a bearing support for the shaft 18. The other arm of the bell crank is bifurcated, the bifurcations straddling a member 63. A pin 62 extends through member 63 and the bifurcated ends of the bell crank pivot on the pin 62. The member

63 constitutes a part of push-pull linkage for actuating the caster locks.

The linkage includes push-pull rods 64 and 66 which extend into bores formed in the member 63 and which are welded or soldered in position. The other ends of the links are threaded into turnbuckles 67. Nuts 68 hold the turnbuckles 67 against rotation. The other ends of the turnbuckles 67 are threaded to receive the threaded ends of links 71 and 72 which are also held rigidly in position by lock nuts 73. An opening 74 in each of the turnbuckles for reception of a bar enables turning of the turnbuckles upon loosening nuts 68 and 73.

The ends of the links 71 and 72 have downwardly turned hooks 76 which actuate the caster locks, as presently will appear. The turnbuckles 67, as well known in the art, are right and left hand threaded to receive right and left hand threads on links 64, 66, 71, and 72. The purpose of the turnbuckles will later appear.

Formed as part of the link member 51 is a boss 77 which has a threaded bore 78 adapted to receive a threaded screw 79 which may be locked in an adjusted position by a nut 81. The upper end of the screw 79 is adapted to engage underside of crossbar 28 under certain conditions of operation for a purpose which will presently appear.

The caster assembles, only one of which will be described, have been shown most clearly in FIGS. 6 and 7. Each of them includes a mounting plate 36 having openings 82 at the corners thereof. Through bolts extend through the openings 82 in the mounting plates and through the openings 33 in the caster support plates 31. The hook shaped ends 76 of the links 71 and 72 extend downward through an opening 83 in lever 84. A notched disc 86 has an annular ring of notches 87 into one of which the hooked end 76 is selectively engaged as shown in FIG. 7. The notched disc is retained in rigid relation to a plunger 88 as by welding, as indicated at 89. A snap retaining ring 91 is snapped over the end of the plunger and normally holds the apertured lever 84 in fixed relation to the notched disc 86.

Each of the casters, indicated as a whole by the numeral 90, comprises a wheel 92 covered with an annular rubber wear surface 93. The casters or wheels are carried by a roller yoke 94 the arms 95 of which are connected together by a bridge 96. A ball bearing assembly 97, diagrammatically illustrated (FIG. 6), enables free rotation of the caster 90 about a horizontal axis 98.

The bridge 96 of the roller yoke 94 has an opening 99 through which a stud 101 extends. The plunger 88 is enlarged at 102 and its periphery is threaded as indicated at 103, to mesh with complementary threads formed interiorly of the stud 101. Below the enlarged threaded portion 102 the plunger is decreased in diameter at 104 and a further decreased portion 106 projects below the stud 101.

The exterior of the stud 101 is threaded at 107 to receive a lock nut 108. After the stud 101 is adjusted toward and from the plate 36 so that ball bearing assemblies 109 and 111 will run freely, the lock nut 108 is tightened to hold the parts in this relationship. The ball bearing assemblies 109 and 111 are provided between the plate 36 and the top surface of the bridge of the roller yoke 96 and the bottom surface of the bridge of the roller yoke and a ball receiving flange on the stud 101 to enable free rotation of the caster about the vertical axis.

It now should be understood that the stud 101 is a fixed member locked to plate 36 by the nut 108. By providing clearance at 112, rotation of the notched disc 87 will cause threading or gearing in or out of the plunger on the threads 103 to shift the plunger part 104 upward or downward with respect to the stud. Due to the bearing assemblies 109 and 111, the roller yoke 94 and its arms 95 are free to rotate about the stud and with respect to the plate 36, the center of the plunger 88 being considered as a vertical axis.

A brake plate 116 has an opening 117 somewhat larger in diameter than the projecting end 106 of the plunger 88 freely extending therethrough. A snap ring 118 retains the parts in a loose fitting or spaced position. The brake plate 116 has a serrated or roughened braking surface 119 adapted to engage the periphery of the caster and a braking surface 121 adapted to engage the lower periphery of the stud 101. The end 122 of the brake plate extends through an opening 123 in the roller yoke so that when the force of the brake is not applied the brake rotates with the roller yoke. In the position of parts shown in FIG. 7, which is the unlocked position, I have shown a clearance between the braking surface 119 and the caster and between the braking surface 121 and the stud.

When the hook 76 is rotated in a clockwise direction, as viewed in FIG. 6, the lever 84 and the notched disc 86 are carried with it to rotate the plunger 88 with respect to the stud. This action shifts the brake plate 116 downward causing the braking surface 119 to engage the periphery of the caster and simultaneously the braking surface 121 to engage the stud 101. The caster is thus locked simultaneously against rotation about both a vertical and a horizontal axis.

The means for locking the casters of the mobile unit of my invention is provided with a latching mechanism, generally indicated by the numeral 126. In FIG. 3, I have shown the locking mechanism unlocked which position of the parts corresponds to the unlocked position of the casters as shown in FIG. 7.

Rigidly secured to the frame of the unit is a latch plate 127. A bifurcated latch 129 straddles the lever 38 and is pivoted thereto by means of a pin 130. The latch 129 has a catch 131 and a catch 132 between which angularly extending edge portions 133 of the arms of the bifurcated latch extend. The latching further includes inclined stop edge 134. A spring 136 mounted on a stud 137 carried by the bar 29 has its other end secured to a stud 138. The spring normally acts to pull the lever 38 in an upward direction or into the position of the parts shown in FIG. 3.

Lever 38 has an opening 139 in which a permanent magnet 141 is housed, the magnet being secured to the lever 38 by means of a pin 142. A pole piece carrier 143 is rigid with the latch 129 and mounted on the pivot 130. The pole piece carrier is bifurcated and straddles the latch 129. The pole piece carrier carries pole pieces 144 and 146 and an extended foot 147.

With the parts in position shown in FIG. 3, no space exists at 148 between the permanent magnet 141 and the pole piece 144. The pole piece 144 is drawn against the lower magnet pole.

When the foot pedal is depressed from the position of FIG. 3 to that of FIG. 4, the catch 131 moves downward away from the latch plate 127 and the edges 133 of the latch 129 ride on the edge of the latch plate 127. Due to the circular downward motion of the foot lever 38 and the continuous contact of edges 133 against latch plate 127, the latch 129 and the pole piece carrier 143 pivot clockwise with respect to the lever 38. A space 148 is thereby produced between the pole piece 144 and the lower magnet pole. Continued downward movement of the foot pedal and lever 38 brings the catch 132 to a position adjacent the latch plate 127. As soon as this occurs, the latch 129 and the pole piece carrier 143 are free to swing in a counterclockwise direction (FIG. 4), the swinging movement being caused by the snap action produced by the pole piece 144 being pulled back into engagement with the magnet 141. This position of the parts has been shown in FIG. 4 wherein the catch 132 lies beneath the latch plate 127 and the pole piece 144 is in engagement with the magnet 141. In this position of the parts all four casters are locked against rotation about either their horizontal or vertical axes.

When the casters are to be released the foot pedal is

further depressed until the rubber bumper **42** strikes the floor. During this movement, the stop edge **134** is riding on the latch plate **127**. During this additional downward movement of the foot pedal and lever **38**, the screw or stop **79** is in engagement with the under side of the bar **28**. The application of the stop **79** to the bar **28** of the frame results in the twisting of the torsion bars **44** without rotation of the shaft **18**. Thus, the additional downward movement of the lever **38** does not result in the application of additional or excessive forces on the casters.

It will now be understood that the load to be applied to the casters to lock them against movement is predetermined by the position of adjustment of the screw or stop **79** in the threaded bore **78** and the locking force may be adjusted to a predetermined value sufficient to positively lock the casters. Any additional downward movement of the foot pedal **17** (movement from FIG. 4 to FIG. 5) does not result in additional pressure on the casters but instead causes a twisting movement of the torsion bars.

Continued downward movement of the lever **38** results in the extended foot **147** striking the floor which action pivots the latch **129** and the pole piece carrier **143** in a clockwise direction as viewed in FIG. 4. As soon as the pole piece **146** is in proximity to the magnet **141**, the magnet attracts it and snaps the latch **129** in a clockwise direction. This position of the parts is shown in FIG. 5. In this position, latch plate **127** is clear of the catch **132** so that upon release of the foot pedal **17**, the spring **146** will restore the parts to the caster unlocked position of FIG. 3. In the drawings I have shown the extended foot as striking the floor. This could just as well be a portion of the frame.

One of the important features of the caster locking mechanism of my invention lies in the fact that each connection to a caster includes a turnbuckle **67** and an individual adjustment of each caster lock. By rotating a turnbuckle **67** in one direction or the other the link associated with the adjusted turnbuckle may be lengthened or shortened. Then by withdrawing the hook-shaped end **76** of the rod **71** (FIG. 7) from the opening **83** and rotating the lever **84** the hooked end may be reinserted to register with a different notch **87** in the disc **86**. It will be understood that this adjustment enables the application of the same locking force on all casters and enables adjustment to compensate for wear on the caster wear surface **93**. Thus each caster may be preloaded so that the preload on all casters is the same.

One of the problems encountered with surgical tables and other types of mobile units, lies in the fact that with casters that are freely rotatable about a vertical axis, it is difficult to push the table in a straight line. It is impossible for the person pushing the table to control the casters and quite frequently the table is bumped against the walls of the corridor or against a doorway jamb. So prevalent is this condition that it is commonplace in hospitals to see the walls marked up and scuffed and plaster displaced.

A novel feature of the invention which will be reserved for the above mentioned companion application is provision of means in connection with the two front casters for holding them rigidly in a straight line position and against rotation about a vertical axis. This means, as shown in FIG. 7, comprises a detent **156** which is pressed to a downward position by a spring **157**. In the form of the invention shown herein, the detent comprises a ball against which the spring bears. The other end of the spring seats against a threaded member or stop **158**. The stop is threaded into a threaded casing **159** and the casing is threaded into the mounting plate **36**. Lock nuts **160** hold the parts so that the detent **156** is in a desired position of adjustment. The ball detent is adapted to seat in an opening **161** formed in the bridge **96** of the roller yoke **94**.

When the table is pushed through a corridor, the forward casters tend to move in a straight line and the detents automatically find the openings **161** to hold the casters in a line parallel to the longitudinal axis of the table. When it is desired, a slight sideward push on the table will release the detents **156** from the openings **161**.

While I have shown and described the preferred forms of mechanism of the invention, it will be apparent that various changes and modifications may be made therein, particularly in the form and relation of parts, without departing from the spirit of the invention as set forth in the appended claims.

I claim:

1. An assembly for an axled wheel for a mobile unit comprising, in combination, a depending member rigidly connected to said mobile unit, a yoke embracing an axle rotatably supporting a wheel, said yoke being rotatably mounted with respect to said member, a brake between said member and wheel having a first braking surface adapted to engage said depending member and a second braking surface adapted to engage said wheel, and movable means to which said brake is pivotally mounted extending vertically through the axis of rotation of said yoke for actuating the brake to engage both the periphery of the wheel and member, thereby locking said wheel and yoke against rotation.

2. An assembly in accordance with claim 1 including threaded means interconnecting said movable means and said depending member permitting actuation of said brake.

3. An assembly for an axled wheel for a mobile unit comprising in combination, a depending member rigidly connected to said mobile unit, a yoke embracing an axle rotatably supporting a wheel, said yoke being rotatably mounted around said member, a brake pivotally supported between said member and wheel, said brake having a first braking surface adapted to engage said depending member and a second braking surface adapted to engage said wheel, and movable means slidably mounted concentrically within said member and extending vertically through the axis of rotation of said yoke for actuating the brake to engage said second braking surface against the periphery of the wheel at a first pivot point and pivot said brake about said first pivot point to engage said first braking surface against said member, thereby locking said wheel and yoke against rotation.

4. An assembly in accordance with claim 3 including threaded means intermediate said member and movable means permitting rotation of said movable means downwardly.

5. An assembly for an axled wheel for a mobile unit comprising, in combination, a yoke embracing an axle rotatably supporting a wheel, said axle being the horizontal axis of said wheel, a stud rigidly connected to said mobile unit, means intermediate said yoke and stud enabling said yoke to rotate concentric to at least a part of said stud, a vertically movable member having a vertical axis radially spaced from said horizontal axis, said movable member being concentric with and slidably mounted in said stud, a brake member having an upper braking surface adapted to engage said stud and a lower braking surface adapted to engage said wheel, said brake being positioned between said stud and wheel and pivotally connected at its inner most radial point to said vertically movable member, and actuating means connected to said movable member for sliding said movable member vertically to actuate said brake member to engage said lower braking surface against the periphery of said wheel at a pivot point thereon and pivot said brake about said pivot point on said wheel to engage said upper braking surface against said stud, thereby locking said wheel and yoke against rotation.

6. An assembly for an axled wheel for a mobile unit comprising, in combination, a yoke embracing an axle rotatably supporting a wheel, said axle being the hori-

zontal axis of said wheel, a stud rigidly connected to said mobile unit, means intermediate said yoke and stud enabling said yoke to rotate concentric to said stud, a vertically movable member constituting the vertical axis of said yoke, said vertically movable member being connected to said stud and adapted to slide relative thereto, a brake member pivotally mounted intermediate said wheel and stud having an upper braking surface radially spaced from said vertical axis adapted to engage said stud and a lower braking surface radially spaced a lesser distance from said vertical axis than said upper braking surface adapted to engage said wheel, and means connected to said vertically movable member for actuating said brake member to engage said lower braking surface against the periphery of said wheel at a pivot point thereon and pivot said brake about said pivot point on said wheel to engage said upper braking surface against said stud, thereby locking said wheel and yoke against rotation.

7. Apparatus in accordance with claim 6 in which said brake is pivotally mounted to said movable member.

8. An assembly for an axled wheel for a mobile unit comprising, in combination, a yoke embracing an axle rotatably supporting a wheel and said axle constituting the horizontal wheel axis, a mounting plate carried by the mobile unit, a stud having a threaded bore, said stud being connected to said mounting plate, a post extending through said stud and constituting a vertical axis about which the yoke may rotate, said post having a threaded portion mating with the threaded bore of said stud, a brake pivotally mounted between said wheel and stud, said brake having an upper braking surface adapted to engage said stud and a lower braking surface adapted to engage said wheel, means connected to the upper end of said post for rotating said post to actuate said brake downwardly and move said lower braking surface into engagement with the periphery of the wheel and the upper braking surface upwardly into engagement with said stud to prevent rotation of said wheel about the horizontal axis and said yoke about the vertical axis.

9. An assembly for an axled wheel for a mobile unit comprising, in combination, a yoke embracing an axle in turn rotatably supporting a wheel, said axle constituting the horizontal wheel axis, said yoke having a hole therein, a stud having a threaded bore, said stud being rigidly connected to said mobile unit, a post extending through said stud and constituting a vertical axis about which the yoke is rotatably mounted, said post having threads mating with the threaded bore of said stud, a brake having a first braking surface adapted to engage said wheel and a second braking surface adapted to engage said stud, said brake being rotatably mounted on the lower end of and about the vertical axis of said post, said brake also being pivotally mounted to the lower end of said post to pivot between a locked and an unlocked position, said brake tranversing said hole of said yoke enabling said brake to rotate with said yoke, means connected to said post for rotating said post to actuate said brake and move it into said locked position and engagement with the periphery of the wheel and into engagement with said stud to prevent rotation of said wheel about the horizontal axis and said yoke about the vertical axis.

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