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Powlan

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[45] **June 10, 1975**

[54] **ADJUSTABLE TRACTION DEVICE**

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[52] **U.S. Cl.** ..... **128/75;** 128/84 C

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

[58] **Field of Search** 128/75, 70, 71, 72, 73, 128/74, 84, 85

[56] **References Cited**

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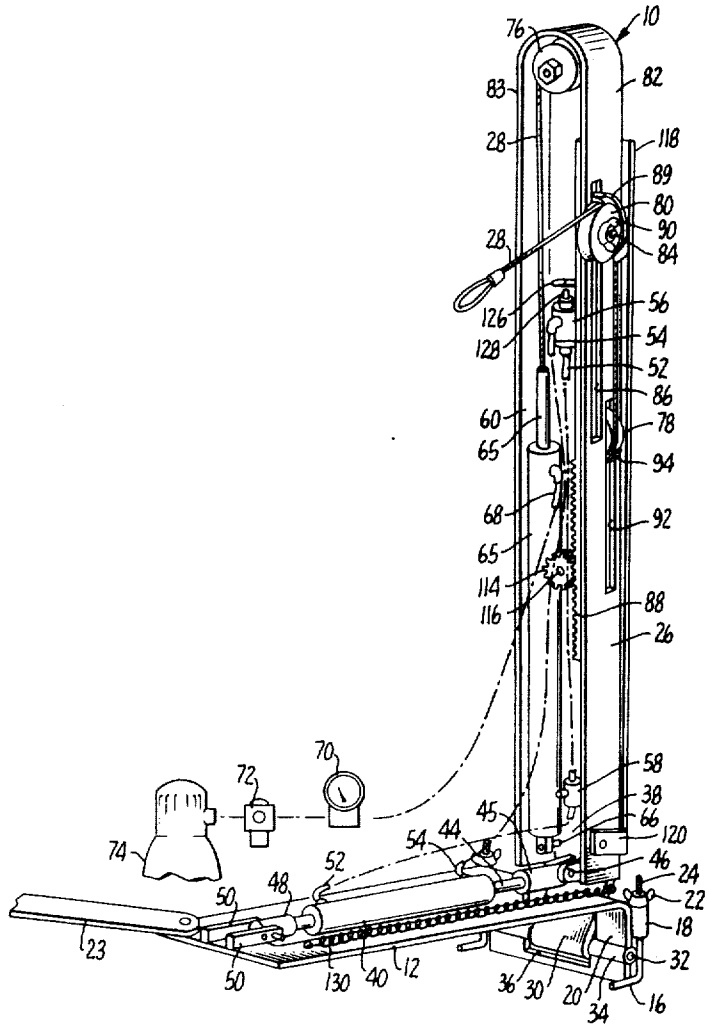
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Primary Examiner—Richard A. Gaudet
Assistant Examiner—J. Yasko

[57] **ABSTRACT**

A traction device comprises a base portion for mounting to the frame of a hospital bed. An upright support is swingably secured to the base portion and extends above the level of the bed. Flexible cable means are provided on the support for attachment to the patient. The vertical positioning of the flexible cable is adjustable on the support without changing the effective length of the cable. The swingable support may be moved in a direction away from the patient but, ordinarily, not toward the patient. However, control means are provided for overriding this condition and for automatically doing so whenever movement of the bed frame brings the support into engagement therewith.

11 Claims, 8 Drawing Figures



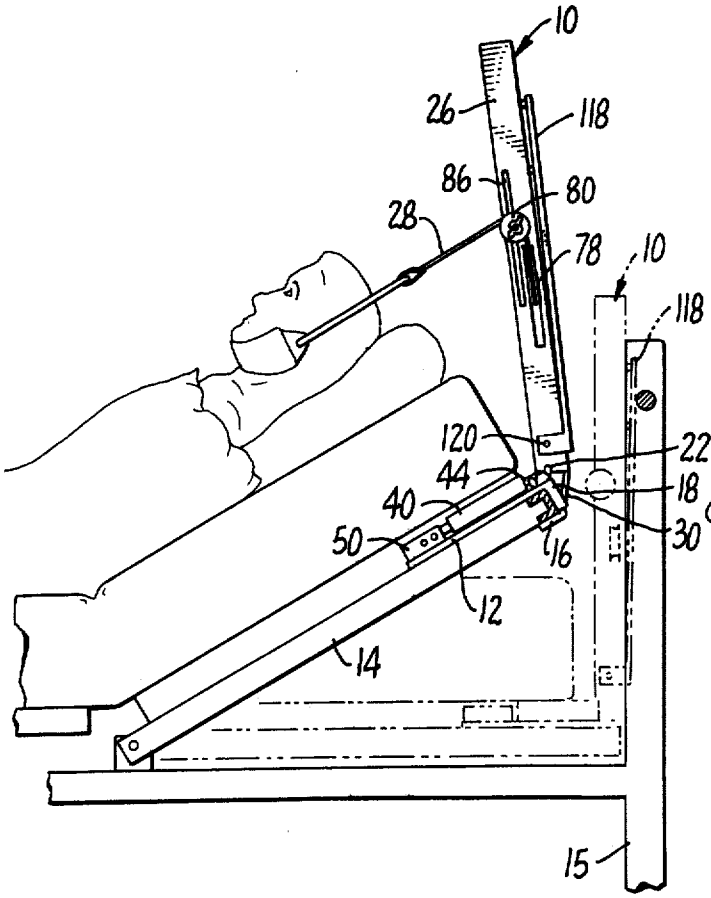

10
26
118
86
80
28
78
10
118
120
22
44
18
40
30
50
16
12
14
15

FIG. 1.

76
10
83
82
28
118
89
80
90
84
28
126
56
128
54
52
86
60
78
65
94
68
92
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114
116
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70
72
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120
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44
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12
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34
16

FIG. 2.

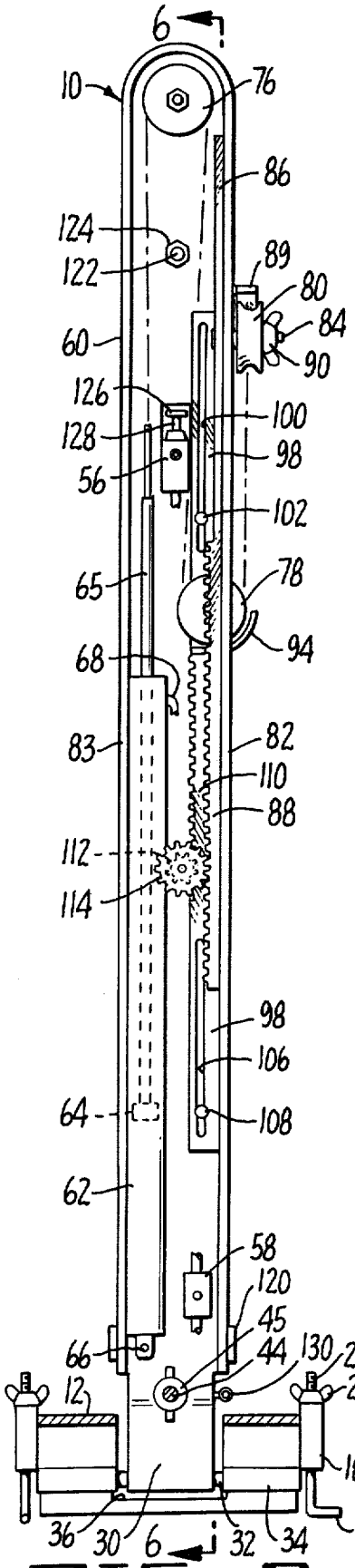


FIG. 3.

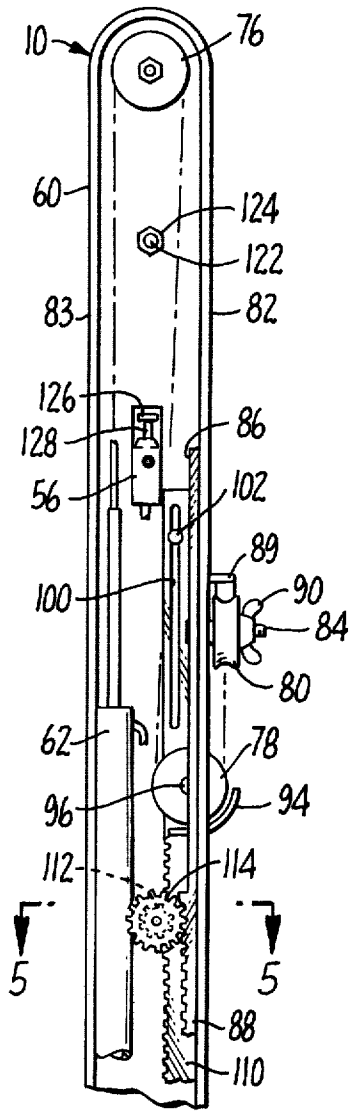


FIG. 4.

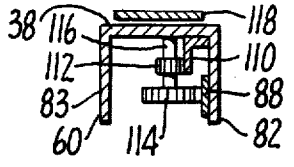
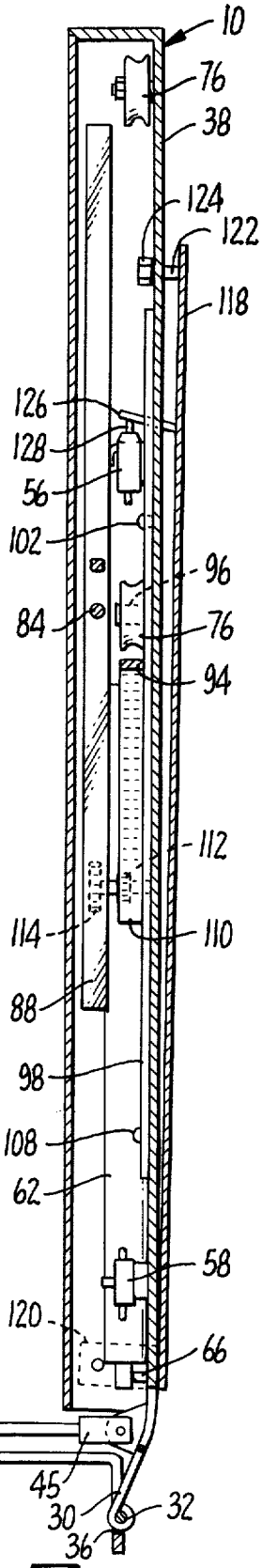


FIG. 5.



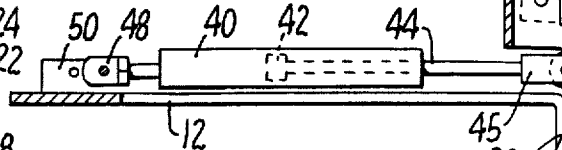


FIG. 6.

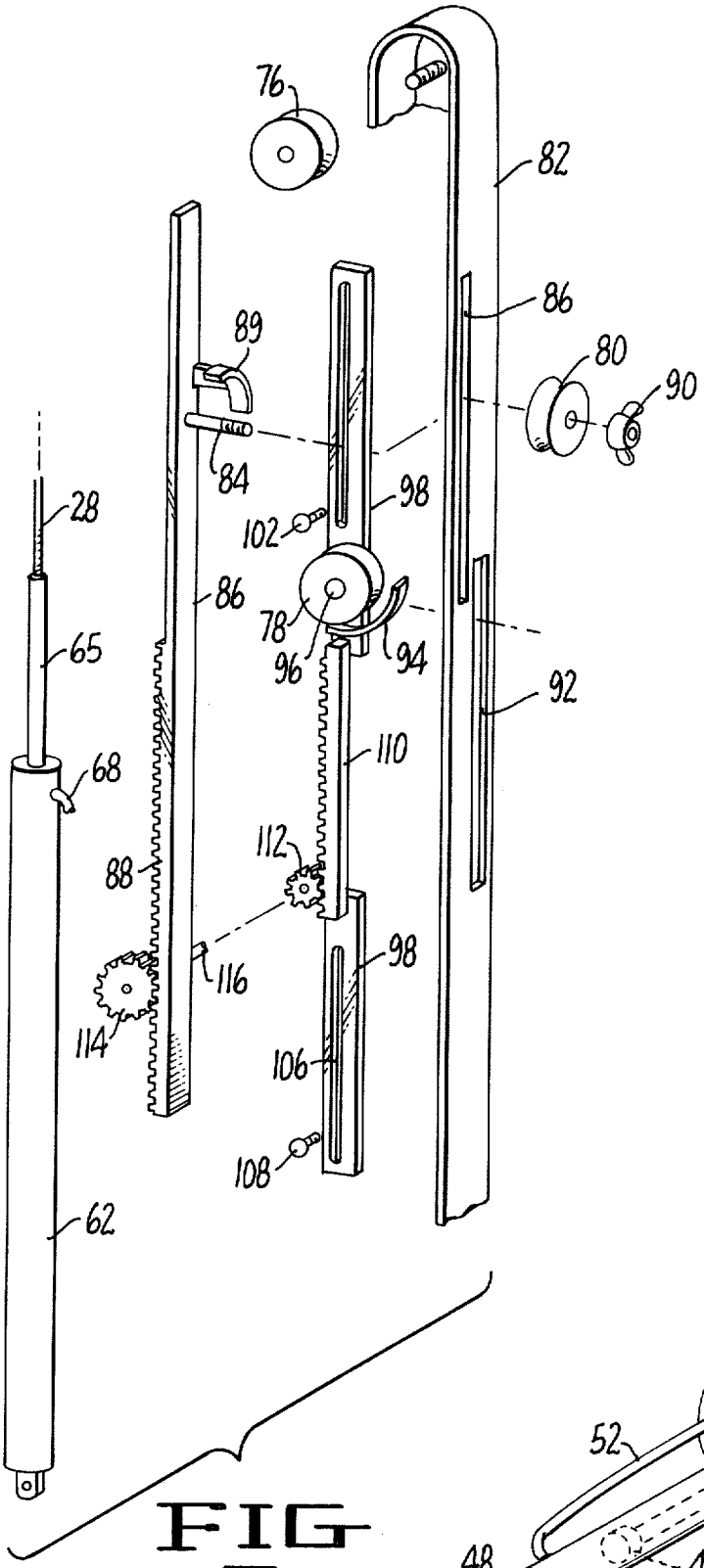

76
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89
86
80
90
84
98
102
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86
78
96
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92
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110
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112
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116
114
106
108
62

FIG. 7.

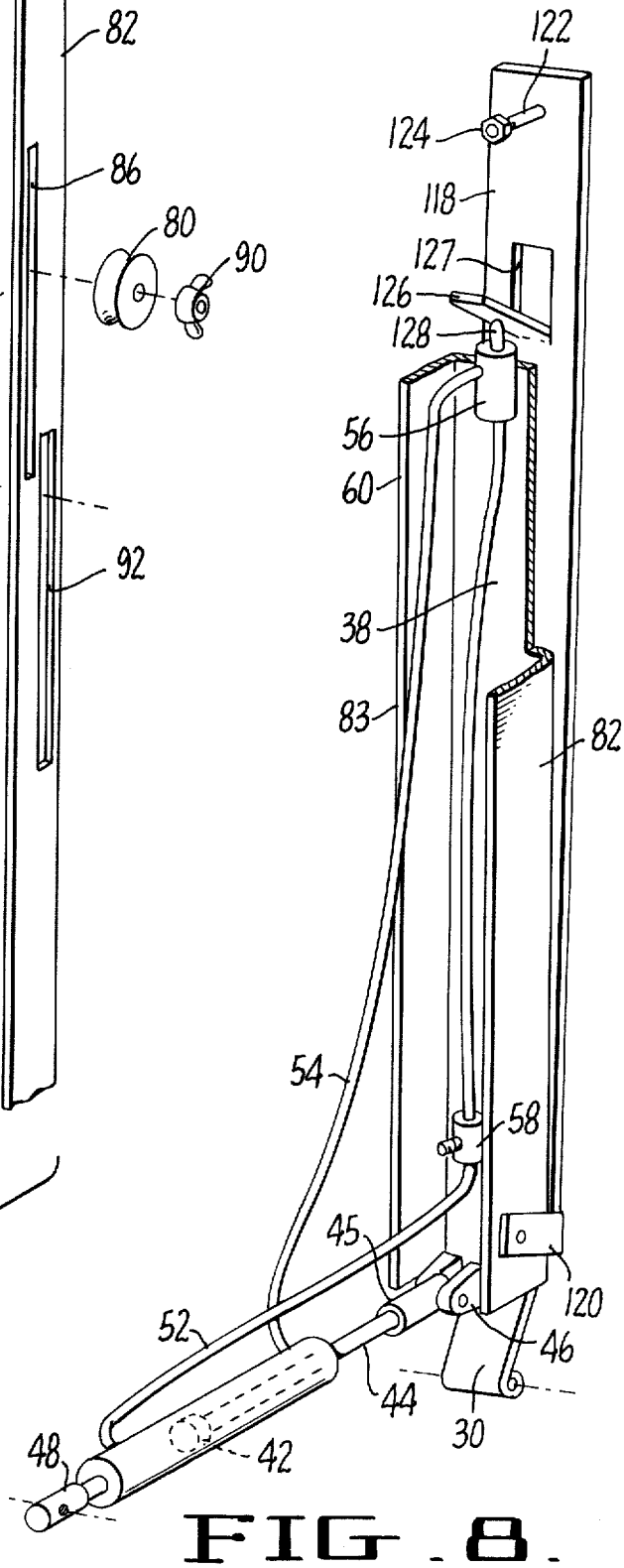

122
124
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FIG. 8.

ADJUSTABLE TRACTION DEVICE

The invention relates to traction devices and, more particularly, to a traction device adapted to be mounted on a movable part of a hospital bed frame and adjustable relative to a patient on the bed so as to maintain proper traction on the patient when the bed is moved through its various positions.

In brief, the invention comprises a base mounted to a hospital bed and having an upright support extending above the level of the bed swingably secured to the base portion whereby said support may be moved away from a patient in the bed. Flexible cable means are secured to said support for attachment to a patient in the bed and the vertical position of said cable means is adjustable relative to said support. Means are provided for applying a force to said cable means to place the patient in traction.

In the drawings:

FIG. 1 is a side view in which a traction device constructed in accordance with the teachings of the invention is mounted to the movable portion of the hospital bed frame lying beneath the mattress and the upper portion of the patient;

FIG. 2 is a perspective view of the traction device with the front panel of the support removed to show the inner mechanism;

FIG. 3 is a front view of the support for the traction device;

FIG. 4 is a partial front view similar to that of FIG. 3 showing the cable means after a change in the vertical position thereof;

FIG. 5 is a sectional view taken along the line 5—5 in FIG. 4;

FIG. 6 is a side view of the support of the traction device taken along the line 6—6 in FIG. 3;

FIG. 7 is an exploded view showing the compensating mechanism for the flexible cable means; and

FIG. 8 is a partial perspective view of the control means on the support which permits the support to be moved toward the patient.

Referring first to FIG. 1, a preferred embodiment of the invention is shown mounted on the frame of a hospital bed and with flexible cable means attached to a patient so as to apply traction. The traction device **10** comprises a base portion **12** adapted for mounting on the frame **14** of a hospital bed **15.** In the drawings, the traction device is shown secured to the pivoted portion of the bed frame which underlies the upper portion of the patient. This portion of a hospital bed is frequently pivotable so as to enable a patient to change from a prone position to a sitting position or, if desired, any intermediate position. As will be apparent, the base portion of the traction device could also be applied to other portions of the frame of the hospital bed.

The base portion **12** is secured to the bed frame **14** by means of L-shaped clamps **16** that are threadedly mounted into lugs **18** welded to the mounting bracket **20** on the base support **12.** Wing nuts **22** are mounted on the threaded ends **24** of the clamps and serve to tighten the clamps against the underside of the bed frame **14.** For added stability, the base portion **12** has an arm **23** that hooks over the side of the bed frame **14.**

An upright support **26** is secured to the base portion **12.** The support **26** carries flexible cable means **28** for attachment to the patient. As seen from the drawings, the support **26** extends above the level of the patient on the hospital bed so as to provide a point from which

traction may be applied. The support **26** is swingably connected to the base portion **12** by a tongue or arm **30** that is rotatably mounted on a shaft **32** secured in a pair of bosses **34** on the mounting bracket **20.** An opening **36** is provided on the mounting bracket **20** to accommodate the tongue **30** which is rigidly fixed to the back **38** of the support **26.** The support is adapted for swingable movement relative to the base portion in one direction only — in a direction away from the patient on the bed. Swingable movement of the support toward the patient is normally prevented.

Control of the movement of the support **26** relative to the base portion **12** is accomplished by pressure fluid means including a cylinder **40** and a piston **42.** The rod **44** for the piston **42** has a terminal bar portion **45** that is pinned between a pair of brackets **46** fixed to the lower end of the back **38** of the upright support **26.** The cylinder **40** has a similar terminal bar **48** secured to it and this terminal bar **48** is likewise pinned between a pair of brackets **50** at the cylinder end of the base portion **12.**

Opposite ends of the cylinder **40** are interconnected by conduits **52** and **54.** The conduit **54** goes from the rod side of the cylinder to a one-way check valve **56** mounted on the back **38** near the upper end of the support **26.** The conduit **52** interconnects the head end of the cylinder with the check valve **56** through an adjustable bleed valve **58.** By reason of this arrangement, a force applied to the support **26** tending to pivot or swing the support in a clockwise direction (as viewed in FIG. 2) will cause the support to pivot about the shaft **32.** Pivotable movement of the support **26** in this direction will cause the piston rod **42** to be withdrawn from the cylinder **40.** This movement will cause air to bleed through conduit **54,** pass check valve **56** under the control of the bleed valve **58** to the head end of the cylinder through conduit **52.** Any attempt to swing the support **26** in an opposite direction relative to the base portion **12** will be prevented by the check valve **56** which prevents any transfer of air from the head end of the cylinder to the rod end of the cylinder.

In the preferred form of the invention shown in the drawings, the upright support **26** comprises a U-shaped channel member **60.** Ordinarily, the support **26** is provided with a front-plate (not shown) which covers the mechanism inside the support. In the drawings accompanying the application, the front-plate has been removed to show the inner mechanism. It is preferred to provide pressure fluid means for applying traction to a patient on the bed. Accordingly, a second pressure fluid means is mounted within the U-shaped channel member **60.** The pressure fluid means comprises a cylinder **62** and a piston **64** which reciprocates with respect to the cylinder. The rod **65** for the piston **64** is secured to one end of the flexible cable **28** so that movement of the piston **64** relative to the cylinder **62** moves the flexible cable **28** an equal amount. The lower end of the cylinder **62** is fixedly secured to the back **38** of the channel member **60** by a pin **66.** At its upper or rod end, the cylinder **62** has a pressure fluid conduit **68** that connects with a pressure gauge **70,** a control valve **72** and a source of compressed fluid, in this case, a cylinder of compressed air **74.**

The flexible cable means for applying traction to a patient comprises a cable **28** secured to the piston rod **65.** The cable passes over a pulley **76** mounted at the upper end of the channel member **60,** then downwardly

around an intermediate pulley **78**, thence upwardly to a terminal pulley **80** which directs the flexible cable **28** toward the patient. The terminal pulley **80** is mounted externally of the support **26** at one side **82**. The pulley **80** is rotatably mounted on a short, stub shaft **84** that extends through an elongated slot **86** in the side **82** of the support **26**. The stub shaft is fixed to a bar **86** that has a gear segment **88** formed on its lower half. A curved guide **89** for the flexible cable **28** is also fixedly mounted to the bar **86** so as to closely overlay the terminal pulley **80**. The pulley **80** is maintained on the stub shaft **84** by a wing nut **90**. The vertical position of the terminal pulley **80** relative to the support **26** may be adjusted by loosening the wing nut **90** and sliding the pulley up or down relative to the support. The amount of adjustment is substantially equal to the length of the elongated slot **86**.

Inasmuch as the flexible cable **28** has a fixed length, adjustment of the terminal pulley **80** would, without a compensating mechanism, vary the amount of cable available at the free end for attachment to the patient. To provide a substantially constant length of cable for attachment to the patient, a compensating mechanism is provided on the support **26**. The compensating mechanism includes an adjustable mounting for the intermediate pulley **78**. The pulley **78** extends partially through a second elongated slot **92** in the side **82** of the upright support **26**. A curved guide member **94** is provided for the pulley **78** so as to guide the flexible cable **28**. The intermediate pulley **78** is mounted on a short, stub shaft **96** which is secured to a longitudinal mounting plate **98**. The plate **98** is adjustably mounted to the back **38** of the upright support **26** by a pair of elongated slots **100, 106**. Screws **102, 108** secure the plate **98** to the back **38** with sufficient clearance to enable the plate **98** to slide vertically relative to the support. The plate member **98** has a gear segment **110** disposed parallel to the gear segment **88** but offset therefrom a slight distance. A small gear **112** meshes with the gear segment **110** while a larger gear **114** meshes with the gear segment **88**. Both gears are mounted on the same shaft **116**.

By reason of this compensating mechanism, adjustment of the terminal pulley **80** causes a compensating adjustment in the vertical position of the intermediate pulley **78**. This is done when the wing nut **90** is loosened and the pulley **80** is slidably moved up or down. The movement of the pulley **80** also moves the plate **86** and the gear segment **88**. Movement of the gear segment **88** rotates gear **114** which in turn rotates the shaft **116** and causes gear **112** to rotate. Rotation of the gear **112** moves the gear segment **110** half the distance of the gear segment **88** so as to maintain the effective length of the cable the same. In this way, the distance from the centerline of the upper pulley **76** to the centerline of the intermediate pulley **78** to the centerline of the terminal pulley **80** is always constant. See FIGS. **3** and **4**.

In operation, the application of traction to the patient will be made under the supervision of the patient's doctor. At that time, the amount of pressure in cylinder **62** will be regulated so as to provide the desired amount of force on the cable **28**. At the same time, the position of the terminal pulley **80** will be set so that the traction force is applied in the proper direction. These adjustments may be made with the bed frame in any position but frequently will be made with the pivotable frame **14** in its lowermost position. When done with the frame in this position, the upright support **26** will be at substantially right angles to the base **12** (see FIG. 1). Should the patient thereafter change his bed position by pivoting the bed frame **14** upwardly toward a sitting position, the patient may wish to change the position of the upright support **26**. To do so the patient need only reach behind him and push the support **26** away from him. If, by reason of a change in position of the patient, it becomes necessary to change the vertical position of the terminal pulley **80**, this can be easily accomplished by loosening the wing nut **90** and repositioning the pulley in the slot **86**.

If the bed frame is lowered while the support **26** is in a rearwardly inclined position, such as that shown in FIG. **1**, the support will eventually come into contact with the bed frame **15**. Ordinarily, swingable motion of the support **26** toward the patient is prevented as previously explained. However, in such a case it is desirable to permit the support **26** to swing toward the patient to avoid wedging the traction device against the bed frame. Accordingly, the support **26** is provided with a long lever arm **118** at the back of the support. Lever arm **118** has a pair of arms **120** that are pivotally secured to the sides **82, 83** of the support. At its upper end the lever arm has a short screw **122** that extends into the support **26**. A nut **124** prevents the screw from pulling out and retains the lever arm on the support. Just below the screw **122** the lever arm **118** has a tongue **126** which extends inwardly through an access opening **127** in the back of the support **26**. The tongue **126** slidably engages a plunger **128** that extends upwardly from the check valve **56**. Depression of the plunger **128** causes the check valve to be held open so as to permit pressure fluid to flow from the roy end of cylinder **40** to the head end of the cylinder. Inasmuch as the tongue **126** is inclined at an angle to the plunger **128**, inward movement of the lever arm **118** toward the support **26** causes the tongue **126** to depress the plunger **128**. As the traction device **10** comes into contact with the bed frame **15**, the lever arm **118** is forced inwardly toward the support **26** causing the tongue **126** to depress the plunger **128** and open the check valve **56**. The support arm **26** is thus allowed to swing inwardly toward the patient under the urging of a spring **130** as the bed frame **14** lowers. Lever arm **118** can also be manually pressed so as to swing the support **26** at other times.

I claim:

1. An adjustable traction device comprising:

a. a base portion adapted to be mounted to a hospital bed,

b. an upright support extending above the level of the bed and swingably secured to the base portion whereby said support may be moved away from a patient in the bed,

c. flexible cable means secured to said support for attachment to a patient in the bed, the vertical position of the point of attachment for said cable means being vertically adjustable relative to said support, and

d. means for applying a force to said flexible cable means to place the patient in traction wherein said force applying means comprise pressure fluid means including a cylinder and piston for the cylinder, said piston being secured to said flexible cable

and said cylinder being secured to said base portion.

2. An adjustable traction device as set forth in claim 1 wherein said base portion is mounted on a movable portion of the hospital bed frame.

3. An adjustable traction device as set forth in claim 2 wherein said flexible cable means are provided with a compensating mechanism whereby the cable means may be adjusted vertically on said support without changing the effective length of the cable.

4. An adjustable traction device as set forth in claim 3 wherein said base support is provided with means for limiting free swingable movement of said support relative to said base to a direction away from the patient.

5. An adjustable traction device as set forth in claim 4 wherein said means for limiting swingable movement of said support relative to said base portion comprises second pressure fluid means including a cylinder and a piston for the cylinder, said piston being connected to the swingable support.

6. An adjustable traction device as set forth in claim 5 having control means for disabling said limiting means to permit the swingable support to be moved in a direction toward the patient.

7. An adjustable traction device as set forth in claim 6 wherein said control means is automatically actuated to disable said limiting means whenever the support contacts the bed frame.

8. An adjustable traction device comprising:

a. a base portion adapted to be mounted to a movable portion of a hospital bed frame,

b. an upright support extending above the level of the mattress of the bed and swingably secured to the base portion,

c. first pressure fluid means mounted on the base portion including a cylinder and a piston for the cylinder, said piston being connected to the support whereby the support is freely swingable relative to the base portion in a direction away from a patient on the bed but not swingable relative to the base portion in a direction toward the patient,

d. control means on the support for disabling said pressure fluid means, said control means including means for venting pressure from said cylinder to permit the support to swing toward the patient,

e. a flexible cable on said support for attachment to a patient on the bed, and

f. second pressure fluid means on the support including a cylinder and a piston for the cylinder, said piston being secured to the flexible cable to permit the patient to be placed in traction.

9. An adjustable traction device as set forth in claim 8 wherein said flexible cable upon attachment to a patient passes around a pulley that is vertically adjustable on said support.

10. An adjustable traction device as set forth in claim 9 wherein said flexible cable engages a plurality of pulleys between its attachment to the piston and to the patient and said support is provided with a compensating mechanism whereby the position of said vertically adjustable pulley may be varied without changing the effective length of the flexible cable.

11. An adjustable traction device as set forth in claim 10 wherein said support has a movable lever arm engagable with a valve for venting pressure from the cylinder of said first pressure fluid means.

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