United States Patent [19]

Smith

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[54] **PORTABLE INTERMITTENT ORTHOPEDIC TRACTION DEVICE**

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[52] **U.S. Cl.** **128/75**

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

[58] **Field of Search** 128/75, 84; 242/107, 129.1, 242/129.2, 129.3

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[57] **ABSTRACT**

A portable intermittent orthopedic traction device for applying vertical or horizontal cervical traction and horizontal pelvic traction. The device utilizes a reversible motor assembly to apply traction controllable in amount by a simple lever control for a short time period. Thereafter, the motor reverses, relieving the traction for a second short time period whereupon the cycle is again initiated and traction reapplied. A time delay relay provides the timing for the system and a quick release is provided so as to allow the rapid extension or withdrawal of the tension line to a desired position. The device is adapted to connect to a door or bed in a simple and convenient manner.

2 Claims, 9 Drawing Figures

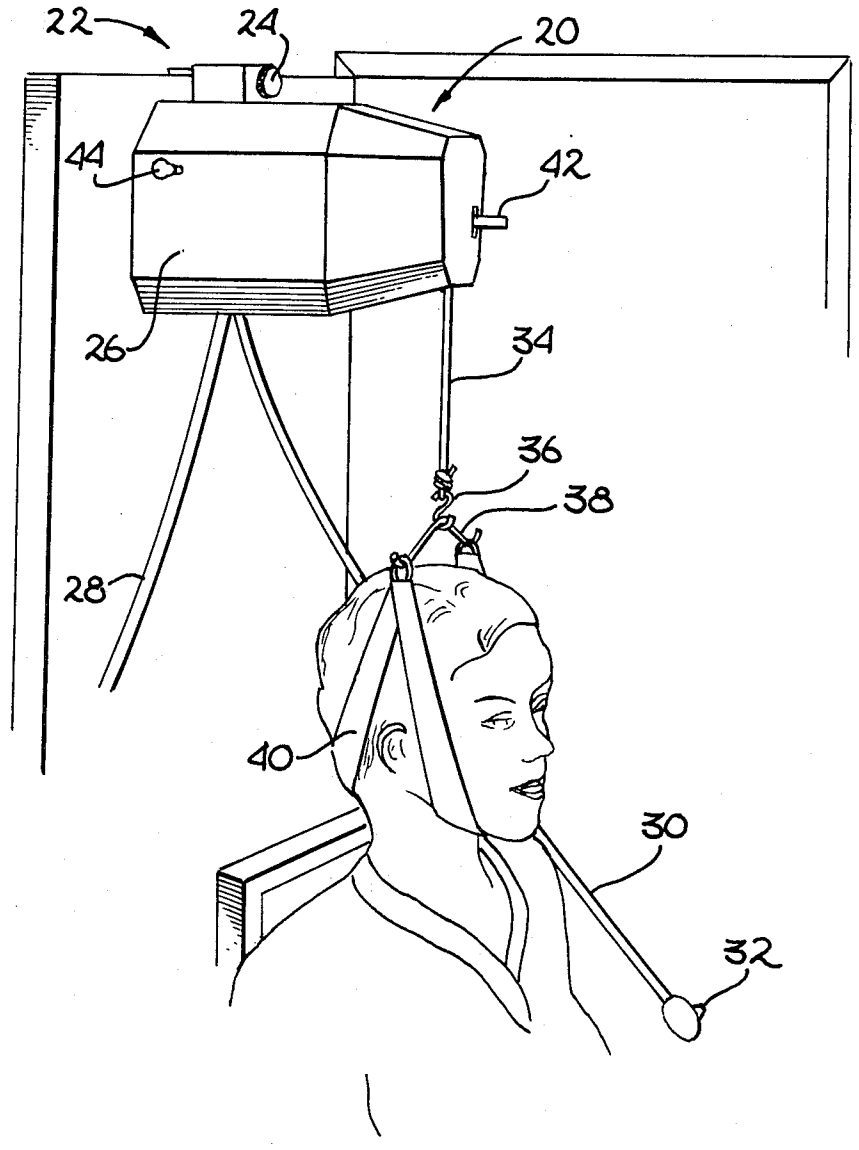
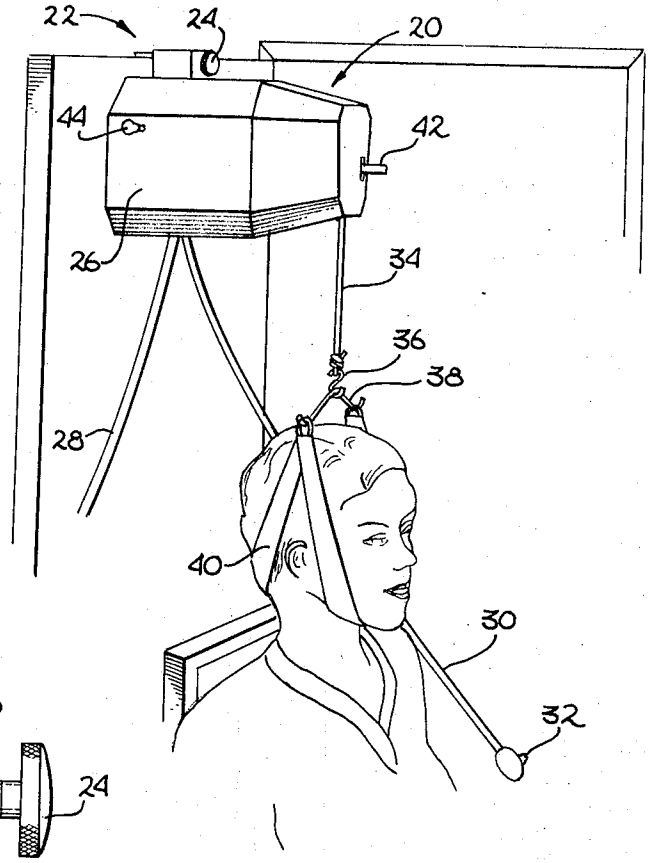


Fig. 1


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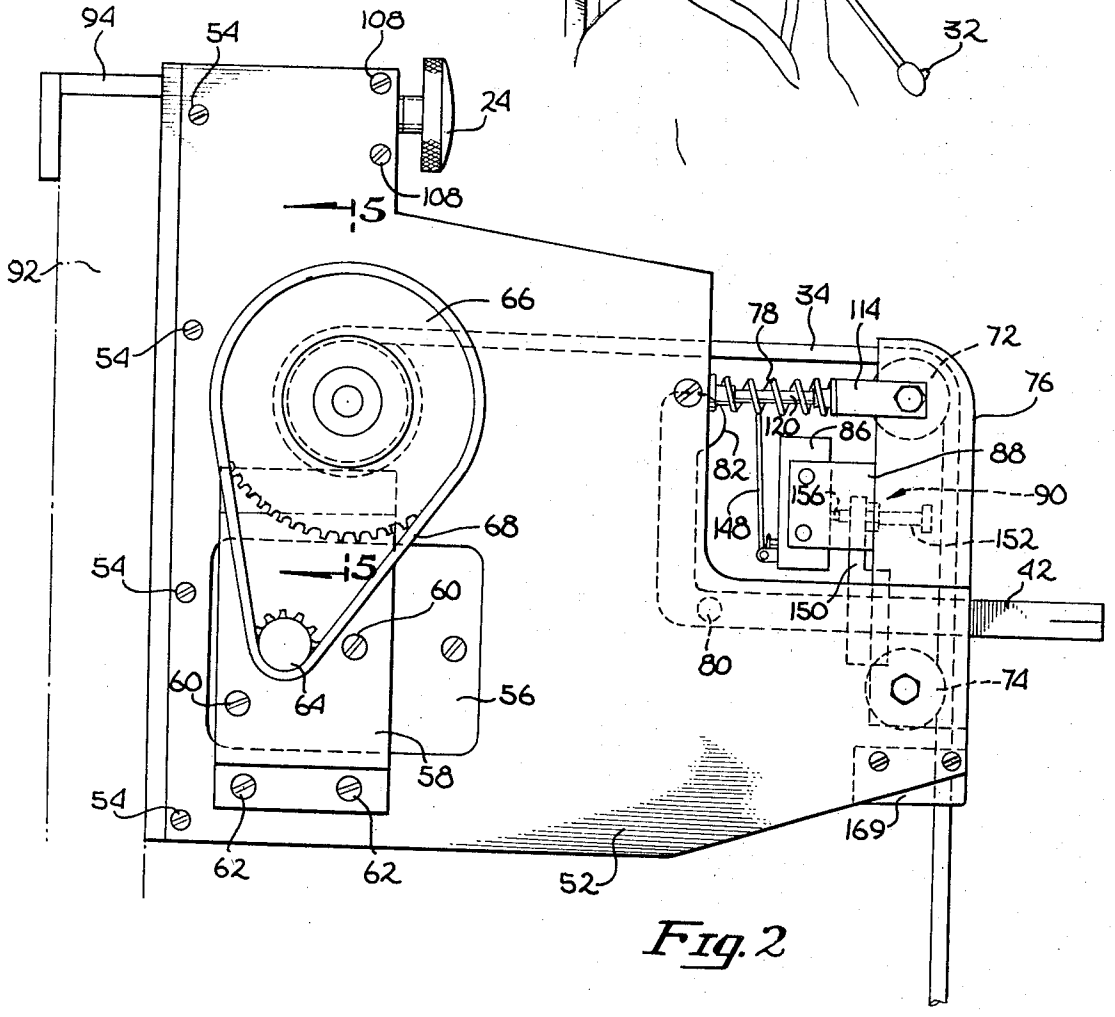

94
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108
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34
114
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76
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90
148
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60
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169

Fig. 2

Fig. 3

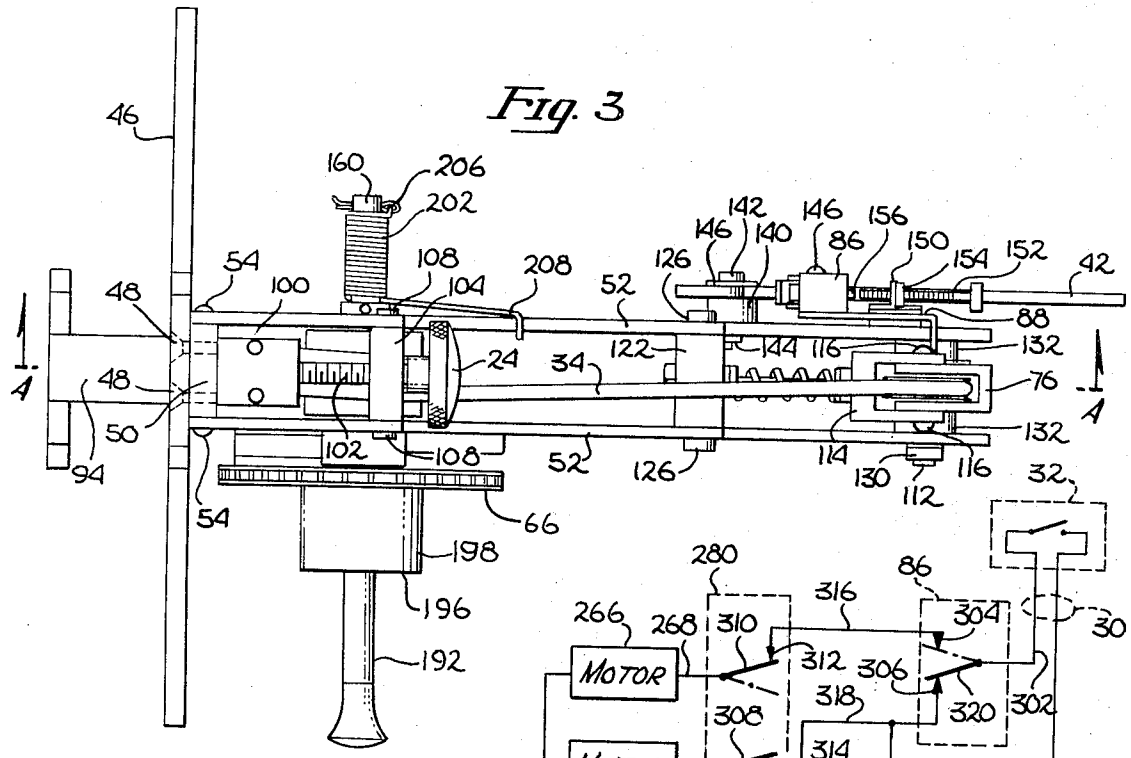


Fig. 9

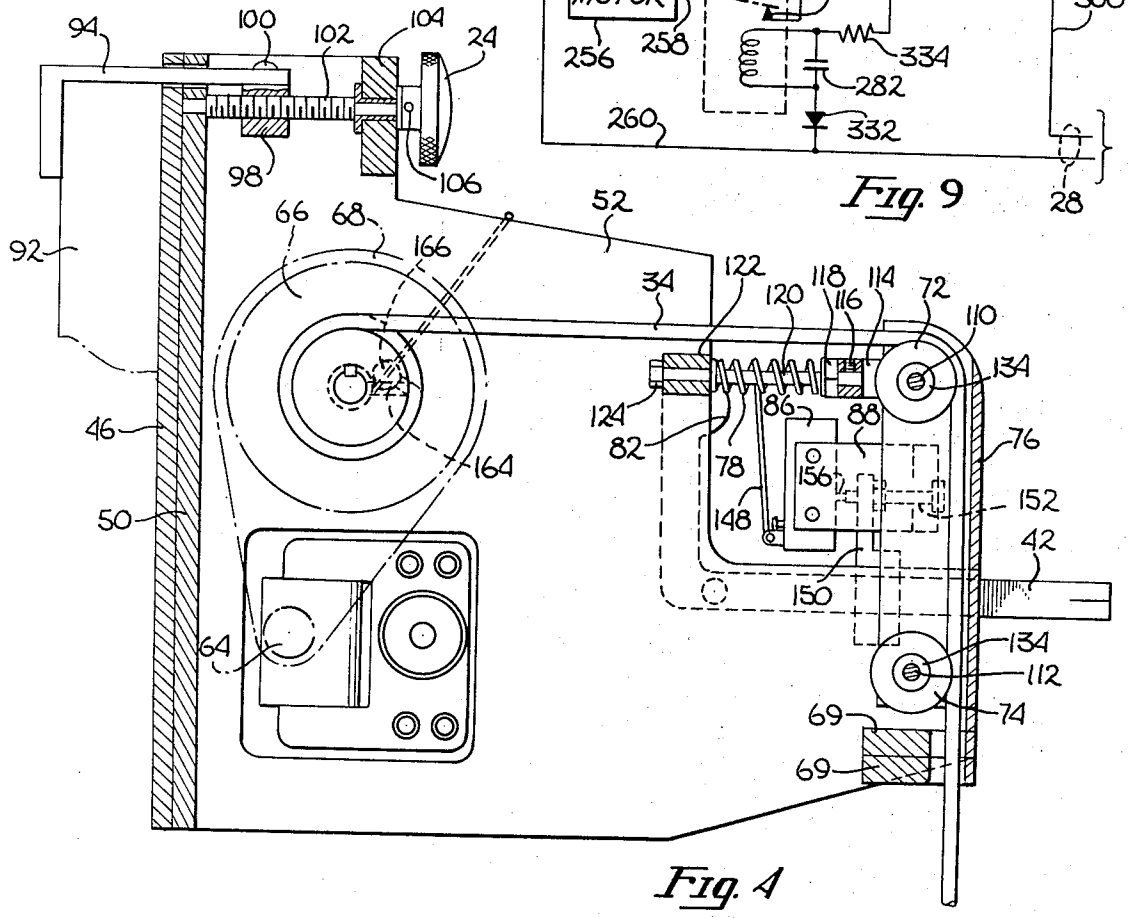


Fig. 4

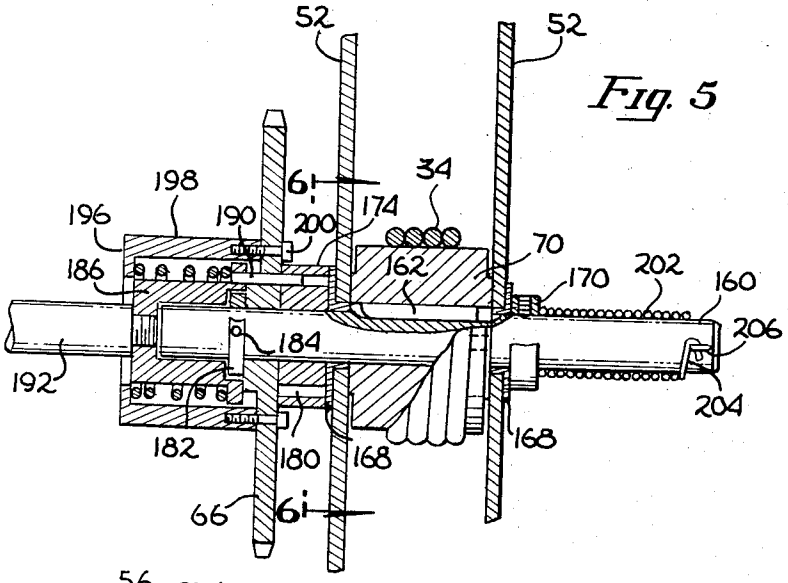


Fig. 5

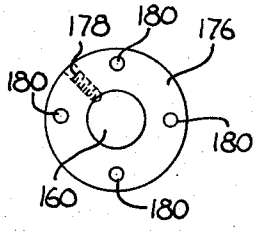


Fig. 6

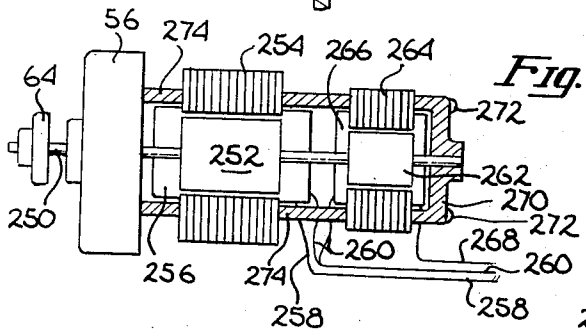


Fig. 8

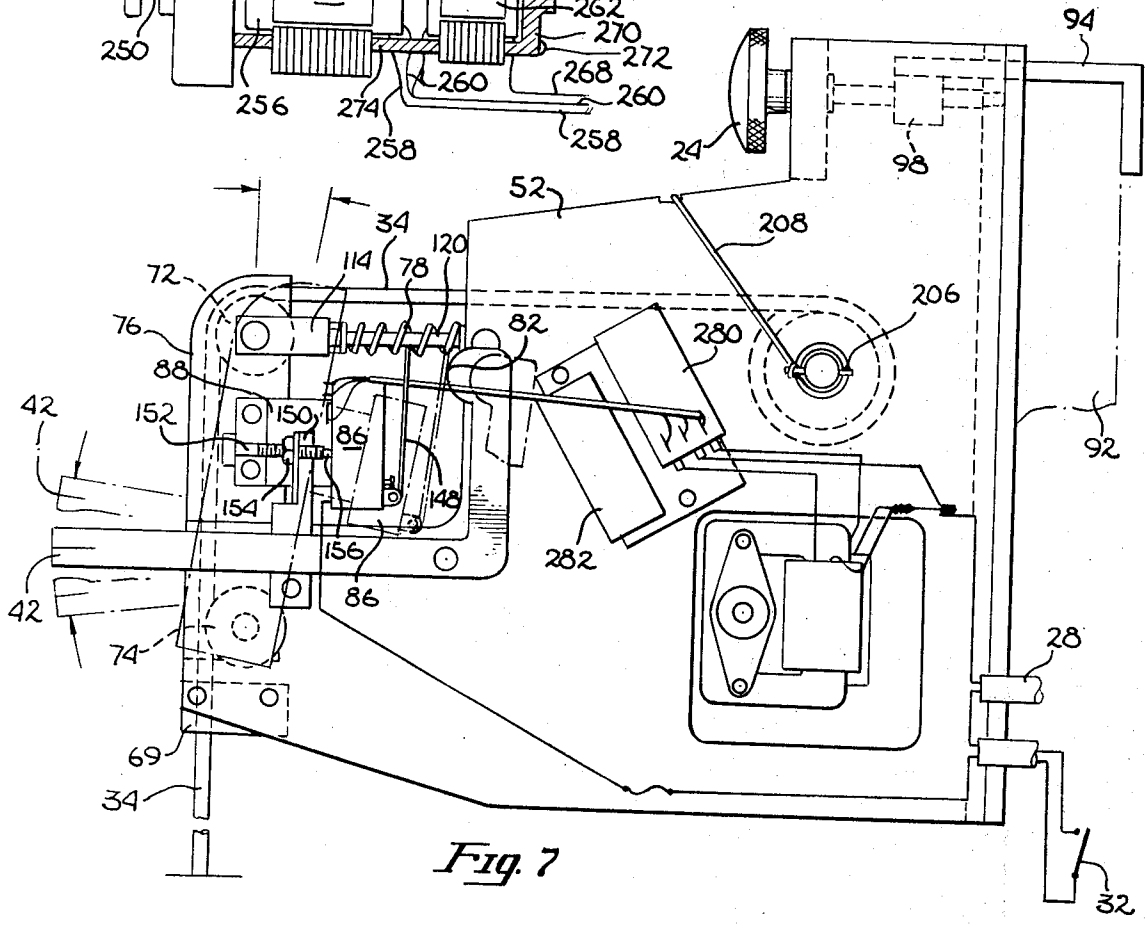


Fig. 7

PORTABLE INTERMITTENT ORTHOPEDIC TRACTION DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to the field of orthopedic devices, and in particular to orthopedic devices for applying traction to a patient.

2. Prior Art

In certain types of injuries and ailments, beneficial treatment may include applying traction to the body or various parts thereof, of the patient. Thus, in the prior art, various forms and mechanisms for applying such traction are well-known. By way of example, weights and pulley systems have been used to apply a steady and continuous traction as desired. However, it has been found that greater benefit may be achieved if the tractive forces applied are intermittent and cyclical, and preferably selected in amplitude based on the patient and the nature of the ailment.

In light of the foregoing, certain devices for applying traction in a repetitive and controlled manner are currently in use. These machines, however, are not adapted for purchase and use by a patient in his own home. In particular, these devices are expensive and heavy, and generally mechanically complicated in design, unreliable and expensive to repair. Thus, such machines as are now known are generally limited to purchase and use by doctors, hospitals, clinics and physical therapists.

There is, therefore, a need for a light weight, reliable and easily controlled portable intermittent orthopedic traction device suitable for use in the home, preferably adapted so as to be mounted and used with ease and readily removed for storage thereafter.

BRIEF SUMMARY OF THE INVENTION

A portable intermittent orthopedic traction device for applying vertical and horizontal cervical traction and horizontal pelvic traction. The device utilizes a reversible motor assembly comprising a pair of shaded pole motors on a common shaft adapted to drive the shaft in opposite directions. The cord through which the traction force is applied passes over a first pulley on an arm-like member and downward past a second pulley, the axis of which further serves as a pivot axis for the arm. The arm is spring restrained in a region of the first pulley so as to deflect against the spring restraint in response to tension in the cord. A switch is mounted on the arm and is actuated in a first direction by the deflection of the arm against the restraining spring in an amount readily selectable by the user of the device. Actuation of the switch terminates the drive to the cord take up system and shortly thereafter, as determined by a time delay relay, the motor reverses, relieving the traction and resulting in the operation of the switch in a reverse direction upon return of the arm-like member to its original position, so that the time delay relay will reinitiate the operating cycle of the device. A quick release capability is provided so as to allow the rapid extension and withdrawal of the tension line to a desired position. A clamping means is provided for readily attaching the device to a door, a bed member or other similar restraining structures.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of the traction device of the present invention illustrating one manner of using the device.

FIG. **2** is a side view of the traction device of FIG. **1** with the outer enclosure removed therefrom.

FIG. **3** is a top view of the apparatus of FIG. **2.**

FIG. **4** is a partial cross sectional view of the apparatus of FIG. **2** taken along lines **4—4** of FIG. **3.**

FIG. **5** is a partial cross sectional view of the drum drive means taken along lines **5—5** of FIG. **2.**

FIG. **6** is a partial cross sectional view taken along lines **6—6** of FIG. **5.**

FIG. **7** is the second side view of the apparatus of FIG. **2** illustrating the location of various electrical components and the manner of operation of the device.

FIG. **8** is a partial cross sectional view of the motor assembly of the present invention.

FIG. **9** is a schematic diagram of the electrical interconnection of the electrical components of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

First referring to FIG. **1,** a view of the present invention portable intermittent orthopedic traction device generally indicated by the numeral **20,** as it might be used by a patient in the patient's own home, may be seen. The traction device has a generally flat rear surface adapted to lie flat against the surface of the door, with a clamp, generally indicated by the numeral **22,** extending over the top of the door and being adjustable so as to clamp the device to the door by a knob **24.** An outer enclosure **26** encloses the mechanical apparatus of the device, with a main power cord **28** being adapted to plug into an ordinary 115 volt 60 cycle power supply. A second power cord **30** is coupled in series with one line of the power cord **28** so that electrical power delivered to the traction device **20** may be controlled by a switch **32** at the end of the power cord **30** conveniently accessible to the patient.

A nylon cord **34** extends downward from the outer end of the traction device **20,** and has attached to the lower end thereof a hook **36** which may be used to connect to an appliance for engaging a body member, such as the combination of member **38** and a traction harness or strap assembly **40** shown in FIG. **1** for engaging the patient's head. In addition to knob **24** for clamping the traction device **20** to the door (or a bed member or other member depending on the nature of the use of the system) and switch **32** for turning on and turning off the traction device, there is also provided a lever **42** for adjusting the extent of tractive force applied through cord **34,** and a knob **44** for controlling a quick take-up and release mechanism, to be subsequently described in greater detail.

FIG. **2** is a side view of the traction device **20** of FIG. **1** with the outer enclosure **26** removed therefrom. FIG. **3** is a top view of the traction device of FIG. **2,** and FIG. **4** is a partial cross-section of the device taken along lines **4—4** of FIG. **3.** The general frame arrangement for the traction device may be best seen in FIG. **3.** A flat member **46** has fastened thereto by screws **48** a normally vertical member **50** which provides the basic spacing and support for side plates **52** through screws **54.** The side plates **52** are maintained in substantially

parallel relationship by additional spacing members as shall subsequently become obvious as more fully described herein.

Now referring specifically to FIG. **2**, the major components of the traction device may be generally seen. The device has a motorized drive means including a reversible motor and a reduction gear assembly **56** supported by a support plate **58** attached to the reduction gear assembly (of ordinary construction) by a plurality of screws **60**, and attached to one of side members **52** by a plurality of screws **62**. The reduction gear **56** drives a sprocket **64**, which in turn drives a larger sprocket **66** through a chain **68**, generally similar to a small bicycle chain. Socket **66** drives a drum, generally indicated by the numeral **70**, located between side plates **52** on which cord **34** is wound. The cord **34** extends over a first pulley **72** and from there downward past a second pulley **74**. The axis of pulley **74**, as shall be subsequently more fully described, provides a pivot point for an arm **76** supporting pulley **72**, so that tension in the cord **34** may cause rotation of the arm about the axis of pulley **74**, which is resisted by a spring return comprised, at least in part, of coil spring **78**.

The adjustment lever **42** extending outward from the case **26** of the unit is frictionally pivotally supported at point **80** so as to provide an adjustment in the position of lobe **82** integral with the lever **42**. Adjacent lobe **82** is a switch actuating member **84** attached to a switch **86** supported from arm **76** by a support plate **88**. Similarly, an assembly generally indicated by the numeral **90** supported by one of the side plates **52** is disposed so as to actuate switch **86** in a reverse manner as the switch moves in a direction away from lobe **82**. Thus, as tension in cord **34** increases, the upper portion of arm **76** moves to the left, pivoting about the axis of pulley **74** against the force of coil spring **78**, resulting in the actuation of switch **86** by lobe **82** at a selected tension in line **34** determined by the adjustment of lever **42** to determine the relative position of lobe **82**. When the motor reverses, as shall be more fully described herein, tension in line **34** is reduced, allowing arm **72** to return to the position shown in FIG. **2** and to actuate the switch **86** in the opposite manner by contact with the assembly **90**.

Now referring specifically to FIGS. **3** and **4**, further details of the components described with respect to FIG. **2** may be seen. The device may be mounted to a door **92** by a clamp member **94** adapted to project over the top of the door and to be adjustable so as to clamp against the door. Thus, clamp **94** is adapted to slide in the slots, generally indicated by the numeral **96**, in members **46** and **50** and to be forced in a horizontal direction by a member **98** attached to the clamp member **94** by screws **100**. Member **98** threadedly engages a screw member **102** rotationally supported at each end by members **50** and **104** respectively, with an extension of the screw member **102** extending through member **104** to receive an adjustment knob **24** attached to the screw member by a set screw **106**. Thus, by rotation of the knob **24**, the desired clamping and releasing action may be obtained, and clamp member **94**, being supported both by screws **102** and slots **96** in members **46** and **50**, provides strong clamping action as well as adequate vertical support to support the maximum tension allowable in line **34**. Member **104** also acts as a separator for the side plates **52** and is rigidly attached therebetween by screws **108**.

Arm **76** is basically in the form of a channel member and is adapted to receive an axle bolt **110** through the upper end thereof, and a pivot axle **112** at the lower end thereof. Within the channel of member **76**, pulley **72** is supported by the axle bolt **110**, and also pivotally supported by the axle bolt is a forked member **114** supported to each side of member **76** by the axle bolt, with cap nuts **116** retaining the axle bolt **110** in place. The relative position of the axle bolt **110**, as well as the axle bolt **112**, is chosen in relation to the depth of the channel of member **76** so that the pulleys **72** and **74**, which have a concave periphery to matingly accept the cord **34**, is chosen so that the bottom of the channel generally retains the cord **34** in proper disposition with respect to pulleys.

Attached to member **114** by means of a set screw **116** and a nut **118** is a rod **120** slidably projecting through a spring restraining member **122**. The rod **120** is maintained in member **122** in part by a nut **124** which prevents the inadvertent withdrawal of rod **120** from member **122**. Member **122** in turn is rotationally supported by slide plate **52** by means of screws **126**. The lower end of member **76** is rotationally supported by axle **112**, comprising a flat head screw retained in position between the two slide plates **52** by a nut **130**, with cylindrical spacers **132** on each side of the member **76**. (A metal axle bearing **134** is provided for each of pulleys **72** and **74** so as to prevent the nylon pulleys from being scored by the axle.)

Thus, it may be seen that member **76** is pivotally supported by axle **112** and the top thereof is limited in its travel to the right (FIG. **4**) by the engagement of nut **124** on rod **120** with member **122**. On the other hand, as the line **34** is wound up on drum **70** and the tension in line **34** increases, the forces of the line on pulley **72** cause a horizontal component of force on the top of arm **76**, forcing the top of the arm to the left against the yieldable and steadily increasing resistance of coil spring **78**. (Fixed guide members **69** are fastened by screws to and between each side plate **52** and provide a guide for the entry of line **34**. Also, pulley **74** guides the line in this region irrespective of the rotation of member **76**.)

Member **42** is supported by one of the side plates **52** and is spaced therefrom by a nylon spacer **140**, with a screw **142** having a nut **144** thereon, and a washer **146** to prevent the scoring of member **42** by the screw is used to reasonably firmly encourage member **42** into abutment with the nylon spacer **140** and the nylon spacer in turn into abutment with side plate **52**. Thus, substantial frictional resistance prohibits the free rotation of member **42** about the screw **142** but allows the manual manipulation of member **42** to a new position as desired. Switch **86** is supported by a screw **146** to a mounting plate **88** which in turn is fastened to member **76** by screws (not shown), and in particular is mounted to member **76** at a position substantially above the pivotal axis for that member. Thus, as the top of member **76** is forced to move to the left (FIG. **4**) as a result of tension in line **34**, switch **86** will similarly move to the left until the switch actuating member **148** engages lobe **82** on member **42**. Thus, member **42** provides a readily controllable selection of the peak tension in cord **34** before the switch **86** is switched by controlling the maximum compression of coil spring **78** before the switch is actuated.

Mounted to one of side plates **52** is a member **150** which supports an adjustment screw **152** locked at a predetermined position by a lock nut **154.** The purpose of this assembly is to provide for the resetting of switch **86** by the engagement of the end of screw **152** with the switch actuating member **156** on the switch. Thus, switch **86** in the preferred embodiment is a single pole, double throw switch having a first actuating member **148** to cause it to switch in a first direction and a second actuating member **156** on the other side of the switch to cause it to switch to the reverse position.

Now referring to FIGS. **5** and **6,** details of the drum **70** and the drive therefor may be seen. FIG. **5** is a cross-section taken along lines **5—5** of FIG. **2,** and FIG. **6** is a cross-section taken along lines **6—6** of FIG. **5.** Drum **70** is a nylon drum and is attached to shaft **160** by a key **162** as may be best seen in FIG. **4.** The drum has a first hole **164** angularly drilled through the periphery thereof, and a second hole **166** larger than the first hole drilled parallel to the axis of the drum to intercept the first hole. Thus, the end of cord **34** is attached to the drum by passing it through the first and second holes and enlarging the end thereof by a knot (or otherwise) so as to allow the withdrawal of the end of the cord into the larger hole **166** but to prevent its further withdrawal through the smaller hole **164.** The shaft is supported by side plates **52** through a pair of metal bushings **168** and is retained in position by a collar **170** having a set screw **172** therein, and by member **174** which, as may be seen in FIG. **6,** is retained to the shaft by a set screw **178.**

Member **176** has a plurality of holes **180** therethrough equally spaced about a circular arc having its center at the center of shaft **160.** Sprocket **66** similarly has a mating hole therethrough. The sprocket is generally freely supported by shaft **160** and is retained in a disposition immediately adjacent member **174** by a collar **182** locked in position by a set screw **184.** A member **186** has an inward projecting flange **188** thereon, with a pin **190** pressed into a mating hole on the flange **188** at the same radius from the center of shaft **160** as the holes **180** in member **176** and the mating hole in sprocket **66.** Thus, with member **186** in the position shown in FIG. **5,** pin **190** projects through the hole in sprocket **190** into one of holes **180** in member **174** so as to rotationally lock the sprocket to member **174,** which in turn is rotationally locked to the shaft so as to provide a drive means between the sprocket and the shaft. Member **186** is internally threaded at the end thereof to receive a threaded member **192** which has knob **44** (FIG. **1**) on the end thereof, so that member **186** may be withdrawn in a horizontal position to withdraw pin **190** from the hole **188** in member **174** to allow the free rotation of drum **70** with respect to the sprocket. It is apparent that the structure just described and operable by the knob **44** constitutes a radially releasable clutch means for selectively connecting and disconnecting the drum **70** to and from its motorized drive means. The knob **44** provides a readily accessible clutch operating member for releasing and engaging the clutch means.

A coil spring, retained between flange **188** on member **186** and in an inwardly directed flange **196** on member **198** yieldably encourages member **186** into the locked position, but allows withdrawal of the pin as hereabove described by an outwardly directed force on knob **44.** (Member **198** is retained to the sprocket **66** by a plurality of screws **200.**) Thus, it may be seen that drum **70** may be driven in rotation by the chain drive on sprocket **66** (a relatively slow drive), or may be allowed to freely and rapidly rotate by the withdrawal of knob **44** to disengage the sprocket from the drum. In order to provide a quick windup capability, that is to provide for the quick takeup of excess line **34,** a multiple turn spring **202** is provided having one end **204** projecting through a cotter pin **206** (see also FIG. **7**) to provide a torsional drive for the shaft, with the other end of **208** of the spring extending upward and disposed over the top edge of one of side members **52** to provide a fixed attachment point for that end.

Now referring to FIG. **8,** a cross-section of the motor assembly used in the present invention may be seen. Already described herein is the gear box **56,** and sprocket **64** which is attached to the output shaft **250** of the reduction gear. The motor itself is comprised of a pair of motors of the conventional AC shaded pole type using a common shaft, with a main forward drive motor having a rotor **252** and a stater **254** containing the shaded pole, with a single winding **256** on the stater having a pair of connections **258** and **260** thereto. A second smaller motor is comprised of a rotor **262** within a stater **264** having a winding **266** with a pair of leads thereto, one of which is connected in common with lead **260** of the larger motor and the other of which is identified as lead **268.** Thus, lead **260** is the common connection for the two motors.

A bearing cap **270** supports the shaft at one end, with the shaft being supported at the other end on bearings located within the gear box **56.** The entire assembly is fastened together by screws **272** extending through the various components and terminating in the housing of gear box **56,** with spacers **274** appropriately spacing the staters so as to provide clearance for the windings thereon. The construction of shaded pole motors is well-known in the prior art, and by use of the two shaded pole motors as shown in FIG. **8** on a single common assembly, a reversing capability is achieved, that is, the poles on one motor are shaded so as to cause rotation of the shaft in a first direction and the poles on the other motor are shaded so as to cause rotation of the shaft in the reverse direction. In this particular invention, the larger motor is used to drive drum **70** to apply tension to cord **34,** with the smaller motor driving in the reverse direction so as to unwind the cord **34** from the drum **70.**

The remaining electrical components and the interconnection thereof may be seen in FIGS. **7** and **9.** Aside from the electrical components heretofore described, there is mounted on one side plate **52** a relay **280** and various additional circuitry including capacitor **282.** The specific elements in the circuit and their interconnection is shown in FIG. **9.** Standard 115 volt 60 cycle AC power is applied through the main power cord **28.** (A third lead for purposes of grounding the metal chassis or frame of the traction device is also used in accordance with standard practice, but for purposes of clarity is not included in FIG. **9.**) One of the leads of the power cord **28,** specifically lead **300,** forms one of the twin leads in line **30** and is connected to switch **32** at the end thereof. Thus, switch **32** is a means for providing an on/off switch capability, with power being applied thereby to the traction device, and more specifically initially to the moving contact **320** of switch **86.** As indicated with respect to FIG. **8,** there are two sepa-

rate motor windings which are connected so as to have a common lead, specifically line **260.** This line forms the second lead in the power cable **28** as shown in FIG. **9.** The second lead of the motor winding **256,** specifically lead **258,** is coupled to a moveable switch contact **308** of relay **280,** and the second motor lead of motor winding **266** is coupled through line **268** to moving contact **310** of relay **280.** The stationary contacts **312** and **314** of relay **280** are coupled through lines **316** and **318** respectively to the stationary contacts **304** and **306** of switch **86** respectively. Coil **330** of the solenoid **280** has one lead thereof coupled to one side of the power cord, namely lead **260,** through a diode **332,** with the other end of the coil **330** being coupled to line **318** through resistor **334,** with capacitor **282** coupled between the two leads of the coil.

When switch **32** is closed with switch **86** and relay **280** in the positions shown in FIG. **9,** power is not applied to either of the motor windings **256** and **266.** However, AC power is coupled through switch **86** and line **318** to the circuit comprised of the diode, the capacitor, the relay coil and the resistor. The resistor **334** acts as a current limiting resistor preventing the passage of sufficient current on each cycle of the AC power to cause a sufficient voltage across capacitor **282** to cause actuation of the relay. However, diode **332** rectifies the voltage applied to resistor **334** so as to cause the gradual build up in voltage (DC voltage) across capacitor **282** until after a time delay of approximately five seconds, a sufficient DC voltage exists across the capacitor to actuate the relay through coil **330.** When this occurs, the moving contacts **308** and **310** of the relay move to the positions shown in phantom, with power then being applied through line **318** to the motor winding **256,** causing the drum **70** to slowly wind up the cord **34.** While the motor is running, capacitor **282** will continue to be charged and, therefore, the relay will stay locked in for so long as the motor continues to operate.

As tension in cord **34** increases, member **76** starts to deflect, as previously described, against the resistance of coil spring **78** until finally lobe **82** strikes the switch actuating member **148** (see also FIGS. **4** and **7**). This causes the actuation of switch **86** interrupting power to the motor winding **256** and simultaneously applying power to line **316** through moving contact **320.** However, the charge previously stored on capacitor **282** prevents the moving contacts in relay **280** from returning to the upper position until the capacitor discharges, through the resistance of winding **330** in the relay, to a level allowing the return of the relay to the unactuated position. Typically, in the preferred embodiment, the various parameters are chosen so that a time delay of 3 to 5 seconds is achieved. Thus, when the relay returns to the unactuated position, power is applied through line **316** to winding **266** of the reversing motor, resulting in the counter rotation of drum **70,** thereby relieving the tension in line **34.** When tension has been reduced to a level ranging from between zero and, typically, approximately 5 pounds, member **76** returns to the position shown in FIG. **4,** with the result that switch actuating member **156** of switch **86** contacts the end of screw **152** so as to actuate switch **86** from the position shown in phantom in FIG. **9** to the initial position shown in FIG. **9,** whereupon capacitor **282** again starts to charge. (It is to be noted that at least part of the time delay in the actuation of the relay **280** is achieved by the fact that the magnetic circuit in the relay is more efficient when in the actuated position that when in the unactuated position, so that higher solenoid coil current is required to actuate the relay than is required to maintain the relay in the actuated position, thereby effectively giving an electrical hysteresis to the relay.)

As a result of the circuit hereabove described, it may be seen that the traction device of the present invention provides for automatic cyclic application and removal of a tractive force in cord **34,** with the traction force being applied for a period of approximately 5 seconds and then removed for a period of approximately 5 seconds (the periods of course being readily controllable and alterable by appropriate selection of the component time delay determining components. Further, it will be noted that in the event there is substantial slack in cord **34,** the take up motor will continue to run until the slack is taken up and the tension has reached the selected level determined by the position of lever **42.** Of course, as herebefore described, a quick wind up and release mechanism controllable through knob **44** is also provided to quickly take up excessive slack or let out the cord **34** as may be required prior to operation of the device. Thus, there has been described herein a portable intermittent orthopedic traction device of rugged yet simple construction which may be quickly and securely mounted, either in vertical, horizontal or slanted positions, to provide a readily controllable intermittent tractive force as desired. While the invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention.

I claim:

1. An orthopedic traction device comprising:

a frame,

means for attaching said frame to a support,

a drum rotatable on said frame,

a cord having one end for attachment to a traction harness and its opposite end attached to said drum,

drive means including reversible motor means for driving said drum in either direction of rotation to wind said cord on and unwind the cord from the drum,

readily releasable clutch means including a readily accessible clutch operating member for effecting disengagement and engagement of the clutch means, whereby said drum may be selectively released for free rotation independent of said drive means,

means responsive to the tension in said cord for controlling said motor means to effect driving of said drum in one direction to wind the cord on the drum when the cord tension is less than a preset maximum tension and in the opposite direction to unwind the cord from the drum when the cord exceeds said maximum tension, and

said motor controlling means comprises a supporting arm pivoted at one end of said frame, a pulley on the opposite end of said arm around which said cord passes in a manner such that tension in said cord urges said arm in one direction about its pivot, a spring acting between said arm and frame for urging the arm in the opposite direction about its pivot, a switch mounted on said arm including an

actuating member, a lever pivoted on said frame having a portion spaced from the pivot axis of the lever and located in the path of movement of said switch actuating member with said arm for engagement with said actuating member to actuate said switch upon pivoting of said arm in said one direction, and said lever having a readily accessible end for adjusting the lever on its pivot to adjust the position ofsaid lever portion along said path, and means for conditioning said motor means to drive said drum in its said opposite direction in response to actuation of said switch by said lever.

2. An orthopedic traction device comprising:

a frame,

means for attaching said frame to a support,

a drum rotatable on said frame,

a cord having one end for attachment to a traction harness and its opposite end attached to said drum,

drive means including reversible motor means for driving said drum in either direction of rotation to wind said cord on and unwind the cord from the drum,

readily releasable clutch means including a readily accessible clutch operating member for effecting disengagement and engagement of the clutch means, whereby said drum may be selectively released for free rotation independent of said drive means,

a spring connected between said drum and frame for rotating said drum in said one direction when said clutch means is disengaged,

means responsive to the tension in said cord for controlling said motor means to effect driving of said drum in one direction to wind the cord on the drum when the cord tension is less than a preset maximum tension and in the opposite direction to unwind the cord from the drum when the cord exceeds said maximum tension,

said motor means comprising relay means including contact means operable between a first position wherein said motor means is conditioned to drive said drum in its said one direction and a second position wherein said motor means is conditioned to drive said drum in the opposite direction and coil means adapted to be selectively energized to effect movement of said contact means between their said positions, switch means in circuit with said coil means, means for actuating said switch means in response to said cord tension, capacitor means connected in electrical parallel with said coil means for delaying energizing and de-energizing of said coil means following actuation of said switch means,

a supporting arm pivoted at one end of said frame, a pulley on the opposite end of said arm around which said cord passes in a manner such that tension in said cord urges said arm in one direction about its pivot, a spring acting between said arm and frame for urging the arm in the opposite direction about its pivot, a switch mounted on said arm including an actuating member, a lever pivoted on said arm having a portion spaced from the pivot axis of the lever and located in the path of movement of said switch actuating member with said arm for engagement with said actuating member to actuate said switch upon pivoting of said arm in said one direction, and said lever having a readily accessible end for adjusting the lever on its pivot to adjust the position of said lever portion along said path, and means for conditioning said motor means to drive said drum in its said opposite direction in response to actuation of said switch by said lever.

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