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(54) **AUTOMATED RESEARCH USING
MULTIPLE QUESTION SUBSETS**

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(57) **ABSTRACT**

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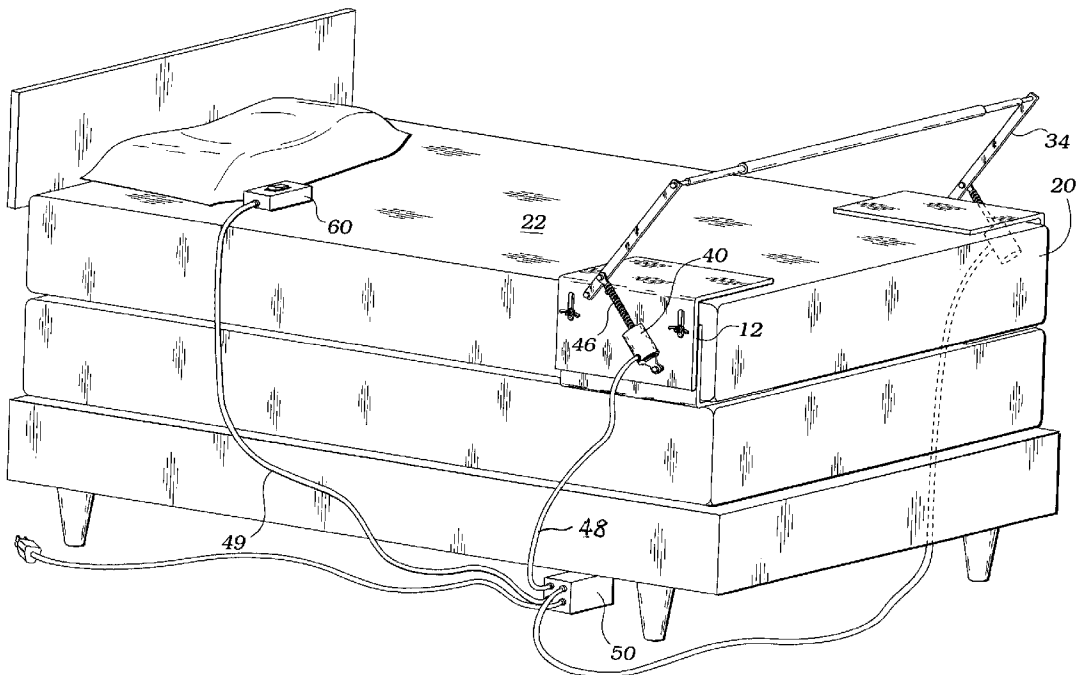
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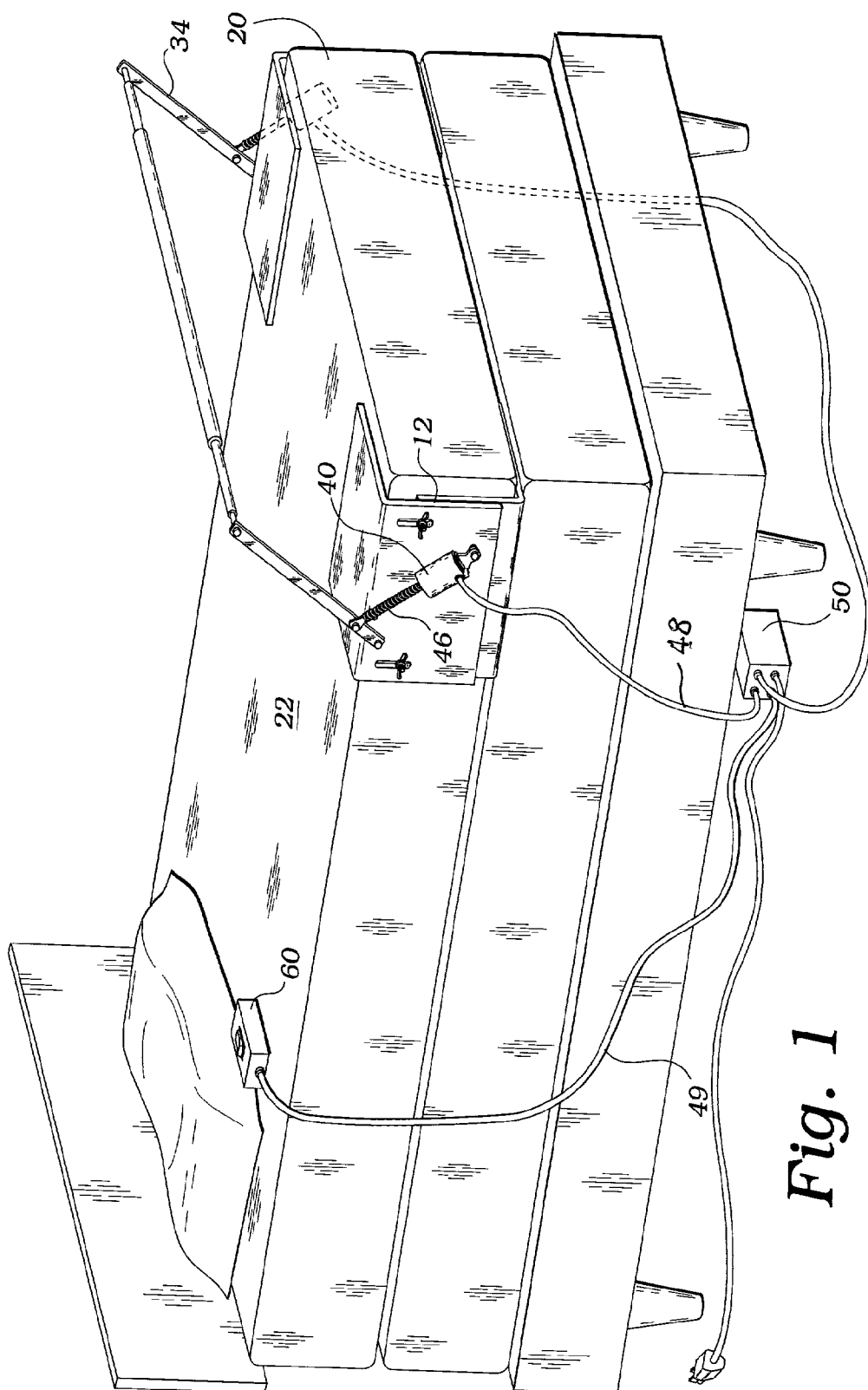
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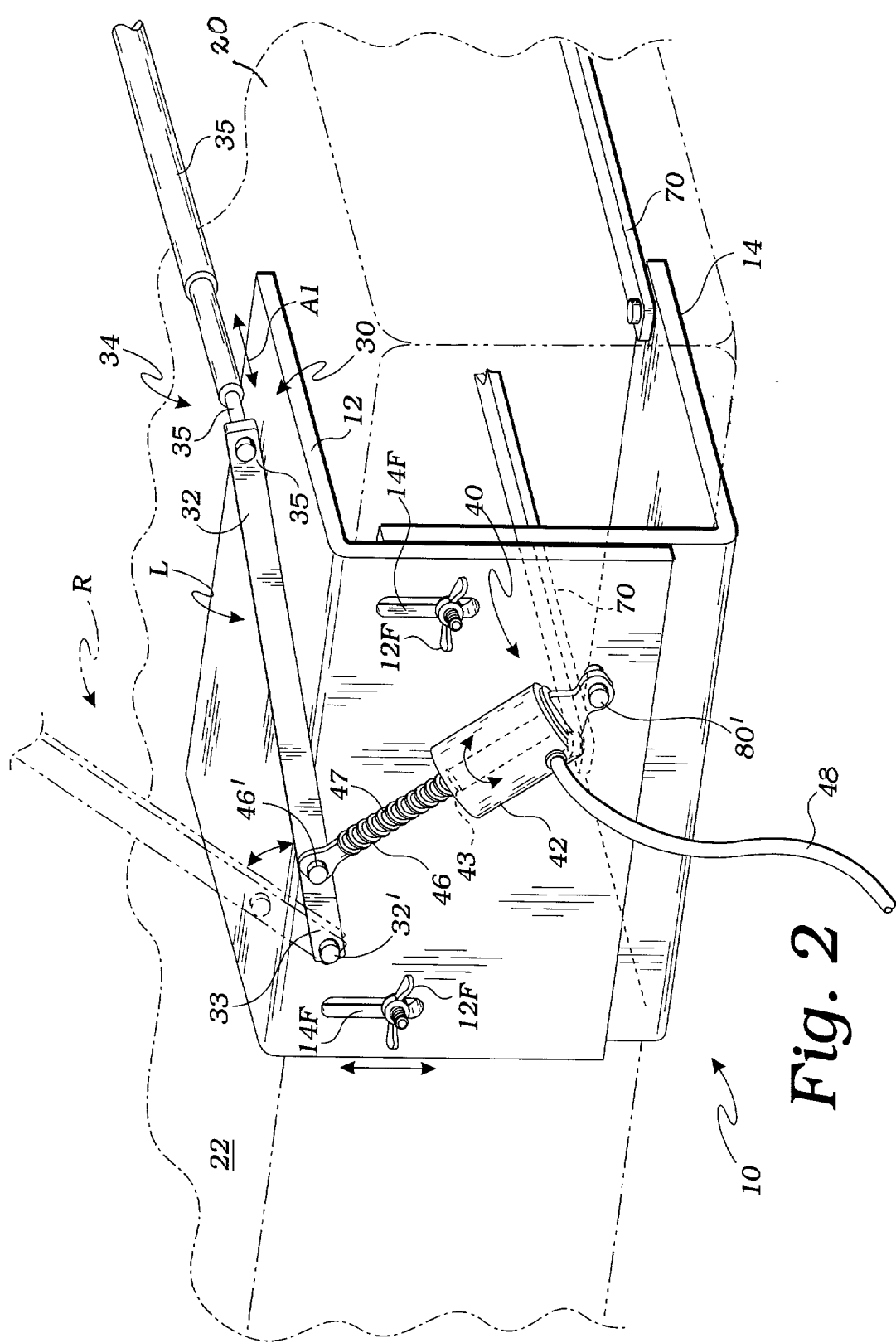
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A bed cover adjusting apparatus comprising mattress clamps which are adjustable for use with a range of mattress thicknesses and a bed cover engaging rod positioned below a bed cover, and which is length extensible corresponding to a range of mattress widths. An engagement positioning device pivots the engaging rod over a desired angular range, and a position controller is enabled for receiving and acting on wave energy signals of remote origin. The engagement positioning device is pivotally joined with the clamps for movement as driven by the positioning device under command of the position controller.







AUTOMATED RESEARCH USING MULTIPLE QUESTION SUBSETS

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] This invention relates generally to automatic mechanical actuators and more particularly to an actuator for moving bed covers for improved comfort and foot space.

[0003] 2. Description of Related Art

[0004] The following art defines the present state of this field:

[0005] Woodward, U.S. Pat. No. 800,779 describes a combination bed-warmer and cover-support comprising a heating-drum to be placed within a bed, a pair of spaced sills capable of being supported upon the side rails of the bed, a plurality of arches loosely mounted upon the sills and capable of supporting the bedclothing in an elevated position, means connecting the arches to maintain them in spaced relation, and a brace extending between the heating-drum and one of the arches.

[0006] Tuttle, U.S. Pat. No. 802,610 describes an attachment for bedsteads, comprising a bar adapted to be arranged transversely of the bedstead and having depending arms bearing against the outer faces of the side rails of the bedstead, clamps carried by the depending ends of said bar, each clamp being formed with an upwardly-extending arm, said arm carrying a stud and each arm carrying a bolt, said stud and bolt passing through the holes in the depending arms, each clamp being formed with a hook-shaped extremity adapted to interlock with the side rail of the bed and a nut fitting on said bolt.

[0007] Dobbins, U.S. Pat. No. 1,351,557 describes a bedclothes support, a pair of parallel, relatively movable base members, and a plurality of hoops arranged in parallel planes and having their opposite ends swiveled in the respective base members, whereby the support may be folded flat when out of use, with the base members brought close together and one thereof longitudinally displaced with respect to the other.

[0008] Sullivan, U.S. Pat. No. 2,112,122 describes a bed appliance comprising a pair of side frames each formed of a pair of uprights connected by a top bar, said frames being formed of telescoping members providing for adjustment of the frames to selected heights and lengths, means on the uprights for securing the members thereof in selected positions, means on the lower ends of said uprights for releasably attaching the uprights to the sides of a bed body for projection above the latter, a top frame, and means for releasably attaching the top frame to the top bars of the side frames for forming with the latter a raised support or housing on the bed, said top frame comprising a pair of telescoping units each comprising a pair of cross strips connected by spaced rods, and end of one unit being disposed in overlapping relation with an end of the other unit, the rods of the units being disposed in parallel staggered relation, and the rods of one unit passing slidably through the adjacent cross strip of the other unit whereby the top frame may be telescopically adjusted as to length in accordance with similar adjustments of said side frames.

[0009] Peevey, U.S. Pat. No. 2,210,255 describes a bedclothes lifting attachment for beds comprising a pair of clamping members each formed from a blank of thin metal folded along parallel lines to provide upper and lower spaced clamping jaws adapted for clamping to a mattress at opposite sides, an arm pivotally attached at one end to each of said clamping members, a stop on the clamping members for holding the arms in an upwardly extended position and a rod attached to the arms and extending transversely of the mattress under the bedclothes and adapted for raising the latter upon an upward movement of said arms.

[0010] Pelton, U.S. Pat. No. 2,598,295 describes a bedclothes holder unit comprising a stationary frame member, a pair of upright supports secured to the rear end of said frame member, a horizontal shaft adjustably and rotatably mounted on said supports, a pair of spaced arms radially connected to said shaft for movement therewith and an angular extension hinged to said arms.

[0011] Ecklund, U.S. Pat. No. 2,611,139 describes a bedstead comprising a spring provided with suitable side rails and having a mattress and bedclothes supported on the spring, a pair of mounting brackets having means for securing them to the side rails of the bedspring, a supporting arm pivotally secured to each mounting bracket, a socket member pivoted to the outer end of each supporting arm, an arch-shaped member having a horizontal portion adapted to be positioned beneath the bedclothes and having spaced legs having their terminal portions received in said arms, said pivotally supported socket members permitting the arch shaped member to be supported in upright operative bedclothes-lifting position when the bed is to be occupied, and means operable in connection with said pivoted socket members for locking the arch-shaped member in operative position.

[0012] Hougham, U.S. Pat. No. 2,614,269 describes a combination with a mattress having bedding thereon, of a device for support of said bedding in partial clearance of one end of said mattress said device comprising a bow positioned intermediate the ends of said mattress and the bed clothes thereon and extending there-across, a pair of angle plates in inter-locked union upon each side of said mattress and adapted to be detachably engaged therewith, and swivel means upon an upper plate of each of the pair thereof, said swivel means being so constructed and arranged as to support said bow for rotational movement to and from a functional use position.

[0013] Gays et al., U.S. Pat. No. 4,043,349 describes a canopy apparatus for use in combination with a conventional child's crib. The canopy apparatus comprises a frame including a plurality of sides, a plurality of support members interconnecting two of said plurality of sides and a cover secured to the frame and supported by the support members. The canopy is mounted on and secured to an upper rail of one side wall of the crib by at least one pivot clamp and may be retained in a closed position over the crib by at least one retaining clamp.

[0014] Glintz, U.S. Pat. No. 4,152,792 describes a receptacle for disposition upon a bed including a form retentive but foldable body constructed of water impervious material and defining a bottom wall extending between and from whose outer marginal peripherally continuous, integral and upwardly extending peripheral walls project. One of the

peripheral walls has a lower opening formed therethrough and a flexible and upwardly opening liner constructed of water impervious material is removably seated in the receptacle, the marginal portion of the liner corresponding to the aforementioned one peripheral wall of the receptacle including a flexible drain outlet neck projectable through the opening formed and the wall of the receptacle remote from the wall having the opening formed therein includes an upwardly opening depression formed therein for seatingly receiving the neck of a person disposed within the receptacle and a plurality of downwardly concave arched support bows are removably supported from and span between opposite side walls of the receptacle with the bows generally paralleling each other and spaced along the length of the receptacle between the notched wall and the wall having the aforementioned opening formed therein. A flexible non-transparent drape is removably disposed over and supported from the bows and the drape includes marginal portions which overlap the exteriors of the side walls of the receptacle between which the bows extend and the wall of the receptacle in which the aforementioned opening is formed.

[0015] The prior art teaches the use of mechanical bed cover supports and moving devices but does not teach the present simplified mechanical bed cover lifting apparatus.

SUMMARY OF THE INVENTION

[0016] The present invention teaches certain benefits in construction and use which give rise to the objectives described below.

[0017] Many individuals require raised bed covers because of ailments such as burns. Other individuals prefer to have bed covers raised to provide the convenience of improved foot room at the foot of the bed. The present invention is a bed cover adjusting apparatus comprising mattress clamps which are adjustable for use with a range of mattress thicknesses and which are placed on opposite sides of the mattress near the foot of the bed. A bed cover engaging rod is positioned below a bed cover, and is length extensible corresponding to a range of mattress widths. An engagement positioning device is able to pivot the engaging rod from each side over a desired angular range, and a position controller acts on received wave energy signals a remote control device. Thus, the bed covers may be raised to any extent desired by the bed occupant in accordance with need or desire.

[0018] A primary objective of the present invention is to provide an apparatus and method of use of such apparatus that provides advantages not taught by the prior art.

[0019] Another objective is to provide such an invention capable of automatically moving bed covers to a lifted position and also returning the bed covers to their original position on a bed.

[0020] A further objective is to provide such an invention capable of being remotely controlled.

[0021] A still further objective is to provide such an invention of inexpensive construction and adaptable to a wide range of mattresses.

[0022] Other features and advantages of the present invention will become apparent from the following more detailed

description, taken in conjunction with the accompanying drawings, which illustrate, by way of example, the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] The accompanying drawings illustrate the present invention. In such drawings:

[0024] FIG. 1 is a perspective view of the preferred embodiment of the invention; and

[0025] FIG. 2 is a perspective view thereof showing details of the several elements of the invention at one side of a mattress, the other side detail being a mirror image thereof.

DETAILED DESCRIPTION OF THE INVENTION

[0026] The above described drawing figures illustrate the invention in at least one of its preferred embodiments, which is further defined in detail in the following description.

[0027] The present invention is a bed cover adjusting apparatus enabled for accomplishing the objectives described above. It comprises a mattress clamping means **10** adjustable for receiving a range of mattress thicknesses in clamped relationship, i.e., the clamping means **10** is able to grip a mattress **20** so as to form a rigid base or foundation for the moving portions of the invention, and it is therefore designed so as to not be easily dislodged from its set position when raising bed covers **25**. A bed cover engaging means, **30** is positioned below the bed covers **25**, which may include a top sheet and/or a blanket or bed spread. The length of the cover engaging means **30** is extensible corresponding to a range of mattress widths which are usually defined by commercial standards, i.e., single, twin, queen and king sizes. An engagement positioning means **40** is pivotally mounted to move over an angular range as well as to extend linearly. It provides the force to raise and lower the cover engaging means **30** as necessary or desired. A position control means **50** is enabled for receiving and acting on wave energy signals of remote origin, such as by a hand-held remote control device **60** of any type well known in the art as for instance those used for remote control of toys and of television sets and audio equipment. The engagement positioning means **40** is pivotally joined with the clamping means **10**, at pivot pin **40'** for pivotal movement thereabout as driven by an electric motor **42** under command by the position control means **50**. This will be further described below.

[0028] The various details of construction will be described now referring to only one side of the mattress, but such details, it will be realized, do apply to both sides as they are mirror images of each other and both are required proper function. The mattress clamping means **10** comprises an upper L-shaped bracket **12** and a lower L-shaped bracket **14**. Preferably, a bracket spacing strap or straps **70** is/are positioned between the bracket assemblies on either side of the mattress and joins them at the lower L-shaped brackets **14** so that they are positioned at a spacing corresponding to the width of the mattress being used. This joining may be made by any type of fastener that is appropriate and will be easily accomplished by those of skill in the art. Preferably the strap(s) **70** are of non-extensible materials and are flat so as to fit between the mattress and its under-support without being noticed by one occupying the bed.

[0029] The bed cover engaging means **30** comprises support arms **32** (one on each side) and a cover lift rod **34**. The support arm **32** is pivotally engaged at pivot pin **32'** with the upper L-shaped bracket **12** at a proximal end **33** of the support arm **32**, and it is engaged with the cover lift rod **34** at a distal end **35** of the support arm **32**. The support arm **32** pivots on the upper L-shaped bracket **12** from a lowered position "L" to a raised position "R". The cover lift rod **34** therefore, moves through an arc to lift or lower the bed covers **25** resting on it between positions "L" and "R." Because both of the support arms **32** move in unison, the lift rod **34** remains parallel with the mattress top surface **22** at all times. Preferably, the cover lift rod **34** comprises plural segments **35** in linear telescoping relationship as is very well known in mechanics. Therefore, the cover lift rod **34** may be adjusted in length to fit over a mattress **20** of any commercial width as desired. Such segments **35** may be frictionally engaged so as to be easily extended or retracted while remaining at any set length thereafter.

[0030] Preferably, the engagement positioning means **40** comprises the electric motor **42** pivotally joined, at pivot pin **40'**, with the upper L-shaped bracket **12**. The electric motor **42** is of the reversing type so that it may rotate in either clockwise or counter-clockwise rotational directions. The rotor **43** of the electric motor **42** has a female machine thread **44** which passes through it. A threaded shaft **46** provides an external machine thread **47** which is engaged with the rotor shaft thread **44**. In this manner, as the electric motor rotor **43** rotates, the threaded shaft **46** advances and retracts linearly therein depending on the motor's direction of rotation. The threaded shaft **46**, at its distal end, pivotally engages, at pivot pin **46'**, the support arm **32** so as to position the support arm **32** at various angles about pivot pin **32'**.

[0031] The position control means **50** comprises a power supply interconnected with the electric motor **42** on each side of the mattress by wires **48** and thus provides, under control, electrical current to the motor **42**. The remote control unit **60**, preferably a hand held unit, is interconnected by wire **49** or wireless, for sending control signals to a controller, within the position control means **50** and an integral part of it, and this controller is adapted, as is very well known in the art, for directing motor rotational sense (direction of rotation) and for enabling and disabling power delivery to the electric motors **42** for starting and stopping the raising of the bed covers.

[0032] In use, the present invention is applied to a mattress **20** by installing the mattress clamping means **10** on opposing sides of the mattress as is shown in FIGS. 1 and 2. Fasteners **12F** are used in slots **14F** to adjust the clamping means **10** to the proper mattress thickness. Next, bed cover engaging means, **30** is positioned below the bed covers (not shown). The plural segments **35** of cover lift rod **34** are extended or retracted for proper length for the mattress being used. See arrow A1.

[0033] While the invention has been described with reference to at least one preferred embodiment, it is to be

clearly understood by those skilled in the art that the invention is not limited thereto. Rather, the scope of the invention is to be interpreted only in conjunction with the appended claims.

What is claimed is:

1. A bed cover adjusting apparatus comprising a mattress clamping means adjustable for receiving a range of mattress thicknesses in clamped relationship; a bed cover engaging means, for positioning below a bed cover, and length extensible corresponding to a range of mattress widths, an engagement positioning means pivotal over an angular range, and a position control means enabled for receiving and acting on wave energy signals of remote origin; the engaging means pivotally joined with the clamping means for movement thereabout as driven by the positioning means under command by the control means.

2. The apparatus of claim 1 wherein the mattress clamping means comprises dual upper L-shaped brackets and lower L-shaped bracket.

3. The apparatus of claim 2 further comprising a bracket spacing strap, the spacing strap joining the L-shaped brackets at opposing strap ends thereof for holding the lower L-shaped brackets at a spacing corresponding to a mattress width.

4. The apparatus of claim 1 wherein the bed cover engaging means comprises a pair of support arms and a cover lift rod, each one of the support arms pivotally engaged with one of the upper L-shaped brackets at a proximal end of the support arm and engaged at one end of the cover lift rod at a distal end of the support arm, such that as the pair of support arms pivot about the upper L-shaped brackets from a lowered position to a raised position, the cover lift rod moves through an arc to lift the bed cover resting thereon.

5. The apparatus of claim 4 wherein the cover lift rod comprises plural segments in linear telescoping relationship.

6. The apparatus of claim 1 wherein the engagement positioning means comprises dual electric motors each pivotally joined with one of the upper L-shaped brackets and each engaging a threaded shaft enabled for advancing and retracting with rotational motion of each of the electric motors in a first and second rotational senses respectively, and each of the threaded shafts pivotally engaging one of the support arms of the bed cover engaging means so as to enable angular positioning thereof.

7. The apparatus of claim 1 wherein the position control means comprises a power supply interconnected with the electric motors for providing electrical power thereto, a remote control unit interconnected for sending control signals to a controller adapted for directing motor rotational sense and for enabling and disabling power delivery to the electrical motors for starting and stopping the raising of the bed covers.

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