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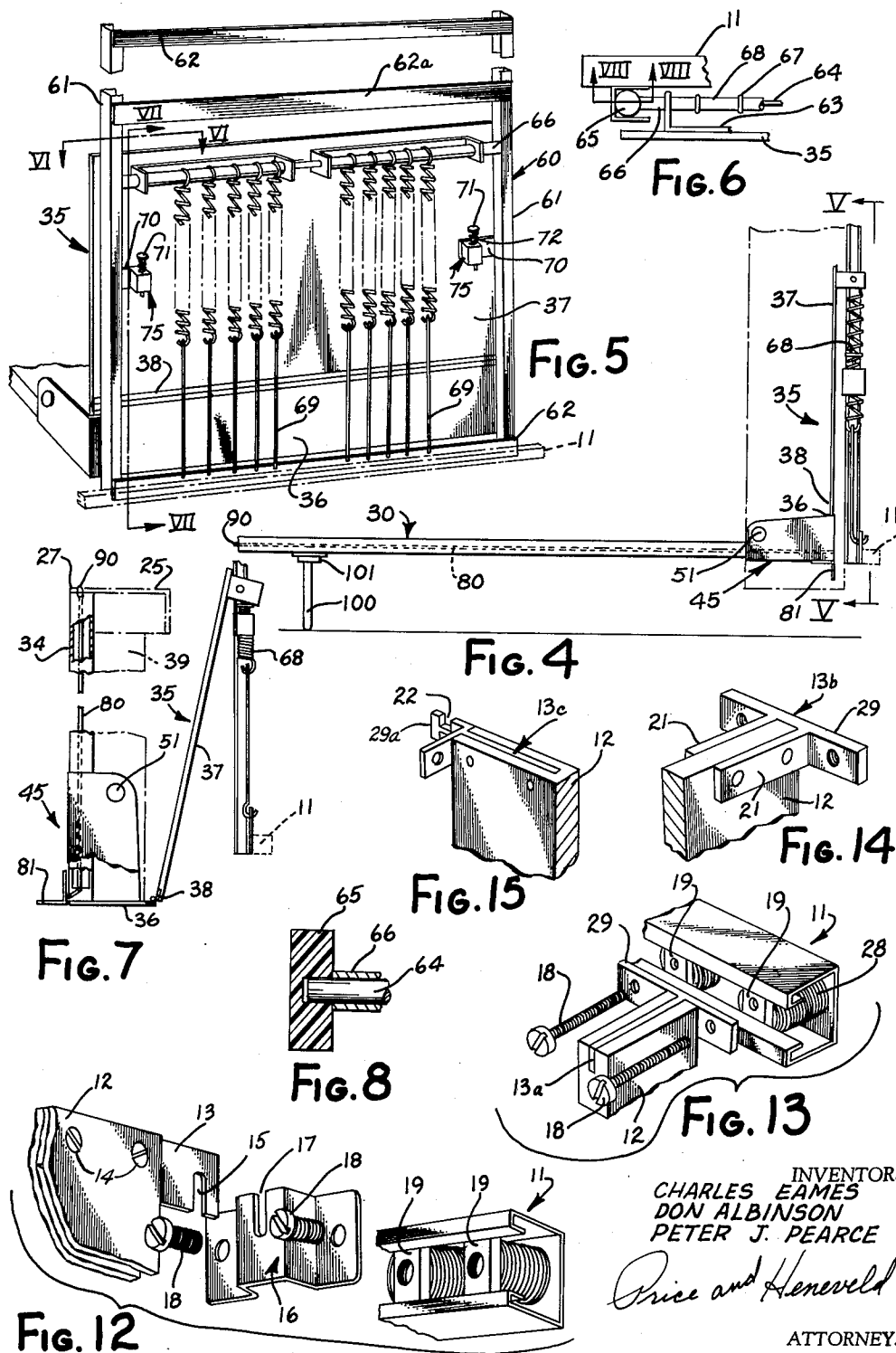


FIG. 6

FIG. 5

FIG. 4

FIG. 14

FIG. 15

FIG. 8

FIG. 13

FIG. 12

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BED

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This invention relates to a bed construction, and more particularly to a folding or self-storing bed.

This invention is a continuation-in-part of co-pending patent application entitled Storage filed November 6, 1959 as U.S. Serial No. 852,589 of which the inventors are Charles Eames and Don Albinson.

It is recognized that folding or self-storing beds are old and known to the art. However, this invention provides such a bed which is a considerable improvement over constructions for such beds already known.

This invention provides a bed which pivots from a flat or extended position to a vertical or storage position. In the latter position, it presents a neat and attractive appearance and is sufficiently concealed that its purpose as a bed is difficult to ascertain. The invention provides an extremely simple structure for this purpose which is easy to manipulate. Because of its simplicity and its high strength, it is dependable and particularly adapted for long and rugged usage.

Not only is its appearance neat and desirable, but it is so designed that both in open and storage positions there are no exposed springs, linkages or other operating mechanisms. This is particularly advantageous from a sanitary point of view because cleaning of the structure is made quick and easy. Further, the tendency to leave difficult corners and ledges without thorough cleaning is eliminated. Its structure also permits continuous ventilation of the bed while it is in storage. This is particularly desirable from the standpoint of sanitation.

The bed is a complete unit within itself, having a headboard and a reading light. These are all cooperatively attached to the bed so that a single unit provides all the necessary facilities.

Other advantages of this invention will be immediately understood by those acquainted with the design and construction of beds, and particularly of folding beds, upon reading the following specification in conjunction with the accompanying drawings.

In the drawings:

FIG. 1 is an oblique view of this invention with the bed open;

FIG. 2 is an oblique view of this invention with the bed closed;

FIG. 3 is a partially broken plan view of the platform for the bed;

FIG. 4 is a side elevation view of this invention with the bed open;

FIG. 5 is a perspective view of the bed balancing mechanism looking in the direction of the arrows V—V of FIG. 4;

FIG. 6 is a fragmentary plan view taken along the plane VI—VI of FIG. 5;

FIG. 7 is a side elevation view showing the bed supporting structure with the bed closed and the counterbalance mechanism illustrated as sectioned along the plane VII—VII of FIG. 5;

FIG. 8 is a fragmentary sectional view taken along the plane VIII—VIII of FIG. 6;

FIG. 9 is a fragmentary, oblique view of the pivot fitting for the bed;

FIG. 10 is an exploded view showing the parts for securing the pivot fitting to the panel;

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FIG. 11 is a perspective view of the header bar for the bed;

FIG. 12 is an enlarged exploded perspective view showing the manner in which the panels supporting the bed are secured to the wall.

FIG. 13 is an enlarged exploded perspective view of a modified means of securing the bed supporting panels to the wall;

FIG. 14 is a fragmentary perspective view of a further modified bracket for attachment of the invention to the wall;

FIG. 15 is a fragmentary, perspective view of one of the brackets for attaching this invention to a wall modified for use in a corner.

In executing the objects and purposes of this invention, a pair of supporting members, such as rails, are secured to a wall. Panels are attached to these rails and the bed structure is pivotally secured to these panels adjacent their lower ends. The bed structure consists of a platform which is rotated about these pivots from a horizontal position, in which the outer end is supported by a leg, to a raised or storage position where the bed is locked to the structure. At the head of the bed a two piece headboard is provided with the pieces hinged together so that they may fold as the bed is pivoted from one position to another. Behind the headboard are counterbalance springs which facilitate the opening and closing of the bed.

Referring specifically to the drawings and to FIG. 1, the numeral 10 indicates a wall on which there has been mounted a pair of parallel horizontal rails 11. The rails are firmly secured to the wall and are spaced from both the ceiling and the floor.

Supported on the rails are a pair of panels 12. For attachment to the rails, each of the panels has a top spline 13 and a similar bottom spline. The splines are anchored to the panels by suitable means such as screws 14 (FIG. 12). The splines project beyond the rear edge of the panel and have a vertical slot 15 extending partially through the spline. The upper and lower splines are identical except that the lower spline is inverted so that the slot 15 opens upwardly rather than downwardly. The splines hook into a hat-shaped anchor fitting 16 having a slot 17 for interfitting with and seating the spline. The anchor fittings 16 are secured to the rails, such as the rail 11, by means of a pair of screws 18 which engage the nuts 19 mounted on the inside of the rail.

FIG. 13 illustrates a modified means for anchoring the panels 12 to the rails 11. In this construction the same bolts 18, nuts 19 and springs 28 are used. However, the spline 13a is T-shaped and its head 29 seats against the face of the rail 11. The bolts 18 secure it to the rail 11 through holes adjacent the ends of the head. FIG. 14 shows a further modification of the spline. Here the spline 13b has a head 29 and a pair of spaced parallel arms 21 designed to embrace a panel 12. The spline 13b is secured to the rail in the same manner as the spline 13a.

FIG. 15 illustrates the spline modified for use in a corner where a projecting portion on one side of the head would interfere with the wall. Here the spline 13c has a generally L-shaped head. One leg of the head 29a is notched on both sides at 22 so as to receive the intumed flanges of the rail 11. This leg is turned to pass through the open face of the rail then rotated to seat the notches about the rail flanges. The other end of the head 29a is then secured in the usual manner. This arrangement permits panel installation against a wall parallel to the panel. It will be noted that, with this arrangement, the panels 12 do not touch either the floor or the ceiling, their ends being spaced a significant distance from both. This structure is described in more detail in our co-pending application entitled Storage.

The above description of the means of securing the panels to the rails is merely illustrative since other means could very well be used without in any way affecting the principles of this invention. It will also be recognized that for the purpose of supporting the bed it is unnecessary to employ the rails 11, since any other specific type of secure anchoring means for attaching the panels to the wall may be utilized and this invention is not to be considered as limited to the use of rails and the specific attachment means illustrated in FIG. 12.

The upper ends of the panels are joined by a header bar 25. The header bar, as herein illustrated, is a generally U-shaped structure (FIGS. 1, 2 and 11), having its two sides secured to the panels 12 by suitable fasteners such as the bolts 26. Near its outward edge and centered between its ends, the header bar has a latch opening 27 to engage the hereinafter described latch.

The frame or main supporting structure of the bed is a platform 30. While this platform may have a number of different constructions, it is preferably a composite panel having a pair of end rails 31, a pair of side rails 32 and a pair of intermediate rails 33 (FIG. 3). This structure is enclosed by suitable facing sheets 34 which may be of any suitable material such as plywood or a composition hardboard. The facing sheets 34 are secured to the frame by suitable means such as adhesives. The bed also has a headboard 35 consisting of a lower section 36 and an upper section 37 joined by a hinge 38 (FIGS. 1 and 9). The lower section 36 is secured to the platform 30 and projects to a height above the top surface of the platform 30 such that the hinge 38, when the bed is in open position, is above the top surface of the mattress 39 and preferably is far enough above the mattress to permit the sheets, blankets and, in some cases, the pillows, to be folded between the mattress and the headboard when the bed is folded into storage. The purpose of the folding headboard will be explained more fully hereinafter.

The end of the bed adjacent the wall 10 is supported by a pair of pivot plates 45 (FIG. 9), one on each side of the bed. The pivot plates are secured to the side edge of the platform 30 and the lower section 36 of the headboard 35. The pivot plates also have an inwardly turned flange 46 which wraps around the back of the headboard 35. The pivot plates may be secured to the bed structure by any suitable means such as screws 47.

The pivot plates 45 carry the full load of the pivotal movement of the bed plus they support the bed at one end when the bed is in open position. Thus, the pivot means by which they are attached to the panels 12 must be designed for heavy duty, dependable operation. This pivot consists of a bearing collar 50 which seats through the opening 51a in the panel 12 (FIG. 10). Passing through opening 51 in the pivot plate 45 and through the collar bearing 50 is a pivot member 52 which has a reduced section 53 designed to seat within the collar 50. The reduced section 53 is internally threaded to receive the cap screw 54, which is inserted from the outside of the panel 12. The pivot member 52 has a head 55 apertured to receive fasteners by which it is secured to the pivot plate 45 in the holes 56.

Turning to FIG. 5, the balancing mechanism for the bed includes a frame 60 having a pair of C-shaped vertical tracks 61 joined at their upper and lower ends by crossbars 62. The crossbars 62 are positioned to seat against the rails 11 and to be secured to them to support the frame 60. The frame may have an intermediate cross brace 62a.

A pair of elongated U-shaped brackets 63 are secured to the headboard 35 adjacent the upper edge of the upper section 37. The legs of the brackets are apertured and receive the rod 64. The ends of the rod 64 are inserted in the guide blocks 65 (FIGS. 6 and 8) which slidably fit in the rails 61. These guide blocks are preferably of a material having high mar resistance and low surface friction, as for example, the polyamide sold by E. I. Du

Pont and Company under the name Nylon, or the polyester sold by the same company under the name Mylar. Between the guide blocks 65 and the adjacent legs of the brackets 63, the rod 64 is surrounded by spacers 66.

Between the legs of each bracket 63, a plurality of springs 67 are hooked over the rod 64 and held in position by spacers 68. The other ends of the springs 67 are secured to hanger wires 69 which are in turn secured to the lower one of the crossbars 62. As many of the springs 67 are used as are necessary to properly counter-balance the weight of the bed frame 30 together with that of the mattress.

A pair of ears 70 project inwardly one from each of the tracks 61. On each ear is mounted a plunger 71 biased upwardly by a spring 72. The plungers 71 are vertically aligned with the outer legs of the brackets 63 and are so positioned vertically that the brackets will contact them when the end of the bed frame 30 is spaced about eight inches from the header bar 25 (FIG. 1). As the bed is moved the remaining distance to closed and latched position, the plungers are depressed against the springs 72, compressing them (FIG. 7). The ears 70 together with the plungers 71 and springs 72 constitute the snubbers 75.

A rod 80 extends through the center of the bed platform 30 (FIGS. 3, 4 and 7). One end of rod 80 is secured to the foot plate 81 on the bottom of the bed platform 30. The other end of the rod 80 terminates at the foot of the bed platform, extending therethrough with a spring loaded latch 90 mounted thereon. Latch 90 is adapted to fit within the latch opening 27 in the header bar 25 as will be more fully explained hereinafter.

The outer end of the bed is supported by a leg 100. Preferably the leg 100 is rigidly secured to the bed. However, the leg may be foldably or hingedly secured to the bottom of the platform 30 by brackets 101 (FIG. 2). These are secured by any suitable means such as screws. Above the headboard 35 of the bed a light 102 is mounted (FIG. 1). Shelves 103 may be mounted between the panels 12 above the light 101 to hold and store items used primarily at night when the bed is down.

Assembly

The folding bed is assembled as follows. For purposes of description, the assembly is described in relationship to the rails 11 and panels 12 mounted on the wall 10. The bed itself may be an assembled unit when it reaches its point of installation, being a flat, compact unit. This assembly may include the balancing mechanism already secured to the bed. The springs 67 and their related mechanisms would be fully assembled. With the bed lowered, the frame 60 can then be secured to the upper and lower rails 11 and the bed pivotally attached to the panels 12 installation of the various components making up the pivot assembly including the cap screws 54. This arrangement reduces the installation costs to a minimum. It also eliminates the necessity for special skills at time of installation. It permits accurate factory adjustment of the mechanism.

The bed could be shipped disassembled and assembled at the point of installation. Again, the bed and its parts could be secured to a wall and standard head supports without departing from the principles of this invention.

Operation

The bed has two basic positions. The open position is illustrated in FIG. 1 and the folded or storage position is illustrated in FIG. 2. In FIG. 1, the bed extends horizontally, supported on its inner end through the pivot plates 45 by the panels 12 and on its outer end by the extended leg 100. This leaves the floor under the bed completely free of obstruction except for the leg 100. This is particularly true since the head or inner end of the bed does not rest on the floor and is supported solely by the panels 12 which, in turn, are hung on the wall rather than supported on the floor. In open position,

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the headboard 35 is moved upwardly and the upper section 37 and lower section 36 of the headboard are substantially aligned. In this position the counterbalance springs 67 are extended, biasing the bed toward folded position. A counterbalancing force for the springs is selected such that the bed will not fold up unless the outer end is positively lifted from the floor. The light 102 at the upper end of the headboard is in a convenient position for use from the bed when the bed is open, as are the shelves 103.

In order to fold the bed, all that is necessary is for the user to raise the outer end from the floor and pivot it up into the space between the panels 12. When lifting the bed, the power of the springs 67 behind the headboard 35 is effective to supply a substantial portion of the force necessary to pivot the bed into storage position. This is because the springs 67, anchored to the lower crossbar 62, pull downwardly on the rod 64 and consequently pull the headboard 35 downwardly since the upper portion 37 is pivotally secured to the rod 64 by brackets 63. As the headboard 35 is pulled downwardly by springs 67, the top end of the top section 37 is guided by the U-shaped guide tracks 61, the bearings 65 at the ends of the rod 64 sliding fully in these tracks. As the bed rotates upwardly about its pivots, the lower section 36 of the headboard rotates from a vertical to a horizontal position while the upper section 37 of the headboard slides downwardly, guided by the tracks 62. The pivot about which the bed rotates is so located that preferably the bottom of the outer face of the platform 30 lies flush with the outer edges of the panels 12 in storage position. It of course will be understood that, if it is desired to have this bottom or outer face inset between the panels 12, the pivot point about which the bed is rotated may be relocated in relation to the panels 12.

When the bed reaches its fully vertical or storage position, the latch 90 engages with the latch opening 27 in the header bar 25, locking the bed against accidental opening. When the bed is locked in storage position, it presents a flush surface to the exterior except for the folded down leg 100. Also, in storage position, an opening remains between the headboard 35 and the wall permitting air to pass vertically between the bed and the wall, thus affording ventilation which is particularly important to this type of furniture.

The snubbers 75 prevent the bed from remaining in true vertical position when it is not latched. They automatically hold the bed some six to ten inches away from the header bar 25 where it will be obvious that the bed is not latched into storage position.

To lower the bed into sleeping position, the user steps on the foot plate 81, causing link 80 to pull the spring loaded latch 90 downwardly, disengaging it from latch opening 27 in the header bar 25. The bed may then be pulled downwardly. The plungers 71 and springs 72 (FIGS. 5 and 7) immediately pivot the bed outwardly a few inches upon release of the latch 90. There is no danger of the bed rocking downwardly with substantial force since the springs 67 restrain it. The springs 67 should be so tensioned that the bed when released and kicked outwardly a short distance by the plungers 71 will automatically arrest and refuse to swing further out without application of force by the operator. However, the bed is not difficult to lower since the weight of the platform 30, the mattress 39 and bedding will aid in extending the springs 67. As the bed moves downwardly, the upper portion 37 of headboard 35 moves upwardly, being guided into upright position by its pivotal attachment to the rod 64, which rides and is guided in the tracks 61. The bed comes to rest when the sections 36 and 37 of headboard 35 are aligned, leg 100 resting on the floor.

Both when the bed is folded and when the bed is opened, the entire operating mechanism is concealed. The counterbalance springs 67 are completely concealed

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at all times behind the headboard 35. This not only affords the bed a neat and attractive appearance but it also makes the bed easy to clean since there are no exposed ledges or mechanisms to gather dust. Further, there are no exposed linkages such as are common to conventional folding beds. The absence of exposed metal parts such as springs and linkages eliminates all possibility of rust spots occurring on the bedding or the mattress where they contact metal parts which must, of necessity, be of a ferrous material to afford the desired strength or resiliency. For this purpose, the pivot plates 45, if of a non-corrosion resistant material such as steel, are plated. The plates 45 may also be fabricated of aluminum which has sufficient strength for this purpose and is non-corrosive and therefore will not mark the linen. If further protection is desired from the aluminum fittings, they may be coated with a suitable synthetic resinous material.

Concealing the springs and other operating portions of the mechanism eliminates the danger of injury to persons manipulating the bed. In conventional folding bed constructions, various coil springs and scissor-like mechanical assemblies are exposed. These, of necessity, are heavy duty structures and often are characterized by substantial mechanical disadvantages as the bed is manipulated. Such mechanisms in conventional folding beds are quite capable of severely cutting the operator or of removal of fingers and toes. Although rare, it sometimes happens that some main structural element breaks while under high load conditions, causing fragments to fly like shrapnel. The concealment of the operating mechanism in this invention creates a protective shield in the event of such an occurrence.

Further, the mechanism is greatly simplified, eliminating the conventional lazy-tong and scissor-like linkages which often become inoperative due to interference resulting from bending and wear after a protracted period of usage. The simplicity of the structure affords it long life with minimum maintenance.

Thus, this invention provides a bed which folds down and up with ease. In its open position it provides a bed with a complete headboard, reading light and other facilities which are also desirable in connection with equipment of this type. In folded position, it forms a neat, compact and attractive unit. It will be recognized that additional facilities for the comfort of the user may be provided, such as shelves or bookcases 103 provided above the light. This however, is merely adding further facilities to the basic invention.

It will be recognized that the panels 12 and the rails 11 or their equivalent may be made a rigid box-like subassembly and the bed, together with its operating mechanism including the springs 67 and their related operating structure, assembled thereto as a single integrated package. This package may then be installed by securing it to suitable stationary structure such as a wall which will restrain the box-like subassembly from following the bed as it is opened and closed.

While a preferred embodiment of this invention has been described, it will be recognized that other embodiments, incorporating modifications of this invention but retaining the principles of the invention may be made. Such of these modifications are to be considered as included in the hereinafter appended claims unless these claims, by their language, expressly state otherwise.

We claim:

1. A bed movable from a flat position to a vertical position including a pair of supports spaced apart generally the width of said bed; a pair of pivot plates secured to the sides of said bed near one end thereof; said pivot plates secured to said supports whereby said bed pivots about an axis lying above said bed and spaced from said one end; a headboard secured to said one end of said bed and vertically movable between said supports; a horizontal hinge in said headboard whereby the top of said headboard folds

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toward said bed when said bed is moved to its vertical position; a first bar secured to the back of said top of said headboard; a pair of spaced, vertically positioned guide tracks receiving the ends of said first bar; a fixed second bar lying below said first bar and extending between said supports; a plurality of spaced, vertically extending coil springs secured at one of their ends to said first bar and anchored at their other ends to said fixed second bar; and said coil springs tensioned when said bed is in its flat position and contracting when said bed is moved toward its vertical position as said top of said headboard moves downwardly toward a generally parallel relationship with said bed.

2. A bed as recited in claim 1, said supports comprising a pair of panels secured to a wall.

3. A bed movable from a flat position to a vertical position including a pair of supports spaced apart generally the width of said bed; a pair of pivot plates secured to the sides of said bed near one end thereof; said pivot plates secured to said supports whereby said bed pivots about an axis lying above said bed and spaced from said one end; a spring loaded latch means mounted in the other end of said bed; a foot plate secured to the bottom of said bed at said one end; a rod, extending through said bed, operably connecting said latch means and said foot plate; a header member mounted above said supports; an opening in said header member for receiving said latch means when said bed is in its vertical position; a headboard secured to said one end of said bed and vertically movable between said supports; a horizontal hinge in said headboard whereby the top of said headboard folds toward said bed when said bed is moved to its vertical position; a first bar secured to the back of said top of said headboard; a pair of spaced, vertically positioned guide tracks receiving the ends of said first bar; a fixed second bar lying below said first bar and extending between said supports; a plurality of spaced, vertically extending coil springs secured at one of their ends to said first bar and

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anchored at their other ends to said fixed second bar; and said coil spring tensioned when said bed is in its flat position and contracting when said bed is moved toward its vertical position as said top of said headboard moves downwardly toward a generally parallel relationship with said bed.

4. A bed recited in claim 3 wherein said supports comprise a pair of panels secured to a wall.

5. A bed movable from a flat position to a vertical position including a pair of supports spaced apart generally the width of said bed; one end of said bed positioned between said supports and pivotally secured thereto enabling said bed to pivot about an axis spaced from said one end; a headboard secured to said one end of said bed and vertically movable between said supports; a horizontal hinge in said headboard whereby said bed folds toward said top of said headboard when said bed is moved to its vertical position; a frame member including a plurality of spaced vertically extending coil springs secured at one of their ends along a first bar secured to the back of said top of said headboard and anchored at their other ends to a fixed second bar lying below said first bar and extending between said supports, and a guide means for guiding said first bar as it moves in a vertical path with said top of said headboard.

6. A bed as recited in claim 5 wherein said supports comprise a pair of panels mounted on a wall.

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