Jan. 5, 1971 J. R. FRYE, SR 3,551,924

VARIABLE FIRMNESS SLEEP UNIT

Filed May 19, 1969 3 Sheets-Sheet 1

FIG. 1

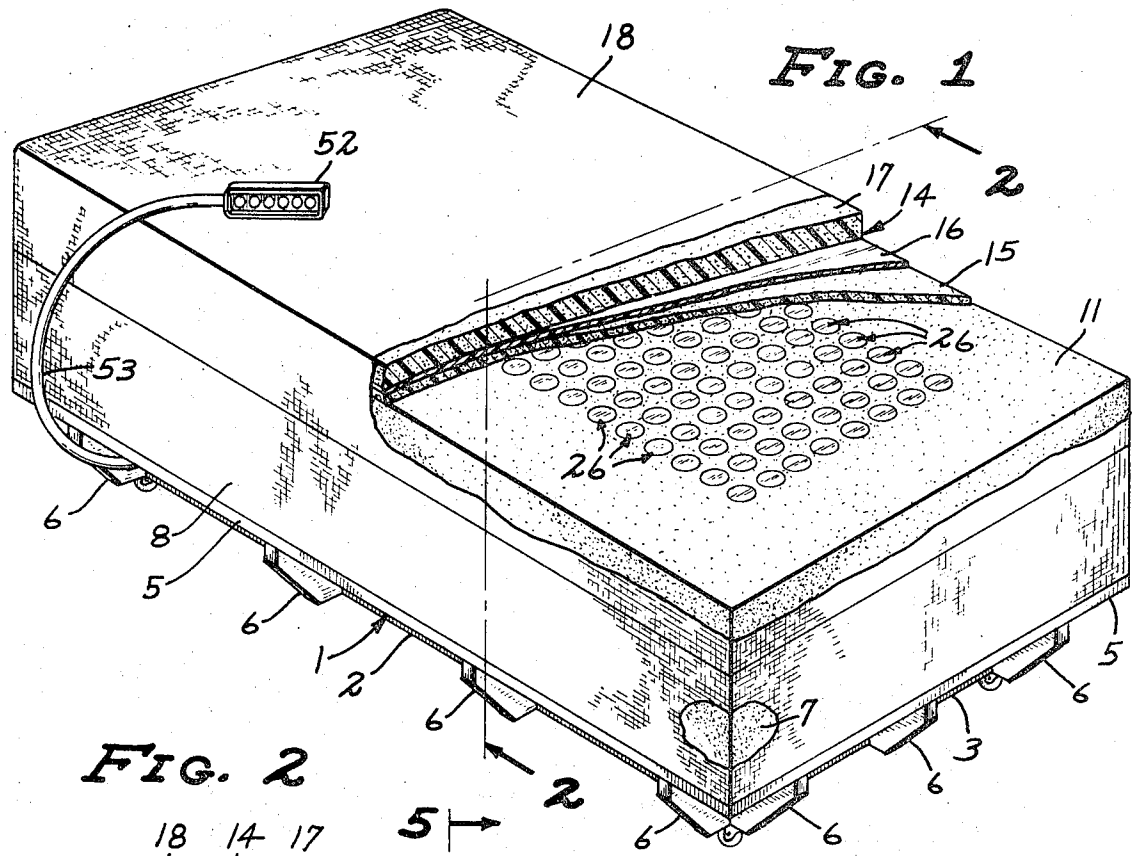

FIG. 2

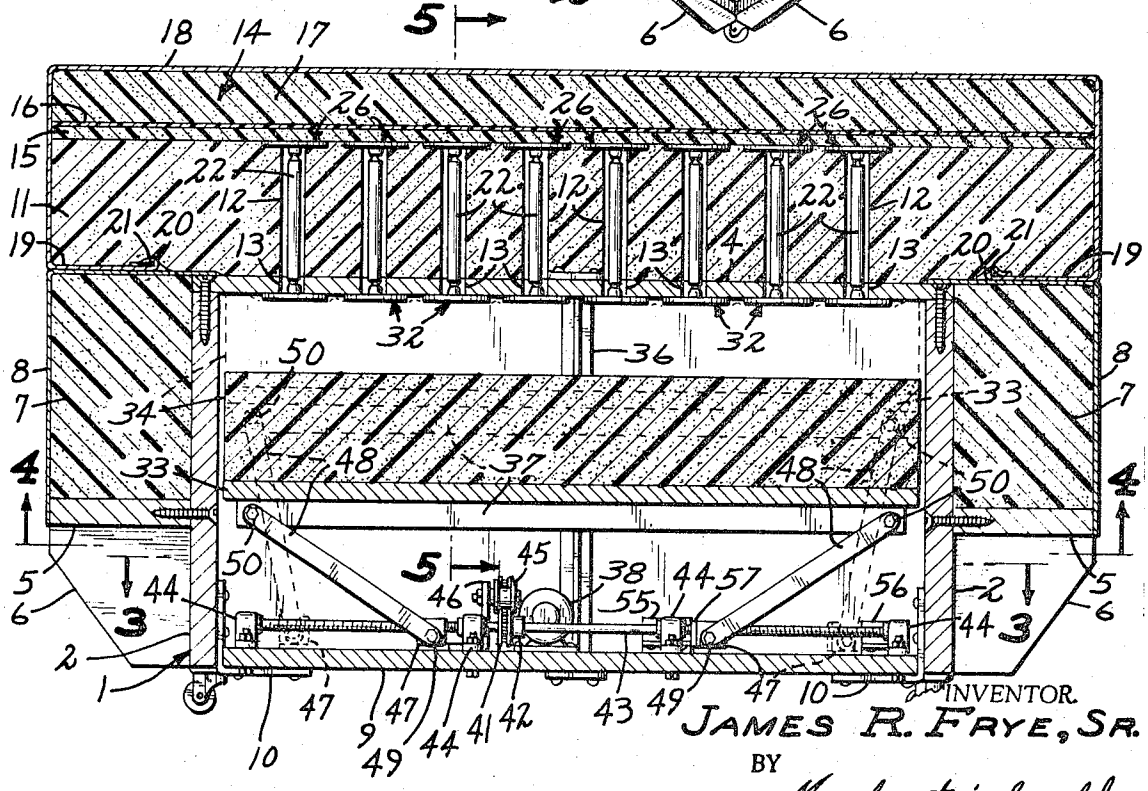

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FIG. 3

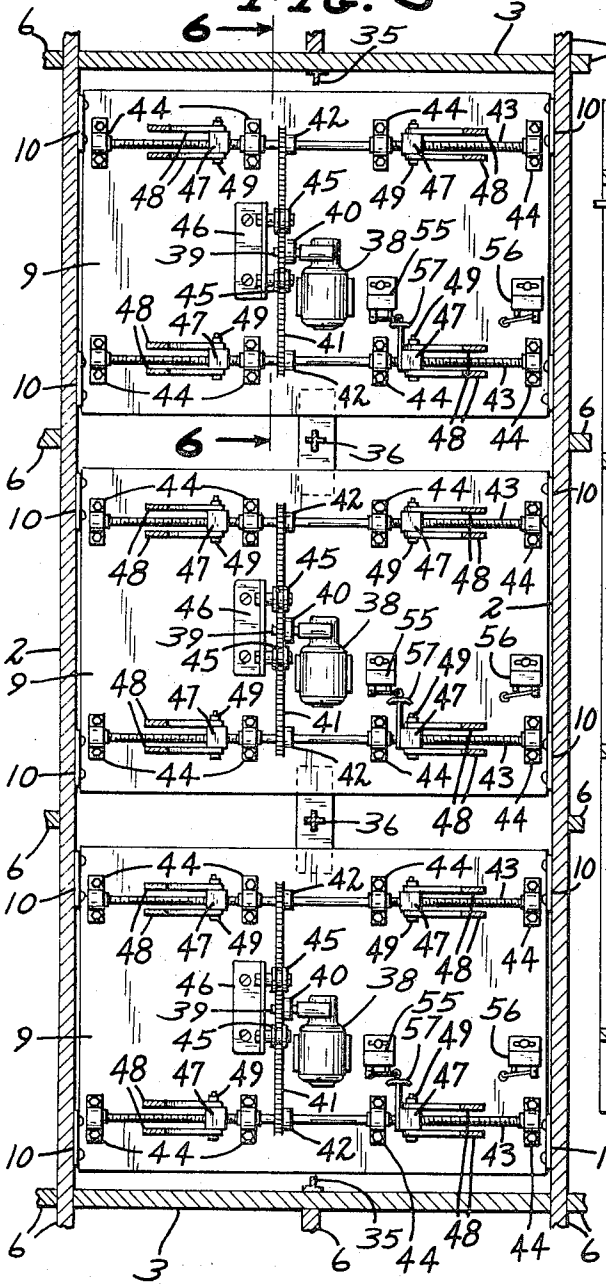
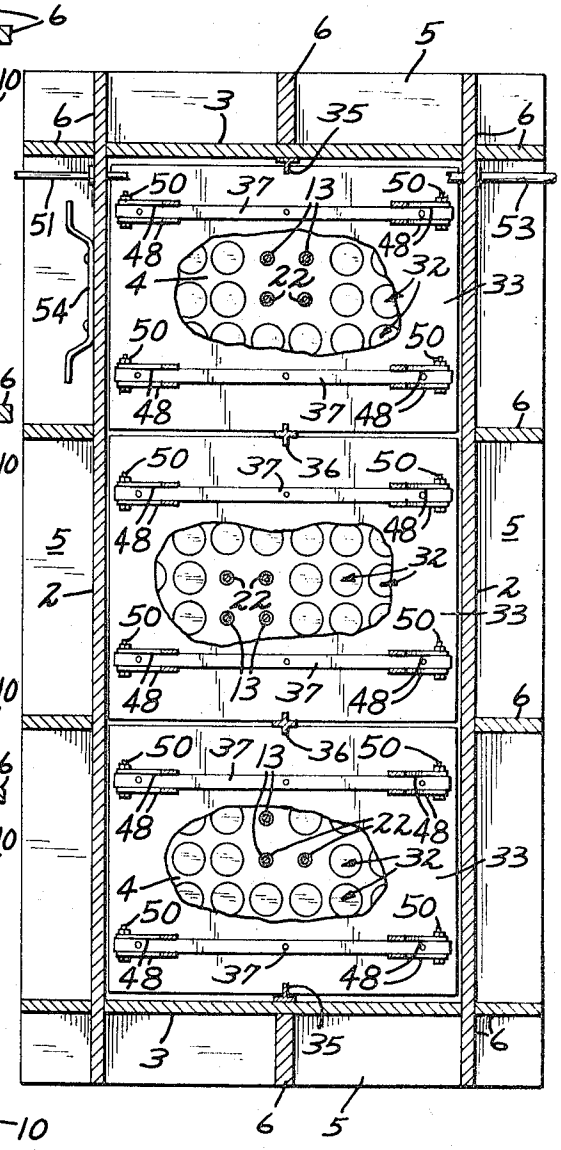


FIG. 4



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VARIABLE FIRMNESS SLEEP UNIT

Filed May 19, 1969 3 Sheets-Sheet 3

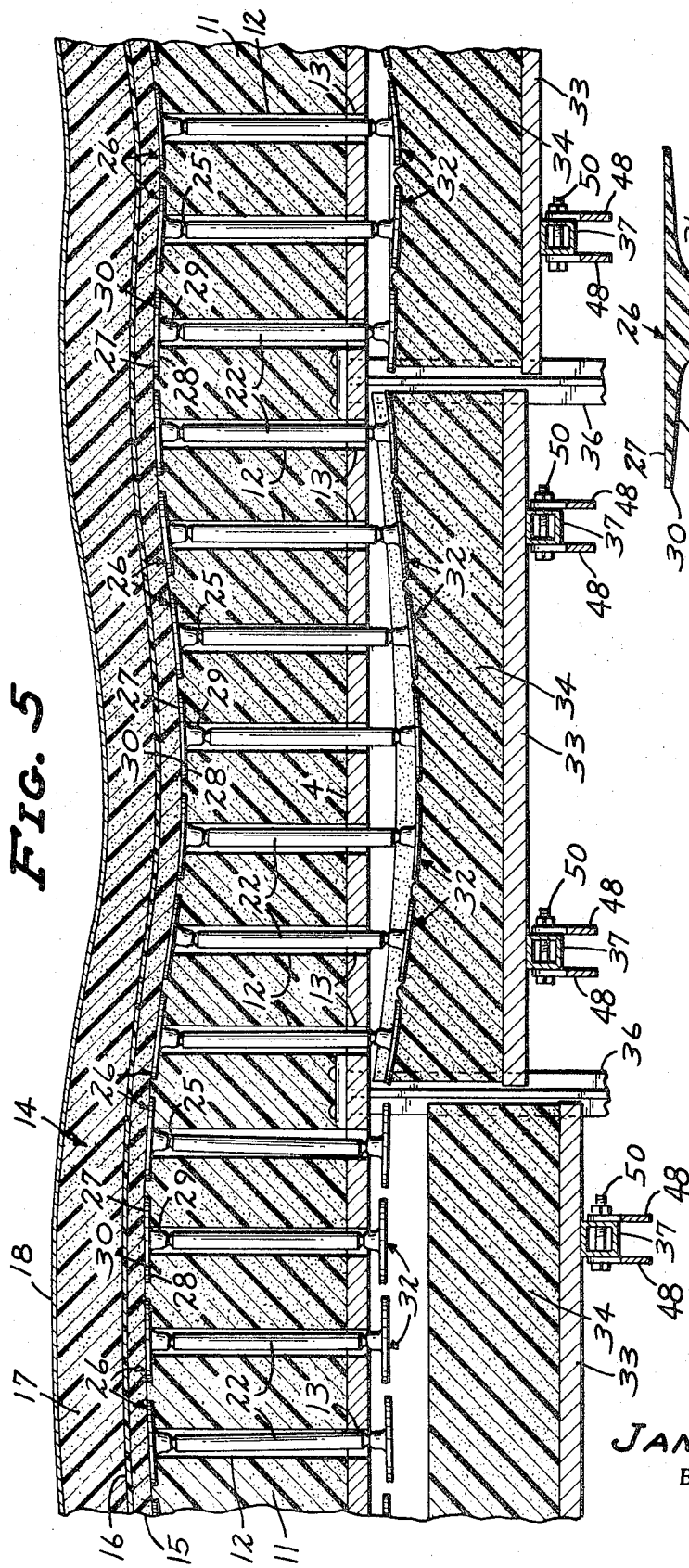

FIG. 5

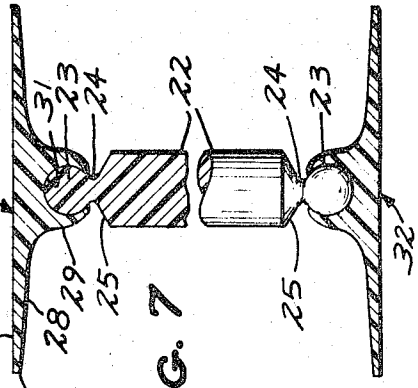

FIG. 7

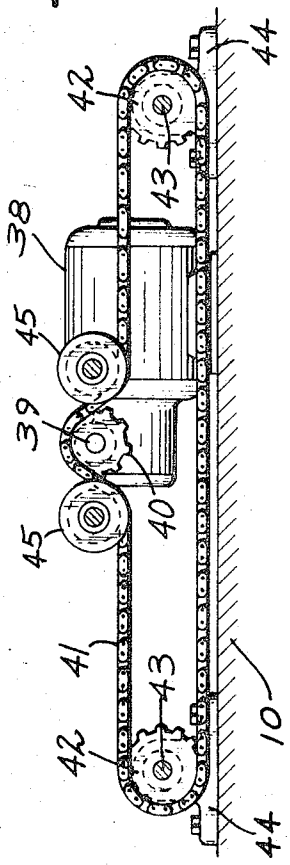

FIG. 6

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VARIABLE FIRMNESS SLEEP UNIT

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Filed May 19, 1969, Ser. No. 825,789
Int. Cl. A47c 27/08, 23/00
U.S. Cl. 5—345 9 Claims

ABSTRACT OF THE DISCLOSURE

A sleep unit including a resilient mattress having vertically movable support rods extending therethrough and resiliently biased against downward movement imparted thereto by a reclining body on the mattress. Vertically movable means underlying the support rods is operable to vary the bias against the support rods, the rods having flexible head elements mounted on their upper ends for universal tilting movements relative to the axes of their respective support rods.

BACKGROUND OF THE INVENTION

This invention is in the nature of an improvement on the device disclosed and claimed in my prior U.S. Letters Pat. 3,252,170, issued May 24, 1966, and other types of variable firmness units utilizing springs which are not always of uniform compressive strength, which are more expensive to produce, and which require special mounting or anchoring facilities to hold the same against lateral movement.

SUMMARY OF THE INVENTION

The present invention involves the use of a resilient foam mattress disposed on a stationary platform, a resilient pad overlying the mattress, and a plurality of generally vertical support rods extending through the mattress and platform and vertically slidable therein. Each support rod is provided at its upper end with a generally flat-topped flexible head element disposed between the mattress and overlying pad and mounted on its respective support rod for universal tilting movements; each support rod being provided at its lower end with a shoe element disposed below the platform. Vertically movable means, disposed below the platform, is provided with resilient means movable toward and away from engagement with the shoe elements to vary upward bias of the resilient means against the support rods. The vertically movable means comprises one or more flat base plates having means for raising and lowering the same. In the embodiment of the invention herein illustrated, the several base plates are movable independently of each other when desired, each base plate and its respective resilient means, in the nature of a block of elastic foam cushioning material, engaging an independent group of the support rods, so that firmness of the unit may be varied in different areas or zones thereof. The universal tilting mounting of the heads on the support rods enables the heads to closely follow the varying contours assumed by the top of the unit when a user reclines thereon.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view in perspective of a variable firmness sleep unit produced in accordance with this invention, some parts being broken away and some parts being shown in section;

FIG. 2 is an enlarged transverse section taken substantially on the line 2—2 of FIG. 1;

FIG. 3 is a view partly in plan and partly in horizontal section, taken on the line 3—3 of FIG. 2, on a reduced scale;

FIG. 4 is a view partly in bottom plan and partly in section, taken on the line 4—4 of FIG. 2, on a reduced scale;

FIG. 5 is an enlarged fragmentary longitudinal section taken substantially on the line 5—5 of FIG. 2;

FIG. 6 is an enlarged fragmentary section taken on the line 6—6 of FIG. 3; and

FIG. 7 is an enlarged fragmentary view partly in side elevation and partly in axial section, of one of the support rod assemblies of this invention.

DETAILED DESCRIPTION

In the embodiment of the invention illustrated, an elongated generally rectangular frame, indicated generally at 1, is shown as comprising a pair of laterally spaced parallel side frame members 2, transverse end frame members 3 and a horizontally disposed platform 4 overlying the frame members 2 and 3 and rigidly secured thereto. A rigid marginal shelf 5 encompasses the frame 1, being rigidly secured to the side and end frame members 2 and 3 and projecting laterally outwardly therefrom. The shelf 5 is reinforced by a plurality of underlying gussets 6 rigidly secured thereto and to the side and end frame members 2. The marginal shelf 5 supports a bolster 7 that encompasses the frame members 2 and 3, the bolster 7 being covered with suitable fabric or other flexible covering material 8. The bolster 7 is preferably in the nature of blocks or bars of elastic foam cushioning material, such as flexible polyurethane foam held in place by the fabric covering 8 that is tacked or otherwise secured to the shelf 5 and platform 4. At its bottom portion, the frame 1 is reinforced by a plurality of plate-like support members 9 that are rigidly secured to the side frame members 2 by angle brackets 10 screwed or otherwise anchored to the support members 9 and side frame members 2, see FIGS. 2 and 3.

A relatively thick soft resilient mattress 11 rests upon the platform 4 and bolster 7, the mattress 11 being preferably formed from elastic foam cushioning material, such as flexible polyurethane foam, and has formed therein a plurality of laterally and longitudinally spaced openings 12 extending vertically therethrough and aligned with corresponding openings 13 through the platform 4. A relatively thin soft resilient mattress structure 14 overlies the mattress 11 and comprises a bottom layer 15 of elastic foam material, a sheet of flexible moisture-proof material 16 overlying the bottom layer 15 and preferably adhered thereto, and a top layer 17 of elastic or resilient foam cushioning material overlying the sheet 16. Preferably, the mattress 11 is adhered to the platform 4, the layers 15–17 loosely resting on the mattress 11. The mattress 11, with the layers 15–17 are releasably held together by a fabric cover 18 having an inturned marginal portion 19 that is tucked inwardly between the mattress 11 and the underlying bolster cover 8. Preferably, the inturned marginal portion 19 is provided with a hem 20 that encloses an elastic cord 21 which holds the cover 18 taut over the mattress 11 and layers 15–17, see particularly FIG. 2.

A plurality of rigid support rods 22 are each loosely axially disposed in a different one of the mattress openings 12 and corresponding openings 13 in the platform 4, each of the support rods 22 including a ball portion 23 at its opposite ends, a reduced neck portion 24 adjacent each ball portion 23, and a tapered shoulder portion 25 between the neck portions 24 and the main body portions of each support rod 22, see particularly FIG. 7. Each support rod 22 is provided at its upper end with a generally flat-topped flexible head element 26 comprising a flange portion 27 the lower surface 28 of which slopes generally upwardly and radially outwardly from a central hub portion 29 to provide a thin marginal edge 30. The

central hub portion **29** defines a downwardly opening socket **31** for reception of the adjacent ball **23** of its respective support rod **22**. Preferably, each head element **26** is molded from flexible plastic resin, such as polyethylene, the adjacent ball **23** being snapped into the socket **31** to be held therein against accidental removal therefrom. The ball and socket connection between each head element **26** and its respective support rod **22** permits the head element **26** to partake of universal tilting movements with respect to the axis of its corresponding support rod **22**. With reference particularly to FIGS. 2 and 5, it will be seen that each head element **26** is disposed between the top surface of the mattress **11** and the overlying foam layer **15**, the central hub portions **29** being of a size to be loosely received in their respective mattress openings **12**. The support rods **22** are provided at their lower ends with shoe elements **32** which, for the purpose of the present example, are identical to the head elements **26** and which are swivelly mounted on the ball portions **23** at the lower ends of the support rods **22**. The length of each support rod **22** is such that the shoe elements **32** closely underlie the platform **4** when the sleep unit is unoccupied, as shown in FIG. 2. It will be appreciated that, while the head and shoe elements **26** and **32** are shown in FIGS. 1 and 4 respectively as being round or disk-like in outline, these may be of any desired shape, such as polygonal. When the sleep unit is unoccupied, the head elements **26** are disposed in a common plane and slightly embedded in the top surface of the mattress **11**, so that the top mattress structure **14** is flat and even, as shown in FIGS. 1 and 2. It will be further noted that all of the mattress openings **12** and the support rods **22** therein are inwardly spaced from the marginal edges of the mattress, **11**, so that all of the shoe elements **32** are disposed within the confines of the frame walls **2** and **3**. With the structure thus far described, when a person reclines on the sleep unit, the portions of the mattress **11** and top mattress structure **14** underlying the occupant become depressed in a manner to conform to the contours of the body of the occupant, see FIG. 5. When this occurs, the head elements **26** swivel or tilt on their respective support rods **22**, so that the top surfaces of the head elements **26** collectively conform to the contour of the top surface of sleep unit. As shown, the head elements **26** are disposed in closely-spaced relationship, the close spacing and flexibility of the head elements **26** and the tilting connection therebetween and the support rods **22** cooperating with the upper mattress structure **14** to assure a comfortable sleeping surface for the user.

Vertically movable means, disposed within the frame **1** between the platform **4** and plate-like support members **9**, comprises a plurality of flat horizontal base members or plates **33**, each thereof having mounted thereon resilient means in the nature of a block or slab **34** of elastic foam cushioning material, such as flexible polyurethane foam. The base members **33** are mounted and guided for independent vertical movement within the frame **1** by vertically disposed end guide rails **35** secured to the end frame members **3**, and intermediate guide rails **36** suitably anchored at their upper and lower ends to the platform **4** and support members **9** respectively. The base members **33** are each reinforced by a pair of elongated brace members **37** secured to the undersurface thereof, each of the base members **33** and its respective resilient slab **34** underlying a different area of the mattress **11** and respective groups of support rods **22**, to divide the mattress area inwardly of the marginal edges of the mattress structure into a plurality of zones.

Each of the base members **33** is independently vertically movable toward and away from the engagement of its respective resilient slab **34** with overlying ones of the shoe elements **32** by independent lifting means now to be described. The lifting means for the several base members **33** are identical, and description of one thereof will apply equally to the others thereof. A conventional motor, preferably of the geared head type, is indicated at **38**, and is mounted on a respective support member **9** and has mounted on its output shaft **39** a sprocket wheel **40** over which is entrained an endless drive chain **41** that is also entrained over a pair of spaced sprocket wheels **42** rigidly mounted on respective ones of a pair of elongated drive screws **43** journaled in bearings **44** secured to the underlying support member **9**. Entrainment of the chain **41** over the drive sprocket **40** is maintained by a pair of idler rolls **45** rotatably mounted on a bracket **46** bolted or otherwise secured to the underlying support member **9**. A pair of traveling nut elements **47** are screw-threaded on each of the drive screws **43** in axially spaced relationship thereon. Pairs of bifurcated toggle-acting links **48** have their inner or lower ends pivotally secured each to a different one of the nut elements **47** and their upper or outer ends pivotally secured to adjacent ends of the base members **37**, as indicated at **49** and **50** respectively. Each of the drive screws **43** have axially spaced threaded portions of opposite hand, the traveling nuts **47** on each screw being correspondingly threaded, so that rotation of a drive screw **43** in one direction will impart axial movements to its traveling nuts **47** in directions axially away from each other, rotation of the drive screw **43** in the opposite direction imparting movements of its respective traveling nuts **47** toward each other. Each motor **38** is of the reversing type and is connected in conventional circuit means, not shown, but including a power lead **51**, shown fragmentarily in FIG. 4, and switching means enclosed within a switch box **52** mounted on the end of a flexible conductor cable **53**. A cleat **54** is mounted on one of the side frame members **2** for carrying the conductor **51** during transport or storage of the sleep unit. As shown in FIG. 2, each motor **38** is operative to move its respective base member **33** between a lowered position shown by full lines in FIG. 2 and a fully raised position indicated by dotted lines in FIG. 2 and wherein its respective resilient slab **34** engages the adjacent shoe elements **32**. The arrangement is such that each base member **33** may be stopped and held in any desired position of its vertical movement between its fully raised and lowered positions. The circuit for each motor **38** includes a pair of limit switches **55** and **56** operated by a switch actuator **57** carried by one of the traveling nut elements **47**, the switches **55** and **56** being suitably mounted on their respective support members **9**. The limit switches **55** are operable to limit downward movement of the base members **33**, the switches **56** being operable to limit upward movement of their respective base members **33**.

With all of the base members **33** disposed in their lowermost positions, shown by full lines in FIG. 2, the mattress structure is in its softest condition. Conversely, when all of the base member **33** are raised to their upper limits of movement, the resilient slabs **34** are pressed against the shoe elements **32**, and the load imparted to the mattress by a person reclining thereon is divided between the mattress **11** and the resilient slabs **34**. Thus, with the base members **33** fully raised, the firmness of the mattress structure is at its maximum. As shown in FIG. 5, the base members **33** may be disposed in any desired elevation between their fully raised and fully lowered positions independently of the others thereof, so that each of the separate areas or zones of the mattress structure overlying the several base members **33** will have different firmness characteristics. In the embodiment illustrated, showing a single or twin-sized sleep unit, a person resting thereon may adjust the firmness of the unit under different portions of the body, enabling the occupant to rest with maximum comfort.

It will be appreciated that the above-described structure may be used with equal facility with sleep units of double bed sizes or larger king-sized units. In such larger units, each occupant would normally rest on a different group of variable firmness mechanisms, each group being independently controlled by switch means convenient to each occupant individually.

The above-described variable firmness sleep unit is particularly adapted for use in commercial accommodations such as hotels, motels, hospitals and other institutions wherein the sleep units are used by many different people over a period of time. The sleep unit of this invention lends itself equally to use in the home, wherein the sole user, in the case of a single or twin-size unit, may wish to vary the firmness of the unit, or specific areas thereof, from time to time, as health or other conditions may require.

In the interest of sanitation, the top mattress structure **14** may be easily removed and replaced, by merely first removing the fabric cover **18**, the moisture-proof sheet **16** affording substantial protection of the mattress **11** from dust or moisture which may seep downwardly through the top foam layer **17** of the unit. If damage should occur to the cover **18** and top foam layer **17**, replacement thereof may be quickly and easily accomplished.

What is claimed is:

1. A variable firmness sleep unit comprising:

(a) a frame structure including a generally horizontal supporting platform having a plurality of spaced openings therethrough;

(b) a relatively thick soft resilient mattress structure on said platform having a plurality of spaced passageways extending generally vertically therethrough and each axially aligned with a different one of said openings;

(c) a relatively thinner resilient pad on said mattress structure;

(d) vertically movable means underlying said platform;

(e) resilient means on said vertically movable means;

(f) a plurality of support rods each extending through a different one of said passageways and the platform opening aligned therewith and freely movable axially therein;

(g) a plurality of generally flat-topped flexible head elements each disposed between said mattress structure and said pad and each mounted on the upper end of a different one of said support rods for common axial movements therewith and for universal tilting movements relative thereto;

(h) shoe elements on the lower ends of said support rods between said platform and said resilient means;

(i) and lifting means for raising and lowering said vertically movable means to move said resilient means toward and away from supporting engagement with said shoe elements.

2. The sleep unit according to claim **1** in which said mattress structure comprises a block of elastic foam cushioning material.

3. The sleep unit according to claim **2** in which said vertically movable means comprises a flat rigid base plate, said resilient means comprising a second block of elastic foam cushioning material underlying said shoe elements.

4. The sleep unit according to claim **1** in which cooperating ones of each of said support rods and head elements are formed to define ball portions, the others thereof defining socket portions for reception of their adjacent ball portions, whereby said head elements are mounted on said support rods for said universal tilting movements of said head elements.

5. The sleep unit according to claim **4** in which cooperating ones of each of said support rods and shoe elements are formed to define ball portions, the others thereof defining socket portions for reception of their adjacent ball portions, whereby said shoe elements are mounted for universal tilting movements on their respective support rods.

6. The sleep unit according to claim **1** in which said support rods each include a ball portion at each end thereof and a reduced diameter neck portion axially inwardly of each ball portion, said head and shoe elements each defining a generally centrally disposed socket portion for reception of an adjacent one of said ball portions.

7. The sleep unit according to claim **1** in which said support rods are disposed within a given area of said mattress structure, said area being inwardly spaced from the marginal edges of said mattress structure and comprising a plurality of zones, each of said zones having a different range of firmness variation than an adjacent zone.

8. The sleep unit according to claim **7** in which said vertically movable means comprises a plurality of laterally spaced flat base plates, said resilient means including a plurality of blocks of elastic foam cushioning material each on a different one of said base plates, said lifting means being arranged to raise and lower each of said base plates independently of the others thereof.

9. The sleep unit according to claim **1** in which said pad includes a pair of upper and lower layers of elastic foam cushioning material and an intermediate layer of flexible moisture-proof sheet material.

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U.S. Cl. X.R.

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