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Blair

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[54] **MATTRESS FOR PREVENTING BEDSORES**

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[52] **U.S. Cl.** ..... **5/345 R**; 5/361 B; 5/334 R

[51] **Int. Cl.** **A47c 23/00**; A47g 9/00

[58] **Field of Search** ..... 5/DIG. 2, 336, 345, 355, 5/361, 361 B, 334, 334 C, 334 R, 345 R, 361 B

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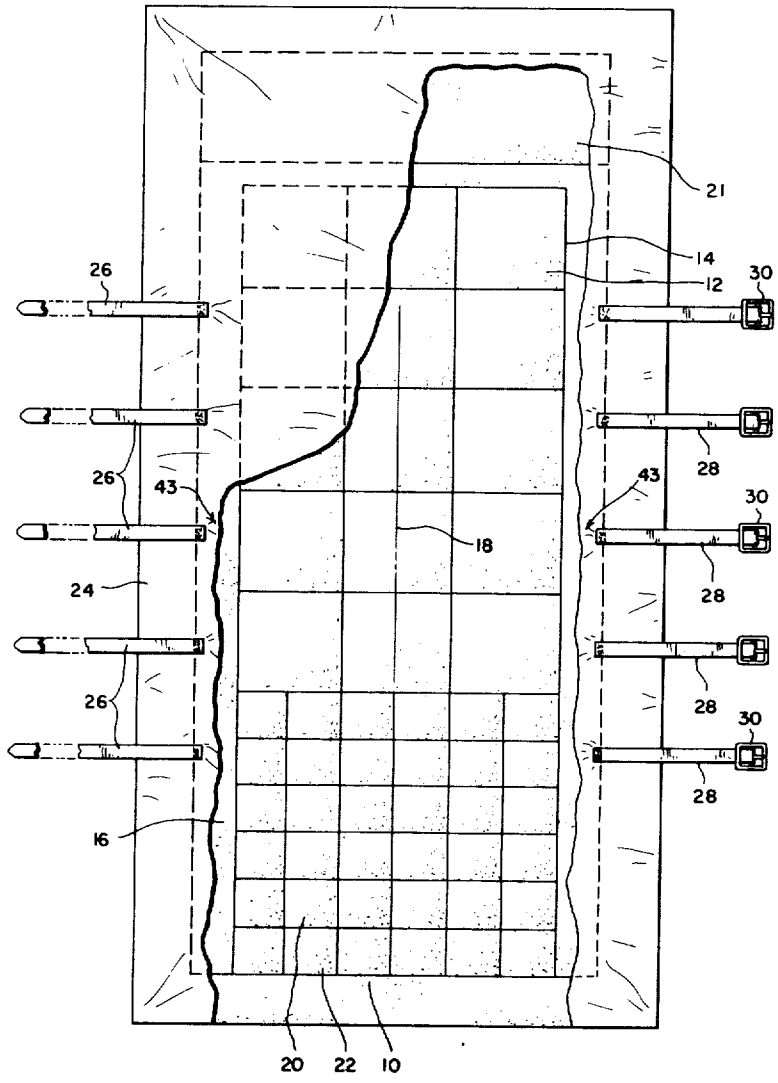
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[57] **ABSTRACT**

A mattress is constructed of foam having a 50% compression deflection pressure equal to the body weight of an average patient divided by his projected body area and a thickness in excess of his body depth, to prevent bedsores by providing a moldable surface which spreads support to a great area of the patient's body. The mattress surface supporting the patient is subdivided into a plurality of individual load bearing units to provide lateral give to the mattress. A water proof cover sheet fits over the mattress and includes means for tightening the cover about the mattress to provide a firmer mattress for maneuvering the patient.

8 Claims, 3 Drawing Figures



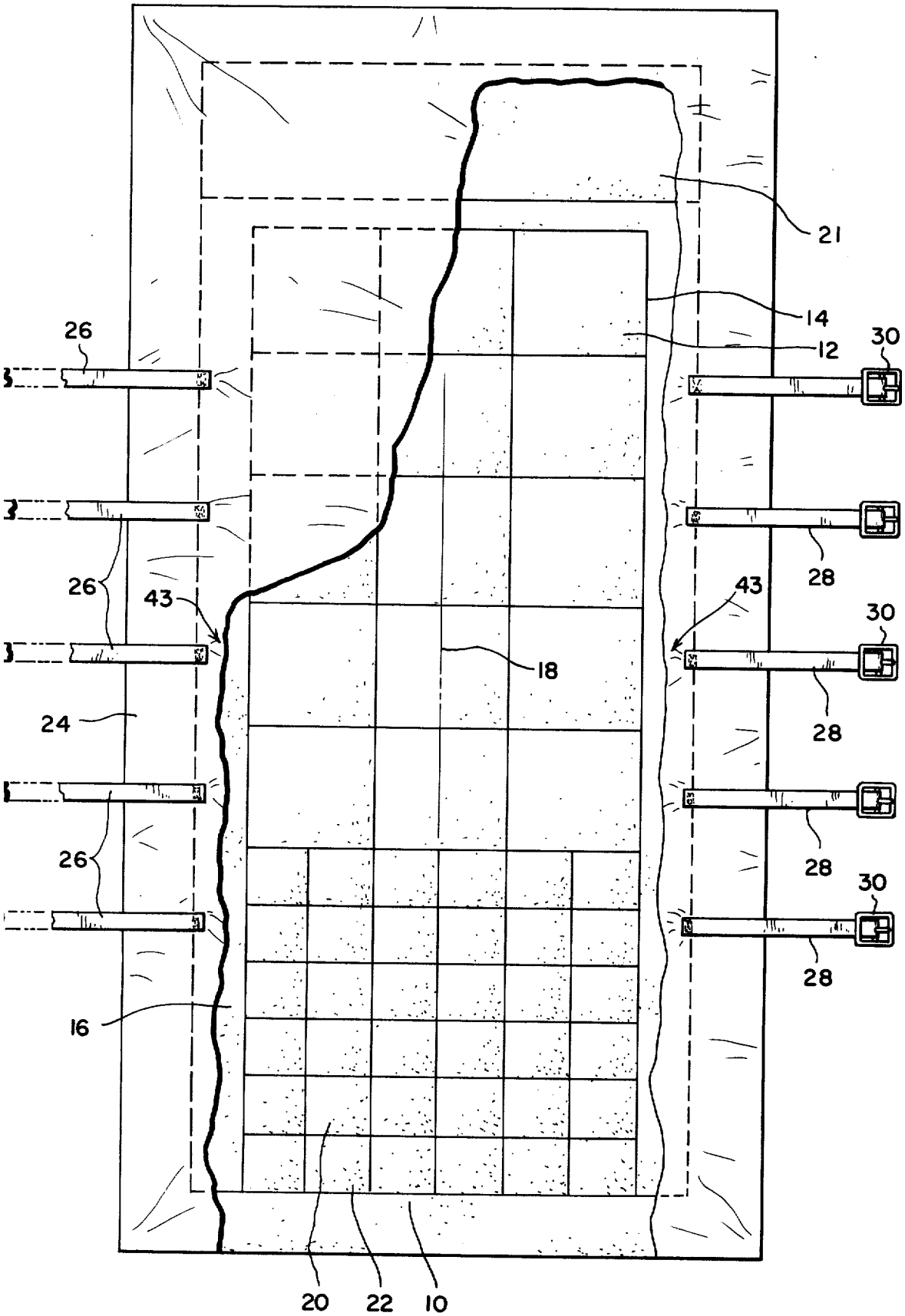


Fig. 1.

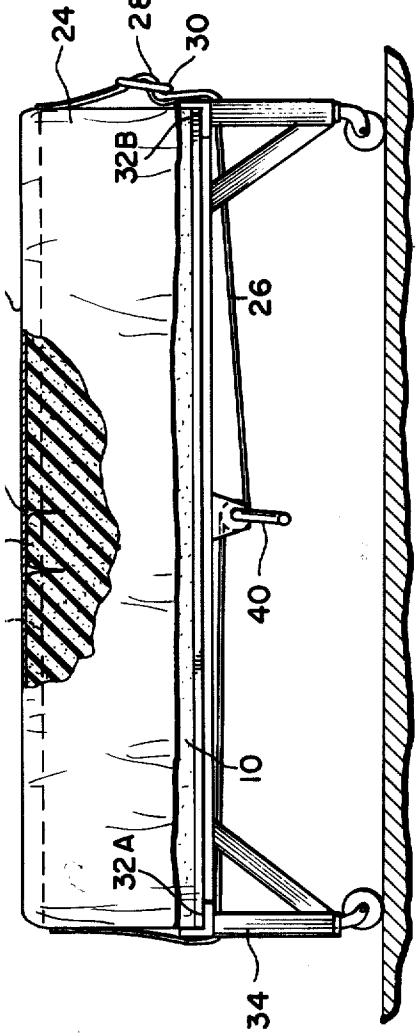


Fig. 2.

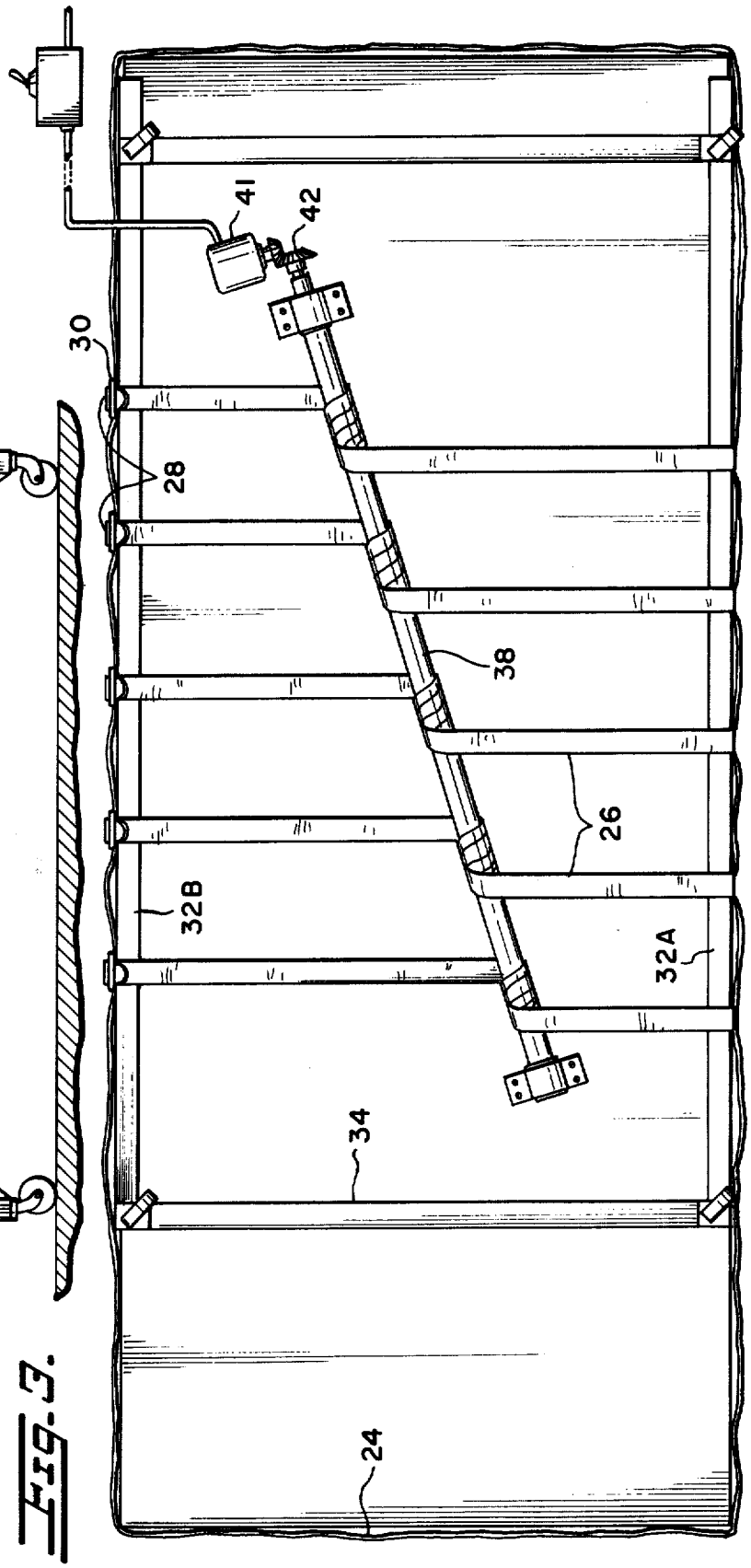


Fig. 3.

MATTRESS FOR PREVENTING BEDSORES

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a mattress for preventing the formation of decubitus ulcers or bedsores as they are popularly known.

2. Description of the Prior Art

Decubitus ulcers or bedsores are a common problem among people who are paralyzed, in a coma, or chronically bedridden, e.g., **10** to **15%** of all bedridden patients develop bedsores. They are a major economic problem among individuals in the categories above and they cause great incapacitation and even death to the people who suffer from them. Generally, bedsores occur over the bony protruberances of the body, such as the sacrum and shoulder blades on the posterior, the iliac crest on the anterior, the greater trochanters on the sides, the knees on the legs and the heels on the feet, i.e., areas where the skin is compressed between hard bone and a hard mattress.

Many methods have been used to treat or prevent bedsores. Turning the patient every **2** hours to allow reestablishment of circulation over the bony protruberances is generally used, but this method increases the work load of the nursing staff and interrupts the patient's rest. Furthermore, in some cases it is not possible to turn a patient because of specific injuries. Sheepskins are often used to allow ventilation and minimize pressure but this creates severe cleaning problems, since the decubitus ulcers often bleed or drain, and patients who have them are often incontinent. This means that the sheepskins must be laundered frequently and they are very difficult to launder.

Other devices attempt to alleviate bedsores. One such device is an air-mattress in which the air pressure is applied alternately to adjacent tubes. This transfers the pressure from one spot to another allowing circulation to be reestablished. This method has the disadvantage of requiring a device for providing an alternating air supply.

A device for providing a soft supporting surface is the water mattress. However, water mattresses have the disadvantage of being extremely heavy, cold, difficult to fill, prone to leakage and their softness makes it difficult to move the patient about on their surface. Further, when a patient lies in a prone position the cover of the mattress closes around his face causing the patient psychological distress and limiting his free breathing. Also, catheters, which may be attached to a patient, will not drain freely because the tube must rise to pass over the edge of the water mattress. These problems make the water mattress the least used solution to bedsores, even though it is the most effective in providing a soft surface.

SUMMARY OF THE INVENTION

This invention concerns a mattress which has all the desirable properties of the water mattress for the prevention of decubiti, without any of its liabilities. It consists of a mattress of a polyurethane or similar foam, having a **50** percent compression deflection pressure equal to the user's weight divided by the projected area of his body in contact with the mattress and a thickness greater than the depth of his body. This is an exceedingly soft foam, having an RMA firmness of **13** to **23**.

Normally, mattresses are made with an RMA firmness of **23** to **35**. If a mattress having an RMA firmness below **23,** is made in the normal thickness of **4** to **6** inches, the person lying on it finds it uncomfortable because he sinks in to the point where he feels the hard supports for the mattress. On the mattress described in this invention, however, the hard support for the mattress is not felt because the person lying on it does not sink in to more than three-fourth of its depth.

A foam mattress having a total thickness of **12** inches may be incised in a pattern to a depth of about **4** inches to provide further softness and decrease resistance to lateral movement. If the incisions are too deep or too close together, the cut edge of the foam curls into them and forms ridges. Thus, the incisions should be about **7** inches apart. Further, no incision should be centered on the longitudinal axis of the mattress, since the patient tends to settle into such an incision thus losing the support of the mattress. It is also preferred that the incisions not reach the edge of the mattress and no incisions are necessary in the head area while the incised pattern may be smaller in the foot area. The head area is cut dowh by a depth of about **4** inches to a thickness of about **8** inches, to allow greater comfort for a patient in the prone position, to allow the neck to remain in a neutral position, and to avoid having the face buried in the mattress.

At the area of the hips, a notch about **7** inches wide and **6** inches deep is cut into the unincised edge of the mattress up to the incised area. A catheter tube can be placed in that notch, thereby allowing it to drain freely when the patient is in the prone position.

Such changes in the surface of the mattress as the cut-out head and catheter tube channels cannot be made on a water mattress.

With such a mattress, in accordance with the invention, the patient's body sinks very deeply into the mattress, with his weight uniformly distributed over the length of his body rather than concentrated on his bony protruberances. Thus, paraplegics may lie on this mattress either prone or supine for unlimited time, without exhibiting any erythema over the bony protruberances. Since erythema is the invariable precursor of decubitus ulcers, it is clear that this mattress eliminates the need to turn the patient to prevent decubiti, when the patient is in the prone or supine position and requires no preventative methods other than the usual appropriate good nursing practices.

A further aspect of the invention is a waterproof cover for the mattress, which is loose fitting and soft and pliable enough so that the patient's weight is supported solely by the mattress and not by the cover. The cover has straps attached to and extending from one side which go under the bed frame, and fasten into clamping buckles which are mounted on straps attached to the other side of the cover. Thus, this cover serves two functions: It protects the foam mattress from being soiled by the patient and, by tightening the straps, the mattress may be made firm so that the patient can be easily turned or moved.

Tightening can be either accomplished manually or a mechanical device may be used which consists of a rod or shaft running the length of the bed, around which the straps are looped. The shaft can be rotated mechanically, thereby tightening the straps and cover. For manual operation, the straps are simply pulled tight through the clamp buckles by hand.

To loosen the cover again so that the mattress recovers its normal softness, the buckles are either released manually or the shaft rotated to its normal position depending upon the tightening method.

The mattress as described above in accordance with the invention also serves the purpose of allowing skin grafts to heal while the patient is lying on them and contributes greatly to comfort in orthopedic and surgical cases in which localized pressure on injured tissue or bones causes discomfort. It may also aid in muscle relaxation.

BRIEF DESCRIPTION OF THE DRAWINGS

The preferred embodiment of the applicant's invention will now be described with reference to the drawings in which:

FIG. 1 is a top view of a mattress in accordance with the invention showing the cover sheet partially removed;

FIG. 2 is a front view of the mattress of FIG. 1 shown in place on a hospital bed from the top end thereof showing one method of tightening the cover; and

FIG. 3 is a bottom view showing a second method of tightening the cover.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, a mattress 10 is illustrated in general which may have appropriate dimensions to serve, for example, as a hospital bed. The mattress 10 is formed of a plastic foam such as polyurethane which has known softness and resilience. The foam is chosen for its firmness so that at 50 percent deflection it will produce an upward force substantially equal to the downward force exerted by the weight of the average patient. Moreover, since the mattress is formed of a pad of plastic foam material deeper than a patient's body, e.g., 12 inches in thickness, it molds itself to the patient's body thereby supporting the maximum area of his body and relieving the usual supporting surfaces, such as the sacrum, hips and heels, iliac crest and knees, from supporting the entire body weight. For an average patient having a body weight of 150 pounds, and a body area in contact with the mattress of 500 square inches which average weight and body dimensions are provided in the publication "The Measure of Man, Human Factors in Design" by Henry Dreyfuss, 2d ed. pub. 1967 by The Whitney Library of Design, 18 East 50th St., New York, N.Y. 10022, for an average pressure of about 0.3 psi exerted by the body, the mattress should have a 50 percent deflection firmness of 0.65 to 1.2 psi, which corresponds to an initial Rubber Manufacturer's Association firmness value of 13 to 23. Such a foam will soften in use to correct values of firmness.

The above mentioned foam is not used in conventional mattresses since it is found that in the conventional range of mattress thickness, 4 -6 inches, a firmer foam is necessary to avoid contact between the mattress user's body and the supporting surface for the mattress.

The mattress 10 is subdivided into a plurality of load bearing units 12 which may be squares having an edge dimension of 7 inches. These square are defined by incisions 14 formed in the upward surface of mattress 10 which, in turn, may be approximately 4 inches deep. The load bearing units 12 have lateral give, due to the incisions 14, and thus when a patient's body moves laterally the shearing effect between his skin and tissues caused by the frictional resistance of the supporting surface to lateral movement is greatly reduced.

Since the incisions 14 would produce a structural weakness if continued to the sides of mattress 10, the incisions stop before all side areas 16 of the mattress. At the level of the hips a notch 43 at least 6 inches wide and 6 inches deep is cut into the side area extending all the way to the incised area (on each side of the mattress 10). These notches form a path for the catheter tube, thereby allowing the cather tube to drain freely when the patient is in the prone position. Further, to prevent the tendency of a patient to fall into a slit arranged along the central axis of mattress 10, there is no longitudinal slit along the length of axis 18.

The feet of a bed ridden patient under the heels due to the high pressures caused by body movements, are particularly subject to the shearing effect described above. Thus, in region 20 which corresponds to the foot of mattress 10, a smaller grid pattern is formed having square load bearing units 22 with an edge dimension of about 3½ inches. Further, since bedsores are rarely a problem on the head, the grid pattern at the head area 21 may be discontinued without harm to the invention.

The head area 21 of the mattress 10 as shown in FIGS. 1 and 2 is cut down across the entire width of the mattress 10 to a depth of about 4 inches. This leaves a thinner section of 8 inches of the mattress at the head area 21 and allows the patient's neck to be in a neutral position when he is lying prone, preventing his head from being sunken into the mattress, as it is in a water mattress.

The mattress 10 described above is covered by a cover 24 of waterproof soft material such as 1.1 ounces per square yard of ripstop nylon coated with polyurethane, vinyl or rubber. As can be seen in FIG. 1, the cover 24 extends beyond all the edges of mattress 10 so that when the patient sinks deeply into the mattress the cover is not drawn tight on the mattress. In addition, straps 26 are attached at intervals of, for example, 10 inches, along one edge of the cover starting 18 inches from the head of the mattress, and registering straps 28 having buckles 30 are arranged at the corresponding places at the other side of the cover.

As is seen in FIG. 2, the straps 26 and 28 may be arranged under the side rails 32A and 32B of a hospital bed 34 and drawn together with buckles 30 to provide a firmer surface 36 upon which a patient may be more easily turned as for bathing. The straps 26 may be alternatively wrapped around a shaft 38 as shown in FIG. 3. Thus, by rotating shaft 38 all the straps 26 may be tightened or loosened in unison. Shaft 38 may be rotated by hand crank 40 shown in FIG. 2 or by other known means such as an electric motor 41 and transmission 42 shown in FIG. 3.

While the above description fully covers the preferred embodiments of the applicant's invention, many modifications may be made within the scope of this invention. Thus, for example, the surface of mattress 10 may be contoured to fit a patient's body.

What is claimed is:

1. A mattress for the prevention of bed sores in a user comprising a unitary member made of resilient foam having a thickness greater than the thickness of an average user's body and having load-bearing properties

wherein a 50 percent compression deflection pressure is substantially equal to the user's body weight divided by his body area in contact with the mattress, said mattress being subdivided upon its surface into a plurality of individual load-bearing units whereby said mattress absorbs the downward weight and lateral movement of the user's body to protect said user's body from contact with hard surfaces and from localized high pressure over the bony protuberances, a cover of flexible, waterproof and soft but strong fabric which is sized to cover the top and overlap, all edges of said mattress which is loose enough that it is not pulled tight when the user sinks deeply into the mattress, means for drawing at least two opposed edges of the cover tightly about the mattress so that the mattress is rendered firm enough to easily move a patient disposed thereupon, said drawing means includes a plurality of straps affixed to one edge of said cover and a plurality of buckles affixed to an opposed edge of said cover, said straps being extended thereunder, a shaft disposed beneath said mattress, said straps being wrapped about said shaft and means for rotating said shaft whereby the tension upon said straps may be adjusted in unison.

2. The mattress recited in claim 1 wherein said rotating means includes an electric motor.

3. A mattress for the prevention of bed sores on a user comprising a unitary member made of resilient foam, having a thickness greater than the thickness of an average user's body and having load-bearing properties wherein a 50 percent comparison deflection pressure is substantially equal to the user's body weight divided by his body area in contact with the foam, said foam absorbing and distributing the downward weight of the user's body by allowing the body to sink deeply into the foam and avoiding localized high pressure being applied to body protuberances, and means for lifting the user's body lying on the foam including a cover of pliable material which rests on the surface of the foam beneath the user's body without being secured to the foam and being loose enough so that it is not pulled tight when the user sinks deeply into the foam, said user being supported solely by the foam during use, and means attached to the cover for drawing at least two opposed edges of the cover apart to make the cover taut while the user is disposed thereupon without applying any force to the foam beneath the user to easily move the user sunk in the foam.

4. The mattress recited in claim 3 wherein said drawing means comprises a plurality of straps affixed to one edge of said cover and a plurality of buckles coupled to an opposed edge of said cover.

5. The mattress recited in claim 3 wherein said cover is waterproof, soft but strong fabric.

6. The mattress recited in claim 3, wherein said cover tautening means includes a plurality of straps and means for tightening the straps.

7. The mattress recited in claim 6 wherein said strap tightening means including a shaft and means for rotating said shaft.

8. The mattress recited in claim 6 wherein said cover tautening means further includes buckles, said straps being extended under said foam.

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