March 31, 1964 R. J. ZASTERA ETAL 3,126,553

AUTO-CONTOURING SUPPORT ELEMENT

Filed April 29, 1963 3 Sheets-Sheet 1

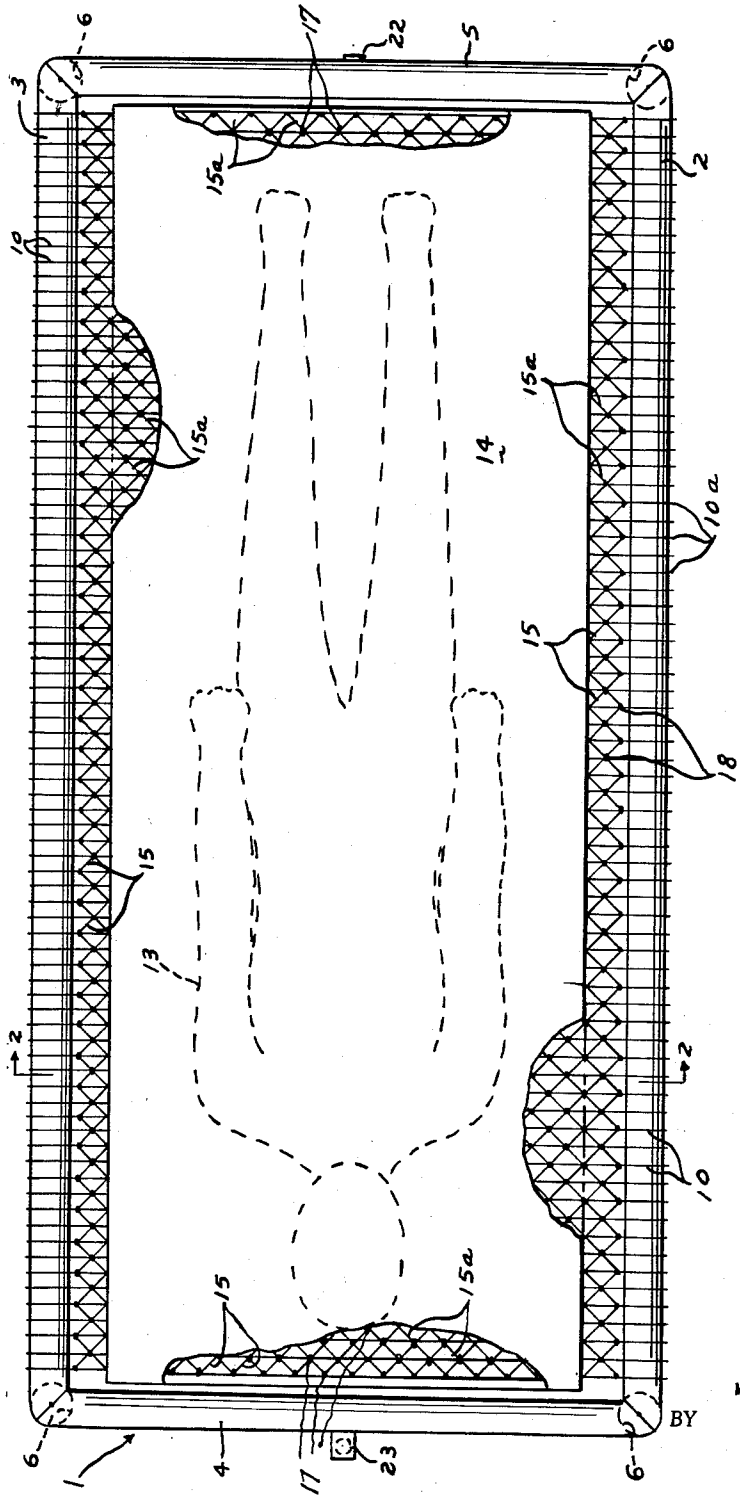


FIG-1

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AUTO-CONTOURING SUPPORT ELEMENT

Filed April 29, 1963 3 Sheets-Sheet 2

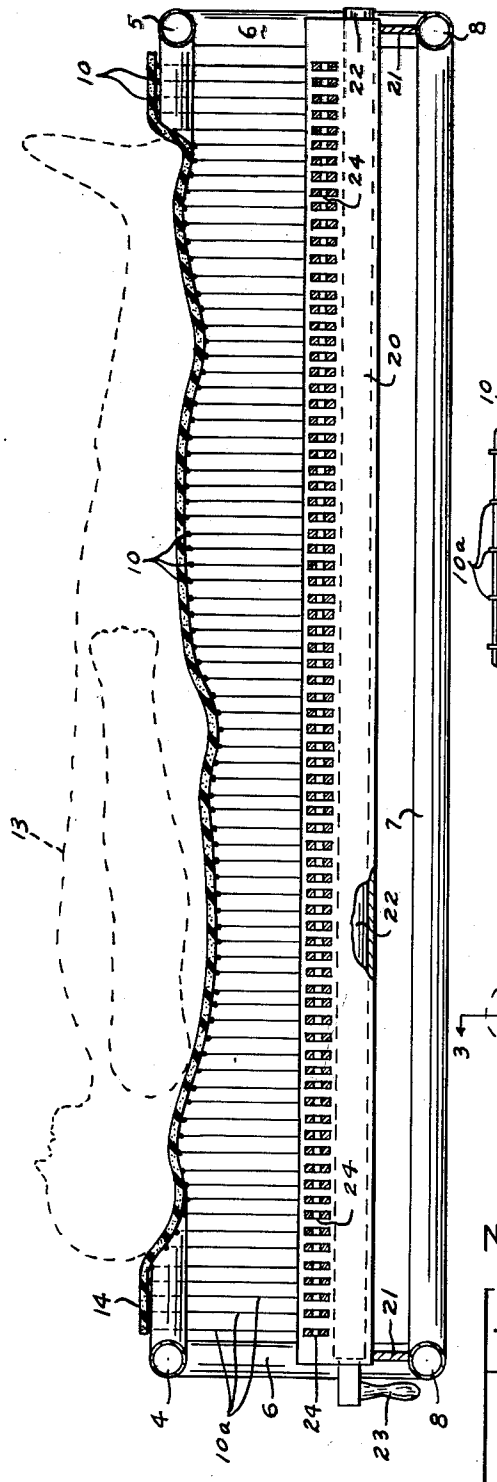


Fig-3

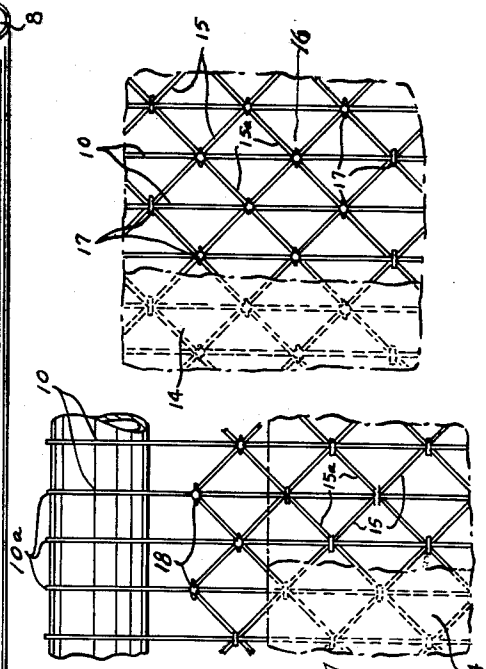


Fig-5

Fig-4

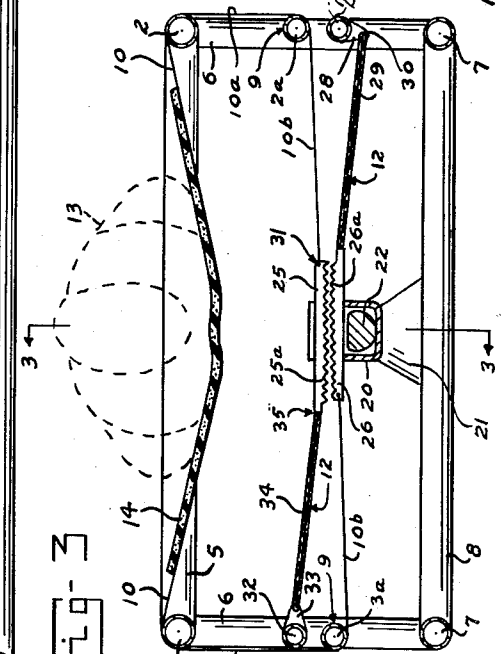


Fig-2

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AUTO-CONTOURING SUPPORT ELEMENT

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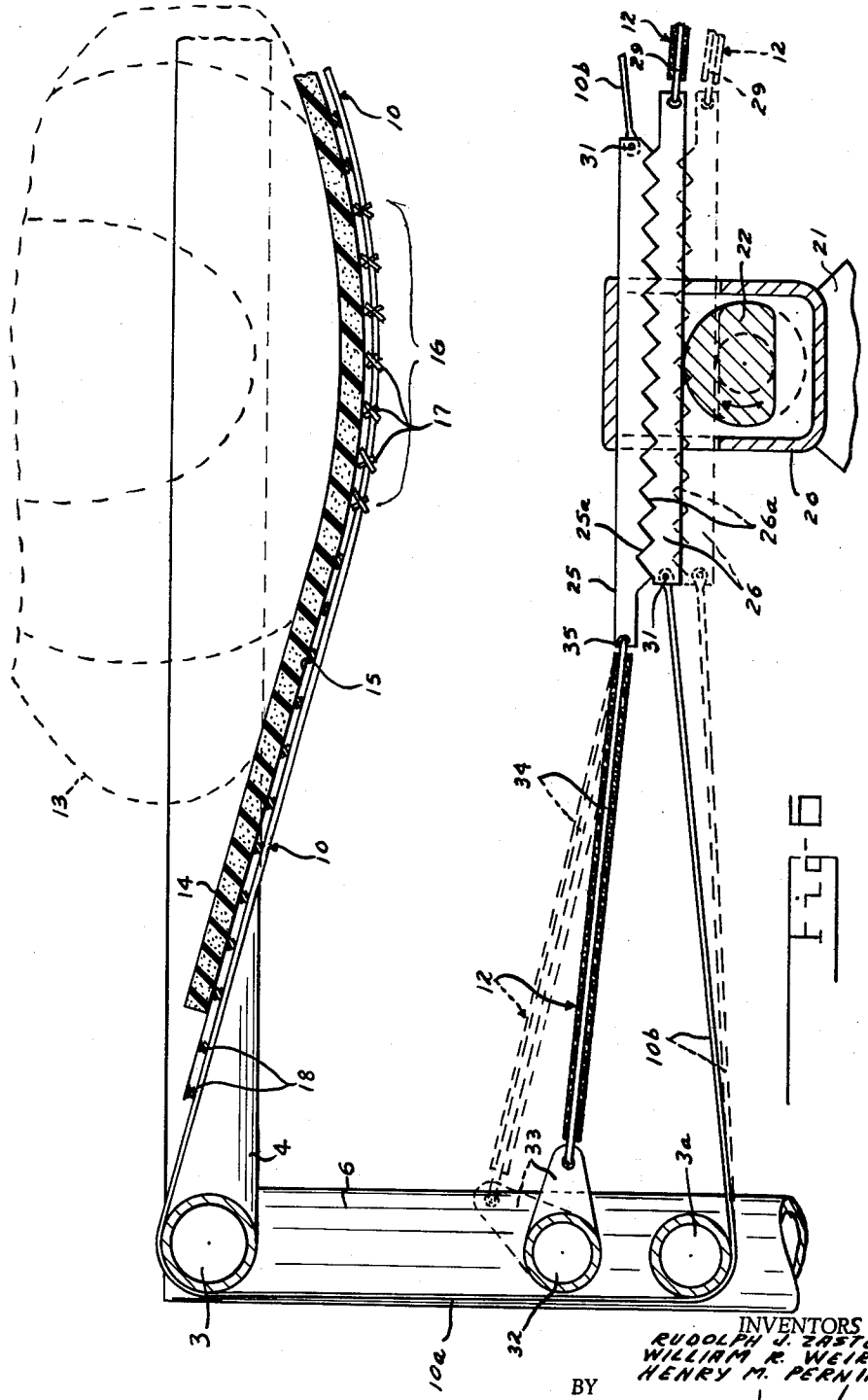


Fig-5

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AUTO-CONTOURING SUPPORT ELEMENT

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6 Claims. (Cl. 5—233)

This invention relates to body supporting bed or couch-like devices, and more particularly to such structures having self-equalizing body conforming upper surfaces for supporting a human body in supine position, having for an object a supporting surface which is yieldable to distribute the weight of the supported body over a maximum area in order to minimize the unit skin pressure, particularly during excessive vertical accelerations, and includes means for maintaining substantially the same contour in the suporting surface after the body has been removed from the supporting surface.

A further object is the provision of a horizontal deformable supporting surface including resilient means for tensioning the supporting surface toward a flat or horizontal plane but yieldable to provide maximum comfort for a person resting thereon during appreciable vertical accelerations, including locking means for rendering the yieldable tensioning means ineffective to resist further return of the supporting means to the horizontal supporting plane, whereby when the supporting surface has been selectively depressed to conform to the contour of a body supported thereon, the depressed contour thereof will be maintained upon removal of the body from the supporting surface.

A further object is the provision of a human body supporting structure having round side rails and a multitude of closely spaced nonstretchable strands extending individually transversely across said side rails with their opposite extremities passing around and under the side rails, each strand having an individual elastic tensioning means connected to each end thereof with the opposite end of each elastic anchored to the supporting structure below the side rails.

A further object includes releasable clamping means for connecting the opposite extremities of each of the strands together to anchor said opposite ends just mentioned together and to render said elastic tensioning means inoperative to tension said nonstretchable strands across said body supporting structure.

Other objects and advantages of the inveniton will become apparent from the following description and accompanying drawings in which like reference characters refer to like parts in the several figures.

FIGURE 1 is a top plan view of a body conforming bed or couch-like structure, showing a body reclining thereon in dotted lines, parts of the upper surface being broken away to more clearly show a greater portion of the transverse cross-wires or strands and fish-net like structure supported on and connected to the transverse cross-wire strands.

FIGURE 2 is a transverse vertical sectional view taken about on the plane indicated by line 2—2 in FIGURE 1.

FIGURE 3 is a longitudinal vertical sectional view taken about on line 3—3 in FIGURE 2.

FIGURE 4 is a fragmentary plan view of a portion of the upper supporting surface adjacent one of the side rails.

FIGURE 5 is a plan view somewhat similar to FIGURE 4, showing a portion of the supporting surface at the central portion thereof.

FIGURE 6 is an enlarged fragmentary transverse sectional view showing the strand members depressed and locked in the depressed form contour retaining position.

In the drawings the reference numeral 1 denotes an upper rigid supporting frame generally, having transversely spaced tubular round upper side rail members 2 and 3 connected at their opposite ends by upper and lower spacer end rails 4 and 5, forming the upper or horizontal rigid elongated rectangular frame 1.

Supporting leg members 6 are fixed to each of the four corners of the frame 1 and extend downwardly, being fixed at their lower ends to a bottom rectangular frame comprising lower supporting side rails 7 and transverse spacing rails 8.

Extending longitudinally at a materially spaced distance below the tubular round upper side rail members 2 and 3 are intermediate round side rails or bars 2*a* and 3*a*, welded or otherwise secured to the leg members 6 at 9.

Parallel strands of cross wires, such as music (piano) wire, or of nonstretchable fibrous or plastic material, indicated at 10, extend in closely spaced parallel relation transversely across the top surface of the frame structure 1 as shown, the strands being closely spaced together, approximately six to twelve strands per inch, along the space between the end frame members 4 and 5.

The end portions of the strands 10 pass over the round upper side rails 2 and 3, and can slide around the round surface of the rails, the strands 10 then extending downwardly, as indicated at 10*a*, and around the lower round rails 2*a* and 3*a* and toward each other, as indicated at 10*b*.

Located longitudinally in the center of the bed structure, materially below the supporting surface comprising the strands 10, is a guide frame or casing 20, supported rigidly at both ends in any suitable manner, such as by brackets 21.

Rotably journalled in the casing 20 is a longitudinal cam member 22 having a handle 23 for rotating the cam member 22 from the inoperative position shown in FIGURE 2 to the operative position to dispose the round surface thereof at the top, as seen in full lines in FIGURE 6 for locking the opposite extremities of the strands 10 together to prevent either further depression thereof between the side rails 2 and 3, for instance during excessive vertical accelerations, or to maintain the slack and contour in the top surface of the bed-like structure when the body or occupant has been removed therefrom.

The casing 20 is provided with a plurality of vertical narrow slots 24 extending through the opposite side walls thereof, one slot in the vertical plane of each of the strand members 10, the bottom edges of the slots 24 extending below the top of the cam member 22 when rotated, as seen in FIGURE 6, to locking position.

Located in superimposed relation in each of the guide slots 24 are a pair of upper and lower locking bars 25 and 26. These bars have complementary inclined locking projections or teeth 25*a* and 26*a* which, when the cam member 22 is rotated by the handle 23 to the position shown in FIGURE 6, force the teeth 25*a* and 26*a* into interlocking positions, thus locking the two bars 25 and 26 together.

One extremity 10*b* of each strand 10 passes around the two side rails 2 and 2*a*, as shown, and is connected to one end of each of the upper locking bars 25 while the opposite extremity 10*b* of each of the same strands 10 is connected to the end of the lower locking bar 26 in the same slot 24.

Extending longitudinally between lower rail 2*a* and the bottom rail 7, below the rail 2*a* is a tubular anchor rail or member 27 having projections or arms 28, preferably rigidly fixed thereto. An elastic member, indicated at 29 is connected under tension at one end, at 30, to each of the arms 28 with its opposite end connected to the end of each of the lower locking bars 26.

A similar arrangement is provided for each of the

upper locking bars **25**, a tubular anchor member or bar **32** extending under the upper side rail **3** and above the rail **3***a* has projecting arms **33** fixed thereto, and elastic members **34**, similar to the elastic members **29** are connected, under tension, at one end to each of the arms **33** with their other ends connected at **35** of the upper locking bars **25**.

The opposite ends of the tubular anchor bars or rails **27** and **32** are preferably carried by the leg members **6** at opposite sides of the frame **1**. If desired, the anchor bars **27** and **32** may be journalled in the legs for rotative adjustment of the arms **28** and **33** so that the tension of the elastic members **29** and **34** may be increased or decreased by rotative adjustment of the anchor rail members, means, of course, being provided to retain the anchor rails in their rotative adjustment.

It will be seen from FIGURES 2 and 3 that with the cam member **22** in release position, when the body indicated at **13** is reclining on the top surface, the individual closely spaced strands **10** are depressed between the side rails **2** and **3**, causing the superimposed locking bars **25** and **26** to slide relative to each other in the slots **24**, the inclined sides of the teeth preventing interengagement at this time, the elastics **29** and **34** yieldingly permitting the strands **10** to conform to the contour of the supported body **13**, both laterally and longitudinally of the frame.

Rotating the cam member **22** by the handle **23** to locking position to interlock teeth of all of the locking bars together of course connects the opposite ends of the strands **10** together to prevent the elastic members **29—34** from being operative, and thus the strands **10** will remain in their contour conforming depressed or slack relations.

A pair of braided fabric jackets, indicated at **12**, are provided to enclose the elastic members **29** and **34** with the opposite longitudinal edges thereof connected to the arms **28** or **33** and to the ends of the locking bars respectively, to limit excessive elongation of the respective elastic members **29** and **34**, thus preventing damage or breakage of the rubber-like elastic members.

In order for the upper supporting surface of the device to conform to the contour of the body being placed on it, indicated at **13**, the individual closely spaced parallel transverse strands or wires **10** must be free to move apart or closer together as required, but, in addition, the strands must be prevented from pinching the skin or clothing. In order to accomplish this, a relatively thick foam rubber rectangular sheet or pad **14** is secured to the top supporting surface of the closely spaced parallel strands **10** to hold the pad in position between the side and end frame members **23** and **4**, **5**, and tends to stabilize the unloaded strands **10** in their parallel relation.

This may be accomplished by bonding the strands **10** to the lower surface of the pad **14** in any suitable manner, thus permitting the individual strands to adjust themselves according to the portions of the load impressed on them between the side frame or rail members **2** and **3**, as well as accommodating the slight transverse or separating adjustments between the strands when certain of the strands are depressed to a greater extent than the adjacent strands.

As seen in the drawings, instead of the foam or sponge rubber pad **14** being deposited directly on the top surfaces of the adjustable supporting strands or wires **10** a net structure, indicated (generally) at **15**, is interposed between the supporting strands **10** and the foam rubber pad **14**. The net utilized is of the fish net type having approximately one-quarter inch square mesh, indicated at **15***a*, the net **15** being of sufficient width to accommodate approximately one-half of the circumference of the body **13** to be supported.

The squares **15***a* of the net **15** are disposed as shown, particularly in FIGURES 1, 4 and 5, at 45° relation to the supporting strands **10** with the strands passing through

or under the opposite corners of squares **15***a* of the mesh.

In the central longitudinal area of the net **15** somewhat narrower than the supporting frame **1**, the parallel strands **10** are woven through (or secured to) the knots **17** of the net **15** as seen in FIGURE 5 and extend diagonally to the net meshes **15***a*.

Outwardly from this central area **16** where the strands pass through the knots the parallel strands merely pass under the net as seen in FIGURE 4, however the edges of the net, indicated at **18**, are fastened to the strands **10**. In this manner the strands or wires **10** are free to slide over the tubular side rails **2** and **3** (and **2***a*, **3***a*) without damaging the net. Under load the square meshes **15***a* of the net **15** are free to warp into diamond shapes, this permitting limited longitudinal relative movements of the parallel strands, thus fulfilling the requirement for adequate contouring of the supported upper surface from side to side as well as from end to end thereof.

A pad of at least one-half inch soft foam rubber, as previously indicated at **14**, is placed over the net **15** and secured, at least at its edges, to the net structure or to the strands, to add to the comfort of the supporting surface.

When a body is placed upon a body supporting device of the type just described, the elastic elements **29** and **34** elongate under load, permitting the net elements **15** to sag, thereby developing a desirable wrap-around of the supporting surface around the lower (or under) portion of the body. Each parallel strand **10** sags individually according to the transverse segment of the body that it is supporting.

Any deliberate forced change in the body contour is reproduced by the resilience of the body supporting structure. However, rotating the cam member to the position shown in FIGURE 6 (in full lines) locks the respective supporting strands in their former depressed contour fitting relations so that a person who is reclining on the supporting surface can retain the former respective contour conforming shape in the upper supporting surface. This locking of the ends of the respective strands together by the locking bars **25** and **26** also prevents excessive stretch in the elastic members **29** and **34** during excessive vertical accelerations.

For the purposes of exemplification, a particular embodiment of the invention has been shown and described to the best understanding thereof. However it will be apparent that changes and modifications in the arrangement and construction of the parts thereof may be resorted to without departing from the true spirit and scope of the invention as defined in the accompanying claims.

We claim:

1. A body contour conforming bed-like structure comprising an elongated rectangular frame, means for supporting said frame horizontally above a supporting surface, said frame comprising horizontally-spaced pairs of vertically-spaced round side rails and connecting end frame members, a plurality of closely uniformly-spaced nonstretchable strands disposed transversely across the top of said frame in parallel relation, extending over the uppermost round side rails of each pair, and downwardly, and around the lowermost side rails of the pairs with the opposite extremities of the strands extending toward each other, a pair of superimposed locking bars for each strand intermediate the extremities of said strands having interlocking edges facing each other in vertically-spaced relation intermediate said pairs of side rails, one of said bars in each pair having one extremity connected to one extremity of each of said strands and the other locking bar of the pair having its opposite extremity connected to the other extremity of the same strand, horizontally-spaced pairs of elastic tensioning members connected to the opposite sides of the frame and extending toward each other below the plane of the upper side rails of the pairs of side rails with their opposite ends connected

under tension to the ends of the locking bars opposite from their strand connected ends, for yieldably tensioning said strands individually across the top of the frame to form a yieldable body contour conforming supporting surface, and means for moving said locking bars into interlocking relation to render said elastic tensioning means inoperative to tension said strands.

2. A body contour conforming supporting frame comprising horizontally-spaced pairs of vertically-spaced side rail members, a multitude of closely-spaced parallel strands disposed transversely across the uppermost side rail members of the pairs, having the opposite extremities thereof extending around the side rail members toward each other, a spaced elastic member operatively connected at one end to each of the said opposite extremities of said parallel strands and extending substantially axially therefrom with their opposite ends connected to said frame below one of the upper side rail members, whereby both extremities of each strand are under individual separate tension to yieldably tension both ends of the individual strands between the horizontally spaced pairs of side rail members.

3. In a body contour conforming bed-like structure as defined in claim 2, releasable interlocking means between the opposite extremities of each of said strand members and the elastic members connected thereto for connecting the said extremities together to render the spaced elastic members inoperative to tension the opposite extremities of the strand members toward each other.

4. In a body contour conforming bed-like structure as defined in claim 3, in which said releasable interlocking means for each strand comprises a pair of superimposed locking bars having complementary interengaging projections on the adjacent edges thereof with the strand members connected at their opposite extremities to the opposite ends of the locking bar pairs, and the other opposite ends of the locking bar pairs connected to the ends of said elastic members remote from the side rail members, and a cam member carried by said frame, below all of said superimposed locking bar pairs movable to cam said locking bars into interlocking relation, to render said elastic members inoperative to tension said strands or retain said strand members in their former contour conforming relations.

5. In a body contour conforming bed-like structure comprising an elongated rectangular frame comprising spaced parallel pairs of vertically-spaced round side rail members, and transversely extending end frame members, a multitude of individual closely-spaced parallel supporting strand members extending transversely across the

tops of said side frame members with the opposite extremities thereof extending around said pairs of side rail members in parallel relation, inwardly toward each other, a plurality of pairs of superimposed locking bar members connected between said opposite extremities of said strand members, one pair for each strand, said strand members having the opposite extremities thereof connected to the opposite extremities of the pairs of said superimposed locking bar members, locking bar support guide means supported by said frame in spaced relation below the plane of the uppermost of said pairs of said round side rail members having transverse vertical guide slots therethrough, each for receiving one pair of said superimposed locking bar members, cam means movably carried by said locking bar support guide means for camming and locking bar members into interlocking relation with each other to lock the opposite extremities of each of the strand members together, an elastic member connected at one end to each of the remaining extremities of each pair of said locking bar members, said elastic members connected at their opposite ends to the sides of said frame for yieldably tensioning the extremities of the strand members toward each other, a fishnet-type net superimposed on said strand members between said side rails having square mesh with the opposite corners of the mesh lying in the vertical planes of the strands with the strand members passing through the knots in the longitudinal center portion of the supporting contour conforming surface between the side rails, with said strand members passing under said net from said central portion outwardly, said net having its opposite longitudinal edges secured to said strands, and a relatively thick foam rubber pad disposed over said net, between said side rails, connected along its edges to said net and strand members.

6. A body contour conforming bed-like structure substantially as defined in claim 5 including a braided fabric jacket enclosing said elastic members operatively connected along one edge to the sides of the frame and connected at their opposite edge to the ends of the superimposed locking bars to which the elastic members are connected.

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