

[54] THREE-DIMENSIONAL UPHOLSTERY ELEMENT

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[51] Int. Cl. A47c 23/00

[58] Field of Search.....5/348, 342, 236, 237, 350, 5/337, 338, 327, 345, 361, 351; 297/456; 154/101

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[57] ABSTRACT

The upholstery element is adapted to provide a resiliently yielding support and comprises individual rod-shaped resilient inserts spaced apart in the direction of one dimension of the upholstery element and extending in said upholstery element in a longitudinal direction which is transverse to the direction in which they are spaced apart, connecting layers of foam disposed between said inserts and constituting the only connection between said inserts and adapted to take up forces which occur between the inserts, said connecting layers joining said inserts in a common composite body, and covering layers of foam adjoining said connecting layers and covering said inserts in those surface areas which are not covered by the connecting layers.

5 Claims, 3 Drawing Figures

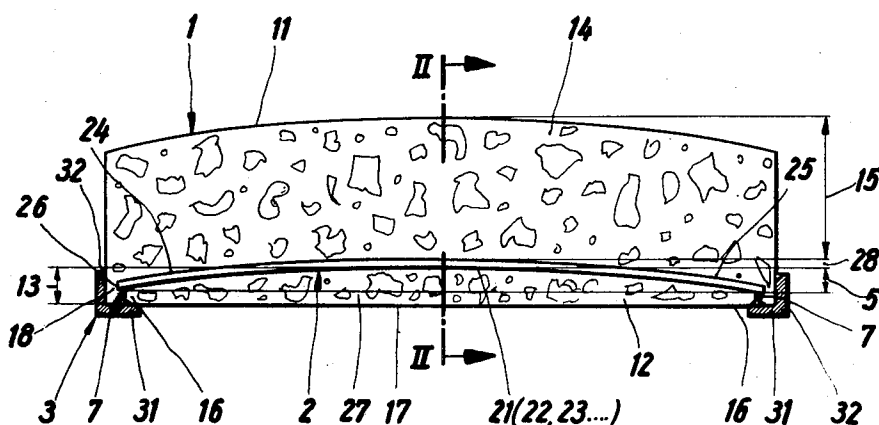


Fig. 1

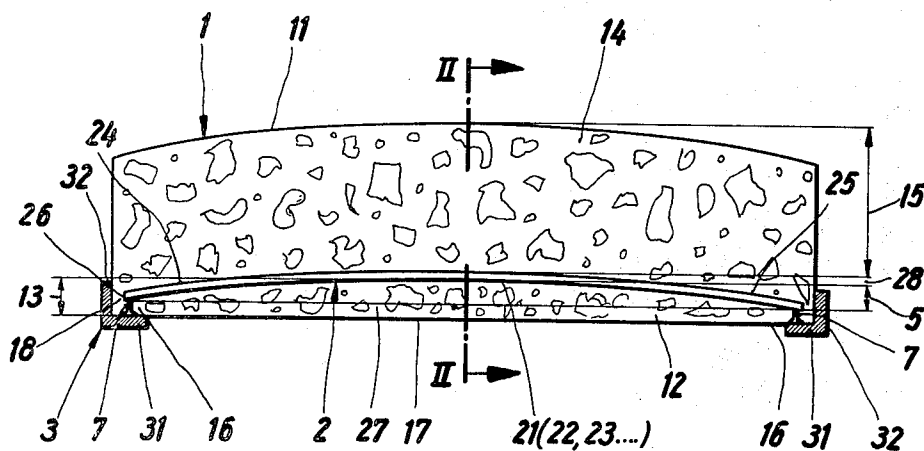


Fig. 2

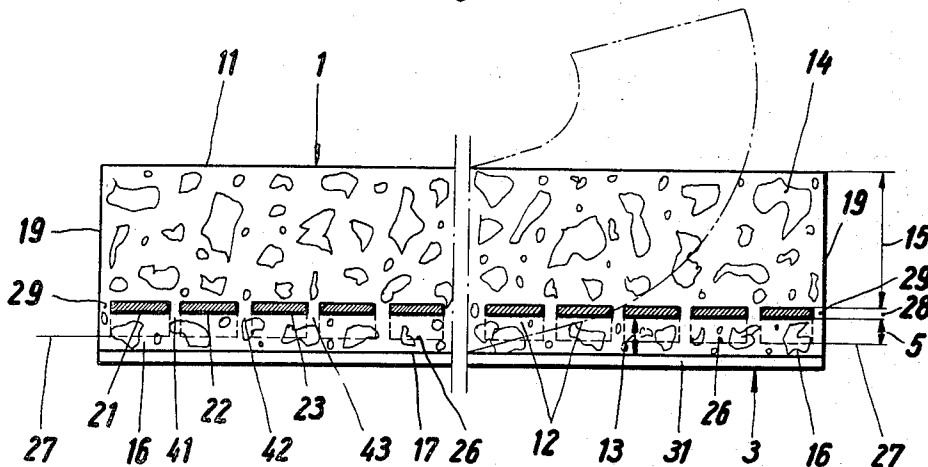
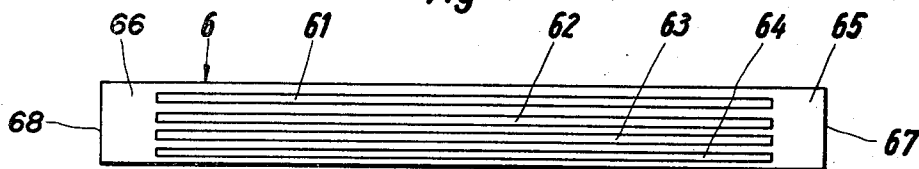


Fig. 3



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THREE-DIMENSIONAL UPHOLSTERY ELEMENT

SUMMARY OF THE INVENTION

Various types of upholstery elements are known in the form of soft and resilient covering pads on seats and surfaces for lying upon, arm rests and back rests as well as foot rests and leg rests of upholstered furniture and upholstered seats, such as are used in transportation vehicles. A distinction is made between thin upholstery elements and thick upholstery elements. The latter include mattresses used as supports in beds. Thin upholstery elements comprise a wooden frame, in which belts, or resilient corrugated wires, coil springs, wire grids etc. are mounted. Above the layer formed by these tensile elements, at least one layer of bed ticking is provided, which is succeeded by horsehair, wadding, kapok, seaweed and/or other fibers of vegetable, animal and/or mineral origin. A thick upholstery element generally comprises conical springs consisting of spring steel. These springs are secured to belts or steel bands. A wire frame is provided around the outer springs. The wooden frame and the springs and the wire frame are tied together with strings so that the upper surface of the cushion is slightly curved upwardly toward the center. A strong linen fabric (mattress ticking) is stretched over said surface and is upholstered as in a thin upholstery element. Upholstery elements may also consist of the so-called spring insert cushions on a spring-cushioned backing. Recent developments include the use of foams, which are provided with coverings of various textile fabrics or plastics material, leather, artificial leather and the like.

The invention is based on a further development of the last-mentioned upholstery elements, which contain supports embedded in foam. Initially, such supports were disposed outside the foam bodies and consisted in the usual manner, e.g., of rigid frames for anchoring the ends of tensioned wires. These wires included coil springs or were supported at their nodes by conical springs. In such arrangement, the upholstery element consists actually of a mattress formed by the body of foam. In a later development, these supports were accommodated within the body of foam but still consisted basically of individual parts which were connected by a frame. Unless a complete frame was employed, which in most cases consisted of a closed cornered frame, a plurality of supports disposed within the foam body were connected by elements consisting of rigid materials to ensure a compound action of the several supports.

The present invention is based on the recognition that such measures are not required and a much improved compound action can be obtained if the supports are merely embedded in the foam. This results in considerable advantages and eliminates the disadvantages inevitably involved in the known upholstery elements.

Based on these recognitions leading to the invention, upholstery elements which contain inserts embedded in foam are characterized according to the invention in that the inserts consist of springs, which are interconnected only by foam which embeds and connects the springs. This arrangement affords the advantage that the upholstery element is much more flexible than the known designs, in which the inserts consist only of reinforcements or stiffeners, which actually form a more or

less rigid, coherent skeleton. The recognitions underlying the present invention result in an increase of the resiliency of an upholstery element as the degree of coupling provided between the inserts by rigid elements decreases so that the elimination of these connecting elements in accordance with the invention results in an optimum elastic behavior of the upholstery element. Further advantages reside in that such upholstery elements can be rolled up at right angles to the longitudinal direction of the springs so that, for instance, such upholstery element in the form of a mattress requires only a minimum space although it has the advantages outlined above. Such mattresses may be used for portable upholstered furniture, particularly beds, such as are required in case of disasters, wars, as well as for camping purposes, in sleeping accommodations for large numbers of persons, etc.

As regards the elimination of the disadvantages of previous designs it is pointed out that the foam is no longer rubbed and fatigued by the movements performed by the reinforcements or stiffeners in case of a movement of the upholstery element in which these reinforcements and stiffeners are connected by rigid parts so that the pinched foam is subjected to constraints under which it is eventually bound to fail. The fatigue and disintegration of the foam results in a decrease of the resiliency of the upholstery element. These conditions are radically changed by the invention. Because there are no cross-connections linking each insert to other inserts, an insert participates only in a passive manner in the movements of the foam and does not exert any forces on the foam. On the contrary, the forces occurring in the foam will control the position of each insert so that the bonds between the insert and the foam are not stressed at all. These conditions result in a substantial increase of the elasticity of the upholstery element under cyclic stresses and of its life. The economy is correspondingly improved whereas the manufacturing costs are minimized because, as will be explained more fully, the novel upholstery elements may be formed as sections of a continuously made web so that the entire manual work previously required to make upholstery elements of the kind in question can be eliminated.

The above-mentioned further developments of an upholstery element according to the invention are characterized in accordance with the invention in that the inserts are self-supporting, e.g. in that they consist of individual leaf springs. This can be accomplished in a very simple manner if the inserts are curved, preferably with different rises, toward the load-receiving boundary surface of the upholstery element. In this case the ends of the inserts are close to those parts of the upholstered furniture which adjoin the upholstery element and which consist of rigid materials, e.g., the ends of the inserts are supported on the edge members of a bed frame, so that the self-supporting inserts will be fully effective particularly because they are provided in a bed frame near the supporting edge members of said bed frame whereas virtually the entire volume of the embedding foam is disposed above the inserts. As a result, the stresses are taken up primarily by the resulting cushioning layer and any shock forces will be damped by said layer. Only when that relatively thick foam layer has been compressed are the forces applied to the

inserts, so that the rise of the inserts is reduced and the inserts perform a work which opposes their deformation. This work can compensate and dissipate the motion-producing work which is due to the stresses. This result will easily be produced if the smallest distance between an insert, e.g., a spring end, and the upper surface of the embedding foam is as large as or larger than the minimum which is required if forces absorbed by the inserts are to be resiliently cushioned before they are transmitted to the rigid material which adjoins the upholstered element. As far as the dimensions are concerned this would mean in case of a bed mattress that the smallest distance between the ends of the supports and the above-mentioned edge member of the bed frame is about 10 millimeters if a usual polyurethane-ether foam is used. Experience has shown that a foam layer of that thickness can transmit the stresses occurring in beds to the bed frame and can resiliently cushion these stresses so that the stresses applied to the upholstery elements are transmitted to the bed frame as desired in a damped, yielding and entirely shockfree manner.

In a preferred embodiment of the upholstery element according to the invention, the inserts consist of individual springs, which are parallel or substantially parallel to each other, each of said springs extends preferably integrally throughout one dimension of the upholstered area of the upholstery element, and a plurality of such springs are preferably spaced apart in the direction of the other dimension of said area.

From the description of the manufacture it will become apparent that the manufacture will be greatly facilitated if supporting elements, preferably in the form of wires or pins, are provided at the ends of the inserts, and these inserts protrude from the inserts in a length which is equal to the minimum distance mentioned above.

In the novel upholstery elements, the contour and/or compliance of the inserts may be selected in accordance with the contour of the body which rests on the upholstery element or, if the element is used for technical purposes, to the contour of an article which is to be stored and/or transported on the upholstery element. This statement need not be explained further as far as the contour is concerned. As regards the compliance, it is pointed out that the inserts in the form of leaf springs may be arranged with a larger or smaller rise depending on the load to be expected. The larger the rise, the stronger will be the opposing spring action exerted by an arcuate insert and the smaller will be the deflection of the spring. This deflection as well as the compliance will be a maximum in a straight insert. The compliance can also be influenced by the selection of the material, which will be discussed hereinafter. Besides, it is possible, e.g., to provide the inserts with slotlike apertures which extend preferably in the longitudinal direction of the inserts. The larger the number of the parallel apertures in an insert, the higher will be its compliance. It goes without saying that the compliance can also be influenced by the selection of the cross-sectional area and shape of the insert, and that a plurality of kinds of materials may be combined to obtain intermediate compliance values. For instance, an insert may consist of laminated wood and an insert or facing of steel.

It has been suggested that the inserts may consist of a very wide range of materials, such as conventional wood, preferably laminated wood, metals, preferably steel, and plastics material, relatively stiff elastomers etc.

The embedding foam may also be selected from a wide range of materials, which include preferably foamed plastics materials, foamed rubber and blends or composites thereof. Combinations of hard and soft foams are already known. An embedding foam of polyurethane-ether has proved particularly desirable. Other suitable materials include cold- and/or hot-cured foams, foamed rubber (latex), latex-impregnated moldings of synthetic fibers, rubberized hair, rubberized coconut fibers, foam moldings consisting of fiber-containing synthetic composite materials, to mention only the most important ones. Cold-cured foams enjoy a certain preference.

It has already been pointed out that the proposed upholstery elements can be made in a continuous process. The process is very simple because it is sufficient to provide spaced apart inserts and to embed them continuously to form a continuous upholstery web, which can be cut into sections of desired length. This process enables a manufacture of upholstery elements with a previously unknown economy. It will be understood that the cuts will always be made between two successive inserts although it will be possible without difficulty to cut through an insert with a punching knife.

It is inherent in the nature of the invention that only its basic features have been outlined hereinbefore. All modifications are included which can be provided in view of the state of the art.

The invention is substantially diagrammatically illustrated in the drawing, in which

FIG. 1 is a vertical transverse sectional view taken through a bed mattress according to the invention,

FIG. 2 is a vertical longitudinal sectional view taken through the mattress shown in FIG. 1 and

FIG. 3 is a somewhat enlarged top plan view showing an insert which is slotted to increase its compliance.

FIGS. 1 and 2 show the basic structure of a bed mattress according to the invention. This mattress may be alternatively used on a sofa, couch, sick-bed, camp bed, camping bed or the like or as an upholstery element for other purposes. The main parts of the element are the embedding foam generally designated 1 and the inserts 2 consisting of individual leaf springs. The mattress may be held in space. In the present embodiment it is held by the edge members 3 of a bed frame, not shown, which is known per se. These edge members comprise in the usual manner a horizontal flange 31 and a vertical flange 32 or may form parts of the side and/or end members of the bed. The individual inserts are designated 21, 22, 23 etc. It is apparent from FIGS. 1 and 2 that the inserts 2 are preferably evenly spaced throughout the length of the mattress so that the preferably equal spaces 41, 42, 43 etc. are left between the inserts 2. Each insert extends continuously throughout the width of the mattress, as is apparent from FIG. 1. The ends 24 and 25 of the inserts 2 are supported by the edge members 3. This fact and the camber of the inserts 2 toward the load-receiving surface 11 of the upholstery element with the rise 5 rela-

tive to an imaginary plane 27 which is with the lowermost point of the edges 26 of the ends 24 and 25 of the inserts cause the inserts 2 to be virtually self-supporting because the foam portion 12 below the inserts 2 has such a small height 13-16 as to present a negligibly small resistance compared to the resistance presented by the foam portion 14 having a height 15 to a deformation. To ensure in spite of that self-supporting design of the inserts 2 that the stresses applied to the inserts 2 will be resiliently yieldably transmitted to the edge members 3, assumed to be rigid, the foam 1 extends also in the area 16 between the edges 26 of the inserts and that boundary surface 16 of the foam 1 which is remote from the load, and in the area 28 which corresponds to the height of the inserts 2. It is also apparent from FIG. 2 that the foam 1 extends through the spaces 41, 42, 43 etc. between the inserts 21, 22, 23 etc. Because a foam portion 29 is provided in accordance with FIG. 2 also between the first insert 21 and the lateral boundary surface 19 of the foam, and a similar remark applies to the opposite side face, the foam 1 contacts all boundary surfaces of the inserts 2. This fact is typical of the present invention and one of the causes of the results produced by the invention. The formation of the foam in contact with the inserts results in a strong bond between the foam 1 and the inserts 2 so that the foam is the only means which connects the inserts 2, which in other respects are separate from each other. Previously, such connection has only been provided by rigid mechanical means. There will be no transmission of forces other than by the resiliently yielding foam so that the dimensions, contour and material of the insert springs 2 may be selected to provide inserts having exactly the compliance which is optimum in view of the requirements to be met by each insert. Because the perfectly separate individual members 2 are completely embedded in foam, the mattress will be absolutely noiseless regardless of its state of deformation and dynamic motion. The width of the inserts shown in FIG. 2 may be selected to provide the desired compliance. Hence, sick-beds for patients having spinal cord diseases and diseases of vertebrae and of intervertebral discs may be adapted to the requirements imposed by the disease of the individual patient. The length of the inserts 2 as represented in FIG. 1 is substantially determined by the distance between the supporting members 3. The thickness 28 of the inserts and their rise 5 may be selected as desired. Certain empirical values will be used in selecting the rise for certain requirements. The rise 5 of the inserts 2 may even be changed when the inserts have been embedded in foam if measures are adopted which are disclosed in the British Pat. specification No. 574,457 for changing the camber of a telescopic girder. The adjusting means may consist of a screw having a shank which is surrounded by a tube embedded in and extending through the foam portion 12, and in a mattress originally intended for a healthy sleeper may be used subsequently to reduce the compliance of the mattress when the sleeper has suffered, e.g., a prolapsus of an intervertebral disc. The compliance will obviously depend on the contour. The hardness of the spring elements 2 will increase with their thickness 28. Besides, the contour of the inserts may be selected to increase the compliance as desired.

Such measures are illustrated in FIG. 3. It is apparent that the insert 6 shown in FIG. 3 in a top plan view in the form of a leaf spring has a series of parallel slots 61, 62, 63, 64, which extend from the upper boundary surface entirely to the lower boundary surface or to any desired depth. Only the supported portions 65 and 66 adjacent to the ends 67, 68 of the inserts are unslotted so that the strength of the spring elements in the portions 24, 25 is fully preserved. The inserts may have, e.g., a cruciform cross-section so that the resistance presented by the ribs can be selected to provide inserts having a desired variable resistance to deformation which depends on the applied load. With reference to FIG. 3, similar remarks are applicable to different apertures, such as concave channels extending in the longitudinal direction of the inserts. The selection of the material is also significant. The materials which may mainly be employed have already been disclosed as well as the fact that the use of combinations of different materials, e.g., of steel bars screw-connected to inserts of wood, enables a control of the compliance and an adjustment of the desired compliance.

The advantages of the described mattress and of any upholstery element according to the invention are obvious. The use of a composite consisting of spring elements and resiliently yielding material results in an upholstery element having a previously unknown flexibility in any desired direction. The inserts 2 need not extend at right angles to the longitudinal direction of the mattress, as is shown in FIGS. 1 and 2, but may extend diagonally or even in a plurality of planes and may cross each other at right angles or diagonally. The advantages pointed out will be afforded also by such special arrangements, provided that only the embedding foam is present between the inserts which are spaced apart in different planes. It has been mentioned hereinbefore that the foam itself may be profiled, e.g., to conform to the body of the sleeper. For instance, an elevation may be provided to support the neck, as well as a transversely extending depression adjacent to the pelvis, and oblique planar surfaces extending toward the lower end of the mattress and bed an serving to support the lower extremities of the sleeper. Such profiled portions of the upholstery element may also include inserts, which may have a different distribution, dimensions, a different profile and rise and consist of different materials.

The above remarks made in connection with a human body are obviously applicable to any article which will be contacted by the upholstery element when the same is used for commercial purposes. For instance, the upholstery element may be used to intercept moving machine members.

Another important advantage is indicated in FIG. 2 in dash-dot-dot lines and resides in that an upholstery element according to the invention may be rolled up. It has not been possible before to transport mattresses in a rolled-up state although this is desired when the mattress is to be used for camping purposes and carried on vehicles. Because the spaces 41, 42, 43 etc. between the inserts 2 are filled with a highly resilient material, this advantage indicated in FIG. 2 by dash-dot-dot lines can be achieved without difficulty. The same advantage will be obtained when furniture is to be upholstered which has smoothly merging seat and backrest sur-

faces. In this case it is sufficient to provide a single elongated upholstery element, which as shown in FIG. 2 can be contacted continuously with the body or article to be cushioned at those surfaces which are to be supported by the upholstery element as the supporting surfaces are also continuous.

Certain advantages have been generally referred to and a consideration of the drawing will show that these advantages will be afforded by the embodiment shown by way of example. This is particularly applicable as far as the simplification of the process of manufacture is concerned, as becomes apparent upon a consideration of FIG. 2 without the supporting flanges 31 of the mattress support 3 and without the end faces 19, which suggest that the upholstery element is of finite length. It may be assumed that numerals 31 indicate laterally disposed, moving conveyor belts on which the inserts 2 are movably supported by means of the wire- or pin-like carrying elements 7 (FIG. 1), and the space between the conveyor belts is occupied by the bottom of a trough which defines a cavity into which the inserts 2 are inserted and in which they are embedded in foam as the foam body 1 is formed. In this case, FIG. 2 represents a length section of a web which may be made in a continuous process. It is known to make bodies of foam by the formation of a continuous web of foam, which is subsequently cut into blocks of a predetermined shape. A suspended foam-producing nozzle means is disposed within and succeeded by a trough which serves to form the web. The only difference from these processes which are known and have proved satisfactory is the fact that inserts 2 with intervening spaces 41, 42, 43, etc. are inserted and moved in the longitudinal direction of the web. If a cutting device is provided, e.g., at the position which corresponds to the left-hand end face and has been used to form the end face 19 and is operated once more when the initially imaginary cross-sectional plane disposed on the right at 19 has reached the cutting device at the left-hand position 19, the resulting web section will constitute a mattress such as is shown in a vertical longitudinal sectional view in FIG. 2. Upholstery elements which have all advantages of upholstery elements according to the invention may thus be made at minimum costs.

The invention includes also individual ones of the features described hereinbefore as well as the combination of all these features and combinations of parts of said features provided that such combinations of parts of the features are technically advantageous, practicable and useful, even though the novel technical results which are produced may not have been stated and described in detail hereinafter. Besides, all details shown in the drawing are considered described as such and in their functional relation.

What is claimed is:

1. A three-dimensional cushioning member for elastically supporting a load, such as a cushion for furniture to sit or lie on comprising, in combination a plurality of elongated resilient rod-shaped support inserts disposed in spaced parallel relationship to one another, each said insert extending in its elongated direction for

an extent substantially equal to the corresponding dimension of the cushioning member, a monolithic body of foam completely enclosing the surfaces of each of said inserts in a shape determining the external configuration of the cushioning member, said body of foam having a first surface against which a load is normally applied to the cushioning member, said body of foam forming the sole connection between said rod-shaped inserts, the part of the body of foam extending from the surface of said inserts in the direction of the first surface of the cushioning body having a greater thickness than the part of said body of foam extending in the opposite direction from the opposite surface of said inserts, and pin-shaped seating elements extending from the exterior surface of said body foam opposite the first surface of said body of foam and in the direction of said first surface into contact with the opposite ends of said inserts, the smallest dimension between said inserts and the exterior surface of said body of foam is located at the ends of said inserts.

2. A three-dimensional cushioning member for elastically supporting a load, such as a cushion for furniture to sit or lie on, comprising, in combination, a plurality of elongated resilient rod-shaped support inserts disposed in spaced parallel relationship to one another and each said insert extending in its elongated direction for an extent substantially equal to the width dimension of the cushioning member, said inserts arranged in the form of leaf springs and being spaced apart in the direction transverse to the width dimension of the cushioning member, a monolithic body of foam completely enclosing the surfaces of each of said inserts and having a shape determining the external configuration of the cushioning member, said body of foam forming the sole connection between said rod-shaped inserts, said body of foam having a first surface against which the load is normally applied, a seating element located at each of the ends of said inserts and having a pin-like shape, said seating elements extending from the surfaces of said inserts disposed in the opposite direction from the surface thereof facing toward the first surface of said body of foam and extending therefrom to the adjacent surface of said body of foam disposed opposite to the first surface of said body of foam, and the body of foam being a cold cured foam.

3. A three-dimensional cushioning member, as set forth in claim 2, wherein the thickness of said body of foam from the first surface thereof to the adjacent surface of said inserts is greater than the thickness between the opposite surfaces of said inserts and the surface of said body of foam disposed opposite to its first surface.

4. A three-dimensional cushioning member, as set forth in claim 3, wherein the cushioning member being subjected normally to varying loads across its surface, and the width and profile dimensions of said inserts being determined by its location within said body of foam and the normal load applied at said location.

5. A three-dimensional cushioning member, as set forth in claim 2, wherein said inserts having recesses extending in the elongated direction thereof.

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