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(54) **INFANT MATTRESS**

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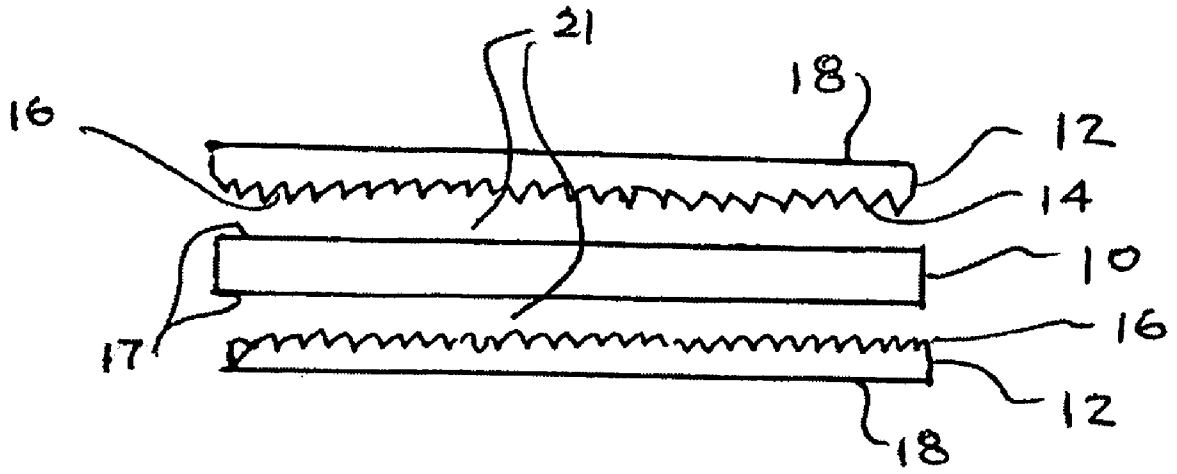
(57) **ABSTRACT**

An infant mattress for underlying an infant. The infant mattress is made of three layers of a foam material; an inner layer comprised of an open or closed cell foam material, preferably urethane, and two outer layers that sandwich the inner layer therebetween, comprised of a visco-elastic foam material, preferably urethane. An outer cover surrounds all three layers and is cleanable and anti-microbial. The inner layer is of a less resilient, or stiffer material than the outer layers that are comprised of a visco-elastic material and are slow to spring back upon being indented by the weight of the infant to evenly distribute the weight of the infant. The outer and inner foam layers are preferably secured together by a mechanical retaining means, one of which is a stripe of adhesive located only around the perimeter of the foam layers.



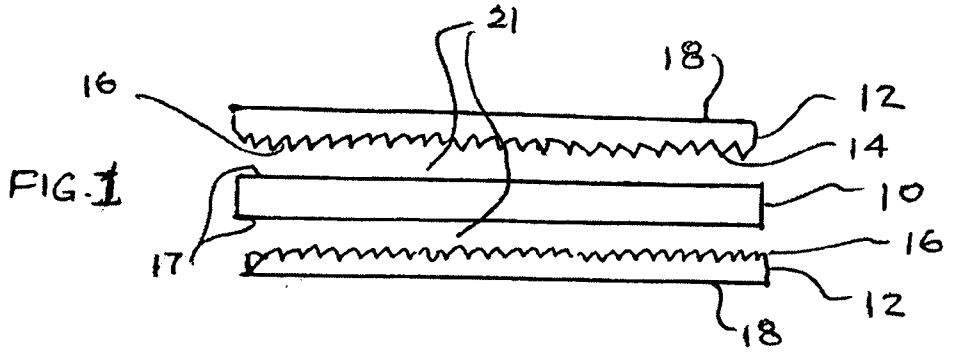


FIG. 1

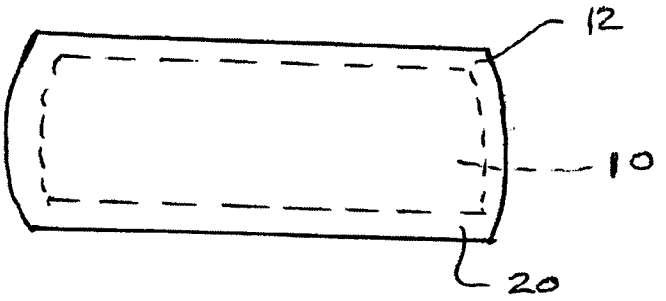


FIG. 2

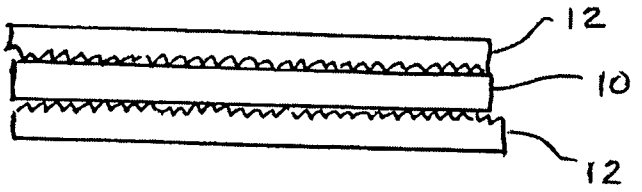


FIG. 3

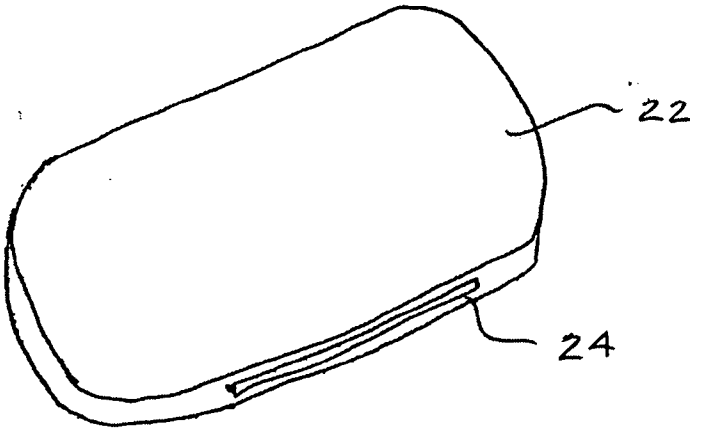


FIG. 4

INFANT MATTRESS

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a mattress, and, more particularly, to a comfortable mattress for underlying an infant.

[0002] In general, with an infant being treated in an infant apparatus or, for that matter, simply resting on a piece of furniture, such as a crib or the like, it is intended that such infant be maintained in a safe, comfortable environment. To that end, there is normally used an infant mattress that underlies the infant for support and comfort of that infant.

[0003] There are, of course, a number of requirements for an infant mattress, that is, it must not only be comfortable and support the infant, but it also needs to be relatively easy to manufacture in order to be commercially viable and also preferably should be anti-microbial. The mattress should have a support surface that is developmentally friendly and have as few as possible pressure points. At present, many of the existing infant mattresses develop pressure points in certain areas of the body of the infant in contact with the mattress because the mattress does not conform to the body uniformly in distributing the weight of the patient. The pressure points result in discomfort and may produce skin ulcers. As a result, many users of such mattresses use secondary developmentally friendly materials to reduce the pressure points with such mattresses.

[0004] The normal mattress also should have a cover that is cleanable and comprised of an anti-microbial, non-toxic material for the safety of the infant and be cleanable with all of the normal hospital disinfectants and should be liquid resistant and not be permeable to liquid or absorb liquid.

[0005] It would thus be advantageous to have an infant mattress having all of the aforementioned qualities and yet be easy and relatively inexpensive to produce.

SUMMARY OF THE INVENTION

[0006] Now, in accordance with the present invention, there is provided an infant mattress that is comprised of a material that is inherently designed to disperse pressure points and evenly distribute the pressure load over a large area of the mattress thereby being a good, developmentally friendly mattress.

[0007] In the construction of the present mattress, there are a plurality of layers of a foam material, that is, there is an inner foam layer comprised of an open or closed cell urethane foam, and with two outer foam layers comprised of a visco-elastic foam material, which also may be a urethane foam. The outer foam layers sandwich the inner foam layer therebetween.

[0008] In the present invention, the outer foam layers are of a visco-elastic material whereby the foam recovers very slowly from an indentation that is made by a body pressed into the visco-elastic material. As such, with an infant positioned on the mattress, the outer foam layer will more evenly distribute the weight of the infant over the mattress and avoid pressure points. As a feature of the present invention therefore, by having the outer foam layers the same, both visco-elastic having the same properties, the caregiver can place the mattress underneath the infant without the need to make sure a particular side is facing upwardly to receive the infant. The density of the outer foam layers can be in the range of about 1.0 to about 5.0 pounds per cubic foot with a preferred density of about 3.0 pounds per cubic foot.

[0009] On the other hand, the inner foam layer is an open or closed cell foam that has a faster memory such that the material returns rapidly to its original configuration when a body causing an indentation has been removed. The combination of the two outer foam layers having a slow to recover material with the inner foam layer having a more rapid recovery rate brings about the particularly desirable properties of the present mattress. The density of the inner foam layer can be in the range of about 1.0 to about 3.0 pounds per cubic foot and preferably may have a density of about 1.7 pounds per cubic foot.

[0010] Despite the aforementioned relative densities of the inner and outer foam layers, i.e. the outer foam layers have a higher density than the inner foam layer, however, the outer foam layers give more easily than the inner foam layer, the reason being that the outer foam layers are made of the visco-elastic material while the inner foam layer is made of the open or closed cell foam that is actually stiffer, and gives less easily, than the outer foam layer but is a less dense foam material. Accordingly, while the various foam layers can be described by means of their densities, those densities are not indicative of the give or firmness of the foam layers themselves where the different foam layers are or are not visco-elastic.

[0011] The outer foam layers can be preferably mechanically captured and retained to the inner foam layer and that mechanical retaining can be carried out through the use of an adhesive, stitching, Velcro fastening system or other mechanical securing means. In one embodiment, an adhesive is used for the mechanical retaining means and, in the preferred embodiment, the adhesive can be in the form of a stripe of adhesive applied only around the outer periphery of the mating surfaces of the inner foam layer and the outer foam layers, thereby leaving a large center area of the mating surfaces having no adhesive at all. By that technique, the center areas of the inner and outer foam layers are free to move with respect to each other.

[0012] In the embodiment shown, the shape of the mattress is rectangular, with the shorter of the opposite sides being rounded and with the adhesive stripe that is between about 0.25 and 2.5 inches in width, preferable about one inch, surrounding the outer periphery of the mattress. Of course, the mattress may have other shapes and the adhesive stripe may only extend substantially around the outer perimeter of the mattress. The important feature of the particular affixation of the outer foam layers to the inner foam layer is that with the use of the perimeter adhesive stripe, the abutting inner areas of the various foam layers are free from any adhesive and, therefore, movement is allowed between the various layers of the foam material inwardly of the adhesive stripe. As an alternative, the can be no affixation between the outer foam layers and the inner foam layer.

[0013] As another feature of the present mattress that may be incorporated into the construction, there may be micro-convolutes that are formed on the interior surfaces of the outer foam layers so as to extend inwardly to contact both surfaces of the inner foam layer. As such, the micro-

convolutes actually contact the surfaces of the inner foam layer in sandwiching the inner foam layer between the outer foam layers.

[0014] Finally, there is an outer cover the surrounds and encloses the three foam layers and that outer cover is comprised of a material that is anti-microbial, cleanable and non-toxic so as to not harm an infant positioned thereon as well as liquid resistant. The means of securing the outer cover to the layers of foam material can be by a stitching, RF or HF welding, zippering, Velcro fastening system or any other suitable means. The outer cover may be removable for cleaning and can have one side openable so as to facilitate the insertion and removal of the foam layers therefrom.

[0015] The outer cover preferable surrounds the three foam layers or composite foam structure with sufficient clearance around the outer perimeter of the foam layers in order to allow the foam layers to expand when the infant is placed thereon and the expanding perimeter is not restrained by the dimensions of the outer cover. Thus, the layers of foam can freely expand under the deformation imposed by the infant so as to avoid a hammock effect where that expanding perimeter of the foam layers is hampered or restrained by the outer cover.

[0016] Other features of the present infant mattress and method of making the same will become more apparent in light of the following detailed description of a preferred embodiment thereof and as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] **FIG. 1** is an exploded side view illustrating the layers of foam that are used to make up the present mattress;

[0018] **FIG. 2** is a top view of the mattress of the present invention illustrating the application of the adhesive stripe;

[0019] **FIG. 3** is a side view of the foam layers of the present invention secured together; and

[0020] **FIG. 4** is a top perspective of the mattress of the present invention and illustrating the outer cover enclosing the composite foam structure.

DETAILED DESCRIPTION OF THE INVENTION

[0021] Taking, therefore, **FIG. 1**, there is shown a side, exploded view of the various components that make up the present mattress. As can therefore be seen, there is an inner foam layer **10** and a pair of outer foam layers **12** that basically sandwich the inner foam layer **10** therebetween when the mattress is assembled.

[0022] The materials of the inner and outer foam layers **10**, **12** are specially selected to achieve the overall benefit of the mattress of this invention. Accordingly, the inner foam layer **10** is an open or closed cell, elastomeric foam, such as urethane, that is relatively stiffer or less resilient than the outer foam layers **12** and can be comprised of a foam such as North Carolina Foam Ultra Cell UC-17, having a density of about 1.7 pounds per cubic foot, a resilience (% rebound) of 59-66 and a total thickness of about 0.75 inches. The range of thicknesses for the inner foam layer **10** can be from about 0.25 inches to about 1.0 inch for suitability as an infant mattress, however, it can be understood that different thicknesses would be expected based upon different uses of the present mattress. Other parameters of the inner foam layer **10** include a specific gravity of 0.015-0.08 and insolubility in water. In essence, the inner foam layer **10**, being less resilient that the outer foam layers **12**, acts as a box spring where there is give and firmness at the same time. While the material having a density of 1.7 pounds per cubic foot has been found to be a preferred density for the inner foam layer **10**, other foams having different densities can be used with the present invention and generally include densities that may be within the range of about 1.0 to about 3.0 pounds per cubic foot.

[0023] The outer layers **12** are each comprised of the same material and thickness and therefore provides the advantage that the caregiver can position the mattress of the present invention with either side facing upwardly and be assured that the conditions and flexibility of the mattress are the same for the infant in either orientation.

[0024] One foam material that has been found applicable for the outer foam layers **12** is North Carolina Foam Convoluted AVE3010, having a density of 3.0+/−0.20 pounds per cubic foot and a resilience (% rebound) of 8-16. The thickness of the outer foam layers **12** for an infant mattress can be about 0.5 inches with a range of 0.25 to 0.75 inches applicable, however, as stated, the actual dimensions would depend on the particular application for the mattress. Again, the material herein described as usable for the outer foam layer **12** is a visco-elastic foam, and may be urethane, having a specific gravity of 0.015-0.08 and be insoluble in water. While the material having a density of 3.0 pounds per cubic foot has been found to be a preferred density, other foams having different densities can be used with the present invention and generally within the range of about 1.0 to about 5.0 pounds per cubic foot.

[0025] As can also be seen in **FIG. 1**, there are a series or plurality of micro-convolutes **14** formed on the interior surfaces **16** of each of the outer foam layers **12**. The micro-convolutes **14** can be conical in shape and taper inwardly in the direction of the inner foam layer **10** and act as tiny springs that allow the infant's weight to be dispersed more evenly over the surface on which the infant is positioned. Also, by facing the micro-convolutes inwardly toward the inner foam layer **10**, the exterior surfaces **18** of the outer foam layers **12** are smooth to the infant. Alternatively, the use of micro-convolutes can be eliminated such that the interior surfaces **16** of the outer foam layers may be flat, relatively planar surfaces.

[0026] Turning now to **FIG. 2**, taken along with **FIG. 1**, there is shown a top view illustrating an outer foam layer **12** enclosing an inner foam layer **10**. There can be seen in **FIG. 2**, an adhesive stripe **20** that is placed on the interior surface **16** of the outer foam layer **12**, or alternatively, on the exterior surface **17** of the inner foam layer **10** and the adhesive stripe **20** surrounds the peripheral edge or perimeter of the outer foam layer **12**. In **FIG. 2**, the adhesive stripe **20** surrounds the entire perimeter of the outer foam layer **12**, however, it is understood that the adhesive stripe **20** may only be placed substantially around the perimeter of the outer foam layer **12**. In the embodiment shown and used for an infant mattress, the adhesive stripe **18** is preferably from about 0.25 inches to about 2.5 inches in width and, more preferably, about 1 inch in width and can be sprayed on to the appropriate surface or applied by other means.

[0027] By the use of an adhesive stripe **18** that extends around the perimeter of the outer foam layers **12**, or inner form layer **10**, the interior surface **16** of the outer foam layer **12** and the corresponding interior facing surface of the inner foam layer **10** are free from any adhesive and, therefore, there is movement that is allowed between the inner and outer foam layers **10**, **12** inwardly of the adhesive stripe **20**. As such, the interior portions **21** of the foam layers have no adhesive, thereby allowing the foam layers to react to the weight load of the infant being exerted thereon without being bound by any other mechanical means except for surface contact friction.

[0028] The use of an adhesive stripe is to mechanically retain the outer foam layers **12** to the inner foam layer **10** however other means may be used to mechanicaly retain the foam layers together such as stitching, Velcro fastening system or other mechanical means. In a further embodiment, there may be no mechanical retaining means between the outer layers and the inner layer.

[0029] Turning briefly to **FIG. 3**, there is shown a side view of the completed assembly of the composite foam structure comprising the three foam layers made up of the inner foam layer **10** and the two outer foam layers **12** sandwiching the inner foam layer **10** therebetween.

[0030] Turning now to **FIG. 4**, there is shown a perspective view of the present infant mattress illustrating the outer cover **22** that encloses the three foam layers shown in **FIG. 3**. As explained, the outer cover **22** is intended to enclose the composite foam structure made up of the three foam layers of **FIG. 3** in forming the eventual mattress. One suitable material for the outer cover **22** is Dartex P091 Polyamide fabric (polyurethane transfer coating on a weft knitted fabric) and is chosen for its properties of being washable, dry cleanable, and is capable of being HF welded. Other comparable material can, of course, be used for the outer cover **22**. The material for the outer cover **22** should also be non-toxic and anti-microbial so as to be safe for the contact with an infant and therefore be skin friendly or irritation free and can be coated with an anti-fungal and antibacterial coating.

[0031] In the application surrounding the foam layers **10**, **12**, i.e. the composite foam structure, it is also preferred that the outer cover **22** be a loose fit surrounding those foam layers, that is, the outer cover **22** should be fabricated and dimensioned so that the outer cover **22** is not tight around the inner and outer foam layers **10**, **12** enclosed therein. As such, the dimensions of the outer cover **22** are such that there is a sufficient space surrounding the outer perimeter of the foam layers **10**, **12** such that the outer cover **22** is not taut on the surface and act like a hammock when the infant is placed on the mattress. The looseness of the outer cover **22** allows the foam layers **10**, **12** to perform the function of weight distribution and elimination of pressure points without the outer cover **22** causing any considerable effect on the intended performance.

[0032] As one way of assuring such looseness, the outer cover **22** should be sufficiently loosely fitted over the foam layers **10**, **12** such that when the infant is placed on the mattress, the normal expansion of the perimeter dimensions of the foam layers **10**, **12** due to the depression created by the weight of the infant will not be constrained by the outer cover **22** such normal perimeter expansion of the foam layers **10**, **12** can readily take place.

[0033] The outer cover **22** can be closed about the foam layers **10**,**12** by means such as stitches that surround the mattress as shown in **FIG. 4** or there may be an opening **24** in the outer cover **22** to enable the foam layers **10**, **12** to be readily inserted into and removed from the outer over **22**. The opening **24** may be secured by means such as a zipper, a Velcro closure system or other similar means.

[0034] Accordingly, as now constructed, the present mattress is comprised of an inner foam layer **10** comprised of a open or closed cell foam material and a pair of outer foam layers **12** comprised of a visco-elastic foam material having less stiffness than the inner foam layer **10** and the composite foam layers **10**, **12** are encased in a outer cover **22** of a particular material to achieve the advantages of the present invention.

[0035] While the present invention has been set forth in terms of a specific embodiment or embodiments, it will be understood that the present infant mattress and method of making the same herein disclosed may be modified or altered by those skilled in the art to other configurations. Accordingly, the invention is to be broadly construed and limited only by the scope and spirit of the claims appended hereto.

I claim:

1. An infant mattress for underlying an infant, said infant mattress comprising an inner foam layer, a pair of outer foam layers that are located on each side of the inner foam layer sandwiching the inner foam layer therebetween, said outer foam layers comprised of a visco-elastic foam material and an outer cover loosely enclosing the three layers within the outer cover.

2. The infant mattress as defined in claim 1 wherein the inner foam layer is less resilient than the outer foam layers.

3. The infant mattress as defined in claim 1 wherein the density of the outer, visco-elastic foam layers is between about 1.0 and 5.0 pounds per cubic foot.

4. The infant mattress as defined in claim 3 wherein the density of the outer, visco-elastic foam layers is about 3.0 pounds per cubic foot.

5. The infant mattress as defined in claim 1 wherein the density of the inner foam layer is between about 1.0 and 3.0 pounds per cubic foot.

6. The infant mattress as defined in claim 5 wherein the density of the inner foam layer is about 1.7 pounds per cubic foot.

7. The infant mattress as defined in claim 1 wherein the outer cover is comprised of a material that is antimicrobial.

8. The infant mattress as defined in claim 1 wherein the outer foam layers are affixed to the inner layer by means of a mechanical retainer.

9. The infant mattress as defined in claim 8 wherein the mechanical retainer is a pattern of an adhesive.

10. The infant mattress as defined in claim 9 wherein the pattern of an adhesive is a stripe of adhesive at least substantially along the perimeter of the outer and inner foam layers.

11. The infant mattress as defined in claim 1 wherein the outer foam layers have interior surfaces facing the inner foam layer comprised of micro-convolutes.

12. A method of constructing an infant mattress comprising the steps of:

providing an inner foam layer comprised of a open or closed cell foam material;

providing a pair of outer foam layers comprised of a visco-elastic foam material;

mechanically affixing the outer foam layers to the inner foam layer to sandwich the inner foam layer between the pair of outer foam layers;

providing an outer cover, and

enclosing the inner foam layer and the outer form layers affixed thereto within the outer cover.

13. The method of claim 12 wherein the step of mechanically affixing the outer foam layer to the inner foam layer comprises applying a predetermined pattern of adhesive to a surface of the outer foam layers or the inner foam layer;

14. The method of claim 13 wherein the step of applying a predetermined pattern of adhesive comprises applying a stripe of adhesive around the outer perimeter of the outer foam layers or the inner foam layer.

15. A composite foam structure comprising an inner foam layer of an open or closed cell foam material having a predetermined resilience, a pair of outer foam layers that are located on each side of the inner layer sandwiching the inner foam layer therebetween, said outer foam layers comprised of a visco-elastic foam material.

16. The composite foam structure as defined in claim 15 wherein the density of the outer, visco-elastic foam layers is between about 1.0 and 5.0 pounds per cubic foot.

17. The composite foam structure as defined in claim 15 wherein the density of the inner foam layer is between about 1.0 and 3.0 pounds per cubic foot.

18. The composite foam structure as defined in claim 15 wherein the outer foam layers are affixed to the inner layer by means of a mechanical retaining means.

19. The composite foam structure as defined in claim 18 wherein the mechanical retaining means is an adhesive pattern provided on the outer foam layers or inner foam layer.

20. The composite foam structure as defined in claim 19 wherein the pattern of adhesive is a stripe of adhesive along the perimeter of the outer and inner foam layers.

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