

[54] **PATIENT UNDERPAD**

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[51] Int. Cl. **A61g 7/04**

[58] Field of Search **5/91, 347**

[56] **References Cited**

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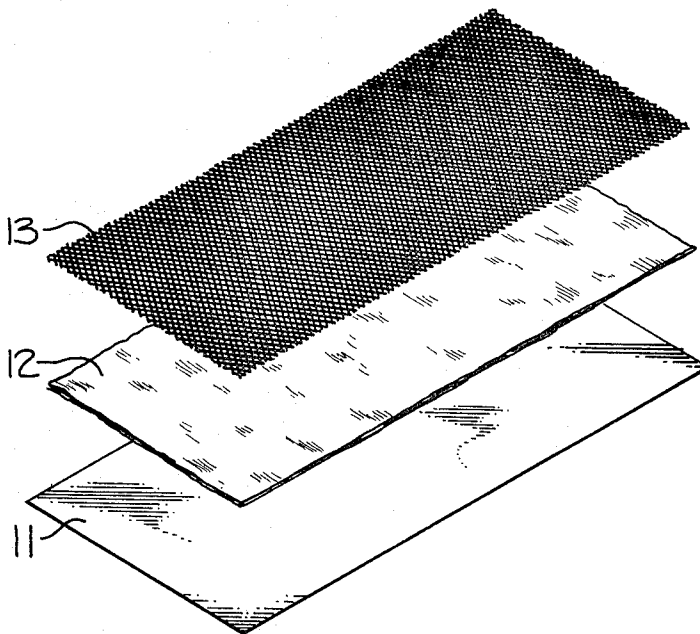
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[57] **ABSTRACT**

A patient underpad characterized in its ability to provide cushioning for a patient and to readily absorb large volumes of liquid in a manner such that the liquid absorbed does not thereafter irritate the patient. The underpad includes a moisture-impervious bottom layer, a moisture-absorbing layer covering the bottom layer and a closed cell, expanded thermoplastic top layer covering the moisture-absorbing layer and having perforations or openings therethrough of sufficient number and size to permit liquids, such as body excretions, to freely pass therethrough to be absorbed by the moisture-absorbing layer while supporting the patient in spaced relation from the liquid absorbed by the moisture-absorbing layer.

10 Claims, 7 Drawing Figures



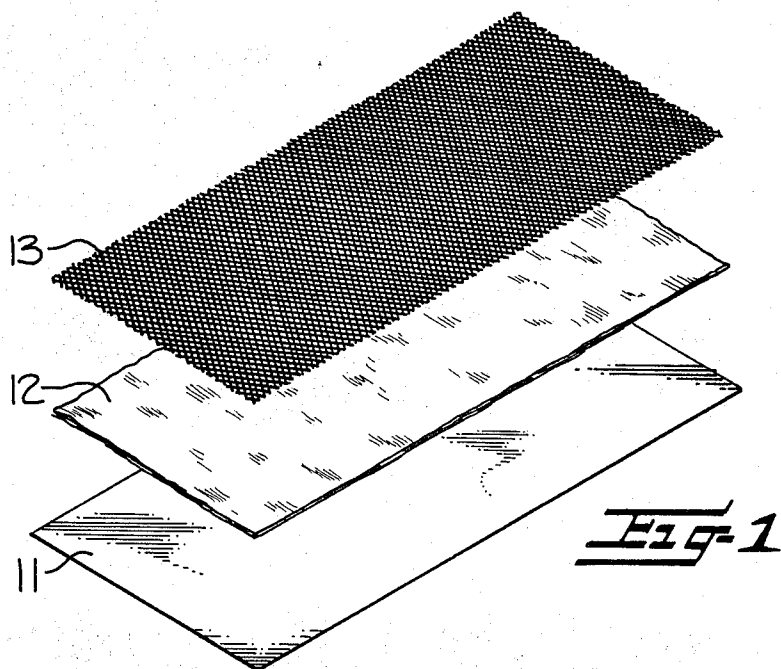


Fig-1

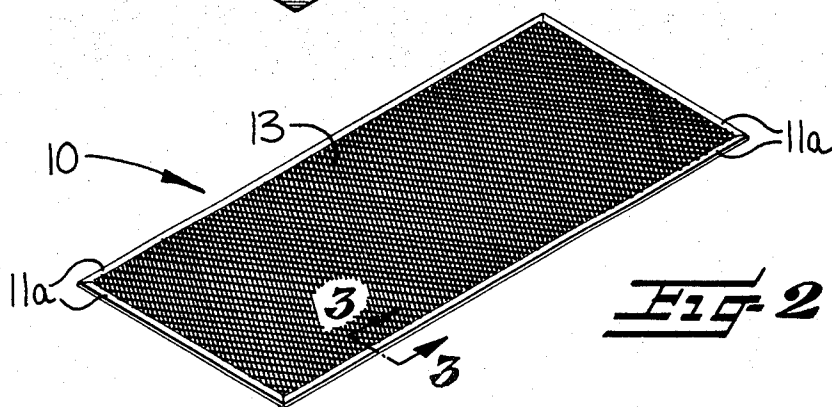


Fig-2

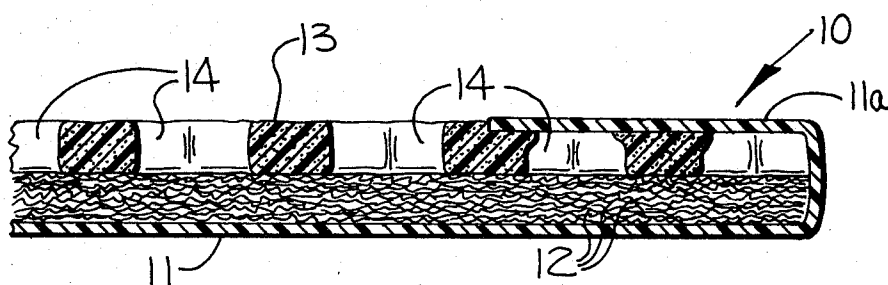


Fig-3

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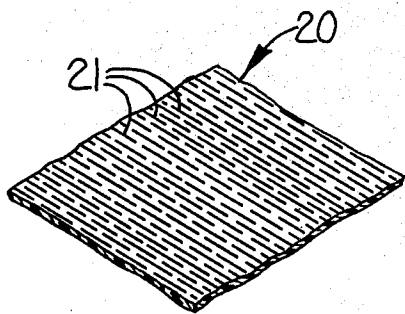


Fig-4

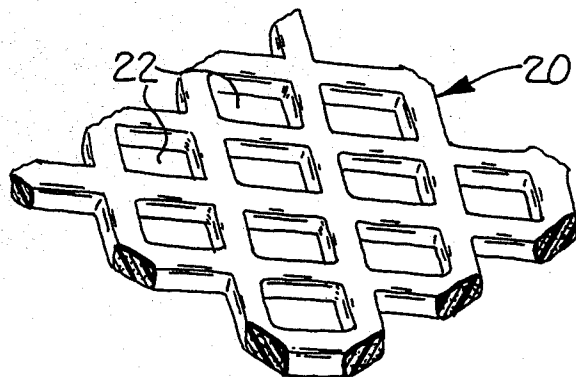


Fig-5

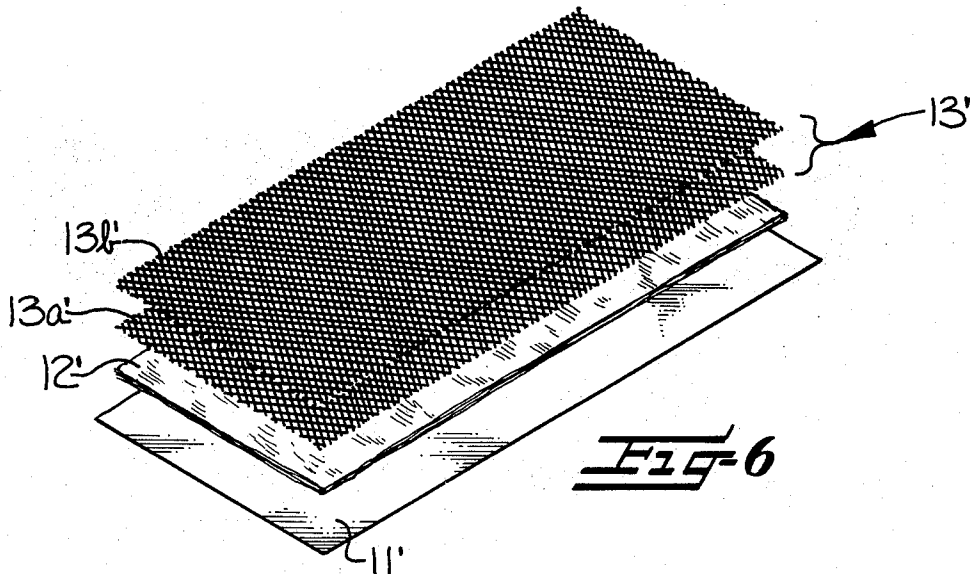


Fig-6

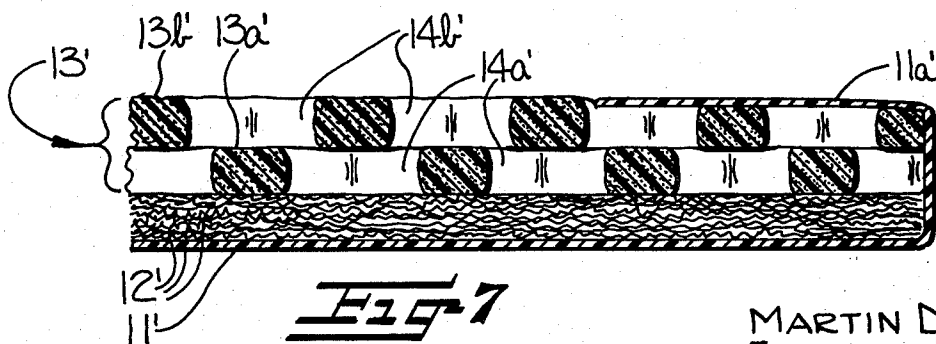


Fig-7

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PATIENT UNDERPAD

This invention relates generally to a patient underpad and more particularly to a patient underpad specifically constructed for use on a bed or the like for absorbing relatively large volumes of liquid, such as body excretions.

In many instances, bedridden personnel, infants and the like, hereinafter referred to as "patients," are unable to control their excretory organs and thus, there is a need for a patient underpad which is capable of absorbing these body excretions. Many attempts have heretofore been made to provide such underpads but with little or no success.

The limited success of previous patient underpads has been mostly due to the failure of the underpad to absorb liquids such as body excretions at a rate commensurate with the rate of excretion by the patient. In addition, it is desirable that the underpad provide cushioning for the patient and support the patient in spaced relation from the liquid absorbed so that the absorbed liquid does not thereafter cause irritation to the patient. Furthermore, it is desirable that the underpad contain liquid absorbed thereby to prevent spoilage or damage to the bed or surrounding environment.

Accordingly, it is an object of this invention to provide a patient underpad characterized in its ability to provide cushioning for a patient and to readily absorb relatively large volumes of liquid in a manner such that the liquid absorbed does not thereafter irritate the patient.

Another object of this invention is to provide a patient underpad which may be inexpensively manufactured so that the expense in the use of the underpad is overcome by the advantages attendant therewith.

By this invention, the above objects are accomplished by providing a moisture-impervious bottom layer, a moisture-absorbing layer covering the bottom layer, and a closed cell, expanded thermoplastic top layer covering the moisture-absorbing layer wherein the top layer has perforations or opening therethrough of sufficient number and size to permit liquids, such as body excretions, to freely pass therethrough to be absorbed by the moisture-absorbing layer. The closed cell, expanded thermoplastic top layer in addition to permitting the liquids to pass therethrough, provides cushioning for the patient while supporting the patient in spaced relation from the liquid absorbed by the moisture-absorbing layer.

The top layer may comprise a plurality of closed cell, expanded thermoplastic layers superimposed on each other with each of the layers having spaced apart rows of lozenge-like openings with openings in adjacent rows being in predetermined staggered relation and being superimposed with openings of each layer communicating with more than one opening in the other layer so that air may circulate between communicating openings of the top layer. In addition, the moisture-impervious bottom layer, preferably, includes edge portions which extend around edge portions of the moisture-absorbing layer and the top layer and overlap marginal edge portions of the top layer for preventing the flow of liquid absorbed by the moisture-absorbing layer exteriorly of the underpad.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds, when taken in connection with the accompanying drawings, in which

FIG. 1 is an exploded isometric view of the various layers of a patient underpad of the present invention;

FIG. 2 is a composite patient underpad including the various layers of FIG. 1 constructed in accordance with the present invention;

FIG. 3 is an enlarged sectional view taken substantially along the line 3—3 of FIG. 2;

FIG. 4 is an isometric view with portions in section illustrating a closed cell, expanded thermoplastic sheet material which may be used in forming the top layer of the patient underpad of FIG. 1;

FIG. 5 is a greatly enlarged perspective view with parts in section of a closed cell, expanded thermoplastic sheet material having lozenge-like openings therein which is illustrative of a top layer which may be used in the patient underpad of FIG. 2;

FIG. 6 is an exploded isometric view of various layers of another embodiment of a patient underpad constructed in accordance with the present invention, and

FIG. 7 is an enlarged sectional view with portions broken away illustrating a composite patient underpad including the various layers illustrated in FIG. 6.

Referring specifically to FIG. 2 of the drawings, there is illustrated a patient underpad, generally indicated at 10, constructed in accordance with the present invention.

As illustrated in FIGS. 1, 2 and 3 the patient underpad 10 is of a laminate structure and comprises a moisture-impervious bottom layer 11, a moisture-absorbing layer 12 covering the bottom layer 11 and a top layer 13 covering the moisture-absorbing layer 12.

Preferably, as illustrated, the various layers are substantially coextensive except for the moisture-impervious bottom layer 11 which includes edge portions 11a which extend around the edges of the moisture-absorbing layer 12 and top layer 13 and are sealed in overlapping relation to the marginal edge portions of the top layer 13 by any conventional means such as a water-proof adhesive for preventing flow of liquid absorbed by the moisture-absorbing layer 12 exteriorly of the patient underpad 10 and spoiling or damaging the surrounding environment.

The bottom layer 11 is formed of any moisture-impervious material, preferably, an inexpensive material such as plastic or the like. The moisture-absorbing layer 12 is formed of a hydrophilic material, as for example, creped cellulose wadding and the like.

The top layer 13 of the patient underpad 10 is formed of a closed cell, expanded thermoplastic sheet material and has perforations or openings 14 therethrough of sufficient number and size to permit liquids, such as body excretions, to free pass therethrough to be absorbed by the moisture absorbing layer 12. Expanded thermoplastic materials, as the term is used herein, are generally known in the thermoplastic industry, and are characterized in having a closed cell construction and as having included a blowing agent therein which has been activated to expand the cells of the thermoplastic material. Blowing agents which lead to such expansion may take the form of fluids incorporated into the thermoplastic material and which expand due to chemical reaction or physical action such as vaporization. As will be apparent, these blowing agents may be activated during the formation of the thermoplastic material or thereafter depending upon the blowing agent and the conditions necessary for its activation.

An example of an expanded thermoplastic material which has been successfully used in the patient underpad 10 of the present invention is a closed cell, polystyrene extruded in sheet form with a blowing agent entrapped in the closed cells which expands on being heated. Following extrusion the polystyrene sheet was heated to activate the blowing agent and expand the closed cells to form an expanded polystyrene sheet.

It is an inherent characteristic of closed cell, expanded thermoplastic materials, as well known to those skilled in the art, that the ending density and rigidity of the material may be controlled by controlling the formulation of the material and the characteristics of the blowing agent and the degree of its activation. Preferably in the patient underpad 10, the closed cell, expanded thermoplastic top layer 13 has a relatively low density which is dimensionally stable and which provides cushioning for the patient while supporting the patient in spaced relation from the liquid absorbed by the moisture-absorbing layer 12 so that the liquid does not thereafter irritate the skin of the patient.

To permit liquids such as body excretions to freely pass through the top layer 13 and be absorbed by the moisture-absorbing layer 12, the top layer 13 is provided with perforations or openings 14 of sufficient number and size to permit body excretions to pass freely therethrough at a rate commensurate with the rate of excretion. Preferably, the top layer 13 is formed of a sheet 20, FIGS. 4 and 5, of expanded thermoplastic material, such as expanded polystyrene which is

provided with a predetermined pattern of incisions 21 therein. The incisions 21 are straight, elongate, equal length cuts into the sheet 20 in closely spaced, parallel straight rows with the incisions 21 of adjacent rows being in predetermined staggered relation. Preferably, the incisions 21 (FIG. 4) are arranged with the incisions 21 of alternate rows being substantially aligned transversely of the rows, with the incisions 21 in the intervening rows equally overlapping the adjacent aligned incisions 21 for reasons soon to become apparent.

The incisions 21 in the sheet 20 may be formed in any number of ways that are known or will occur to persons skilled in the art of machine design. One way, without limitation, is to pass the sheet 20 between a pair of rollers one of which has spaced knives thereon arranged for forming the desired pattern of incisions 21.

After forming the incisions 21 in the sheet 20, the incisions 21 are opened by stretching the sheet 20 in the direction transverse to the rows of incisions 21 to form, FIG. 5, a sheet 20 having a network of lozenge-like openings 22 corresponding to the arrangement of incisions 21. It will be readily apparent that the number and size of the lozenge-like openings 22 may be controlled by the spacing between incisions 21 in a given row, by controlling the spacing between adjacent parallel rows and by controlling the extent to which the incisions 21 are opened. Furthermore, the staggered relation of incisions 21 of FIG. 4 provide a preferred network of openings 22 after opening. That is, the staggered relation illustrated provides a network of openings 22 which consumes a major portion, more than one-half, the planar area of the sheet 20 without affecting the other characteristics imparted to the patient underpad 10 by the use of a closed cell, expanded thermoplastic sheet for the top layer 13. It will be apparent that through use of lozenge-like openings which are staggered as heretofore defined, a top layer 13 may be provided with substantially unlimited capacity for freely passing liquids, such as body excretions, therethrough which can provide cushioning for the patient and support the patient in spaced relation from the liquid absorbed by the moisture-absorbing layer 12.

During the opening of incisions 21 to form the network of lozenge-like opening 22, it should be emphasized that the stretching must overcome the elastic memory of the thermoplastic material. This can be accomplished in several ways, without limitation, including stretching the thermoplastic sheet at a temperature at which any elastic memory is overcome so that the thermoplastic sheet 20 will retain the shaped imparted thereto by the stretching.

From the foregoing description it will be apparent that the stretching and expanding of the thermoplastic sheet 20 may be accomplished simultaneously wherein a thermally activable blowing agent is employed. Where the thermoplastic sheet 20 is polystyrene having a blowing agent incorporated therein, an appropriate temperature for simultaneously stretching to open the incisions 21 and expanding the closed cell polystyrene has been found to be a temperature of at least about 200°F, with a temperature of 240°F being preferred.

For a more detailed description of the formation of closed cell, expanded thermoplastic sheet material having a network of lozenge-like openings similar to that herein described, reference is made to the copending application, Ser. No. 837,162 and entitled "Method of Producing Net-Like Thermoplastic Materials and Products," also assigned to the assignee of the present invention.

With reference to FIGS. 6 and 7 there is shown another embodiment of a patient underpad 10' of the present invention and which includes a moisture-impervious bottom layer 11', a moisture-absorbing layer 12' covering the bottom layer 11' and a top layer 13'. The top layer 13 comprises at least two closed cell, expanded thermoplastic layers 13a' and 13b' superimposed on each other. Each of the layers 13a' and 13b' have spaced apart rows of lozenge-like openings 14a' and 14b', respectively, with openings in adjacent rows being in predetermined staggered relation and, preferably, each of the layers 13a' and 13b' are formed of a closed cell, thermoplastic

sheet 20 as illustrated in FIG. 5 and heretofore described. The layers 13a' and 13b' are superimposed on each other, preferably with the openings 14a' and 14b' of layers 13a' and 13b', respectively, in open communication with more than one opening of the other layer as best illustrated in FIG. 7 so that air may circulate between communicating openings even when a patient is resting on the patient underpad 10'. Furthermore, with the openings of each layer being in identical predetermined staggered relation as illustrated in FIG. 5, openings 14a' and 14b' will communicate throughout the length and width of the superimposed layers 13a' and 13b'. Thus, vapors from the liquid absorbed by the moisture-absorbing layer 12' may escape and not be confined in contact with the patient and cause irritation thereto.

The bottom layer 11' as in the patient underpad 10 previously described includes edge portions 11a' which extend around the edges of the moisture-absorbing layer 12' and the superimposed layers 13a' and 13b' which form the top layer 13'. The edge portions 11a' are sealed in overlapping relative to the marginal edges of the top layer 13' by suitable means to prevent flow of liquids absorbed by the moisture-absorbing layer 12' exteriorly of the underpad 10'.

In accordance with the foregoing description, there is provided a patient underpad which is capable of absorbing large volumes of liquid in a manner such that the liquid absorbed does not thereafter irritate the patient and which underpad provides cushioning for the patient during use thereof.

In the drawings and specification, there has been set forth preferred embodiments of the invention, and although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation.

What is claimed is:

1. A disposable patient underpad adapted to be positioned between the patient and a supporting mattress and characterized in its ability to provide cushioning for a patient and to readily absorb large volumes of liquid in a manner such that the liquid absorbed does not thereafter irritate the patient, said underpad comprising

a moisture-impervious bottom layer,
a moisture-absorbing layer disposed in superimposed relation to said bottom layer, and

an outermost top layer comprising a sheet of non-moisture-absorbing, expanded thermoplastic foam material substantially covering said moisture-absorbing layer and having openings therethrough which consume a major portion of the planar area of said sheet to permit liquids, such as body excretions, to freely pass therethrough to be absorbed by said moisture-absorbing layer, said top layer providing cushioning for the patient while supporting the patient in spaced relation from the liquid absorbed by said moisture-absorbing layer.

2. A patient underpad, as set forth in claim 1, wherein said top layer has spaced apart rows of lozenge-like openings with openings in adjacent rows being in predetermined staggered relation so as to provide a network of spaced openings for the passage of liquid from the patient to said moisture-absorbing layer.

3. A patient underpad, as set forth in claim 2, wherein said top layer is formed of expanded polystyrene.

4. A patient underpad, as set forth in claim 1, wherein said top layer has spaced apart parallel rows of lozenge-like openings, with openings in alternate rows being substantially aligned transversely of the rows and with the openings being staggered such that openings of intervening rows overlap the adjacent transversely aligned openings.

5. A patient underpad, as set forth in claim 1, wherein said top layer is dimensionally stable.

6. A patient underpad, as set forth in claim 1, wherein said layers are coextensive and including moisture-impervious means disposed around the edges of said coextensive layers for preventing the flow of liquid exteriorly of the underpad.

7. A patient underpad, as set forth in claim 1, wherein said moisture-impervious bottom layer includes edge portions ex-

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tending around edge portions of said moisture-absorbing layer and said top layer and overlapping marginal edge portions of said top layer for preventing the flow of liquid exteriorly of the underpad.

8. A patient underpad, as set forth in claim 1, wherein said top layer comprises a plurality of closed cell, expanded thermoplastic superposed layers, each of said layers having spaced apart rows of lozenge-like openings with openings in adjacent rows being in predetermined staggered relation so that air may circulate between communicating openings of said top layer.

9. A patient underpad, as set forth in claim 8, and wherein said moisture-impervious bottom layer includes edge portions extending around edge portions of said moisture-absorbing layer and said plurality of expanded thermoplastic layers and overlapping marginal edge portions of said expanded thermoplastic layers for preventing the flow of liquid exteriorly of the underpad.

10. A disposable patient underpad adapted to be positioned between the patient and a supporting mattress and characterized in its ability to provide cushioning for a patient and to readily absorb large volumes of liquid in a manner such that the liquid absorbed does not thereafter irritate the patient, said underpad comprising

a moisture-impervious bottom layer,

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a moisture-absorbing layer substantially covering said bottom layer,

an outermost top layer comprising a sheet of non-moisture absorbing, dimensionally stable, closed cell, expanded thermoplastic foam material substantially covering said moisture-absorbing layer and having spaced apart rows of lozenge-like openings therein of sufficient number and size to permit liquids, such as body excretions, to freely pass therethrough to be absorbed by said moisture absorbing layer, said lozenge-like openings having been formed by forming a plurality of parallel incisions in the material and then stretching the material in a direction transverse to the direction of the incisions while expanding the same, said top layer providing cushioning for the patient while supporting the patient in spaced relation from the liquid absorbed by said moisture-absorbing layer, and

said moisture-impervious layer including edge portions extending around edge portions of said moisture-absorbing layer and said top layer and overlapping marginal edge portions of said top layer for preventing the flow of liquid absorbed by said moisture-absorbing layer exteriorly of the underpad.

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