

[54] **DISPOSABLE BED COVERING**

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[58] Field of Search 161/62, 50, 49, 148;
5/334 R, 334 C, 335, 347, 355, 361, 361 B, 334

[56] **References Cited**

UNITED STATES PATENTS

2,736,043	2/1956	Temple	5/334
2,816,054	12/1957	Howden	5/334
3,216,028	11/1965	Lawson	5/337
3,654,059	4/1972	Zisblatt	5/334 R
3,691,570	9/1972	Gaines	5/347
3,765,040	10/1973	Holstein	5/334 R

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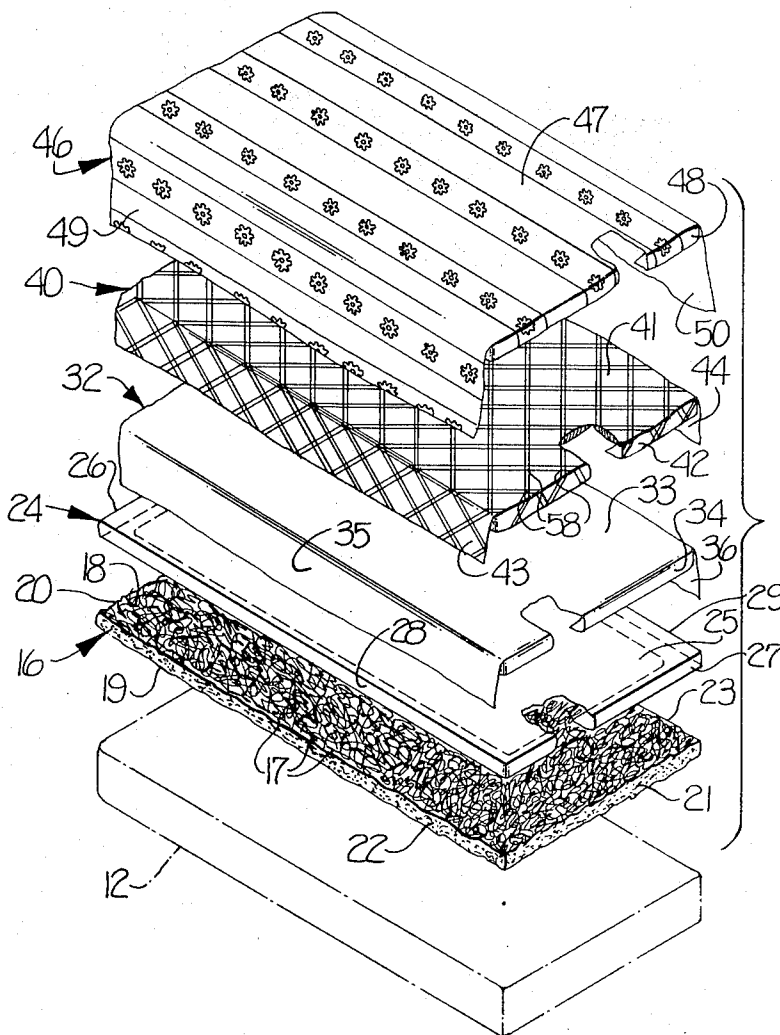
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[57]

ABSTRACT

A disposable bed covering which may be handled as a unit to facilitate the making up of a bed in a hospital or the like. The covering includes an air permeable, highly compressible rectangular mat of filamentary polymeric material, and an air permeable non-woven polymeric sheet carried by the mat and overlying at least the upper surface thereof. The bed covering is designed to be positioned upon a conventional bed mattress, and the normal movements of the patient resting thereupon create a ventilating air flow which passes through the mat and sheet to vaporize the moisture on the skin of the patient and thereby assist in the prevention and treatment of bed sores and the like.

11 Claims, 6 Drawing Figures



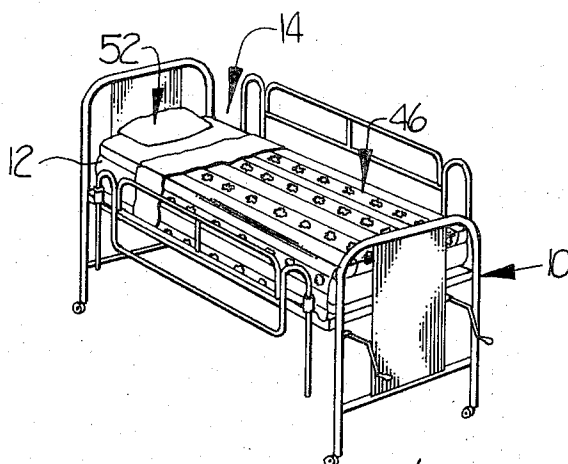


FIG-1

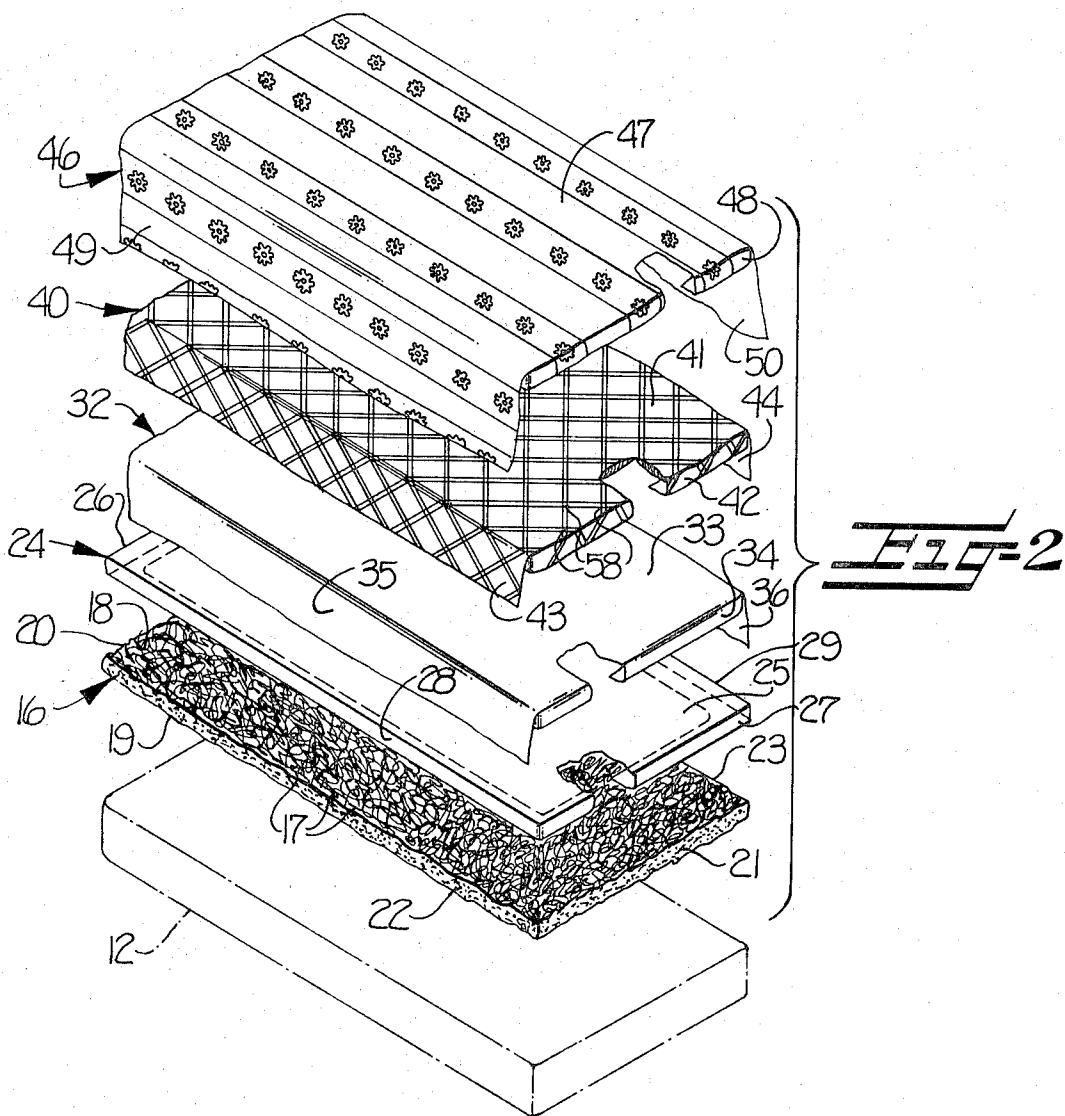
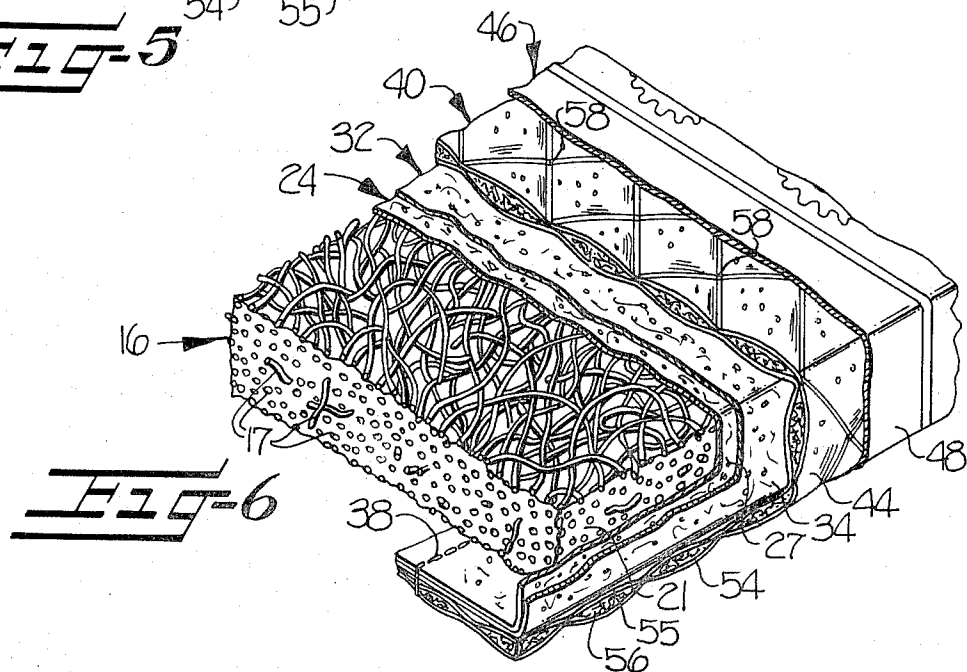
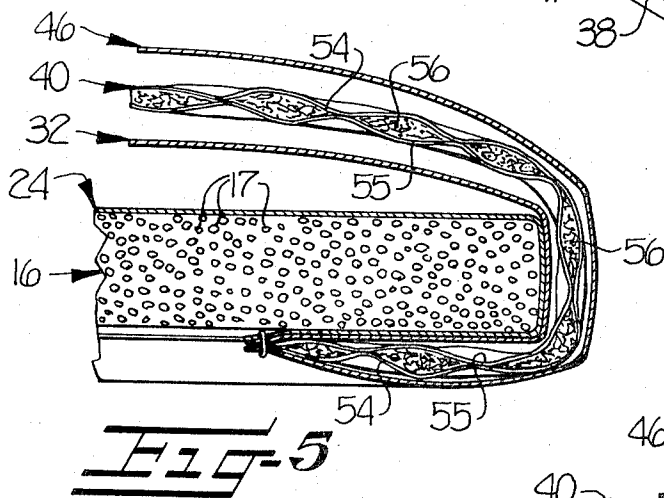
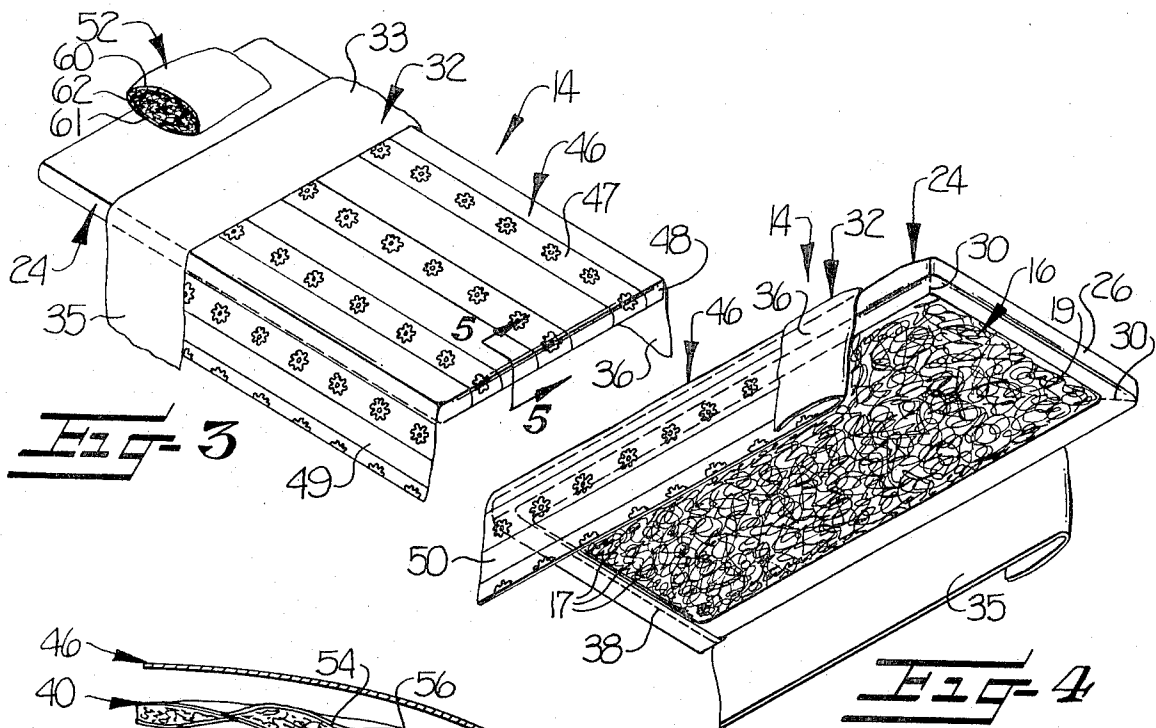


FIG-2



DISPOSABLE BED COVERING

The present invention relates to a disposable bed covering which is adapted to be positioned on a conventional bed mattress and which provides air circulation about the body of the patient to thereby assist in the prevention and treatment of bed sores and the like.

It is well known that patients who are confined to bed for an extended period of time during an illness or convalescence frequently develop decubitous ulcers or bed sores on portions of their body. Typically, such bed sores develop on the elbows, low back, hip, and heels due to the skin abrasion resulting from continually being rubbed against the bed clothing. Also, the fact that conventional bedding serves to hold the moisture resulting from perspiration against the skin of the patient is believed to further aggravate the abrasion and thus contribute to the development of bed sores.

In an attempt to alleviate the development of bed sores, it has been proposed to cover the elbows, low back, hip, and heels of the patient with protective pads of various designs. However, such pads have not proven to be entirely satisfactory since they generally hold the moisture against the skin of the patient, and they are uncomfortable to the wearer.

It is accordingly an object of the present invention to provide a patient underpad which may be positioned between the patient and a conventional mattress and which is highly compressible to cushion the patient resting thereupon. It is a further object of the present invention to provide a patient underpad which comprises an open filamentary mat having substantial voids for retaining air beneath the patient, and wherein the normal movements of the patient creates a ventilating air flow through the mat to vaporize the moisture on the skin of the patient and thereby effectively alleviate the development of bed sores.

It is another object of the present invention to provide a disposable bed covering which may be handled as a unit to permit the ready placement of the same on a conventional hospital bed mattress or the like and the subsequent removal of the same from the mattress after use.

It is still another object of the present invention to provide a disposable bed covering which is sufficiently inexpensive to permit its disposal after a single use if desired, and which may be constructed entirely of polymeric materials which are able to be readily recycled into new products.

It is also an object of the present invention to provide a bed covering which may be fabricated from non-wetting polymeric materials so as not to retain moisture in contact with the patient.

These and other objects and advantages of the present invention are achieved in the embodiment illustrated herein by the provision of an air permeable, highly compressible mat comprising non-woven polymeric filaments and defining upper and lower generally flat rectangular surfaces, the mat having a thickness of at least about one inch, and an air permeability of at least about 300 cubic feet per minute per square foot. An air permeable lower sheet of non-woven polymeric material is carried by the mat and overlies at least the upper surface thereof, the lower sheet being adapted to directly contact the patient.

A top sheet having a construction generally similar to that of the lower sheet may be positioned to overlie the lower sheet such that a patient may be positioned

therebetween, and a blanket and spread may in turn be positioned to overlie the top sheet. The top sheet, blanket, and spread may be interconnected to the lower sheet along the foot end portions thereof to maintain the assembly of the various components and permit the bed covering to be conveniently handled as a unit.

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 a perspective view of a hospital bed which employs a bed covering embodying the features of the present invention;

FIG. 2 is an exploded perspective view illustrating the components of the bed covering shown in FIG. 1, as well as the conventional mattress upon which the covering is adapted to be positioned;

FIG. 3 is a perspective view illustrating the upper surface of the bed covering shown in FIG. 1;

FIG. 4 is a perspective view of the lower surface of the bed covering shown in FIG. 3;

FIG. 5 is a sectional view of the foot end of the bed covering and taken substantially along the line 5—5 of FIG. 3;

FIG. 6 is a fragmentary perspective view of the bed covering and with portions sectioned to show the various components thereof.

Referring more specifically to the drawings, a standard hospital bed is shown generally at 10 in FIG. 1, the bed having a conventional mattress 12 positioned thereupon. The bed covering of the present invention is indicated generally at 14, and as best seen in FIG. 2, comprises an air permeable and highly compressible mat 16 which comprises randomly arranged polymeric filaments 17. The mat further defines upper and lower generally flat rectangular surfaces 18 and 19 respectively, a head end edge 20, a foot end edge 21, and opposite side edges 22 and 23.

An air permeable lower sheet 24 is carried by the mat 16 and includes a central portion 25, a head end portion 26, a foot end portion 27 and side portions 28 and 29. The central portion 25 of the sheet overlies the upper surface 18 of the mat, and the end portions 26, 27 and side portions 28, 29 are folded about the respective end edges 20, 21 and side edges 22, 23 of the mat 16 to thus overlie a portion of the lower surface 19 of the mat as best seen in FIG. 4. The end portions 26, 27 and side portions 28, 29 of the sheet are maintained in this folded condition by stitching these portions together at the corners as seen at 30 in FIG. 4. Alternatively, where the sheet 24 includes a thermoplastic material, the end portions and side portions may be maintained in the folded condition by means of a heat seal. In either case, the sheet 24 is maintained in assembly with the mat 16.

An air permeable top sheet 32 is positioned to overlie the lower sheet 24 and comprises a central portion 33, a foot end portion 34 and opposite side portions 35 and 36. The central portion 33 of the top sheet overlies the central portion 25 of the lower sheet to provide an opening along the head end such that a patient may be positioned therebetween in the conventional manner. Also, the foot end portion 34 of the top sheet is folded about the foot end edge 21 of the mat to overlie the foot end portion 27 of the lower sheet. The top and lower sheets are interconnected along their respective foot end portions by means of the stitching 38 as best

seen in FIGS. 4 and 6, and the side portions 35, 36 of the top sheet are free to drape downwardly to present a neat appearance.

The bed covering 14 of the present invention may further comprise a blanket 40 which includes a central portion 41, a foot end portion 42, and opposite side portions 43 and 44. The central portion 41 of the blanket overlies the central portion 33 of the top sheet, and the foot end portion 42 of the blanket is folded about the foot end edge 21 of the mat to overlie the foot end portion 34 of the top sheet. Also, the foot end portion 42 of the blanket is interconnected with the foot end portions of the top and lower sheets by means of the stitching 38 to thereby maintain the assembly of the blanket with the top and lower sheets and with the mat.

A lightweight decorative spread 46 may be positioned to overlie the blanket 40, the spread 46 comprising a central portion 47, a foot end portion 48, and opposite side portions 49 and 50. The central portion 47 of the spread overlies the central portion 41 of the blanket, and the spread is similarly interconnected by the stitching 38 along the foot end portion thereof to maintain the assembly of the spread with the blanket, the top and lower sheets, and the mat.

From the above description, it will be apparent that the entire bed covering 14 may be handled and stored as a unit, and that the bed covering may be easily positioned on the supporting mattress 12 to make up the bed by simply placing the bed covering 14 as a unit upon the mattress. After use, the entire bed covering also may be easily removed simply by lifting the same away from the mattress.

As a further aspect of the present invention, the bed covering 14 may also include a pillow 52 as seen in FIGS. 1 and 3, and which may or may not be secured by a suitable arrangement (not shown) to the remaining portions of the bed covering.

To describe the structure of the mat 16 more specifically, it will be understood that the mat should have a substantially uniform thickness of at least about one inch between the upper and lower surfaces 18 and 19 to insure adequate cushioning for the patient, and that the randomly arranged polymeric filaments 17 should occupy less than about 50 percent of the total volume of the mat, and preferably only about 20-30 percent. Thus the overall density of the mat is low, and significant voids are provided within the mat for retaining air immediately beneath the patient. As hereinafter further explained, this air will be forceably circulated through the mat 16 and overlying sheet 24 by the periodic compression of the mat resulting from the normal movements of the patient resting thereupon, and this ventilating air serves to vaporize the moisture on the skin of the patient and thereby assist in the prevention and treatment of bed sores.

As will be apparent to those skilled in the art, various polymers may be used in fabricating the filaments 17. As a specific example, it has been found that the closed cell, pneumatic, cellular filaments as more completely described in U.S. Pat. No. 3,485,711 issued to Fish, Jr. et al. (and incorporated herein by reference), are very satisfactory for use with the present invention. Such filaments are presently commercialized in a consolidated form which is intended for use as a carpet underlay, and a product of this type is sold by E. I. duPont de Nemours and Company under the trademark "Pneumacel".

It has been found that commercial "Pneumacel" carpet underlay may be expanded under a moderate temperature to produce a mat having the desired degree of voids, a surprisingly high air permeability, and also a high compressibility under moderate loads such as would be applied by a patient resting thereupon. It is believed that such expansion results from a softening of the adhesive which secures the filaments together at the filament junctions. The following represents a comparison of these and other physical properties of commercial "Pneumacel" carpet underlay and the same material which was expanded by placing a sample thereof in an oven maintained at a temperature of about 120° F. for about one minute.

Property	Commercial Form	Expanded
Thickness at 0.1 lb/sq. in inches	0.475	1.25
Apparent density g/cc	0.0282	0.0100
Air permeability cu. ft./min/sq. ft.	22	315
Compressibility at ½ psi		
%	4-5	30-40
% at 1 psi	5-6	43-50
% at 12 psi	33.5	80
Recovery after 5 compression cycles to 12 psi		
%	95	80

The air permeability was determined by the conventional Frazier test with a pressure drop of about ½ inches of water across the sample, and the compressibility tests were conducted on an Instron testing machine using a 2¼ inch diameter pressure foot.

The significance of the high air permeability in the case of the expanded mat will be readily apparent in that it greatly facilitates the above described ventilation through the mat. With regard to the compressibility, it will be noted that a patient in the prone position will normally exert a load of between about 0.45 and 0.60 pounds per square inch, assuming uniform loading. Thus the expanded material will compress sufficiently to provide a comfortable cushioned surface for the patient under these moderate loads. Also, this compressibility assures that there will be adequate movement of the filaments resulting from the normal movements of the patient to insure the ventilating air flow there-through as described above. Thus the above expanded material is seen to possess the required combination of high air permeability and high compressibility under moderate loads to achieve the objects of the present invention.

The lower and top sheets 24 and 32 are preferably fabricated from a non-woven polymeric material since these materials are lightweight, relatively inexpensive and do not appreciably absorb moisture. In this regard, the sheets should not weigh more than about five ounces per square yard, and should possess an air permeability of at least about 200 cubic feet per minute per square foot (Frazier), and preferably about 300 cubic feet per minute per square foot, so as to not significantly interfere with the ventilating air flow upwardly to the patient. In addition, the sheets should be relatively soft so as to be nonirritating to the patient. A suitable non-woven polymeric material is sold under

the trademark "Reemay" by duPont, and comprises a spunbonded polyester which comprises continuous filament polyester fibers that are randomly arranged, highly dispersed, and bonded at the filament junctions. This material is produced with either straight or crimped fibers, the crimped fibers being somewhat preferred for present purposes since the resulting product has a softer, more conformable hand.

To further increase the softness and warmth of the non-woven material employed in fabricating the sheets 24 and 32, it has been found that such material may be napped by a conventional textile napping process to raise some of the fibers from the surface. Also, to increase the air permeability, the material may be perforated with myriad tiny holes in any suitable manner.

As best seen in FIGS. 5 and 6, the blanket 40 may further comprise a pair of overlying interconnected sheets 54, 55, each of these sheets comprising a non-woven polymeric material such as described above in connection with the sheets 24 and 32. A fibrous polymeric padding material 56 such as a polyester wadding or floss, may be interposed between the sheets 54, 55 to impart heat insulating properties thereto. The degree of insulation may readily be controlled by the thickness of the padding material 56. Also, the sheets 54, 55 may be readily interconnected by a heat sealing operation to form the intersecting juncture lines 58 as best seen in FIG. 6.

The spread 46 may also comprise a non-woven polymeric material of the type described above in connection with the sheets 24 and 32. The spread 46 is primarily for decorative purposes, and may be printed with an appropriate pattern to present a pleasing appearance for the bed covering 14.

The pillow 52 may also comprise a pair of interconnected sheets 60, 61 of non-woven polymeric material corresponding to the material of the sheets 24 and 32, the sheets 60, 61 being interconnected along the peripheral edges by a heat sealing operation or the like to form an enclosed envelope. The envelope in turn contains a relatively thick layer of fibrous polymeric padding material 62, such as a polyester wadding or floss, to impart the desired cushioning properties thereto.

From the above description, it will be apparent that the bed covering 14 may be varied in size so as to be adapted to overlie any conventional mattress, such as a crib mattress. In addition, the covering 14 is not only adapted for use where it is desired to prevent and treat bed sores as described above, but it also may be used in a variety of other circumstances where the bed coverings are often changed, such as in hospitals, hotels, boats, and civilian and military institutions.

It will also be apparent that the entire bed covering 14 may be constructed from inexpensive polymeric materials so that the entire unit may be discarded after a single use if desired. In addition, the discarded units may be melted in a suitable heating apparatus so that the materials may be recycled into other products. A further advantage in the use of all polymeric materials in the bed covering is the fact that such materials do not appreciably absorb moisture, thus there is no tendency to retain moisture resulting from perspiration in contact with the skin of the patient.

While the top sheet 32, blanket 40, and spread 46 have been described as being interconnected to the lower sheet 24 to maintain the assembly of the various components, it will be appreciated that in some in-

stances it may be desirable for economic reasons not to attach these upper components so that they may be changed without replacing the mat 16. Such would be the case for example where the bed covering is used by the same patient for a number of days.

In the drawings and specification, there has been set forth a preferred embodiment 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.

That which is claimed is:

1. A disposable patient underpad adapted to be positioned upon a conventional bed mattress so as to underlie and cushion the entire body of a patient, and characterized by the ability to provide air circulation about the body of the patient to thereby assist in preventing and treating bed sores and the like, said underpad comprising

an air permeable, highly compressible mat of generally rectangular outline to define upper and lower generally flat surfaces and being sized to completely overlie a conventional bed mattress, said mat having substantially uniform thickness of at least about one inch between said upper and lower surfaces, and comprising non-woven polymeric filaments which occupy less than 50 percent of the total volume of the mat and such that the mat has an air permeability of at least 300 cubic feet per minute per square foot,

an air permeable sheet carried by said mat and including a central portion overlying said upper surface of said mat, edge portions folded about the respective edges of said mat to thus overlie a portion of said lower surface of said mat, and means for maintaining said sheet in said folded condition to thereby maintain the assembly thereof with said mat, said sheet comprising a non-woven polymeric material having an air permeability of at least 200 cubic feet per minute per square foot.

2. The patient underpad as defined in claim 1 wherein said mat has a compressibility of between about 30 to 40 percent at one-half pounds per square inch, and between about 43-50 percent at one pound per square inch.

3. The patient underpad as defined in claim 1 wherein said mat has a density not greater than about 0.01 grams per cubic centimeter and wherein said polymeric filaments of said mat comprise a closed cell, pneumatic, cellular polymer, said filaments being adhesively secured together at the filament junctions.

4. The patient underpad as defined in claim 1 wherein said sheet comprises continuous filament crimped fibers which are randomly arranged, highly dispersed, and bonded at the filament junctions, and wherein said sheet has a weight not greater than about five ounces per square yard.

5. A disposable bed covering adapted to be positioned to overlie a conventional hospital bed mattress or the like and to be handled as a unit to permit the ready placement of the same on such bed mattress and the subsequent removal of the same from the mattress after use, and characterized by the ability to provide air circulation about the body of a patient to thereby assist in preventing and treating bed sores and the like, said bed covering comprising

a highly compressible mat comprising randomly arranged polymeric filaments which occupy less than

50 percent of the total volume of the mat and defining upper and lower generally flat rectangular surfaces, a head end edge, a foot end edge, and opposite side edges, said mat having a substantially uniform thickness of at least about one inch between said upper and lower surfaces, and an air permeability of at least 300 cubic feet per minute per square foot, and being sized to completely overlie a conventional bed mattress,

an air permeable lower sheet comprising a non-woven polymeric material having an air permeability of at least 200 cubic feet per minute per square foot and including a central portion, a head end portion, a foot end portion, and opposite side portions, said central portion overlying said upper surface of said mat and said end portions and side portions being folded about the respective end edges and side edges of said mat to thus overlie a portion of said lower surface of said mat, and means for maintaining said lower sheet in said folded condition to thereby maintain the assembly thereof with said mat,

an air permeable top sheet comprising a non-woven polymeric material having an air permeability of at least 200 cubic feet per minute per square foot and including a central portion, a foot end portion, and opposite side portions, said central portion of said top sheet overlying said central portion of said lower sheet such that a patient may be positioned therebetween, and

means for interconnecting said top sheet with said lower sheet to thereby maintain the assembly of said top sheet with said lower sheet and said mat.

6. The bed covering as defined in claim 5 wherein said foot end portion of said top sheet is folded about said foot end edge of said mat to overlie the foot end portion of said lower sheet, and said means for interconnecting said top and lower sheets comprises means for interconnecting said foot end portion of said top sheet with said foot end portion of said lower sheet.

7. The bed covering as defined in claim 6 further comprising a blanket including a central portion, a foot end portion, and opposite side portions, said central portion of said blanket overlying said central portion of said top sheet, and said foot end portion of said blanket

being folded about said foot end edge of said mat to overlie the foot end portion of said top sheet, and means for interconnecting said foot end portion of said blanket with the foot end portions of said top and lower sheets to thereby maintain the assembly of said blanket with said top and lower sheets and said mat.

8. The bed covering as defined in claim 7 wherein said blanket comprises a pair of overlying interconnected sheets of non-woven polymeric material, and a fibrous polymeric padding material interposed between said sheets to impart heat insulating properties thereto.

9. The bed covering as defined in claim 8 further comprising a lightweight spread comprising a non-woven polymeric material and including a central portion, a foot end portion, and opposite side portions, said central portion of said spread overlying said central portion of said blanket, foot end portion of said spread being folded about the foot end edge of said mat to overlie the foot end portion of said blanket, and means for interconnecting said foot end portion of said spread with said foot end portions of said top and lower sheets and said blanket to thereby maintain the assembly of said spread with said blanket, said top and lower sheets, and said mat.

10. The disposable bed covering as defined in claim 9 further comprising a pillow comprising a pair of interconnected sheets of non-woven polymeric material, and a relatively thick layer of fibrous polymeric padding material interposed between said sheets to impart the desired cushioning properties thereto.

11. The bed covering as defined in claim 5 wherein said polymeric filaments of said mat occupy between about 20-30 percent of the total volume of said mat and comprise a closed cell, pneumatic, cellular polymer, and said mat has a compressibility of between about 30 to 40 percent at one-half pounds per square inch and between about 43-50 percent at one pound per square inch, and

each of said lower and top sheets have a weight not greater than about five ounces per square yard and said top and lower sheets are napped to increase the softness thereof and provide greater warmth to the patient positioned between the sheets.

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