ABSTRACT

A low air loss universal coverlet includes a perforated top layer formed with a breathable waterproof material, a middle air permeable layer underlying the top layer, and a bottom plenum layer underlying the middle air permeable layer. The bottom plenum layer includes air tunnels and air pockets. An air source is connected to the bottom plenum layer and supplies pressurized air to the air tunnels and the air pockets, where air flows from the air pockets, through the middle air permeable layer, and through the top layer. The air pockets define tufts when filled with air that support a patient on the surface and prevent blocking of air flow.
Fig. 1
THERAPY AND LOW AIR LOSS UNIVERSAL COVERLET

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Patent Application Ser. No. 61/226,539, filed Jul. 17, 2009, the entire content of which is herein incorporated by reference.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] (NOT APPLICABLE)

BACKGROUND OF THE INVENTION

[0003] It is common knowledge in the wound care industry that heat and moisture aggravate the condition of a decubitus or pressure ulcer. Currently there are specialty mattresses, used to cure or prevent pressure wounds, with devices or features that allow for additional flow of air to remove moisture and heat from the patient. These devices typically are called low air loss therapy mattresses.

[0004] Some mattresses have a large amount of air flowing below the top cover on which the patient lies, but interior to the mattress. This may remove some of the heat that has built up in the mattress itself, but unfortunately, this is not as effective as a mattress with a specialty top cover that allows air to flow into and out of the top cover itself, i.e., more directly in contact with the patient.

[0005] Another device or feature has a top cover that is essentially two layers of material, the top layer of which usually is of a breathable type fabric. There are slits at either end of this top cover. This allows air to be blown into the bottom of the cover and allows for the air to escape out the top slits at the head of the bed.

[0006] This last type of device is an improvement over air just inside the mattress itself as the air flow is closer to the patient and removes more heat and moisture than models that have air internal to the mattress.

[0007] Another more advanced type of device is described in U.S. Pat. No. 5,926,884, Air Distribution Device for the Prevention and Treatment of Decubitus Ulcers and Pressure Sores, the contents of which are hereby incorporated by reference. This low air loss top coverlet also has air flow from the foot to the interior of the two layer coverlet. An improvement is the design of the top layer of the coverlet. It has thousands of perforations (very small holes). These holes allow the air to directly reach the skin of the patient, thereby maximizing the effect of cooling and moisture removal. This greatly aids the healing of the wound and prevents further skin degradation of other pressure points on the patient’s body.

[0008] These methods, however, still are not ideal. When the patient lies on the top cover, the weight of the body naturally closes the “envelope” that is formed by the two layers of the cover. These areas under the body, especially the torso, therefore get less air flow, and consequently less reduction of heat and moisture.

[0009] Also, these specialty top covers, the ’884 patent coverlet, and the top covers with slits at the head and foot are made for specific specialty mattress systems, which include the mattress, top cover, and controller. These top covers only fit and function on the system mattress. These systems are, consequently, very expensive. Unfortunately, then only those patients with the worst ulcers and other medical conditions can benefit from this additional direct low air loss therapy.

BRIEF SUMMARY OF THE INVENTION

[0010] It is therefore, desirable to have a direct low air loss coverlet that does not block air flow under the patient torso or other body extremities, is low cost, and is universal to all mattresses whether another specialty mattress system or just a standard hospital mattress. The low air loss universal coverlet of the described embodiments endeavors to overcome the drawbacks of prior designs.

[0011] The coverlet, by its design features, can be placed on any mattress (truly universal). It allows air to circulate under the torso and other body parts to achieve a greater curative rate for wounds by removing more heat and moisture. As there is a middle layer in the coverlet made of soft yet very air permeable material, the patient receives extra pressure relief. Another feature is its low cost. It is more affordable for the general population of wound patients. Finally, as heat and moisture are removed under the patient and away from the mattress, the standard hospital mattress life is prolonged.

[0012] In an exemplary embodiment, a low air loss universal coverlet includes a top layer formed with a breathable material, a middle air permeable layer underlying the top layer, and a bottom plenum layer underlying the middle air permeable layer. The top layer, the middle air permeable layer and the bottom plenum layer define a coverlet support surface. Sides extend from the coverlet support surface are shaped to fit over and around an existing mattress to thereby secure the coverlet support surface to the mattress. The bottom plenum layer includes a first sub-layer and a second sub-layer underlying the first sub-layer, where the first sub-layer is connected with the second sub-layer to define a pattern of air pockets that are expandable into air tufts when filled with air.

[0013] The coverlet preferably includes a pump connected to the bottom layer that supplies the air pockets with air. The top layer may be perforated. In one arrangement, the top layer is formed of nylon or similar material with laminated urethane. The middle air permeable layer may comprise an air permeable foam material. In one arrangement, the first sub-layer and the second sub-layer of the bottom plenum layer are selectively welded to each other to define the pattern of air pockets. The first sub-layer may be perforated.

[0014] The bottom plenum layer may include a plurality of sections including at least a foot section and a center section. The foot section comprises an air channel defined via a connection between the first sub-layer and the second sub-layer, the air channel being attachable to an air source, and the center section comprises the pattern of air pockets. An opposite end of the air channel is attached to the pattern of air pockets and supplies air to the pattern of air pockets. The bottom layer preferably includes three sections including the foot section, the center section and a head section. The head section may be attached to the center section, where all sides of the first sub-layer and the second sub-layer in head section are attached to one another.

[0015] In another exemplary embodiment, a low air loss universal coverlet includes a perforated top layer formed with a breathable waterproof material, a middle air permeable layer underlying the top layer, and a bottom plenum layer underlying the middle air permeable layer. The bottom plenum layer includes air tunnels and air pockets, where at least the air pockets are perforated. An air source is connected to
the bottom plenum layer and supplies pressurized air to the air tunnels and the air pockets, where air flows from the air pockets, through the middle air permeable later, and through the top layer.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] FIG. 1 is a perspective view of the low air loss coverlet design;
[0018] FIG. 2 is an exploded view showing the coverlet layers;
[0019] FIG. 3 is a detailed view of the bottom plenum layer;
[0020] FIG. 4 is a sectional view through section A-A in FIG. 3; and
[0021] FIG. 5 is a sectional view through section B-B in FIG. 3.

DETAILED DESCRIPTION OF THE INVENTION

[0022] With reference to the drawings, a unique top coverlet is shown that can be used on any home, hospital or specialty mattress. The coverlet 10 is designed such that air can be blown into the interior of the coverlet, utilizing a small pump controller 12 which can hang on the foot of the bed.

[0023] The controller 12 is very simple, not requiring complex valve mechanisms, printed circuit boards, visual displays, touch control panels, large housings, and larger pumps utilized on complete specialty mattress systems. The described system simply utilizes one small air pump, an on/off switch, a small housing and a few other inexpensive components. It is small, light weight, and can hang off the bed. It is therefore and most importantly inexpensive. In an alternative construction, the controller 12 may effect two-speed control for the air flow from the pump. The user can choose a low flow or a high flow of air for the coverlet.

[0024] Referring to FIG. 2, the coverlet 10 has a top layer 14, a very air permeable middle layer 16, a bottom plenum layer 18, and four sides 20 (FIG. 1).

[0025] The sides 20 can be made out of laminated materials (nylon or similar materials with urethane or vinyl), or stretchy materials or any other suitably strong material. The preferred sides 20 have elastic all around their respective bottom edges, like a bottom of a fitted bed sheet. This elastic secures the coverlet 10 to the mattress. Straps or other means could also be used to secure the coverlet 10 to the mattress. The sides 20 of the coverlet 10 are made full and deep, such that the coverlet 10 will fit over any thickness of mattress or mattress system, and hold securely. The sides are typically 18", but any depth can be made.

[0026] The top layer 14 of the coverlet 10 is preferably made out of a highly breathable material such as the well known Gore-Tex®. Any nylon with laminated urethane which is breathable would be suitable. This breathable material is also waterproof and has little friction and shear so as to not irritate the patients' skin. In addition to the breathability feature, this top layer is also perforated (as in the "884 patent identified above).

[0027] The middle layer 16 is made out of any material that is very air permeable that has some thickness and has a "soft" quality. Some examples of this material may be a wide variety of open cell foams, reticulated foams, fiber batting, or 3D spacer fabric. The thickness is typically 1", but could be thicker or thinner. The middle layer 16 allows the air from the bottom plenum layer 18 to easily go through it to the top perforated layer 14. It also adds comfort especially over the air filled tufted areas (described below). This area can tend to be quite firm, therefore, the soft foam (or other material) middle layer 16 prevents patient discomfort. As this layer 16 covers the whole bed, it also acts like a basic simple foam therapy layer, which improves the ability to prevent pressure points aiding pressure relieving therapy. This is especially true if the universal coverlet 10 is placed over a standard hospital mattress, which is typically very firm.

[0028] The preferred bottom plenum layer 18 is made from any type of material which can be RF welded, such as a laminated nylon with urethane or vinyl. Other methods of attachment such as gluing, sonic welding, or heat sealing, with the appropriate material could be used. The bottom layer 18 is made up of two layers, an upper (first sub-layer) 22 and a lower (second sub-layer) 24, preferably the upper being perforated. The perforations are not where the air channels are made. The air channels are formed to be air tight. That is, the perforations are made while the material is flat, before any RF welding or the like, and therefore, any pattern of perforations can be made. For example, the center of the flat material can be perforated, leaving the edges with no perforations. When RF welding, the edges are the channels (with no perforations) and the center is tufted, with perforations (described below). The end is connected to the tufted portion (usually the trunk area) and allows air to flow out to the tufts.

[0029] The bottom layer 18, in the preferred design, has three sections. A foot section 26 has two air channels 32 formed by welding the upper and lower layers together, one channel on either side of the coverlet 10. The air pump in the controller 12 is connected via tubing 34 to the foot of both the air channels 32. The other ends of the air channels 32 connect to a center section 28 of the bottom layer 18. The purpose of the air channels 32 is to direct the air to that section of the coverlet 10 that needs the most air flow, and disallows the air from finding the path of least resistance and escaping out to the edge of the coverlet. That is, the air channels 32 are preferably air tight except at the ends. One end is at the foot of the bed, and connects to the pump allowing air to flow in. The other end connects to the tufts 36 (described below). There are no perforations in the air channels 32. By containing the air and directing it very specifically to the tufts 36, the air cannot escape to other portions of the coverlet, like the edges, following a path of least resistance.

[0030] The center section 28 is constructed by welding the upper and lower layers in (a variety of) patterns that form, when filled with air, small "tufts" 36. For example, the material could be welded with small (¼" round) welds, about 2" apart on a diamond shaped pattern. These tufts 36 keep the air passages open, even under the weight of the torso. The upper layer of the center section 28 is perforated preferably with many very small holes. The air coming from the pump, passing through the two air channels 32, passes through to the tufted areas 36 and out the small perforated holes, through the middle layer 16 of very air permeable material (reticulated foam for example), and through the top surface 14 directly to the patient’s torso.

[0031] A head section 30 of the bottom layer 18 is formed with the upper and lower layers attached on all four sides and attached to the center section 28. It also is perforated on the upper layer.
The three sections 26, 28, 30 can be varied widely as to the number of sections in the coverlet 10 and to the pattern of the tufting 36. For example, tufting could be added around the leg sections and also changing the arrangement of welded air tubes. The whole coverlet 10 could, for example, be completely tufted. Also the type of foam or other very air permeable material could have different sections or thickness, differing for torso as opposed to the foot and head sections. This would allow for more or less comfort and pressure relieving therapy.

The device overall dimensions can be changed from regular width to wide for obese patients, or from regular length to short or long. However, the full sides 20 of the coverlet 10, along with the elastic allow for some mattress dimension changes.

As the coverlet of the described embodiments removes heat and moisture, it can also extend the life of ordinary foam hospital mattresses. Over time, heat and the moisture from patients tend to degrade the foam interior of standard mattresses reducing their effectiveness. This device will help extend their life. This is therefore a long term cost savings to the medical facility.

The low air loss and therapy coverlet 10, by its universal and unique design, can be added to any current or future mattress, and greatly adds to the therapy given to the patient. Not only is the skin condition of the patient improved due to less heat and moisture, but the coverlet also adds to the pressure relief of bony protuberances.

The coverlet can be used for prevention due to its relatively low cost. Prevention is very desirable, and cost effective, in the pressure wound care arena. However, currently, a specialty mattress system is very costly. Medicare and other payment mechanisms do not allow for much preventative care. The coverlet with a very simple air source (air pump) is on the order of one half to one tenth the cost of a complete specialty mattress system. A specialty mattress system must employ a larger air pump and a more expensive control system to operate the mattress at the right pressures and areas. The specialty mattresses require significantly more material and labor to produce than the described coverlet. Specialty mattress systems are, therefore, very expensive. The described coverlet is a very viable low cost therapy and low air loss alternative.

While the invention has been described in connection with what is presently considered to be the most practical and preferred embodiments, it is to be understood that the invention is not to be limited to the disclosed embodiments, but on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

1. A low air loss universal coverlet comprising:
   a top layer formed with a breathable material;
   a middle air permeable layer underlying the top layer;
   a bottom plenum layer underlying the middle air permeable layer, wherein the top layer, the middle air permeable layer and the bottom plenum layer define a coverlet support surface; and
   sides extending from the coverlet support surface, the sides being shaped to fit over and around an existing mattress to thereby secure the coverlet support surface to the mattress,
   wherein the bottom plenum layer comprises a first sub-layer and a second sub-layer underlying the first sub-layer, the first sub-layer being connected with the second sub-layer to define a pattern of air pockets that are expandable into air tufts when filled with air.

2. A low air loss universal coverlet according to claim 1, further comprising a pump connected to the bottom layer, the pump supplying the air pockets with air.

3. A low air loss universal coverlet according to claim 1, wherein the top layer is perforated.

4. A low air loss universal coverlet according to claim 1, wherein the top layer is formed of nylon with laminated urethane.

5. A low air loss universal coverlet according to claim 1, wherein the middle air permeable layer comprises an air permeable foam material.

6. A low air loss universal coverlet according to claim 1, wherein the middle air permeable layer comprises one of open cell foams, reticulated foams, fiber batting, and 3D spacer fabric.

7. A low air loss universal coverlet according to claim 1, wherein the first sub-layer and the second sub-layer of the bottom plenum are selectively welded to each other to define the pattern of air pockets.

8. A low air loss universal coverlet according to claim 7, wherein the first sub-layer is perforated.

9. A low air loss universal coverlet according to claim 1, wherein the bottom plenum layer comprises a plurality of sections including at least a foot section and a center section, wherein the foot section comprises an air channel defined via a connection between the first sub-layer and the second sub-layer, the air channel being attachable to an air source, and wherein the center section comprises the pattern of air pockets, an opposite end of the air channel being attached to the pattern of air pockets and supplying air to the pattern of air pockets.

10. A low air loss universal coverlet according to claim 9, wherein the bottom layer comprises three sections including the foot section, the center section and a head section.

11. A low air loss universal coverlet according to claim 10, wherein the head section is attached to the center section, and wherein all sides of the first sub-layer and the second sub-layer in head section are attached to one another.

12. A low air loss universal coverlet comprising:
   a top layer formed with a breathable waterproof material,
   a middle air permeable layer underlying the top layer,
   a bottom plenum layer underlying the middle air permeable layer, the bottom plenum layer comprising air tunnels and air pockets, wherein at least the air pockets are perforated; and
   an air source connected to the bottom plenum layer, the air source supplying pressurized air to the air tunnels and the air pockets, wherein air flows from the air pockets, through the middle air permeable later, and through the top layer.

13. A low air loss universal coverlet according to claim 12, wherein the middle air permeable layer comprises an air permeable foam material.

14. A low air loss universal coverlet according to claim 12, wherein the middle air permeable layer comprises one of open cell foams, reticulated foams, fiber batting, and 3D spacer fabric.

15. A low air loss universal coverlet according to claim 12, wherein the bottom plenum layer comprises a first sub-layer and a second sub-layer underlying the first sub-layer, the first
sub-layer being connected with the second sub-layer to define the air pockets when filled with air.

16. A low air loss universal coverlet according to claim 12, wherein the bottom plenum layer comprises a plurality of sections including at least a foot section and a center section, wherein the foot section comprises an air channel defined via a connection between the first sub-layer and the second sub-layer, the air channel being attachable to the air source, and wherein the center section comprises the air pockets, an opposite end of the air channel being attached to the air pockets and supplying air to the air pockets.

17. A low air loss universal coverlet according to claim 16, wherein the bottom layer comprises three sections including the foot section, the center section and a head section.

18. A low air loss universal coverlet according to claim 17, wherein the head section is attached to the center section, and wherein all sides of the first sub-layer and the second sub-layer in head section are attached to one another.

19. A low air loss universal coverlet according to claim 12, wherein the top layer, the middle air permeable layer and the bottom plenum layer define a coverlet support surface, the low air loss universal coverlet further comprising sides extending from the coverlet support surface, the sides being shaped to fit over and around an existing mattress to thereby secure the coverlet support surface to the mattress.

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