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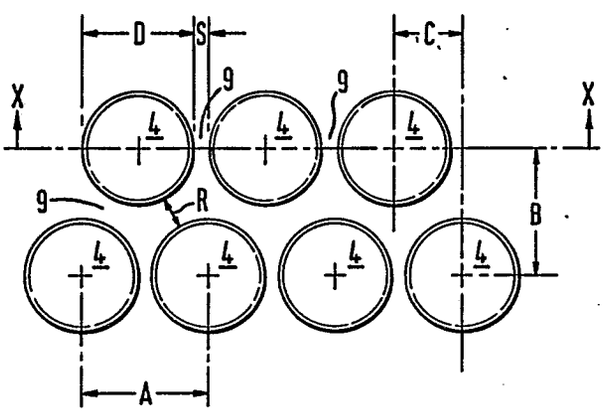
(71) Applicant: **AOE Plastic GmbH, Alkorstrasse 1, D-8090 Wasserburg/Inn (DE)**

(72) Inventor: **Riedler, Peter, AOE Plastic GmbH Alkorstrasse 6, D-8090 Wasserburg/Inn (DE)**
Inventor: **Utz, Kastulus, AOE Plastic GmbH Alkorstrasse 6, D-8090 Wasserburg/Inn (DE)**

(74) Representative: **Hymers, Ronald Robson et al, BP INTERNATIONAL LIMITED Patents Division Chertsey Road, Sunbury-on-Thames Middlesex, TW16 7LN (GB)**

(54) Flexible, water-impermeable mattress.

(57) A bed insert comprising a flexible, water-impermeable blister film comprising a first plastic sheet (1) having substantially cylindrical recesses (2) and a second plastic sheet (3) bonded to the first sheet (1) such that the second sheet seals the recesses of the first sheet to form gas-filled blisters (4), the total area of the bases of the gas-filled blisters amounting to 45 to 92% of the total area of the blister film. The first sheet and preferably also the second sheet are formed from a thermoplastic material comprising polyethylene and chlorinated polyethylene.



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FLEXIBLE, WATER-IMPERMEABLE MATTRESS

The present invention relates to a bed insert comprising a flexible, water-impermeable blister film and to the use of the blister film as a bed insert.

Blister film comprising a first plastic sheet having substantially cylindrical recesses and a second plastic sheet bonded to the first sheet such that the second sheet seals the recesses of the first sheet to form gas-filled blisters is known.

The use of blister films in absorbent pads which are suitable for use as bed inserts is also known. For example, German Offenlegungschrift 2506876 discloses an absorbent sanitary bed insert comprising a blister film covered by an absorbent pad and with a water-permeable covering layer. The air-filled blisters of the blister film are relatively widely spaced i.e. the smallest diameter of the blisters is less than the distance between adjacent blisters in the direction of the diameter. Also, German Offenlegungschrift 2420946 discloses an absorbent pad comprising a layer of compressible liquid-absorbent material and a blister film, the blisters of the blister film being positioned within the absorbent material such that when a compressive force is applied to the absorbent pad the blisters accept a substantial portion of the load, thereby allowing the absorbent material to remain in a generally uncompressed state.

The present invention relates to a bed insert comprising a blister film which has a prophylactic effect against decubitus ulcers, in particular in the case of incontinent patients. In

addition, blister film according to the present invention can, depending on the type of patient and use, have a usable life of between five days and six weeks.

Thus, according to the present invention a bed insert comprising a flexible, water-impermeable blister film which blister film comprises a first plastic sheet having substantially cylindrical recesses and a second plastic sheet bonded to the first sheet such that the second sheet seals the recesses of the first sheet to form gas-filled blisters is characterised in that the total area of the bases of the gas-filled blisters amounts to 45 to 92% of the total area of the blister film and in that the first sheet is formed from a thermoplastic material comprising a blend of polyethylene and chlorinated polyethylene.

When used as a bed insert, the pressure within the blisters, under the bearing load of a patient, is preferably less than the mean arterial pressure of the patient.

The mean arterial pressure determines the blood flow in the tissues and is slightly below the arithmetic mean of the systolic and diastolic blood pressures and can be determined by the following approximate equation;

$$\text{Mean arterial pressure} = D+(S-D)/3$$

where S is the systolic blood pressure and D is the diastolic blood pressure.

The second plastic sheet can also have recesses so that the blister film can have blisters on both surfaces. However, the second sheet is generally a smooth film.

The blisters are substantially cylindrical. They are preferably circular cylinders but may also be, for example, elliptical cylinders. The invention will be described in the remainder of this Specification on the basis that the blisters are circular cylinders. However, the statements apply equally to other cylinders except that references to the "diameter" of a blister should be taken to mean the average diameter i.e. in the case of elliptical cylinders, the diameter is the arithmetic mean of the major and minor diameters.

According to an advantageous embodiment of the invention, the gas-filled blisters of the blister film are arranged in a plurality of substantially parallel rows, each of the gas-filled blisters has the same diameter and the distance between adjacent gas-filled blisters in the same row is less than the diameter of the gas-filled blisters. Preferably, the distance between adjacent gas-filled blisters in adjacent rows is also less than the diameter of the blisters. Channels, through which body fluids can flow off, are thus created between the individual gas-filled blisters.

According to a further advantageous embodiment of the invention, the gas-filled blisters have a diameter of from 20 to 40mm, a height of from 5 to 15mm and the distance between adjacent gas-filled blisters in the same row is from 2 to 10mm.

The total area of the blister film is the area as seen in plan view, i.e. the projected area of the film and not the total surface area. The area of the bases of the gas-filled blisters amounts to 45 to 92% of the total area of the blister film. In order that the area covered by the gas-filled blisters is maximised, it is preferable that the gas-filled blisters of one row are offset with respect to the gas-filled blisters of adjacent rows by about half the distance between the centers of two adjacent gas-filled blisters in the same row.

The blister film according to the present invention can be manufactured using known apparatus and techniques for the manufacture of blister film. Preferably, the recesses are formed in the first plastic sheet by deep-drawing of a sheet of the thermoplastic material to form substantially cylindrical recesses in which the side walls are of a thickness which is less than that of the base. The second plastic sheet is bonded to the first plastic sheet, e.g. by welding or by using a suitable adhesive composition, thereby sealing the recesses in the first sheet to form gas-filled blisters. Although other gases may be used, the blisters are conveniently filled with air. The preferred feature of the blisters having relatively thin side walls and relatively thick bases provides the additional advantage that the bases of the gas-filled

blisters forming the actual bearing surface for the patient remain substantially unchanged when under a load, since the gas-filled blisters preferentially deform in the region of the thinner side walls, the flow-off channels for body fluids being substantially preserved.

Preferably the first plastic sheet has, before deep-drawing, a thickness of from 150 to 350 microns. Preferably, the second plastic sheet is a smooth sheet having a thickness of from 50 to 150 microns.

The first sheet of the blister film according to the present invention is formed from a thermoplastic material comprising a blend of polyethylene and chlorinated polyethylene. Preferably, the amount of chlorine in the chlorinated polyethylene is from 25 to 42% by weight and preferably the amount of chlorine in the blend of chlorinated polyethylene and polyethylene is from 10 to 40% by weight. The second plastic sheet may be formed from any suitable flexible, water-impermeable plastic material capable of forming gas-tight blisters with the polyethylene/chlorinated polyethylene blend of the first sheet. Suitable materials include polyethylene, EVA copolymers, acrylic acid copolymers, synthetic rubbers and blends of polyethylene and chlorinated polyethylene. Preferably, the second sheet is formed from polyethylene or a blend of polyethylene and chlorinated polyethylene.

The blister films according to the present invention tend not to have a "greasy" feel which is typical of some other known sheets and tend to produce less rustling noises.

According to a further advantageous embodiment of the invention, the first and/or second sheets can contain known anti-slip agents, for example, silica, chalk or barium sulphate. The use of anti-slip agents in the compositions from which the blister film is produced tends to reduce or prevent slippage of the blister film relative to the bed or bed sheets.

The blister film according to the present invention can be produced in a range of sizes. When used as a bed insert, the blister film according to the present invention is preferably

positioned on the bed, preferably over a linen sheet, with the first-sheet uppermost and retained in position by means of a linen draw-sheet. The blister film may be used for particular parts of the body for example shoulders, neck, buttocks or heels, or may be used to support the entire body.

When the blister film according to the present invention is used as a bed insert, it provides good air circulation in the channels located between the gas-filled blisters and thus tends to reduce problems associated with perspiration by the patient. The bed insert is comfortable to lie upon and the gas-filled blisters have a massaging effect. The gas-filled blisters provide a prophylactic effect against decubitus ulcers due to the changing pressure distributions which are generated by the movement of the patient and the avoidance of pressure points which tend to restrict blood circulation. Body fluids collect in the channels formed between the gas-filled blisters, so that the patient does not lie directly in such fluids; at the same time, wetting of the mattress is avoided. Additional wetness protection, which is generally required when other phrophylactic measures against decubitus ulcers are taken e.g. the use of sheepskin, is not necessary. The blister film has a soft feel, is well tolerated by the skin and is more comfortable than lying on rubber draw-sheets.

The blister film according to the present invention will be further described with reference to the accompanying drawings in which:

Figure 1 shows a partial view of a blister film according to the present invention in plan view, and

Figure 2 shows a vertical section of the blister film shown in Figure 1 taken along the line X-X.

A blister film according to the present invention illustrated in Figures 1 and 2 comprises a first plastic sheet (1) having a plurality of substantially cylindrical recesses (2) and a second plastic sheet (3) which is bonded to the first plastic sheet (1) such that the second film seals the recesses (2) of the first film to form gas-filled blisters (4). The recesses (2) in the first

sheet (1) are arranged in a plurality of substantially parallel rows and can be formed by known rotational deep-drawing processes. The thicknesses of the first and second sheets (1, 3) have been exaggerated in Figure 2 in order to illustrate that the side walls (5) of the recesses (2) are thinner than the bases (6). The blisters (4) are arranged in a plurality of substantially parallel rows such that channels (9) for body fluids to flow-off are formed between the blisters. The distances between adjacent blisters both in the same row (S) and in adjacent rows (R) are less than the diameter (D) of the gas-filled blisters (4). The blisters (4) of one row are off-set with respect to the blisters of adjacent rows by about half the distance between the centres of two adjacent blisters in the same row (i.e. the distance C in Figure 1 is approximately half the distance A).

In one embodiment of the present invention, the first plastic sheet (1) and second plastic sheet (3) were both formed from a thermoplastic material comprising (a) 49% by weight of low density polyethylene having a density of 0.920, (b) 47% by weight of chlorinated polyethylene having a chlorine content of 42% by weight and (c) conventional processing aids and stabilisers. The first plastic sheet (1) before the formation of the recesses had a thickness of 200 microns and the thickness of the second sheet (3) was 100 microns. The blisters (4) all had the same diameter (D) and the distance between the centers of adjacent blisters in the same row (indicated by the letter A in Figure 1) was 1.09 times the diameter (D) of the blisters (4). Thus the distance between adjacent blisters in the same row was 0.09 times the diameter (D). The blisters (4) of one row of the embodiment were off-set with respect to the blisters of adjacent rows by 0.546 times the diameter (D). The distance between the centers of the blisters in adjacent rows in the preferred embodiment (i.e. B in Figure 1) was 1.09 times the diameter (D) of the blisters (4). The height of the blisters (4) in the embodiment was 0.25 times the diameter (D) of the blisters. The pressure inside the blisters, under the bearing load of a patient, was found to be less than the mean arterial pressure of the patient.

Claims:

1. A bed insert comprising a flexible, water-impermeable blister film comprising a first plastic sheet (1) having substantially cylindrical recesses (2) and a second plastic sheet (3) bonded to the first sheet (1) such that the second sheet (2) seals the recesses of the first sheet to form air filled blisters (4) characterised in that the total area of the bases (6) of the gas-filled blisters (4) amounts to 45 to 92% of the total area of the blister film and in that the first plastic sheet is formed from a thermoplastic material comprising a blend of polyethylene and chlorinated polyethylene.

2. A bed insert as claimed in Claim 1 in which the blisters (4) are arranged in a plurality of substantially parallel rows, each of the blisters (4) having the same diameter (D) and the distance (S) between blisters in the same row is less than the diameter of the blisters.

3. A bed insert as claimed in Claim 1 or Claim 2 in which the distance (R) between adjacent blisters (4) in adjacent rows is less than the diameter (D) of the blisters.

4. A bed insert according to any one of Claims 1 to 3 in which the blisters (4) have a diameter (D) of 20 to 40mm, a height of 5 to 15mm and a distance between adjacent blisters (S) in the same row of from 2 to 10mm.

5. A bed insert according to any one of Claims 1 to 4 in which the blisters (4) of one row are offset with respect to the blisters of adjacent rows by about half the distance between the centers of

two adjacent blisters in the same row.

6. A bed insert according to any one of Claims 1 to 5 in which the first sheet (1) has been deep-drawn in order to form the recesses (2) therein, the side walls (5) of the recesses being thinner than the bases (6) of the recesses and the second sheet is a smooth sheet.

7. A bed insert according to any one of Claims 1 to 6 in which the first sheet (1) has, before deep-drawing, a thickness of 150 to 350 microns.

8. A bed insert according to any one of Claims 1 to 7 in which the second sheet (3) is a smooth sheet having a thickness of 50 to 150 microns and formed from polyethylene or a blend of polyethylene and chlorinated polyethylene.

9. A bed insert according to any one of Claims 1 to 8 in which the compositions from which the first sheet and second sheet (1, 3) are formed also contain an anti-slip agent.

10. A bed insert as claimed in any one of claims 1 to 9 in which the chlorine content of the blend of polyethylene and chlorinated polyethylene is from 10 to 40% by weight.

11. The use of a bed insert as claimed in any one of Claims 1 to 9 in which the blister film is placed on a bed with the first sheet (1) uppermost.

FIG.1

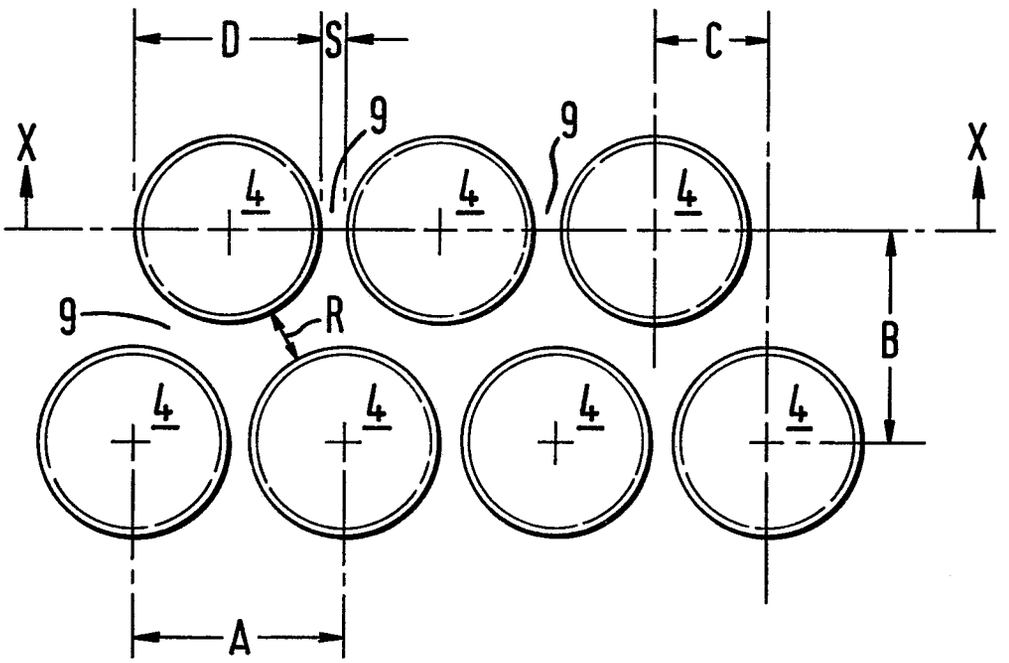

FIG.2