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(54) **Mattress**

Matratze

Matelas

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Description

[0001] The present invention relates to mattresses, especially mattresses for relieving or reducing pressure exerted by the body of a patient lying thereon.

[0002] It is known that people who are confined to bed for long periods of time are prone to formation of decubitus ulcers (i.e. bed sores or pressure sores). Such sores are caused by restriction in the blood circulation of the person as a result of pressure between the person and the mattress. Once a certain pressure is exceeded (approximately 0.043 bar [32mm of mercury], although this figure may vary depending on the age and state of health of the individual) the blood supply is interrupted and oxygen is no longer supplied to the skin. Tissue decay and ulcer formation usually results.

[0003] Attempts have been made to reduce the pressure between the patient and the mattress by various means.

[0004] DE - A 3143883 discloses mattresses specifically for children's beds comprising a resilient core, the upper and lower sides of the mattress having plates of different thickness and/or material consistency, one plate being soft and the other plate being hard.

[0005] US - 5160785 discloses a resilient padding body comprising an intermediate base layer and upper protuberances extending upwardly off the surface of the base layer and bottom protuberances extending downwardly off a lower surface of the base layer.

[0006] US - 4999868 discloses a mattress formed with an upper variable firmness section covering a lower section of generally uniform firmness. The upper section is divided along its length into four transversely extending regions, namely, a head, an upper torso and a leg support region.

[0007] FR - A - 2324260 discloses a mattress having the features as set forth in the preamble of claim 1 an insert with a number of protuberances therein.

[0008] One problem however is that the weight and shape of the patient using the mattress has a bearing upon the pressure exerted. Action taken in order to deal with the problem in so far as a fairly light patient is concerned, therefore, would not necessarily be successful for a heavy patient and vice versa. There is therefore a problem in designing a mattress which would cope with both heavy and light patients.

[0009] According to the present invention there is provided a mattress having a first supporting surface which is of a different degree of hardness or firmness to an opposite second supporting surface, wherein each of the first and second supporting surfaces are formed by a plurality of projections and wherein the second supporting surface has a greater number of projections than the first supporting surface.

[0010] The mattress may thus be turned to the appropriate side for the person in question.

[0011] In the description which follows reference will be made generally to patient, patient supporting sur-

face, etc. since the use of the mattress of the invention is for patients.

[0012] In some embodiments the mattress is made wholly or partly from foamed plastics material, e.g. a foamed polyurethane material, and is preferably at least flame retardant.

[0013] At least one of the two supporting surfaces (and preferably both patient supporting surfaces) is formed by a plurality of projections each preferably designed to flex independently of one another.

[0014] The projections are preferably, though not necessarily, in the form of truncated pyramids, preferably defined by two series of grooves at right angles to each other, with the grooves being wider at the patient supporting surface than at the bottom.

[0015] According to a further aspect of the present invention there is provided a mattress, each patient supporting surface of which is formed with a plurality of projections (e.g. truncated pyramids), one of said surfaces having a greater number of projections than the other so as to provide support for a lighter patient than the other of said surfaces.

[0016] By varying the number, size, resilience and/or density of the projections, the degree of support provided by the patient support surfaces can be varied.

[0017] If desired either or both patient supporting surfaces may have areas which provide different amounts of support at different points. This is of advantage because different parts of the body apply different degrees of pressure to the mattress and therefore require different degrees of pressure relief.

[0018] Regardless of its shape, (a square or oblong patient support surface for each projection is preferred) each projection on the surface for supporting heavy patients preferably has a support surface having an area which is from 58.05cm² to 161.25cm² (9 to 25 square inches). If the support surface of each of the projections is square it would therefore preferably be from 7.62 x 7.62cm (3" x 3") and 12.7 x 12.7cm (5" x 5"). More preferably the support surface of each projection on the surface for heavier patients is from 77.4 to 129cm² (12 to 20 square inches), ideally about 93.53cm² (14.5 square inches). In one embodiment the area is 94.62cm² (14.67 square inches).

[0019] On the surface to support the heavier patient there are preferably from 120 to 152, more preferably 136, projections e.g. 10.16 x 10.16cm (4" x 4") in a mattress of a size approximately 190.5 x 88.9cm (75" x 35"). The mattress size can vary and clearly the larger the mattress the more projections. Preferably the number of projections would be increased or decreased pro rata in relation to the size of mattress.

[0020] On the surface to support a lighter patient the projections each preferably have a patient supporting surface which is from 12.9 to 102.4cm² (2 to 16 square inches) in area. The patient support surface of each projection may be any shape but is preferably oblong or square.

[0021] The surface of the mattress for lighter patients preferably has from 250 to 350 more preferably 280 to 320, still more preferably 306 projections in a mattress of size about 190.5 x 88.9cm (75" x 35") with more or less projections on a pro rata basis for larger or smaller mattresses.

[0022] Preferably the surface of the mattress for lighter patients has three separate zones, (which are preferably all part of one member), one for the head of the patient, one for the trunk of the patient and one for the lower legs and feet. The zone for the trunk is preferably more dense than the areas for the head and feet. If the patient support surface comprises projections each projection will be of larger patient support area in the trunk support zone than in the head and/or feet support zone. Preferably there are from 88 to 128, more preferably 98 to 118, ideally 108, projections in each of the head and foot support zones. Preferably the patient support surface of each projection in the head and foot support area is oblong and has an area from 11.61cm² (1.8 square inches) to 18.06cm² (2.8 square inches), more preferably 12.9 to 16.77cm² (2.0 to 2.6 square inches) (in one embodiment the area is about 15.3cm² (2.37 square inches)).

[0023] Preferably there are from 70 to 110, more preferably 80 to 100, ideally 90 projections in the trunk support zone

[0024] Preferably in the trunk support zone each projection is oblong and has a patient support area of 25.8 to 103.2cm² (4 to 16 square inches) preferably 38.7 to 51.6cm² (6 to 8 square inches). In one embodiment the area is about 45.92cm² (7.12 square inches).

[0025] Preferably in a mattress of size approximately 190.5 x 88.9cm (75" by 35") each of the head and feet support areas will have approximately 88 to 128 projections arranged e.g. in a 9 x 12 layout and the trunk support area will have approximately 70 to 168, more preferably 70 to 110, projections e.g. in a 9 x 10 layout.

[0026] When made from foamed plastics material, the original material (i.e. before forming the projections when present) preferably has a density of from 35 to 55 kg/m³. The projections may then be formed e.g. by cutting grooves in the material. The density of the final material will then depend e.g. upon the original density, and the size, shape and number of projections, which will in turn depend upon the number and extent of the grooves.

[0027] It can clearly be seen that the mattress may be placed with one patient support surface uppermost for light patients and with the other patient support surface uppermost for heavier patients. Preferably the arrangement is that one surface is used for patients above 70kg in weight and the other support surface is used for patients below 70kg in weight.

[0028] The support surface for the lighter patients provides a softer surface and the patient support surface for the heavier patients provides a harder or firmer surface. There is thus a better chance that the mattress surface will conform to the body shape of the patient when

in use. In the event that decubitus ulcers are not a problem, the patient may choose which surface he/she prefers.

[0029] If desired the whole of the mattress may be encased in a cover which is preferably vapour permeable and fluid proof.

[0030] In one preferred embodiment, one of the support surfaces (preferably the surface for lighter patients) is provided by an insert located in a cavity formed in the main body of the mattress. The advantage of one of the support surfaces being in the form of a separate insert is that the separate support surface may be changed without changing the whole mattress and also a series of such separate inserts may be provided of different firmness or hardness to use as desired.

[0031] The insert may be a foamed plastics material, e.g. having projections preferably in the form of truncated pyramids as described above to form the patient support surface.

[0032] The figures given above for the number and size of projections for a mattress of about 190.5 x 88.9cm (75" x 35") size would be the same for an insert to go into a cavity in a mattress of about 190.5 x 88.9cm (75" x 35") size.

[0033] Alternatively the insert may be formed by other suitable material e.g. a 'gel'. The cavity may thus for example be filled with a suitable gel. It may be necessary or desirable to encase the insert in a loose fitting cover especially when it is in the form of a gel which can offer additional fire retardant protection (if suitable material is used) and perhaps more importantly provide a low friction interface with the external cover (when used) surrounding the mattress. This would provide the additional benefit of lower shear force than would ordinarily be expected of a foam or gel mattress.

[0034] The mattress is of any convenient size but is usually a single mattress and is preferably about 190.5cm (75") long and 88.9cm (35") wide and of a thickness between 12.7cm (5") and 16.51cm (6.5") e.g. 13.97cm (5.5"). Any other size is acceptable however e.g. 15.24 x 7.62cm (6'0 x 3'0).

[0035] The invention will now be further described by way of example with reference to the accompanying drawings, in which

Figure 1 is a perspective view of a mattress in accordance with the present invention,

Figure 2 is a perspective view of the opposite side of the mattress of Figure 1, and

Figure 3 is a cross-sectional view through the mattress of Figure 1.

[0036] Referring now to the drawings, the mattress 10 comprises a polyurethane foam base member 12 of length 1932.5 mm, width 875mm and thickness 153mm. One surface of this base member 12 is formed with a series of 136 truncated pyramids 14 by means of two series of grooves 16, 18 formed at right angles and hav-

ing a depth of 45mm. The patient supporting surfaces of these truncated pyramids 14 are 98.6mm in length and 96mm wide. The width of the grooves 16, 18 is greater at the surface than at the bottom of the grooves. The support surface formed by the truncated pyramids 14 is for heavier patients e.g. those above 70kg. The foam base prior to forming the grooves and truncated pyramids has the following properties

Density (kg/m ³)	48 - 52
Hardness (N)	190 - 230
Tensile Strength (KPa)	70 min
Elongation at break (%)	90 min
Dry Compression Set (%)	8 max
Fatigue class	V

[0037] The other surface of the base member 12 is formed with a cavity 20 into which is placed a polyurethane foam insert 22 which is 1783mm long, 725mm wide and 55mm deep. One surface of the insert is formed with a series of 306 truncated pyramids 24. The truncated pyramids 24 are defined by grooves of a depth 25mm the width of which are greater at the top than at the bottom. The foam insert 22 is a single piece and is provided with three zones 26, 28, 30 of differing support to make the mattress more comfortable to the different areas of the body and to provide varying pressure relief to different areas of the body. The two ends of the insert are provided with 108 truncated pyramids in a 9 x 12 layout to support the head and the feet and lower legs where a softer or less firm surface is required. Each truncated pyramid in these zones 26 and 30 has a patient support surface which is 66mm wide (i.e. in the direction across the insert) and 23 mm long (i.e. in the direction along the length of the insert). The centre zone 28 comprises 90 larger truncated pyramids in a 9 x 10 layout (10 along the length and 9 across the width) to provide a firmer or harder surface for the trunk section of the body. Each truncated pyramid in this zone 28 has a patient support surface which is 66mm wide and 69.7 mm long.

[0038] The foam insert prior to forming the grooves and truncated pyramids has the following properties.

Density (kg/m ³)	35 - 38
Hardness (N)	90 - 110
Tensile strength (kPa)	70 min
Elongation at break (%)	120 min
Compression set (%)	4 - 6
Humidity Compression Set (%)	4 - 7
Fatigue Class	V

Claims

1. A mattress (10) having a first supporting surface

which is of a different degree of hardness or firmness to an opposite second supporting surface, **characterised in that** each of the first and second supporting surfaces are formed by a plurality of projections (14; 24) and the second supporting surface has a greater number of projections than the first supporting surface.

- A mattress (10) as claimed in claim 1, which is made wholly or partly from foamed plastics material.
- A mattress (10) as claimed in claim 1 or claim 2, in which the projections (14; 24) are in the form of truncated pyramids.
- A mattress (10) as claimed in any one of the preceding claims, in which either or both of the first and second supporting surfaces has areas (26, 28, 30) which provide different amounts of support at different points.
- A mattress (10) as claimed in claim 4, in which the second supporting surface of the mattress has a head zone (26), a trunk zone (28) and a lower legs and feet zone (30).
- A mattress (10) as claimed in claim 5, in which the trunk zone (28) is more dense than the head zone (26) and the lower legs and feet zone (30).
- A mattress (10) as claimed in any one of the preceding claims, in which the second supporting surface is provided by an insert (22) located in a cavity (20) formed in the main body (12) of the mattress (10).
- A mattress (10) as claimed in claim 7, in which the insert (22) is a foamed plastics material or formed by a gel.

Patentansprüche

- Matratze (10) mit einer ersten Stützfläche, die einen anderen Härtegrad oder Festigkeitsgrad aufweist als eine gegenüberliegende zweite Stützfläche, **dadurch gekennzeichnet, dass** sowohl die erste als auch die zweite Stützfläche durch eine Vielzahl von Erhebungen (14; 24) gebildet ist und dass die zweite Stützfläche eine größere Anzahl von Erhebungen aufweist als die erste Stützfläche.
- Matratze (10) nach Anspruch 1, die vollständig oder teilweise aus geschäumtem Kunststoffmaterial hergestellt ist.
- Matratze (10) nach Anspruch 1 oder Anspruch 2, bei der die Erhebungen (14; 24) die Form von ge-

stutzten Pyramiden aufweisen.

4. Matratze (10) nach einem der vorhergehenden Ansprüche, bei der eine oder beide der ersten und zweiten Stützfläche Bereiche (26, 28, 30) aufweisen, die an verschiedenen Stellen eine unterschiedlich große Stützung bieten. 5
5. Matratze (10) nach Anspruch 4, bei der die zweite Stützfläche der Matratze eine Kopfzone (26), eine Rumpfzone (28) und eine Zone (30) für die Unterschenkel und Füße aufweist. 10
6. Matratze (10) nach Anspruch 5, bei der die Rumpfzone (28) dichter ist als die Kopfzone (26) und die Zone (30) für die Unterschenkel und Füße. 15
7. Matratze (10) nach einem der vorhergehenden Ansprüche, bei der die zweite Stützfläche durch einen Einsatz (22) bereitgestellt ist, der sich in einem Hohlraum (20) befindet, der in dem Hauptkörper (12) der Matratze (10) gebildet ist. 20
8. Matratze (10) nach Anspruch 7, bei der der Einsatz (22) aus einem geschäumten Kunststoffmaterial besteht oder durch ein Gel gebildet ist. 25

Revendications

1. Matelas (10) ayant une première surface de support présentant un degré de dureté ou de fermeté qui est différent de celui d'une deuxième surface de support opposée, **caractérisé en ce que** chacune des première et deuxième surfaces de support est formée par une pluralité de saillies (14 ; 24) et la deuxième surface de support possède un nombre plus grand de saillies que la première surface de support. 30 35
2. Matelas (10), selon la revendication 1, qui est réalisé, intégralement ou partiellement, en matière de mousse plastique alvéolaire. 40
3. Matelas (10), selon la revendication 1 ou la revendication 2, dans lequel les saillies (14 ; 24) ont la forme de pyramides tronquées. 45
4. Matelas (10), selon l'une quelconque des revendications précédentes, dans lequel l'une ou l'autre des première et deuxième surfaces de support, ou les deux, possède des zones (26, 28, 30) offrant différents niveaux de support en différents points. 50
5. Matelas (10), selon la revendication 4, dans lequel la deuxième surface de support du matelas possède une zone pour la tête (26), une zone pour le tronc (28) et une zone pour les pieds et les parties inférieures des jambes (30). 55

rieures des jambes (30).

6. Matelas (10), selon la revendication 5, dans lequel la zone pour le tronc (28) est plus dense que la zone pour la tête (26) et la zone pour les pieds et les parties inférieures des jambes (30).
7. Matelas (10), selon l'une quelconque des revendications précédentes, dans lequel la deuxième surface de support est constituée d'une section d'insertion (22) qui est positionnée dans une cavité (20) formée dans le corps principal (12) du matelas (10).
8. Matelas (10), selon la revendication 7, dans lequel la section d'insertion (22) est une matière mousse plastique alvéolaire ou est formée à partir d'un gel.

