



(86) Date de dépôt PCT/PCT Filing Date: 2007/01/31

(87) Date publication PCT/PCT Publication Date: 2007/08/16

(45) Date de délivrance/Issue Date: 2015/01/27

(85) Entrée phase nationale/National Entry: 2008/08/01

(86) N° demande PCT/PCT Application No.: US 2007/002713

(87) N° publication PCT/PCT Publication No.: 2007/092243

(30) Priorité/Priority: 2006/02/02 (US60/764,861)

(51) Cl.Int./Int.Cl. *A47C 27/14* (2006.01),  
*A47C 27/15* (2006.01)

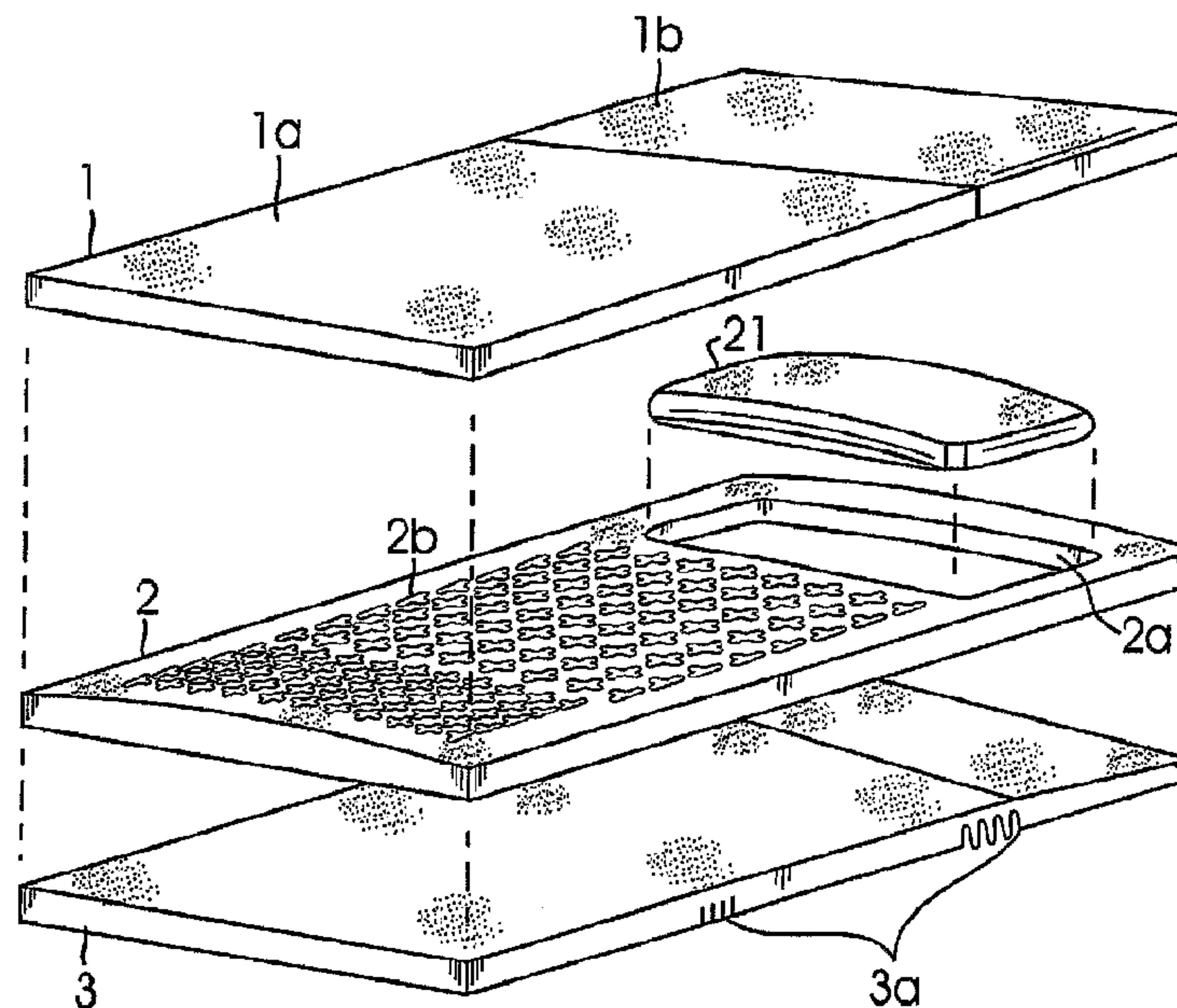
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(54) Title: PRESSURE REDUCTION HEALTHCARE MATTRESS SYSTEM



(57) Abrégé/Abstract:

A foam core for a pressure reduction healthcare mattress is disclosed. It includes a top layer made of memory retention foam, a middle layer made of foam and having a convex shape that is higher along a longitudinal center line than along the two sides, and a lower support layer made of foam. The top layer is made of a torso piece and a softer foot/lower leg piece. The middle layer includes a heel pillow that fits into a heel pillow cavity in the foam, the heel pillow including layers of fiber material over a crown shaped foam insert. The lower support layer has a sloped portion in a lower leg section that slopes down toward a heel end of the foam core. Also disclosed is a pressure reduction healthcare mattress that includes the foam core and a cover.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau(43) International Publication Date  
16 August 2007 (16.08.2007)

PCT

(10) International Publication Number  
**WO 2007/092243 A3**

## (51) International Patent Classification:

A47C 27/14 (2006.01) A47C 27/15 (2006.01)

## (21) International Application Number:

PCT/US2007/002713

## (22) International Filing Date: 31 January 2007 (31.01.2007)

## (25) Filing Language: English

## (26) Publication Language: English

## (30) Priority Data:

60/764,861 2 February 2006 (02.02.2006) US

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

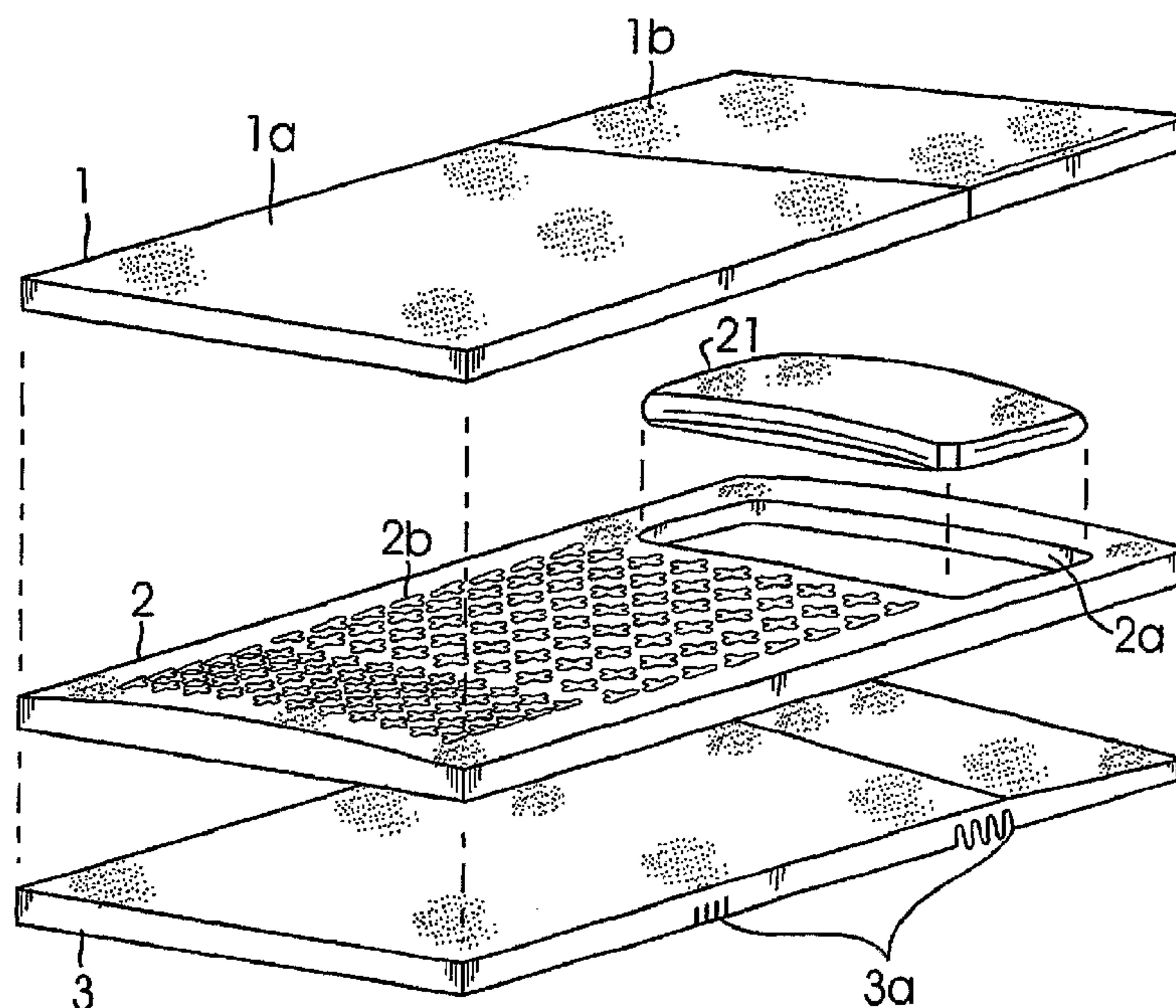
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

## Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

[Continued on next page]

## (54) Title: PRESSURE REDUCTION HEALTHCARE MATTRESS SYSTEM



(57) **Abstract:** A foam core for a pressure reduction healthcare mattress is disclosed. It includes a top layer made of memory retention foam, a middle layer made of foam and having a convex shape that is higher along a longitudinal center line than along the two sides, and a lower support layer made of foam. The top layer is made of a torso piece and a softer foot/lower leg piece. The middle layer includes a heel pillow that fits into a heel pillow cavity in the foam, the heel pillow including layers of fiber material over a crown shaped foam insert. The lower support layer has a sloped portion in a lower leg section that slopes down toward a heel end of the foam core. Also disclosed is a pressure reduction healthcare mattress that includes the foam core and a cover.

WO 2007/092243 A3

**WO 2007/092243 A3**



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**(88) Date of publication of the international search report:**  
17 January 2008

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*



## PRESSURE REDUCTION HEALTHCARE MATTRESS SYSTEM

### BACKGROUND OF THE INVENTION

#### Field of the Invention

5           This invention relates to healthcare mattresses, and in particular, it relates to a pressure reduction healthcare mattress system.

#### Description of the Related Art

10           New raw materials, chemical processes and ingredients used to manufacture today's synthetic foam materials, have allowed the use of a greater variety of foams than used in the past. All foam, over a period of time, shows a slight body depression after use. Even the most expensive and luxurious chemically enhanced foams will demonstrate a slightly concave affect over time when used in a healthcare setting 24 hours a day. Heat, moisture and bed articulation affect the pores of the foam and therefore the hospital mattress.

15           Foam healthcare mattresses are manufactured with either flat or irregularly surfaced foams. Patients normally lay in place on a healthcare mattress, and after a period of time moisture and heat contribute to the foam particles losing part of its memory, thereby creating a slightly depressed area in the center of the healthcare mattress where most of the patient's weight is disbursed.

### 20   SUMMARY OF THE INVENTION

          This invention addresses this "depression" problem by enhancing the foam core with an inherent minimal convex elevation to allow the foam to be more supportive to a hospital patient over longer period of time as compared to the life of expectancy of a conventionally flat constructed quality foam mattress.

25           Additional features and advantages of the invention will be set forth in the descriptions that follow and in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the invention will be realized and attained by the structure particularly pointed out in the written description and claims thereof as well as the appended drawings.

30           To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described, the present invention provides a foam core for a pressure reduction healthcare mattress, which includes a top layer made of memory

retention foam materials, a middle layer made of a foam material and having a convex shape that is higher along a longitudinal center line than along two longitudinal sides, and a lower support layer made of a foam material. The invention also provides a pressure reduction healthcare mattress having such a foam core.

5 It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

#### BRIEF DESCRIPTION OF THE DRAWINGS

10 Figure 1 is an exploded perspective view of the foam core of a mattress according to an embodiment of the present invention.

Figure 2 is a partially exploded perspective view of the mattress.

Figure 3a illustrates a heel portion of the foam base of the foam core of Fig. 1.

15 Figure 3b is a cross-sectional view of the heel portion of the middle layer of the foam core of Fig. 1.

Figures 4a-4b are bottom perspective views of the mattress of Fig. 1.

Figures 5a-5d are pressure maps obtained using a mattress according to an embodiment of the present invention and a conventional mattress.

20

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A pressure reduction mattress according to embodiments of the invention is described with reference to Figs. 1 to 4b. The pressure reduction mattress is a tri-laminated mattress with a convex shaped, center support layer which has a lower profile at the edges and a  
25 slightly elevated profile throughout the body section of the mattress running from the head to the foot. Newly developed foams are memory friendly, and allow the patient to be engulfed and supported rather than having the patient fall into a hollow depression created over a period of time of 24 hour a day use. This construction also allows the pressure reduction mattress to be manufactured in a lower height, for example approximately 5" as compared to  
30 conventionally constructed healthcare mattresses which are normally manufactured between 6" to 7" in height. The lower profile of this pressure reduction mattress allows the patient to have easier ingress and egress to and from the bed when the bed is in a lower height. The lower profile of the pressure reduction mattress also increases the protection from the side rails of the bed, and offers some patients more protection in bed. Also, the integral, non-die



cut internal side rail protection is approximately 2 ¾" in from the border, offering a more secure border for the patient as they sit on the side of the mattress.

As shown in Figs. 1-3c, the foam core of the mattress has three foam layers. The top layer 1 is formed of two separate pieces of foam (preferably Visco Elastic memory retention foam), namely, a torso top layer 1a and a foot/lower leg section 1b. The top layer 1 is designed to cradle the patient's bony prominences. It compresses gently and is supported by a middle convex shaped resilient layer of foam 2. The two pieces of foam 1a and 1b are joined by a glue joint approximately 24" from the foot section of the foam core. The foot/lower leg portion 1b is preferably made of lower density (softer) Visco elastic memory retention foam in order to create the first layer of heel protection. The top layer of foam 1 is approximately 1" thick.

The middle or secondary support layer 2 is approximately 2" high along the two longitudinal sides and is slightly, gradually convex with an apex of approximately 2.25" along the longitudinal center line. This middle support layer 2 has three die shaped patterns. The first pattern has small die shaped "+" in the head section, and the second pattern has slightly wider and more open die cut "+" in the scapula through upper leg area. The third die shaped pattern is a heel pillow cavity 2a at the heel area of the middle support layer 2. The integral, non-die cut internal side rail protection 2b is approximately 2 ¾" in from the side border, offering a more secure border for the patient as they sit on the side of the mattress.

A heel pillow 21, which fits into the heel pillow cavity 2a of the middle layer 2, is a foam shimmed fiber pillow. It is manufactured with four layers of synthetic raw materials, and enclosed in a non-woven pillow shell which is sewn closed. As shown in Fig. 3b, the heel pillow 21 includes three layers of needle-punched polyester fiber 21a over a crown shaped foam insert 21b. Due to this construction, the heel pillow does not pack down as conventional institutional or home type pillows. It incorporates a wedge (approximately ¼" height at the center) of convex, contour cut foam 21b on the bottom of the three separate layers of polyester fiber padding in the pillow. Therefore, the pillow 21 follows the contour of the convex middle support layer 2 of foam in the core. The heel pillow 21 is the second address to the critical heel pressure problem which affects patients a healthcare environment.

The lower support layer 3, the foundation layer of foam in the foam core of this pressure relieving healthcare mattress, is approximately 2.25" in height. It is provided with articulation cuts 3a located at the head section articulation point as well as the knee section articulation point of the core. The foundation layer 3 also features a tapered slope section 3b which starts its taper from approximately 24" from the end of the foam base towards the heel



section. The slope section 3b starts at approximately 2.25" high and is lowered to approximately 1.25" high at the foot section of the mattress. This forms the third layer of heels protection for the patient. Because of the slope section 3b, the overall height of the mattress has a downwardly sloped shape in the heel section.

5           Although various dimensions are described for the above embodiment, other suitable dimensions may be used, and the invention is not limited to the precise dimensions illustrated described herein.

10           As seen from the above descriptions, pressure reduction mattresses according to embodiments of the present invention have three desirable features in their design: (1) lower density top layer foam 1b at the heel section, (2) heel pillow 21 with a convex wedge, and (3) the slope 3b in the lower support layer. These features contribute to the pressure reduction properties of the mattress. Another feature illustrated in this drawing are the lateral cuts on the bottom surface of this third layer that facilitate the articulation of this firm layer and the completed mattress core.

15           As shown in Figs. 4a and 4b, the foam core is covered by a top cover 4, a bottom cover 5, and a zipper 6 (preferably a 270 degree zipper) connecting the top and bottom covers, forming a zippered waterproof covering system. The mattress also includes a linen lock 51 for sheet retention and carrying handles 52 on the bottom cover 5. Preferably, all foam is anti-microbial and meets normal flammability standards (e.g. California Technical  
20   Bulletin #117).

#### EXAMPLE

25           Table 1 below shows an example of a pressure reduction mattress according to embodiments of the present invention ("Embodiment"). It also compares the structures of the pressure reduction mattress to a conventional mattress ("comparison"). The mattress can be made with different dimensions such as 191 x 88.5 x 15.24 cm, 191 x 80.5 x 15.24 cm, or 191 x 75.5 x 15.24 cm.

TABLE 1

	Comparison	Embodiment
1. Top Cover	Hypolex Ultra Navy Blue rubber coated 70 Denier nylon with silkscreen print	ElastiMax 4-way stretch. Alternate: Hypolex nylon top cover (*detail listed below)
2. Bottom Cover	11 oz. Dresden Blue vinyl bottom cover with handles and Linen Locks	DuraTuff II bottom cover with handles and Linen Locks (**detail listed below)
3. Zipper Assembly	Separating 360° YKK zipper with moisture proof flap	270° spiral zipper connecting top and bottom cover with moisture proof flap
4. Foam Core - three layer construction		
Top Layer	1.5" 2.4 21 HR	1" 3 lbs. 15 ILD VE foam
Heel Section	1.8 11 HR	1" 2.5 lb. 10 ILD VE foam
Center	2" 1.85 29 Polyurethane with die cuts and pillow die cut opening	2" 1.85 35 ILD foam with ¼" crown and 2" side depth, three section die cuts with pillow die cut
Bottom Layer	2.5" 1.85 35 Polyurethane with articulation cuts	2.25" 1.85 lb. 46 ILF foam with Heel Slope
Heel Pillow	Three layer densified fiber	Three layer densified fiber with ¼" crowned foam insert on bottom of pillow
Misc.	n/a	Polyurethane Flexskin inner liner
<p>*Top Cover - Cast-coat polyurethane film adhered to a 2 way stretch polyester knit substrate. The film includes flame retardant and anti-microbial additives. Weight is 5.4 oz/ sq yd</p> <p>**The bottom cover "DuraTuff" is a 300 X 600 denier polyester woven fabric with a .55mm PVC coating on the back. This fabric also includes flame retardant and anti-microbial treatment. Weight is 13.5 oz/ sq yd.</p>		



## TEST RESULTS

Figs. 5a-5d are pressure maps obtained using a mattress according to an embodiment of the present invention and a conventional mattress. Figs. 5a and 5b show the pressure maps of a test object using a mattress according to an embodiment of the present invention and a  
5 conventional mattress, respectively. Figs. 5c and 5d show the pressure maps of another test object using a mattress according to an embodiment of the present invention and a conventional mattress, respectively.

It will be apparent to those skilled in the art that various modification and variations can be made in the pressure reduction healthcare mattress of the present invention without  
10 departing from the scope of the invention. Thus, it is intended that the present invention cover modifications and variations that come within the scope of the appended claims and their equivalents.

**CLAIMS:**

1. A foam core for a pressure reduction healthcare mattress, comprising:  
a top layer made of memory retention foam materials and having a uniform thickness;  
a middle layer located immediately below the top layer, made of a foam material and having a convex shape that is higher along a longitudinal center line than along two longitudinal sides, wherein the top layer has a shape conforming to the convex shape of the middle layer; and  
a lower support layer located immediately below the middle layer and made of a foam material, wherein the lower support layer defines a sloped portion in a lower leg section that slopes down towards a heel end of the foam core.
2. The foam core of claim 1, wherein the top layer is made of first and second pieces of memory retention foam materials connected together, the first piece being located in a torso section and the second piece being located in a foot and lower leg section of the foam core, the second piece of foam having a lower density than the first piece.
3. The foam core of claim 1, wherein the middle layer define a first die shaped pattern having small die shaped “+” in a head section and a second die shaped pattern having wider and more open die cut “+” in a scapula through upper leg section of the foam core.
4. The foam core of claim 3, wherein the middle layer has an integral, non-die cut internal side rail portion along each side border of the foam core.
5. The foam core of claim 3, wherein the middle layer further defines a heel pillow cavity in a heel section of the foam core.
6. The foam core of claim 5, further comprising a heel pillow that fits into the heel pillow cavity.



7. The foam core of claim 6, wherein the heel pillow comprises one or more layers of fiber material and a foam insert under the fiber material, the foam insert having a convex shape that is higher along a longitudinal center line than along two longitudinal sides.

8. A pressure reduction healthcare mattress comprising the foam core of claim 1 and a cover for covering the foam core.

9. A foam core for a pressure reduction healthcare mattress, comprising:

a top layer having a uniform thickness and made of first and second pieces of memory retention foam materials connected together, the first piece being located in a torso section and the second piece being located in a foot and lower leg section of the foam core, the second piece of foam having a lower density than the first piece;

a middle layer located immediately below the top layer, made of a foam material and having a convex shape that is higher along a longitudinal center line than along two longitudinal sides, wherein the top layer has a shape conforming to the convex shape of the middle layer, the middle layer defining a heel pillow cavity in a heel section of the foam core;

a heel pillow that fits into the heel pillow cavity, the heel pillow comprises one or more layers of fiber material and a foam insert under the fiber material; and

a lower support layer located immediately below the middle layer and made of a foam material, the lower support layer defining a sloped portion in a lower leg section that slopes down toward a heel end of the foam core.

10. A pressure reduction healthcare mattress comprising the foam core of claim 9 and a cover for covering the foam core.

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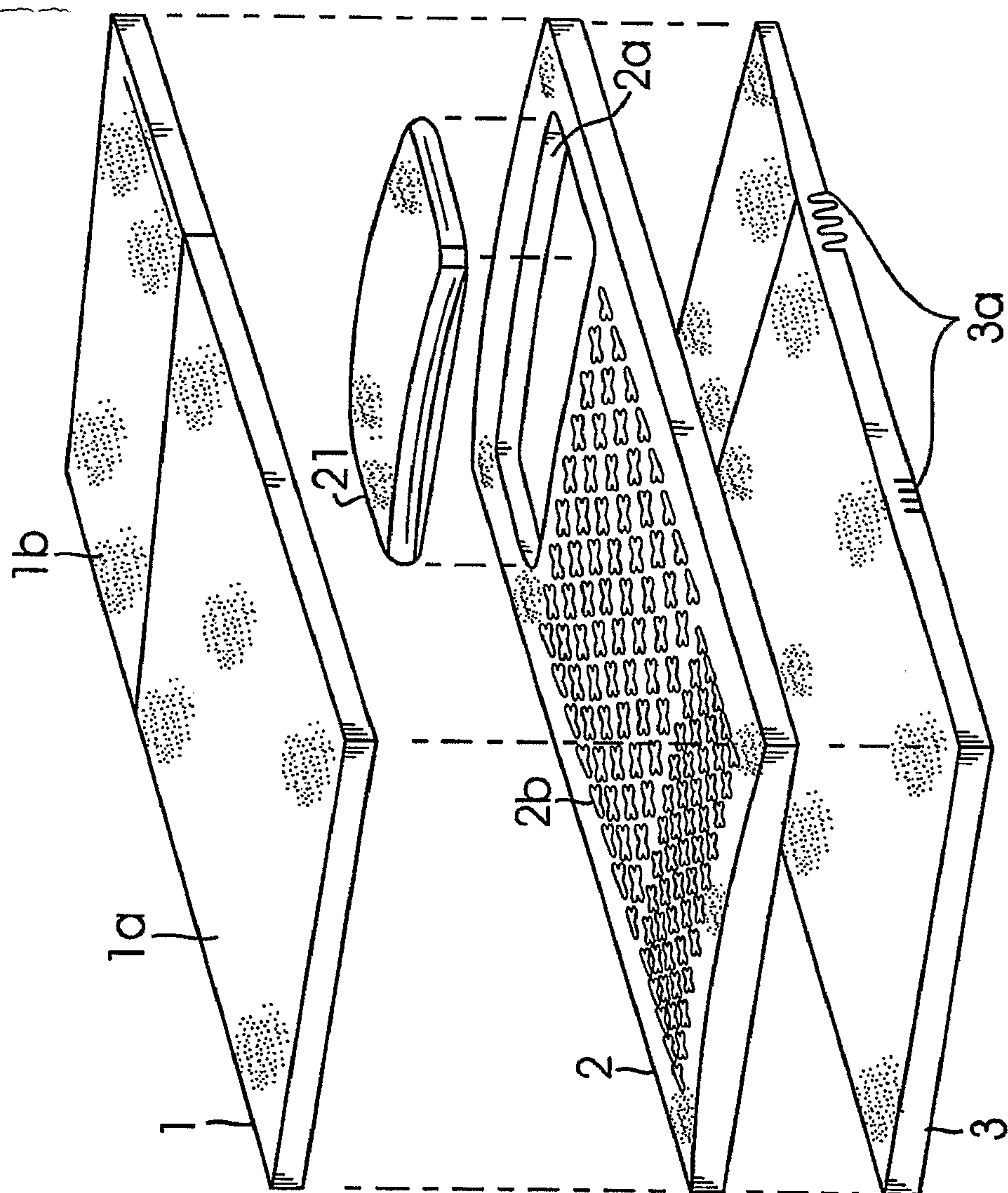


FIG. 1



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FIG. 3a

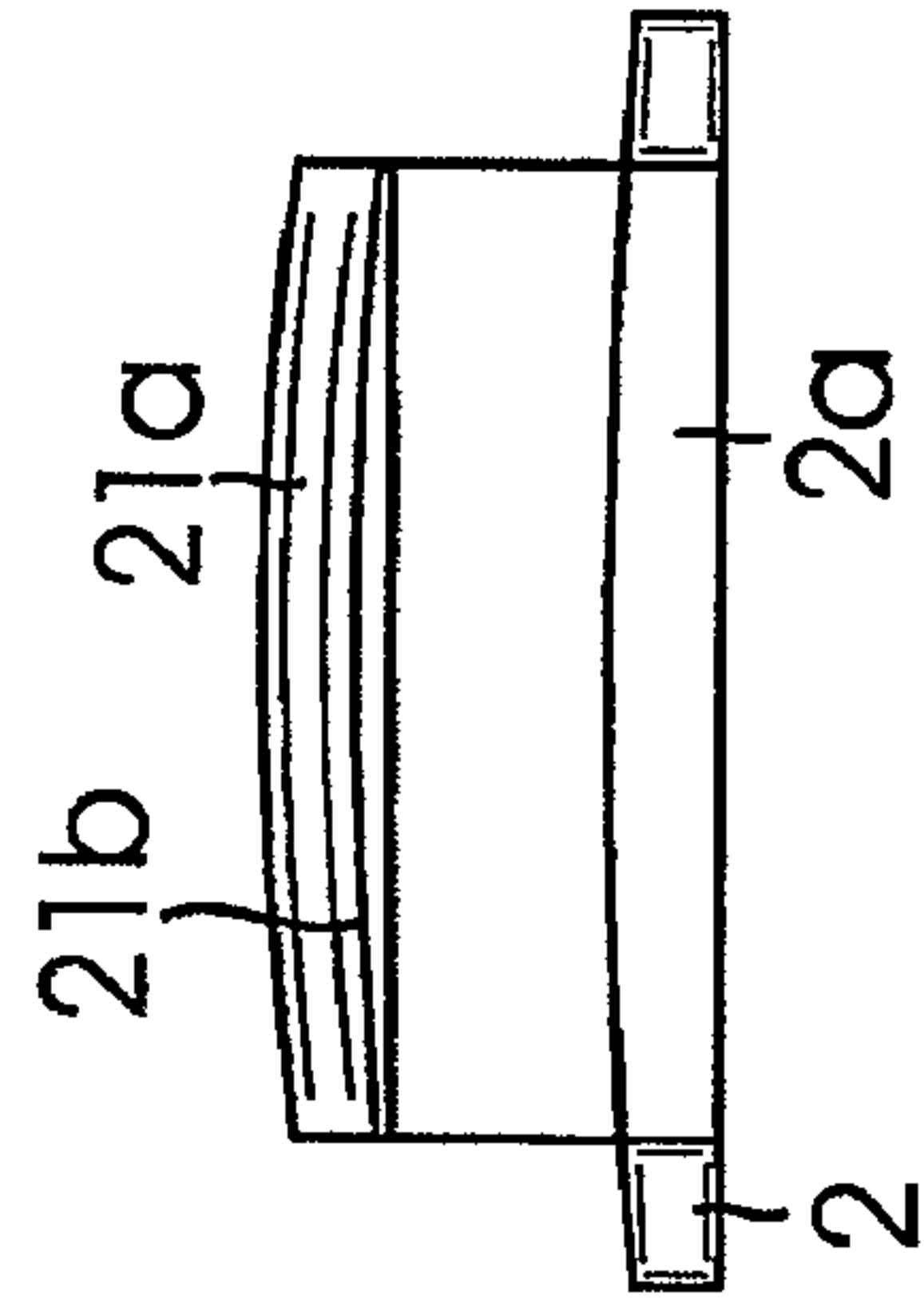


FIG. 3b

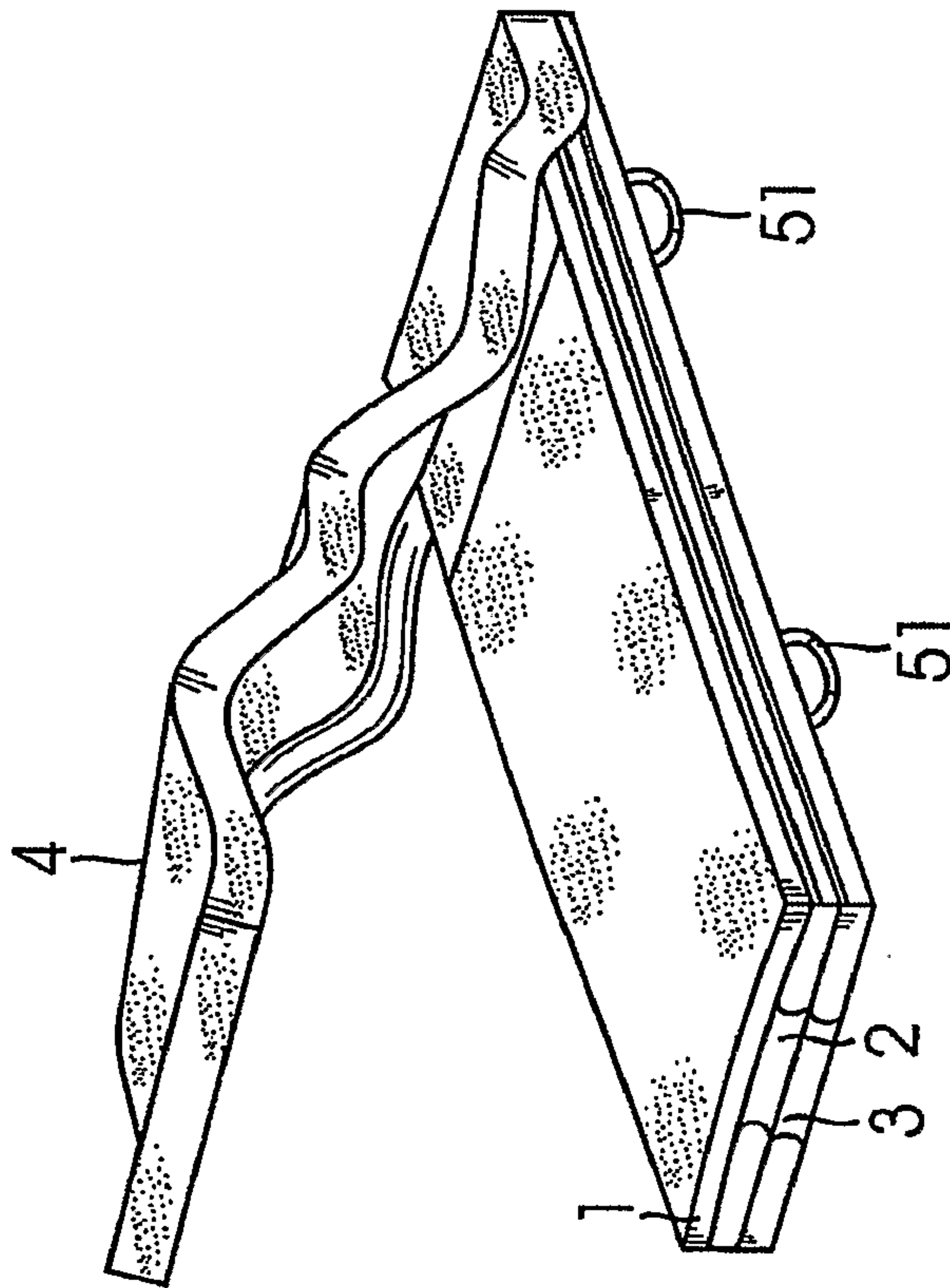
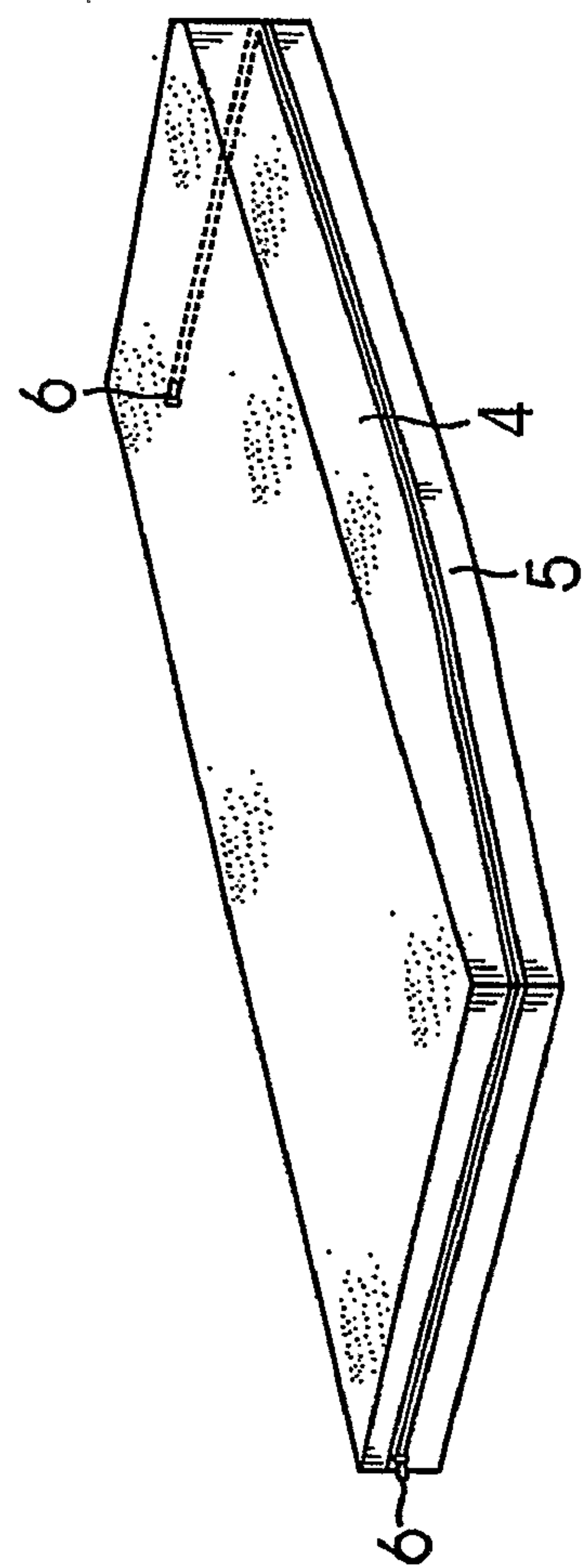
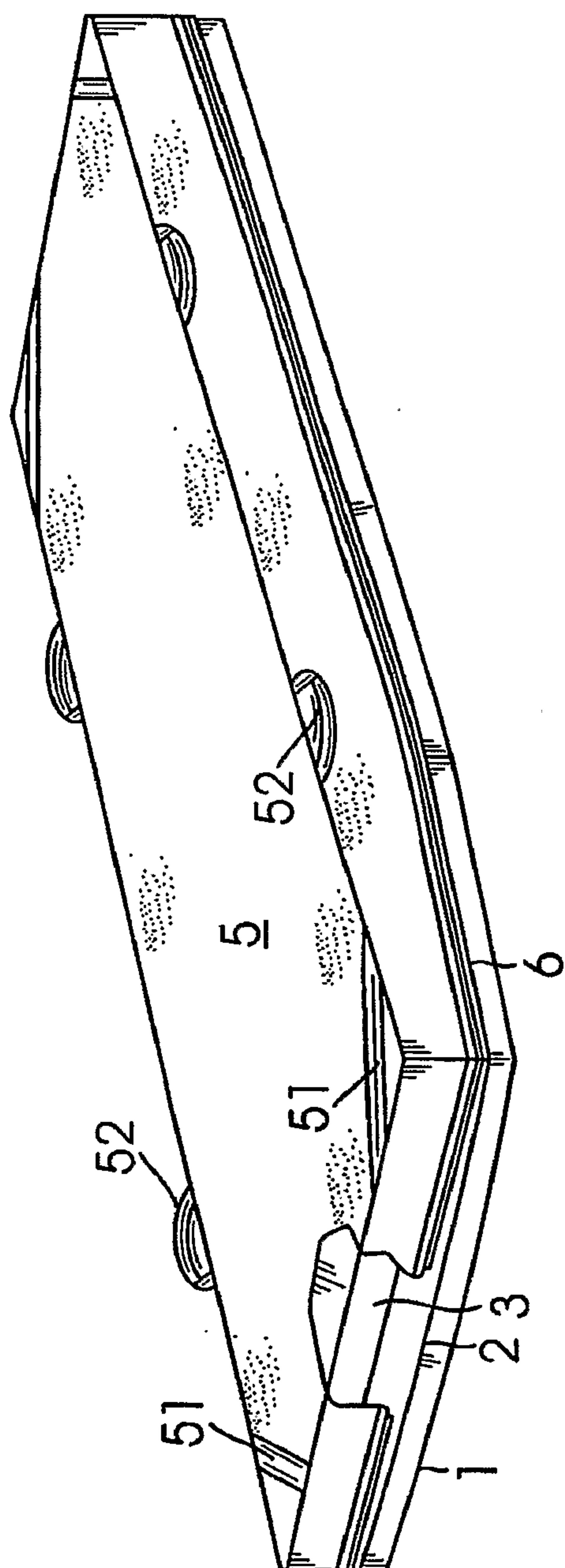


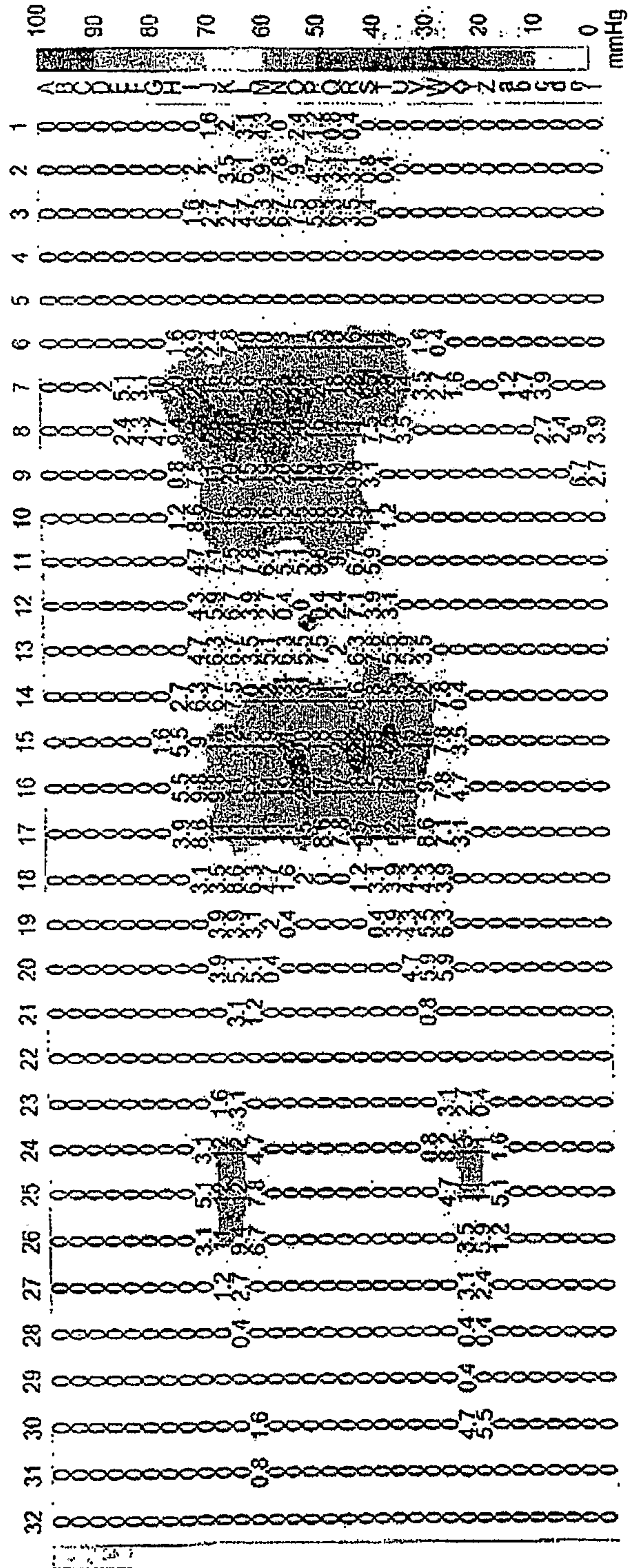
FIG. 2

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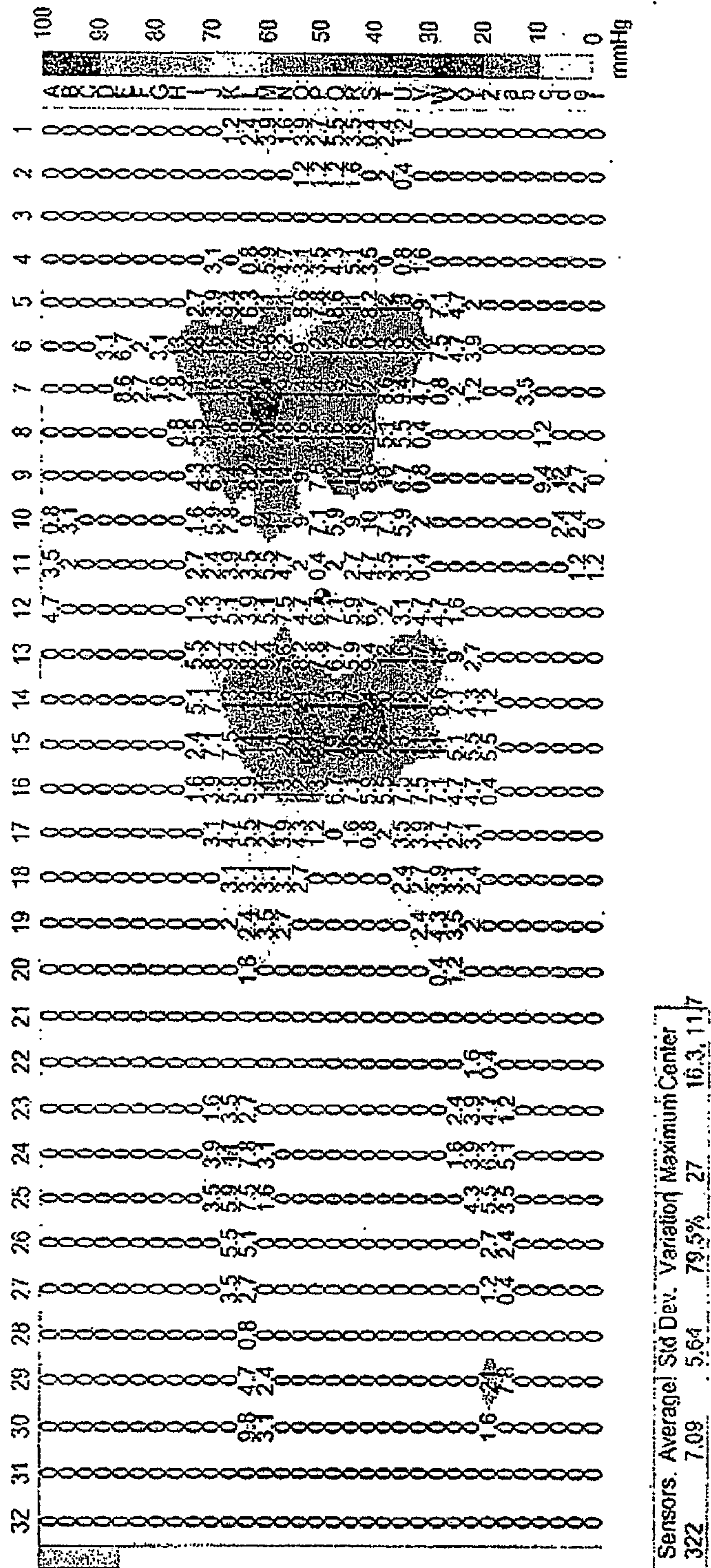


Sensors	Average	Std Dev	Variation	Maximum	Center
298	8.41	6.42	76.4%	26	15.4, 12.4

0574 26 Jan 2006 02:54:48.30PM  
 Pressure Mapping ( Proposed/Improved MaxiFloat )  
 Male 65 Years Old 6' Tall 195 Lbs  
 Back Lie Flat

Fig. 5a

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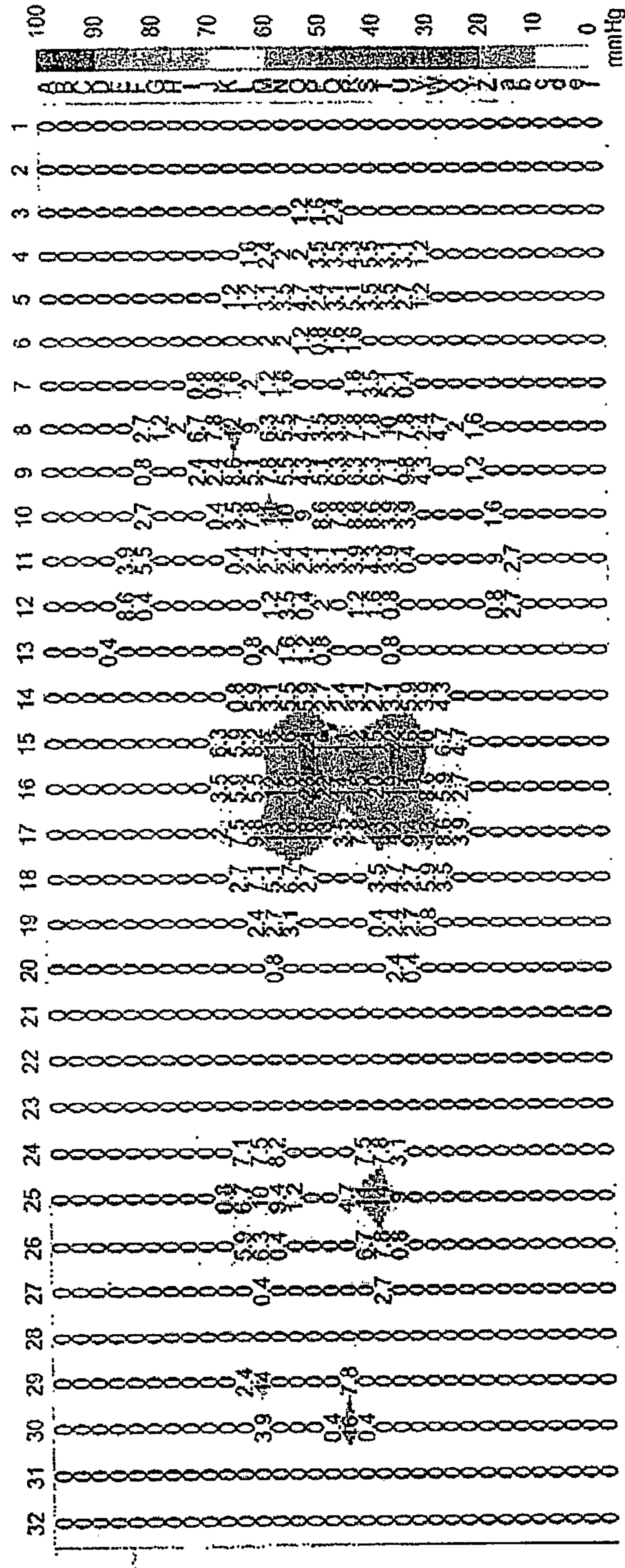


0457 26 Jan 2006 02:51:52.06PM  
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 Male 65 Years Old 6' Tall 195 Lbs  
 Back Lie Flat

Fig. 5b



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Sensors	Average	Std Dev	Variation	Maximum	Center
233	5.49	4.77	87.0%	24	16.4, 14.8

0018 26 Jan 2006 02:32:11.09PM  
 Pressure Mapping ( Proposed/Improved Version of Maxifloat )  
 Female 17 Years Old 5'2" Tall 120Lbs.  
 Back Lie Flat

Fig. 5c

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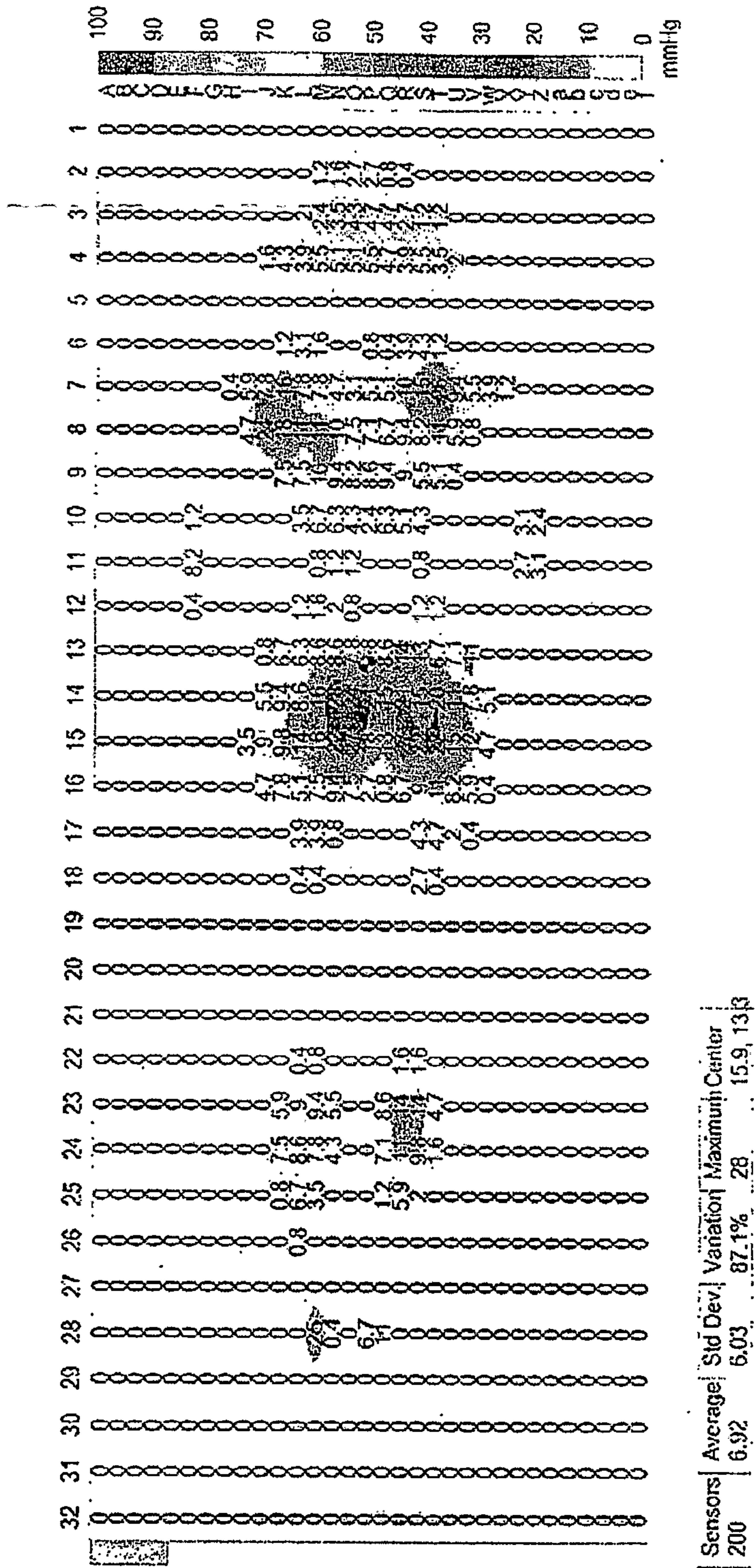


Fig. 5d

