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(54) **Mattress with foam core**

(57) Mattress with a foam core (1) made from at least one flexible foam material (6), which mattress has a top side (2), a bottom side (3) which is virtually parallel to the top side, and a head end (4) and a feet end (5). Of the top and bottom sides of the mattress, at least the top side (2) is intended as a surface for sleeping on. According to the invention, the foam core (1) of the mattress contains, in addition to the abovementioned flexible foam material (6), a layer of a less flexible material, in

particular a layer (7) of an agglomerated foam, which extends at a greater depth below the sleeping surface (2) of the mattress towards the head end (4) of the mattress than towards the feet end (5) of the mattress. In this way, the legs are at a higher level than the body without the mattress having to be raised at the level of the legs or, in other words, without an adjustable bed base or the like being required.

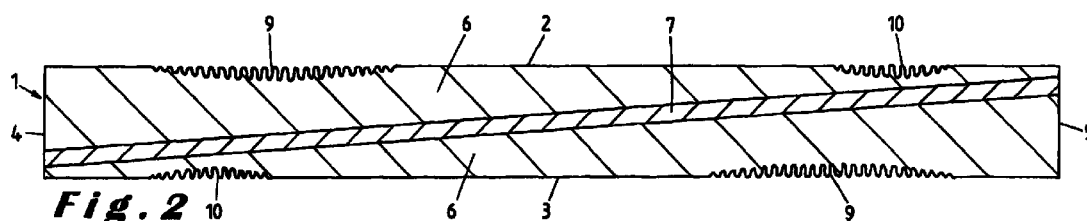


Fig. 2

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Description

[0001] The present invention relates to a mattress with a foam core which is made from at least one flexible foam material, which mattress has a top side, a bottom side, which is virtually parallel to the top side, and a head end and a feet end, at least the top side of the mattress being intended to serve as a surface for sleeping on.

[0002] In practice, it is often desirable for the sleeping surface to rise towards the feet end of the mattress in order, in this way, to obtain improved blood circulation during sleeping and to counteract the so-called "heavy legs" effect. To achieve this, slatted bases in which the feet end can be directed upwards at an angle, by way of example, are known. However, if one does not have an adjustable slatted base of this nature, in practice the only current improvement to the blood circulation which can be achieved is by placing blocks or the like either under the feet end of the bed or under the feet end of the bed base, so that the feet end is raised to a higher level. It is also possible, for example, to arrange cushions beneath the mattress itself. However, these are relatively unaesthetic and inelegant solutions.

[0003] Therefore, the object of the invention is to propose an alternative system which can be used to place the legs of the user lying on the mattress at a higher level without having to have an adjustable slatted base available or without having to use all kinds of makeshift measures.

[0004] According to the invention, for this purpose use is made of a new type of mattress, which is characterized in that the foam core of the mattress contains, in addition to the abovementioned flexible foam material, a layer of a less flexible material which extends at a greater depth below the sleeping surface of the mattress towards the head end of the mattress than towards the feet end of the mattress.

[0005] At locations where the layer of the less flexible material extends at a deeper level below the sleeping surface, more specifically towards the head end, the body will sink more deeply into the flexible foam material of the mattress than at locations where the layer of the less flexible material is situated less deeply below the sleeping surface, more specifically towards the feet end. Despite the fact that the top and bottom side of the mattress, as in conventional mattresses, are therefore parallel to one another, in this way the legs nevertheless come to lie at a higher level, and in this way the desired improvement in the blood circulation is obtained without the feet end of the mattress itself having to be positioned at a higher level.

[0006] In a preferred embodiment of the mattress according to the invention, the layer of the less flexible material is formed by a foam layer of a harder foam material, in particular a foam layer formed by agglomerated small pieces of foam.

[0007] It has been established that it is possible to

influence the extent to which the mattress is depressed by means of a foam layer made from a harder material, in such a manner that there is no need to use other materials, such as hard plastic sheets or metal plates, for the production of the mattress. Furthermore, the embodiment with the foam layer formed by agglomerated foam particles offers the advantage that recycled foam can be used for this layer.

[0008] The layer of the less flexible material may be of a thickness which is greater towards the feet end of the mattress than towards the head end of the mattress and, in this case, may in particular form the bottom side of the mattress.

[0009] Preferably, however, the bottom side of the mattress is also intended as a surface for sleeping on, in which case, if the mattress is laid with its bottom side upwards, in order for this bottom side to be used as a surface for sleeping on, the layer of the less flexible material, in this position too, extends at a greater depth below this sleeping surface of the mattress towards the head end of the mattress than towards the feet end of the mattress. Unlike in the preceding embodiment, in this embodiment the mattress can therefore be slept on both sides.

[0010] Further advantages and particular features of the invention will emerge from the following description of a number of preferred embodiments of the mattress according to the invention. However, this description is given purely by way of example and is not intended to limit the scope of protection as defined by the claims. The reference numerals indicated in the description relate to the appended drawings, in which:

Figure 1 diagrammatically depicts a longitudinal section through a first embodiment of the mattress according to the invention, in which the layer of the less flexible material forms the bottom side of the foam core;

Figure 2 diagrammatically depicts a longitudinal section through a second embodiment of the mattress according to the invention, in which both the top and bottom sides of the mattress can be used as a surface for sleeping on; and

Figure 3 diagrammatically depicts a longitudinal section through a third embodiment of the mattress according to the invention, which is similar to that of Figure 2 but in which the shape of the layer of the less flexible material has been adapted slightly to the anatomy of the user.

[0011] Throughout the various figures, the same reference numerals relate to the same or similar elements. Furthermore, for the sake of clarity only the foam core of the mattress, without the cover, is shown in these figures.

[0012] The mattresses shown in the figures, more specifically the foam cores 1 thereof, have a top side 2, a bottom side 3 which is parallel thereto, a head end 4

and a feet end 5, the top side 2 and, if appropriate, also the bottom side 3 of the mattress being intended as surfaces for sleeping on. The foam cores 1 are made from a flexible foam material 6, such as the known polyurethane or latex foams. The hardness of this material can be selected as a function of the desired hardness of the mattress. If appropriate, different hardnesses can be used in a single mattress in order, in this way, to obtain a mattress with different hardness zones.

[0013] It is essential for the invention that the foam core 1 of the mattress contains, in addition to the flexible foam material 6, a further layer 7 of a less flexible material which extends at a deeper level below the sleeping surface 2 towards the head end 4 of the mattress than towards the feet end 5 of the mattress. As has already been described above, this layer 7 contributes to the legs of the user sinking less deeply into the mattress than the user's body and to the legs therefore lying at a higher level, thus promoting the blood circulation during sleep and counteracting the so-called "heavy legs" effect.

[0014] As the material for the less flexible layer 7, it is possible, by way of example, to make use of a sheet of hard plastic or of metal, in particular of steel, which is arranged on a slope inside the foam core 1. Compared to the flexible foam material 6 of the mattress, these hard sheets yield only slightly or scarcely at all under the pressure of the user, in such a manner that primarily the foam material situated above these sheets will be depressed. At locations where this foam material is thicker, more specifically towards the head end 4 of the mattress, the body of the user can therefore sink more deeply into the mattress than towards the feet end 5.

[0015] As an alternative to using hard sheets, according to the invention it is also possible to make the layer 7 from a foam material, more specifically from a less flexible, in other words harder, foam material. This may be newly produced foam with a harder formulation, but preferably, for this foam, use is made of an agglomerated foam. An agglomerated foam of this nature consists of small pieces of foam which are glued together, the pieces of foam being compressed during the gluing. The small pieces of foam used may be pieces of waste foam which have been cut or milled into smaller pieces. The density and hardness of the agglomerated foam increases as a function of the quantity of glue and in particular also of the extent to which the pieces are compressed during the gluing. In the mattress according to the invention, an agglomerated foam with a density of from 60 to 200 kg/m³, and more particularly an agglomerated foam with a density of from 70 to 150 kg/m³, is preferably used for the layer 7. For a softer mattress (ILD=90-130N), by way of example an agglomerated foam with a density of 80 kg/m³ is used, while for a harder mattress (ILD=131-170N) an agglomerated foam with a density of, for example, 120 kg/m³ can be used.

[0016] Figure 1 shows a first possible embodiment

of the mattress according to the invention. In this embodiment, the layer 7 of the less flexible material forms the bottom side of the foam core. Since the thickness of this layer 7 increases towards the feet end of the mattress, the depth at which it is situated below the top side 2 of the mattress, or in other words below the sleeping surface, decreases. In view of the hardness of the material of the layer 7, the bottom side of the mattress is unsuitable or less suitable for use as a surface for sleeping on. If appropriate, however, an additional layer of flexible foam material could be arranged on the bottom of the mattress, in which case the layer 7 could also be made thicker towards the bottom side, in the direction of the feet end.

[0017] In the embodiment shown in Figure 2, both the top side 2 and the bottom side 3 of the mattress can be used as a surface for sleeping on. In contrast to the previous embodiment, the layer 7 of the less flexible material now has a virtually constant thickness. Since this layer 7 is arranged on a slope in the foam core 1, it always extends at a deeper level below the sleeping surface towards the head end 4 of the mattress than towards the feet end 5, irrespective of whether the top side 2 or the bottom side 3 of the mattress is being used as the surface for sleeping on. When the mattress is turned in order for its bottom side to be used as a surface for sleeping on, it will be evident that the head and feet ends then also have to be exchanged, in such a manner that the legs come to lie in a raised position in both positions. Obviously, it is also possible to lie on the mattress the other way round, but in this case the effect on the blood circulation is lost, but on the other hand there will be a feeling of sleeping on a harder mattress.

[0018] The embodiment shown in Figure 3 is similar to that shown in Figure 2. The only difference is that where in Figure 2 the layer 7 is flat, in such a manner that the depth at which this layer 7 extends below the sleeping surface of the mattress decreases in virtually linear fashion as a function of the distance from the head end 4 to the feet end 5, in the embodiment shown in Figure 3 a depression 8 is provided in the surface of the layer 7 at the location of the shoulder zone of the mattress. If appropriate, this depression may also be provided in the pelvis zone of the mattress or in both the pelvis zone and the shoulder zone. In this way, the shape of the layer 7 is better matched to the anatomy of the human body, and the shoulders and/or the pelvis can sink more deeply into the mattress, resulting in an improved pressure distribution to the body. In the embodiment shown in Figure 3, a depression 8 is also provided on the bottom in the layer 7 of the less flexible material, more specifically also in the shoulder zone when the mattress is turned.

[0019] The depressions which are provided in the layer 7 of the less flexible material enable the depth at which this layer 7 extends below the sleeping surface to increase or remain the same locally from the head end towards the feet end. On average, however, this depth

will decrease from the head end towards the feet end. This average can, in particular, be determined by indicating points on the surface of the layer 7 at regular intervals and by using a linear regression analysis to draw a straight line through these points. In the mattress according to the invention, this line should slope upwards towards the feet end, preferably sloping by at least 3% (= rise in cm/length in cm * 100), and more particularly should slope by at least 4%.

[0020] With regard to the thickness of the various components of the mattresses shown in Figures 2 and 3, it can also be stated that the mattresses themselves may, for example, have a standard thickness of from 12 to 18 cm. The layer 7 which is preferably formed by a layer of agglomerated foam then has a thickness of, for example, from 1 to 4 cm, and more particularly from 2 to 3 cm. If the layer 7 is made from a relatively hard plastic or from a metal, its thickness can, of course, be limited.

[0021] In the embodiments shown in the various figures, in each case in the shoulder zone of the mattress recesses are formed in the foam material 6 of the foam core 1, more specifically grooves 9 are formed in the surface of the foam core 1, in order in this way to increase the softness of the mattress in this zone. This not only results in an improved pressure distribution, but also allows the shoulders to sink in further, so that they come to lie slightly further below the legs. If appropriate, the recesses in the shoulder zone may also be provided in the foam core, in which case they are formed, for example, by transverse holes. As can be seen from Figures 2 and 3, these recesses may be provided in both the top side 2 and the bottom side 3 of the foam core.

[0022] In the embodiments shown in the figures, grooves 10 are also provided in the feet zone of the mattress. In this way, the surface of the mattress in the feet zone is made sufficiently soft, so that the feet, which are the least heavy part of the body, would still be able to sink into the mattress to some extent, so that a good pressure distribution is obtained even at the location of the feet.

[0023] It will be clear from the above description of a number of particular embodiments of the mattress according to the invention that all kinds of amendments may be made to these embodiments without departing from the scope of the invention as defined by the appended claims.

[0024] For example, it is obviously possible for the invention to be used for both a single mattress and a double mattress. When used for a double mattress, the invention allows the flexible foam material 6 of the foam core to be cut through in the middle of the mattress all the way to the layer 7 of the less flexible material on both the top and bottom sides. In this way, the movements of a user on one half of the mattress will have less effect on the second half of the mattress, while the layer 7 nevertheless ensures that there is a sufficiently strong connection between the two mattress halves.

[0025] The layer 7 may also be made from other

materials, in particular from coir or other fibres which, if appropriate, may also be joined together by means of glue in order to increase the strength of the layer 7.

5 Claims

1. Mattress with a foam core which is made from at least one flexible foam material, which mattress has a top side, a bottom side which is virtually parallel to the top side, and a head end and a feet end, at least the top side of the mattress being intended to serve as a surface for sleeping on, characterized in that the foam core of the mattress contains, in addition to the abovementioned flexible foam material, a layer of a less flexible material which extends at a greater depth below the sleeping surface of the mattress towards the head end of the mattress than towards the feet end of the mattress.
2. Mattress according to Claim 1, characterized in that the bottom side of the mattress is also intended as a surface for sleeping on, in which case, if the mattress is laid with its bottom side upwards, in order for this bottom side to be used as a surface for sleeping on, the layer of the less flexible material, in this position too, extends at a greater depth below this sleeping surface of the mattress towards the head end of the mattress than towards the feet end of the mattress.
3. Mattress according to Claim 1 or 2, characterized in that the layer of the less flexible material has a virtually constant thickness.
4. Mattress according to Claim 1, characterized in that the layer of the less flexible material has a thickness which is greater towards the feet end of the mattress than towards the head end of the mattress.
5. Mattress according to claim 4, characterized in that the layer of the less flexible material forms the bottom side of the foam core.
6. Mattress according to one of Claims 1 to 5, characterized in that the depth at which the layer of the less flexible material extends below the sleeping surface decreases in virtually linear fashion as a function of the distance from the head end to the feet end.
7. Mattress according to one of Claims 1 to 5, characterized in that the depth at which the layer of the less flexible material extends below the sleeping surface decreases on average from the head end towards the feet end, a depression in the surface of this layer also being provided at the location of the shoulder zone and/or the pelvis zone.

8. Mattress according to one of Claims 1 to 7, characterized in that the layer of the less flexible material is formed by a foam layer of a harder foam material, in particular a foam layer formed by agglomerated small pieces of foam. 5
9. Mattress according to Claim 8, characterized in that the agglomerated foam layer has a density of from 60 to 200 kg/m³, and in particular a density of from 70 to 150 kg/m³. 10
10. Mattress according to one of Claims 1 to 9, characterized in that recesses are arranged in the foam material at least in the shoulder zone of the mattress, above the layer of the less flexible material, in order to increase the softness of the mattress in this zone. 15

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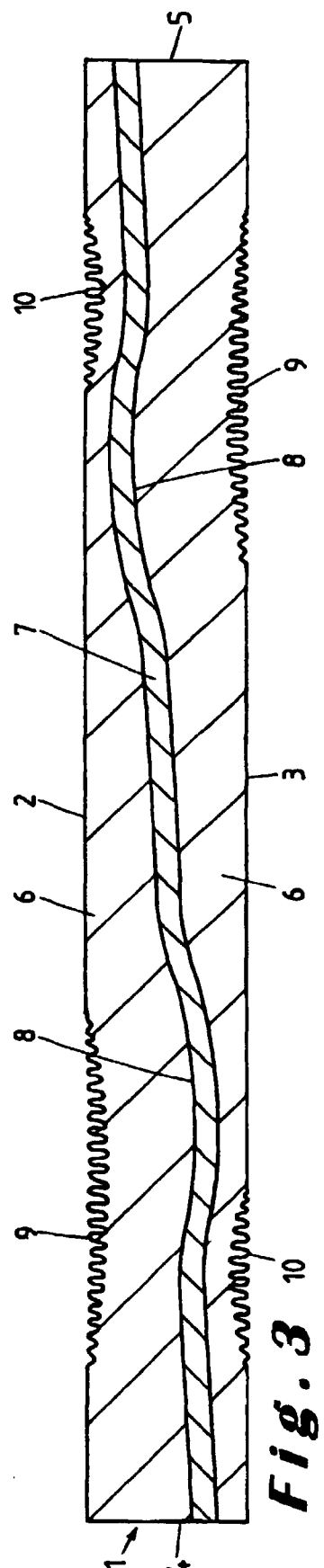
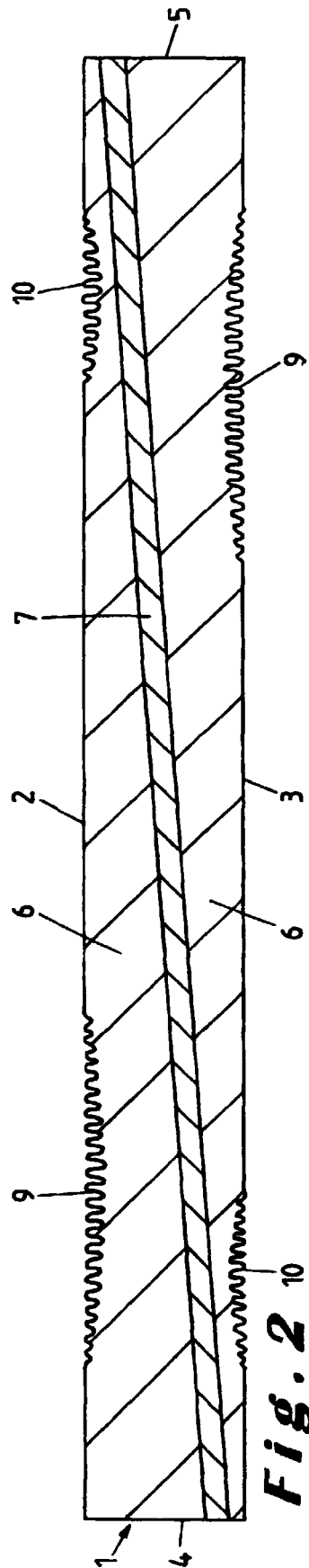
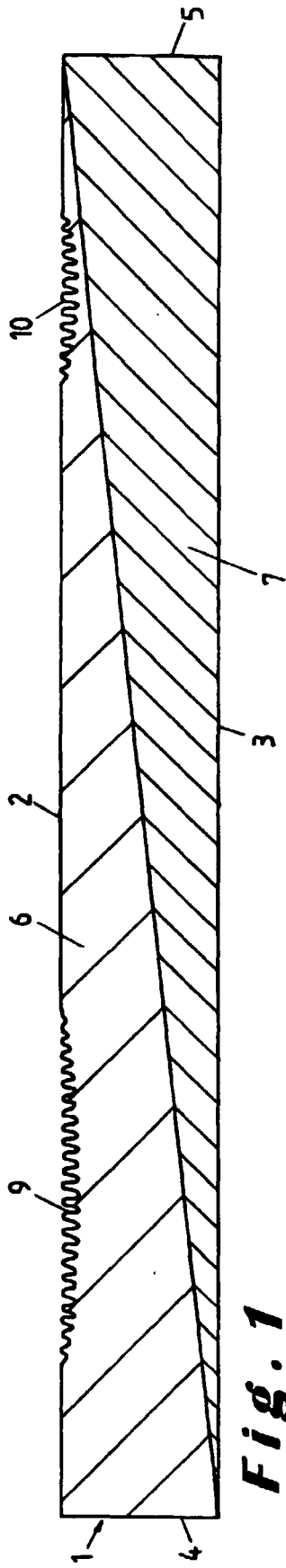
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EUROPEAN SEARCH REPORT

Application Number
EP 00 87 0080

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 3 885 258 A (REGAN JOHN J) 27 May 1975 (1975-05-27) * abstract; figures 2,4 *	1	A47C27/14
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A	US 5 671 492 A (SIMON KEITH DOUGLAS) 30 September 1997 (1997-09-30) * figure 4 *	10	TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 3 August 2000	Examiner van Bilderbeek, H.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 00 87 0080

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