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(54) **MATTRESS COMPRISING AN ACTIVE HEAT ABSORBING/RELEASING LAYER IN COMBINATION WITH A SPACER MATERIAL LAYER**

MATRATZE MIT EINER AKTIVEN WÄRMEABSORBIERENDEN/-FREISETZENDEN SCHICHT IN KOMBINATION MIT EINER ABSTANDHALTERMATERIALSCHICHT

MATELAS COMPORTANT UNE COUCHE ABSORBANTE/LIBÉRABLE ACTIVE COMBINÉE À UNE COUCHE DE MATIÈRE INTERCALAIRE

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EP 1 898 751 B1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a mattress.

BACKGROUND OF THE INVENTION

[0002] During sleep the human body goes through different phases, and in these phases the body temperature varies both as a result of internal temperature changes in the body during sleep and because of variations of the temperature in the surroundings. These temperature variations disturb the sleep. It is especially important in connection with the sleep that the most important phase - the REM phase - is undisturbed, because in this phase the brain is recharged and prepared for the next waken period. Another effect of the temperature changes is that the quilt covering the person is kicked of during sleep, which often results in the person waking up later by freezing. Further, the temperature changes might also result in a sweaty, wet mattress. In both cases the temperature change does not only disturb the sleep, but might also result in sickness.

[0003] New materials have been developed in an attempt to address special clothing and other thermal regulating system requirements. For example, microencapsulated phase change materials have been described as a suitable component for substrate coatings when exceptional heat transfer and storage capabilities are desired.

[0004] In US 5,290,904 substrates are described, which are coated with a binder containing microcapsules filled with energy absorbing phase change material. These microcapsules enable the substrate to exhibit extended or enhanced heat retention or storage properties.

[0005] Also by way of example, microencapsulated phase change materials have been described as a suitable component for inclusion in fibres, when exceptional heat transfer and storage capabilities are desired. In US 4,756,958 a fibre with integral micro spheres filled with phase change material or plastic crystals has enhanced thermal properties at predetermined temperatures. This document further teaches that such fibres may be woven to form a fabric having the enhanced thermal storage properties.

[0006] Generally speaking, phase change materials have the capability of absorbing or releasing thermal energy to reduce or eliminate heat transfer at the temperature stabilizing range of the particular temperature stabilizing material. The phase change material inhibits or stops the flow of thermal energy through the coating during the time where the phase change material is absorbing or releasing heat, typically during the material's change of phase. This action is transient, i.e. it will be effective as a barrier to thermal energy until the total latent heat of the temperature stabilizing material is absorbed or released during the heating or cooling process. Thermal energy may be stored or removed from the phase change material, and can effectively be recharged by a source of heat or cold. By selecting an appropriate phase change material, a substrate can be coated or a fibre manufactured incorporating a phase change material for use in a particular application where the stabilization of temperatures is desired.

[0007] One approach of solving the above-mentioned sleeping problem is by introducing a layer of phase change material above the core of the mattress. Phase change material has the ability of absorbing and releasing heat to/from said body depending on the temperature of the body during sleep and by using phase change material in the mattress, it is the intention that temperature variations of the body should be minimised during sleep. A problem with this solution is that during sleep moist from the body is generated and the moist is then absorbed in the layer following in the phase change material which typically either is the core of the mattress or a layer of synthetic filling between the core and the phase change material. The moist decreases the effect of the phase change material considerably, whereby the introduction of the phase change material does not sufficiently solve the problem of minimising the temperature variations during sleep.

[0008] US 2002/0164474 describes a composite material for cooling and insulating a user in a cold environment where the material i.a. provides a path for evaporation or direct absorption of perspiration from the skin of the wearer an where one application of the composite material is described as a metabolic heating or cooling blanket useful for treating hypothermia or fever patients and therapeutic heating or cooling orthopaedic joint supports.

[0009] WO 2005/016074 describes a temperature regulating mat having a basic mat structure with compartments filled with Phase Change Materials which allow the mat to operate at a stable temperature defined by the mat's use being, principally, to keep people cool in hot environments.

[0010] US 2003/109908 describes a support surface for general skin cooling, or reducing the incidence and promoting the healing of bedsores. The support surface comprises a layer of heat tubes comprising several adjunct enclosed hollow tubes which hold a small amount of refrigerant liquid. The refrigerant in the heat tube layer channelizes heat from warmer areas to cooler areas of the support surface.

[0011] None of the above documents, however, solves the problem with moist described above.

OBJECT AND SUMMARY OF THE INVENTION

[0012] It is therefore an object to provide a mattress solving the above-mentioned problems.

[0013] This is obtained by a mattress comprising a support element, wherein said support element is covered by a first layer of a material having temperature regulating

properties by absorbing and releasing heat and a second layer of spacer material.

[0014] By using a material with temperature regulating properties together with a layer of spacer material, very good properties of minimizing temperature variations are obtained. By using spacer material, moist can easily vanish because of air circulation from the surroundings, and by minimizing the moist, tests have shown that the functionality of temperature regulating materials such as e.g. phase change materials is improved considerably. Thereby, the temperature regulating material can be used to fulfill the quite strict requirement to temperature variation which is necessary in order to get an undisturbed sleep - and especially an undisturbed REM sleep. Further, by using the temperature regulating material in the mattress it is avoided that the user gets sick, both because a better sleep improves the immune system and because the risk of the person unintentionally kicking of the quilt or making the mattress wet because of sweat is reduced. Further, since the risk of the mattress getting sweaty is reduced, the frequency of which the mattress and/or mattress covers have to be cleaned can be reduced.

[0015] Examples of spacer material are distance mesh, a 3mesh® product from Müller Textil. By using this product it is possible to adjust the hardness and the spring characteristics.

[0016] According to the invention, the temperature regulating material comprises a phase change material. This material has proven to be a good material to be used on a mattress and can be adapted to optimally minimize the temperature variations in temperature ranges around the human body temperature.

[0017] In an embodiment the mattress further comprises a third layer of down above said second layer. Compared to e.g. fiber filling, down filling has very good moist absorbing properties, and this therefore further reduces the moist and improves the functionality of the phase change layer.

[0018] In an embodiment the mattress further comprises a fourth layer of spacer material, said fourth layer positioned on the opposite site of the support element than the second layer, whereby each spacer material covers each side of said support element. This ensures that moist from both sides of said mattress is minimized because of a possible air circulation around the mattress.

[0019] In an embodiment the third layer of down comprise goose downs. Goose downs have proven to be very good at absorbing moist, whereby the functionality of the temperature regulating material is improved.

[0020] In an embodiment the second layer has a thickness between 3 mm and 50 mm.

[0021] In an embodiment the third layer has a thickness between 1 mm and 20 mm.

[0022] In an embodiment the mattress further comprises at least one cover layer. This protects the layer of phase change material

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] In the following, preferred embodiments of the invention will be described referring to the figures, where

figure 1 illustrates an embodiment of a mattress according to the present invention,

figure 2 illustrates another embodiment of a mattress according to the present invention,

figure 3 illustrates the functionality of the mattress according to the present invention,

figure 4 illustrates the human body temperature variations when using a mattress according to the present invention compared to the human body temperature variations when using prior art mattresses,

figure 5 illustrates a further embodiment of a mattress according to the present invention,

figure 6 illustrates a further embodiment of a mattress according to the present invention,

figure 7 illustrates the functionality of the mattress according to the embodiment of the mattress illustrated in figure 6.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0024] Figure 1 illustrates a mattress according to the present invention. The mattress 101 is in contact with a large part of the human body 103 during sleep. A cross section of the mattress 101 is illustrated at 102. The mattress comprises a support element 105, e.g. a core based on foam and/or springs, wherein the support element is covered by a first layer of a material having temperature regulating properties such as phase change material 107 and a second layer of spacer material 109

[0025] As an alternative, a top mattress to be placed on top of an existing spring based mattress could comprise the second layer of spacer material and the first layer of temperature regulating material. Further, a layer could be provided above the temperature regulating material 107 to protect the temperature regulating layer.

[0026] In figure 2, another embodiment of a mattress according to the present invention is illustrated, here beside the first layer of temperature regulating material 207, the mattress comprises a third layer of down 201 positioned between the spacer material layer 209 and the support element 205.

[0027] In figure 3, the functionality of the mattress according to the present invention is illustrated. The human body is illustrated at 301, the temperature regulating material is illustrated at 303 and the spacer material layer is illustrated at 305. When the temperature of the human body 301 increases, the extra heat is stored in the tem-

perature regulating layer 303, and the body temperature is lowered. When the body temperature of the human body 301 decreases, the stored extra heat is released from the temperature regulating layer 303 whereby the body temperature is raised. Further, the spacer material layer makes it possible for air circulation, which minimises moist from the surroundings and moist released from the human body 301.

[0028] In figure 4, the human body temperature variations when using mattresses according to the present invention are compared to the human body temperature variations when using prior art mattresses. On the horizontal axis the time is shown, and on the vertical axis the body temperature is shown. The body temperature when using a prior art mattress is illustrated by the curve 405, whereas the body temperature when using a mattress according to the present invention is illustrated by the curve 403. Further, the interval 401 on the vertical axis is the interval defined as the optimal sleeping temperature. By using a mattress according to the present invention, the body temperature variations are minimized and kept within the optimal sleeping temperature interval 401, whereas when using a prior art mattress large temperature variations occur.

[0029] In figure 5, another embodiment of a mattress according to the present invention is illustrated, here, beside the first layer of temperature regulating material 507, the mattress comprises a third layer and a fourth layer of spacer material 501, 503 on each side of the support element 505.

[0030] In figure 6, a further embodiment of a mattress according to the present invention is illustrated; here cover layers 601, 603 are positioned as the outer parts on each side of the mattress.

[0031] In figure 7, the functionality of the mattress according to the embodiment of the mattress shown in figure 6 is illustrated. The human body is illustrated at 701, the temperature regulating material is illustrated at 703 and the down layer is illustrated at 705. Further, the third and fourth layers of spacer material 707, 709 are illustrated on each side of the support element 708. When the temperature of the human body 701 increases, the extra heat is stored by the temperature regulating layer 703, and the body temperature is lowered.

[0032] When the body temperature of the human body 701 decreases, the stored extra heat is released from the temperature regulating layer 703 whereby the body temperature is raised. Further, the down layer, being a very effective moist absorber, absorbs moist from the surroundings and moist released from the human body 701. The spacer material layers 707, 709 allow air circulation through the mattress and thereby further minimize the amount of moist.

[0033] The mattresses can be filled uniquely, e.g. based on the climate in which the mattress is to be used and based on the comfort temperature of the human being intending to use the mattress.

[0034] In the above description, mattresses comprising down filling are described. In this connection the word down relates to both down, feathers or a combination thereof and should therefore be interpreted correspondingly.

[0035] It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims. The word 'comprising' does not exclude the presence of other elements or steps than those listed in a claim. The invention can be implemented by means of hardware comprising several distinct elements, and by means of a suitably programmed computer. In a device claim enumerating several means, several of these means can be embodied by one and the same item of hardware. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

Claims

1. A mattress comprising a support element (105), wherein said support element is covered by a first layer of a material having temperature regulating properties (107) by absorbing and releasing heat and a second layer of spacer material (109) e.g. distance mesh positioned directly beneath said first layer, where said spacer material allows air circulation from the surroundings directly beneath said first layer, **characterized in that** the temperature regulating material comprises a phase change material.

2. A mattress according to claim 1, wherein the mattress further comprises a third layer of down (201).

3. A mattress according to claim 2, wherein the mattress further comprises a fourth layer of spacer material (503), said fourth layer positioned on the opposite site of the support element than the second layer, whereby each spacer material covers each side of said support element.

4. A mattress according to any of the claims 2-3, wherein the third layer of down comprises goose downs.

5. A mattress according to any of the claims 1-4, wherein the second layer has a thickness between 3 and 50 mm.

6. A mattress according to any of the claims 2-5, wherein the third layer has a thickness between 1 mm and 20 mm.

7. A mattress according to any of the claims 1-6, wherein the mattress further comprises at least one cover layer (601).

Patentansprüche

1. Matratze, umfassend ein Unterstützungselement (105), wobei das Unterstützungselement mit einer ersten Schicht eines Materials mit Temperaturregulierenden Eigenschaften (107) durch Absorbieren und Abgeben von Wärme sowie einer zweiten Schicht aus Abstandhaltermaterial (109), z.B. Distanznetz, das direkt unter der ersten Schicht positioniert ist, wobei das Abstandhaltermaterial Luftzirkulation von der Umgebung direkt unter der ersten Schicht ermöglicht, **dadurch gekennzeichnet, dass** das Temperaturregulierende Material ein Phasenänderungsmaterial umfasst.

2. Matratze nach Anspruch 1, wobei die Matratze weiter eine dritte Schicht aus Daunen (201) umfasst.

3. Matratze nach Anspruch 2, wobei die Matratze weiter eine vierte Schicht aus Abstandhaltermaterial (503) umfasst, wobei die vierte Schicht auf der gegenüberliegenden Seite des Unterstützungselements als die zweite Schicht positioniert ist, wobei jedes Abstandhaltermaterial jede Seite des Unterstützungselements abdeckt.

4. Matratze nach irgendeinem der Ansprüche 2-3, wobei die dritte Schicht aus Daunen Gänsedaunen umfasst.

5. Matratze nach irgendeinem der Ansprüche 1-4, wobei die zweite Schicht eine Dicke zwischen 3 und 50 mm aufweist.

6. Matratze nach irgendeinem der Ansprüche 2-5, wobei die dritte Schicht eine Dicke zwischen 1 mm und 20 mm aufweist.

7. Matratze nach irgendeinem der Ansprüche 1-6, wobei die Matratze weiter mindestens eine Deckschicht (601) umfasst.

Revendications

1. Matelas comprenant un élément de support (105), dans lequel ledit élément de support est couvert par une première couche d'une matière avec des propriétés régulatrices de température (107) en absorbant et libérant la chaleur et une deuxième couche de matière intercalaire (109), p. ex. une maille de distance positionnée directement au-dessous de ladite première couche, ladite matière intercalaire permettant la circulation d'air du milieu ambiant directement au-dessous de ladite première couche, **caractérisé en ce que** la matière régulatrice de température comprend une matière à changement de phase.

2. Matelas selon la revendication 1, dans lequel le matelas en outre comprend une troisième couche de duvet (201).

3. Matelas selon la revendication 2, dans lequel le matelas en outre comprend une quatrième couche de matière intercalaire (503), ladite quatrième couche étant positionnée sur le côté de l'élément de support opposé à la deuxième couche, chaque matière intercalaire couvrant chaque côté dudit élément de support.

4. Matelas selon l'une quelconque des revendications 2 à 3, dans lequel la troisième couche de duvet comprend des duvets d'oie.

5. Matelas selon l'une quelconque des revendications 1 à 4, dans lequel la deuxième couche présente une épaisseur comprise entre 3 mm et 50 mm.

6. Matelas selon l'une quelconque des revendications 2 à 5, dans lequel la troisième couche présente une épaisseur comprise entre 1 mm et 20 mm.

7. Matelas selon l'une quelconque des revendications 1 à 6, dans lequel le matelas en outre comprend au moins une couche de recouvrement (601).

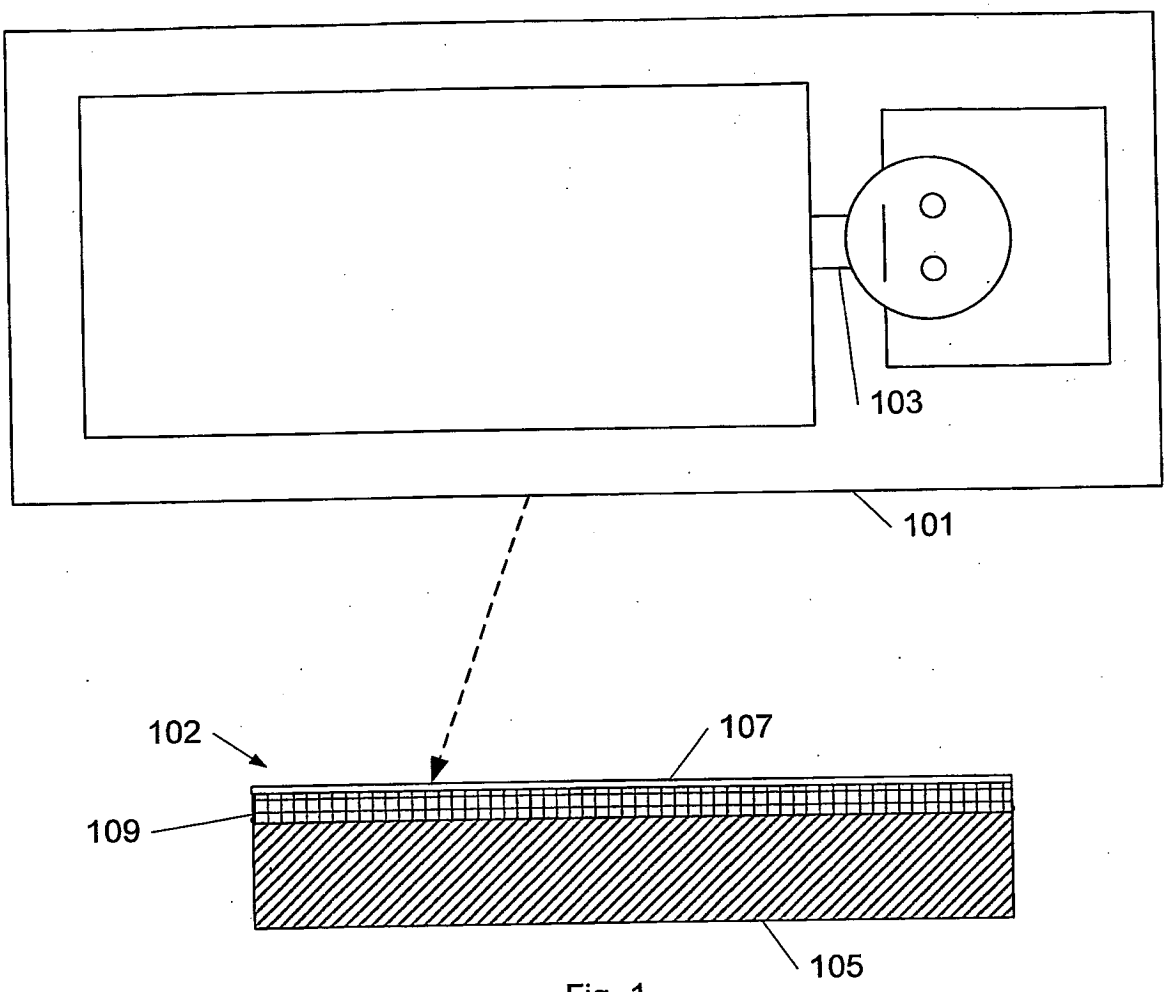

Fig. 1

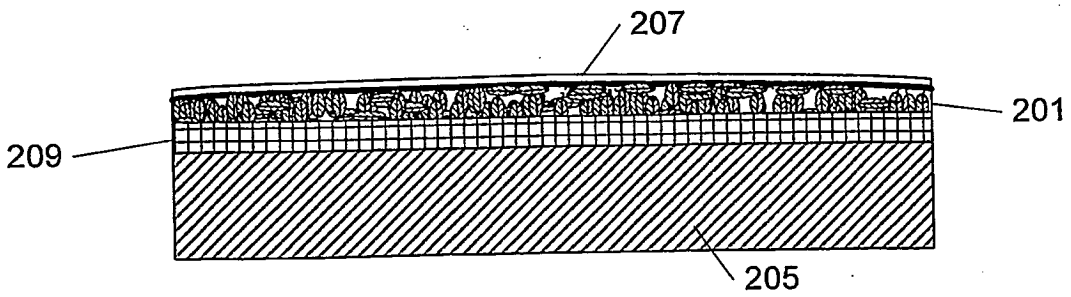

Fig. 2

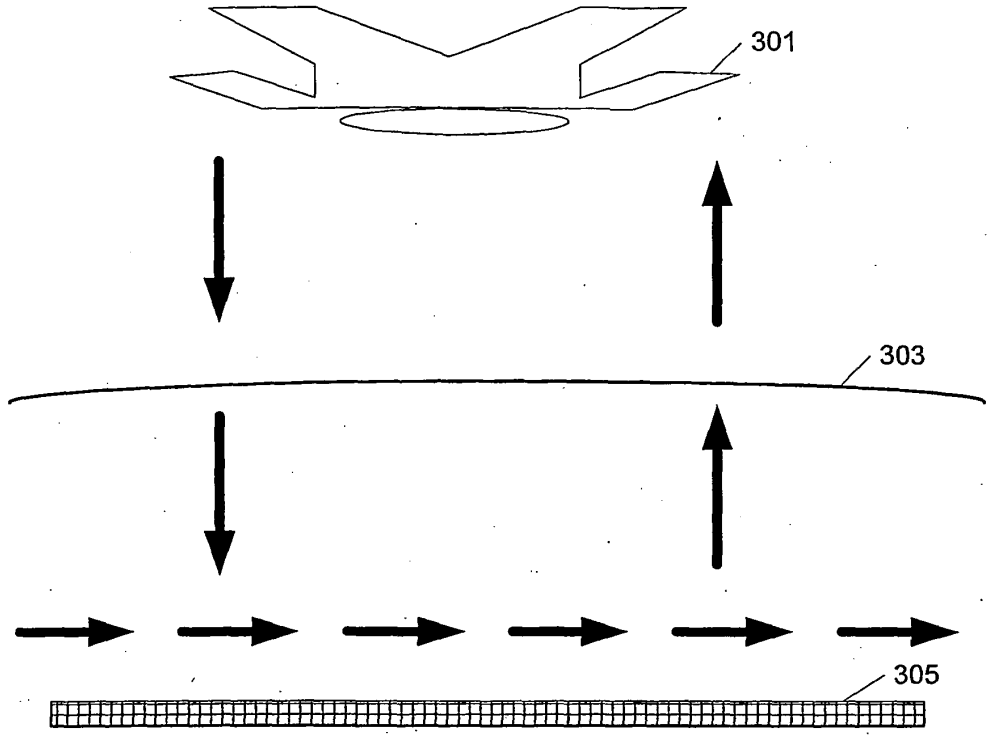

Fig. 3

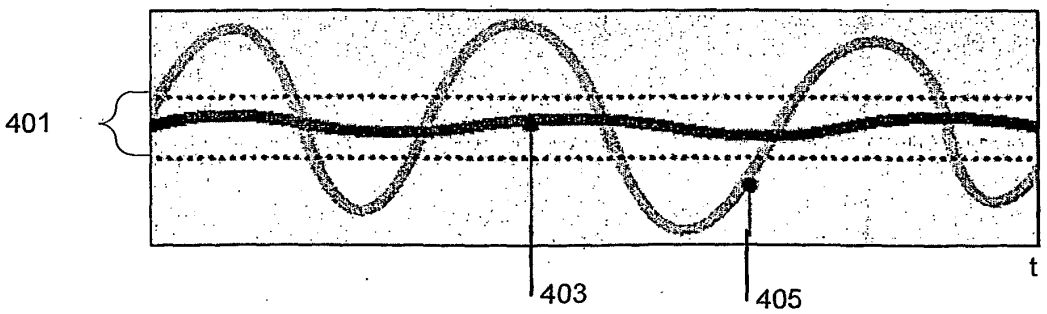

Fig. 4

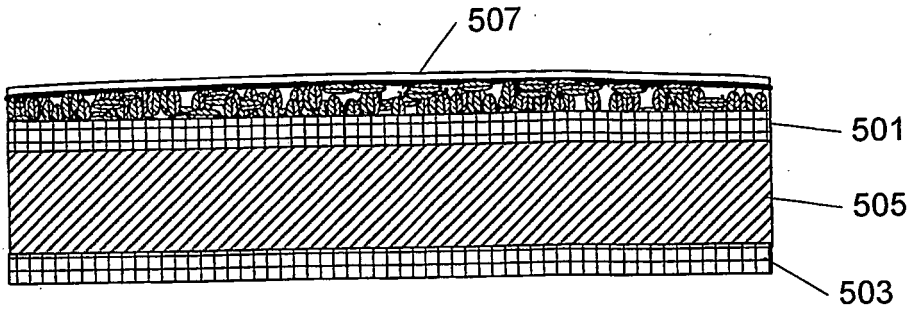

Fig. 5

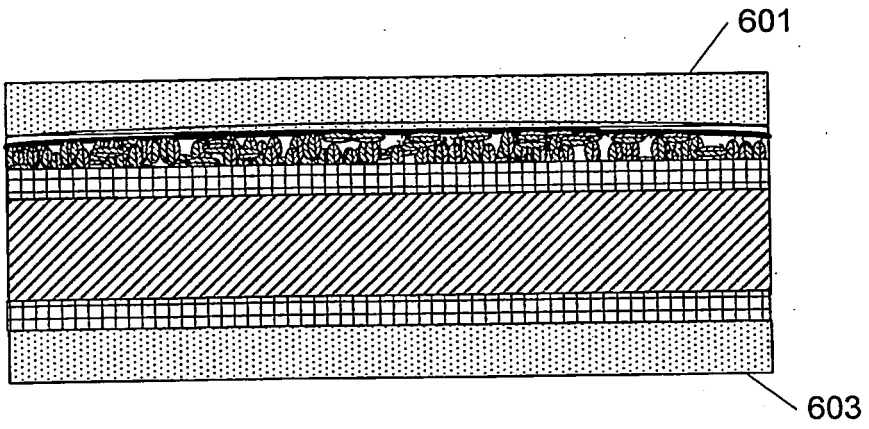

Fig. 6

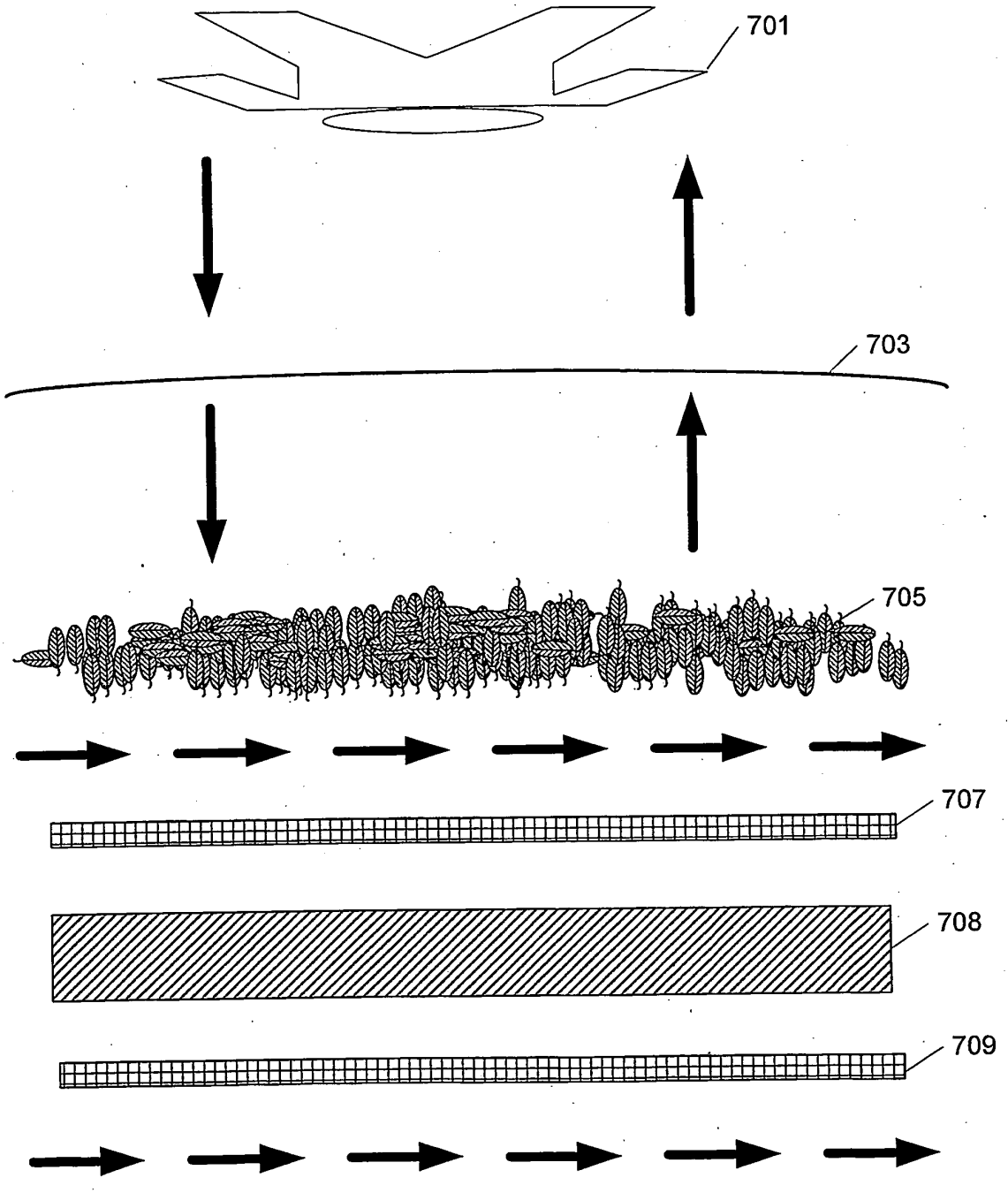

Fig. 7

REFERENCES CITED IN THE DESCRIPTION

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