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- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for all designations

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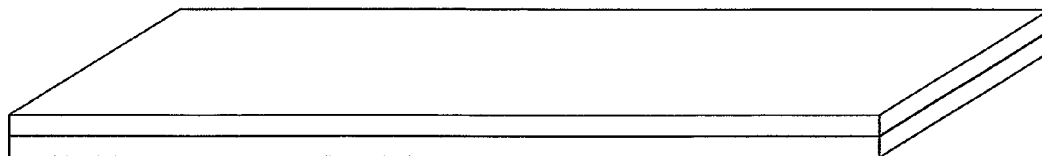
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: TEMPERATURE CONTROL AND REGULATION MAT



(57) Abstract: A temperature regulating mat (either cooling or warming), consisting of a basic mat structure with compartments filled with Phase Change Materials. The Phase Change Materials allow the mat to operate at a stable temperature defined by the mat's use, which may principally be to keep people cool in hot environments. For example a cooling mat would cool down to a stable and comfortable temperature suitable to provide the user with a significant but not uncomfortable cooling effect. The Phase Change Materials need to be 'recharged' after use. This can be done very easily - with a cooling mat it simply needs to be stored in an environment cooler than its operating temperature (this could be 32 degrees Celsius). Recharging could also be achieved through an integrated heat exchanger in the mat powered by a suitable power source. The mat will be flexible for easy handling and will normally have a comfortable and practical cover fixed over the core mat.

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TEMPERATURE CONTROL AND REGULATION MAT

TECHNICAL FIELD:

Phase Change Materials - Temperature control and regulation

BACKGROUND ART:

Phase Change Materials:

1) These materials are best known as "Phase Change Materials" but can also be known by the term "Eutectic". Phase Change Materials are comprised of chemicals mixed in particular combinations and ratios to give the resulting compound a specifically desired freezing/melting point and thermal capacity. During a Phase Change Material's phase change from solid to liquid (melting), or liquid to solid (freezing), it either absorbs or emits a certain amount of energy. During its transition the material will stay constant at its specific freezing/melting point until phase change is complete. It is this property which allows phase change materials to be used to regulate and control temperatures. As an example, a cooling Phase Change Material will cool the environment surrounding it by absorbing thermal energy from that environment as the material melts - it will produce a cooling effect until phase change is complete.

DISCLOSURE:

TECHNICAL PROBLEM:

2) The problem solved by the invention is one that is common in any part of the world where a warm environment exists. In hot environmental conditions people get uncomfortably hot. In a lot of cases this discomfort is often an extremely distressing and tiring problem as well as sometimes even being life-threatening (e.g. hyperthermia). This can occur in a vast number of potential situations and is a part of everyday life for many, but in particular is often a problem when people go on holiday to hot climates. When you are on the beach, by the pool, trying to sleep or simply trying to relax in a hot climate (without air-conditioning) there is no practical way at present to be cool and comfortable, people just suffer the heat. The cooling mat solves the distressing problem of being too hot in such situations, a problem for which there is currently no solution.

3) The scope of temperature related problems which the cooling mat can solve are numerous. However, another specific problem in addition to holidays and generally coping with everyday life in hot conditions, is in medical situations - especially in poorer countries. The cooling mat is a very cheap and effective solution for keeping medical patients cool in hot conditions and could not only aid treatment, comfort and recovery, but in some circumstances it could also mean the difference between life and death.

TECHNICAL SOLUTION:

4) The solution to being uncomfortably hot in circumstances such as those detailed above is to use a Cooling Mat to remain at a cool and comfortable temperature. Lying on the mat, for example when sunbathing, or even when wearing clothing will keep people cool and comfortable.

5) The mat will be comprised of either a plastic, nylon, or rubber (or other suitable material) hollow structure (the 'core') and other materials such as aluminium foils to improve heat conduction from the body, as well as any other insulating materials which may be necessary. This structure is the main body of the mat. The size and inner compartmental structure and layout of the mat will vary depending on

intended application. For example, a mat designed for medical use may be larger than one used for sunbathing. Dependent on application, the mat may be incorporated into other products to enhance the product's functionality (eg. a 'cool bed/mattress').

6) To provide an example of size and shape, the sunbathing version of the mat may be 2000mm x 580mm x 45mm. However, the mat could be produced in a variety of different shapes as well as sizes. As it will be constructed to suit a given application, it may be constructed so that it is flexible, and easy to fold up and carry (to enhance its portability). In addition, the mat's structure may allow it to be compressed to a smaller volume for storage.

7) The hollow core/compartments within the basic mat structure will be filled with a suitable Phase Change Material for the mat to perform its intended function. For example, in the sunbathing application the Phase Change Material must be chosen correctly so as to produce a significant cooling effect but must also not be too cold. Changing the Phase Change Material used could also turn the mat into a heating/warming mat with a higher freezing/melting point. In addition, a range of different Phase Change Materials could be used in a single mat to create a mat which had differing temperatures in different areas. This may be beneficial in situations whereby certain parts of the body need to be cooled or warmed to differing degrees. The structure so far described represents the essential technological 'core' of the mat but in many applications this 'core' will need to be padded and covered in material so as to be comfortable to lie on. This cover for the mat could be fixed, or could be removed for washing or replacement. The cover may also be customised to any customer's specific designs; for example hotels could have their name, logo and corporate colours on the cover, as well as being able to choose the quality of the cover (e.g. 'basic', 'intermediate' or 'luxury').

8) The mat functions by the Phase Change Material first of all being frozen/'charged' (the freezing/melting point is whatever temperature the Phase Change Material is designed to freeze/melt at and is also known as the "operating temperature"). The Phase Change Material becomes frozen/'charged' in a cooling mat when it is in an environment which is at a temperature lower than the Phase Change Material's freezing/melting point (a heating mat would be recharged by a higher temperature than its operating temperature). As an example, if the freezing/melting point is 33 degrees Celsius, the Phase Change Material in a cooling mat will freeze/'charge' at 32 degrees Celsius. There are a number of ways to recharge the mats but basically cooling mats need to be stored in an environment that is cooler than their freezing/melting point. In a holiday situation, a hotel could store the mats in air-conditioned space to recharge them or in other circumstances they could simply be left overnight, or even cooled in water. A further enhancement for the recharging process is to include a heat exchange as part of the mat. This could be powered by mains electricity supply, battery power, or even built-in solar panels. This would allow the mat to remain constantly cool, or it would cool at the touch of a button. The recharging process can be repeated as necessary and therefore the mats will be completely reusable.

9) To be effective the mats will be constructed to maintain their cooling/warming effect for a suitable period of time. For a sunbathing cool mat this could be 4-5 hours and is achieved by choosing the correct Phase Change Material and the correct amount of Phase Change Material to construct into the mat.

ADVANTAGES EFFECTS:

10) The Cooling mat allows people to remain cool and comfortable in hot conditions where air-conditioning is unavailable and/or impractical.

11) The basic mat can be applied to many potential applications with only very minor adjustments.

12) The Phase Change Materials can be changed to suit any desired application and in addition to cooling, they could also be used to make a mat that keeps people warm in cold conditions.

13) A version of the mat with an integrated heat exchanger could be automatic and operate 'on-demand'.

DESCRIPTION OF DRAWINGS:**Description of Drawings**

14) Basic drawings are provided to help clarify how a mat may look and how it may be constructed.

15) Fig.1 shows a basic example of how the 'core' of a mat may look. Fig. 1 shows two rubber mats as described in the 'best mode' sealed together.

16) Fig. 2 shows more depth than Fig.1. In Fig. 2 it is possible to see a basic example of a compartment inside the core mat filled with Phase Change Materials (the dashed outline).

BEST MODE:

17) The best mode initially contemplated for carrying out the basic cooling mat invention as claimed is as follows: The Phase Change Material will be sandwiched between two flexible surfaces. This resulting construction will be the 'core' mat. It will likely be covered with a quilted/cushioned cover with suitable fittings such as Velcro to attach the cover to the core mat.

INDUSTRIAL APPLICABILITY:

18) The initial business concept for the industrial exploitation of the invention is to sell it in bulk to hotels, who can then either include the mats as a benefit in a holiday package or can rent out the mats to customers allowing the hotels to generate revenue and/or competitive leverage from the mat. Customers will simply collect the recharged mats from a kiosk/hotel distribution centre (this would usually be the same place beach towels are distributed from), use them throughout the day, and then return the mat to the hotel distribution centre for recharging and cleaning.

19) The business will be expanded to include other routes of distribution to holiday-makers, such as through car rental businesses for example - people could rent a car and some cooling mats at the same time.

20) The business will also move into new markets such as camping, the medical sector and the military sector.

21) The business will develop new applications for the cooling mats - such as incorporation into existing products like a mattress to create a cooling bed.

22) To further increase the benefits to the customer (especially those such as hotels) the cover of the mat will be fully customisable, from any desired colour scheme and logo design to the quality level of the cover itself (e.g. there may be 'basic', 'intermediate' and 'luxury' covers available depending on customers' requirements)

CLAIMS:

- 1) A cooling mat for human body cooling purposes, consisting of organic or salt based (or a combination of both) Phase Change Materials, and/or other materials with compartments filled with, or the whole assembly manufactured with, Phase Change Materials, that cools down to a stable and comfortable temperature.
- 2) A cooling mat as claimed in claim 1 that may be constructed with an incorporated heat exchange mechanism for cooling or heating purposes that may be powered by mains electricity, chemical, battery power, solar cells, or another suitable power source/supply. This will allow the mat to stay cool continuously and/or cool down at the touch of a button.
- 3) A cooling mat as claimed in claim 1 and claim 2 which may have suitable flexibility and/or hinging between segments of the mat to allow for general flexibility and easy packing and storage.
- 4) A mat as claimed in claims 1, 2 and 3 that may use a range of different Phase Change Materials to produce mats with differing operating temperatures - this may include mats which warm up and stay warm as well as mats that cool down and stay cool. In addition, a range of different Phase Change Materials could be used in a single mat to create a mat which had differing temperatures in different areas.
- 5) A cooling mat as claimed in claims 1 through 5 in single or multiple formats.
- 6) A mat as claimed in any preceding claims that may be constructed from plastic, nylon, rubber, or any other suitable material.
- 7) A mat as claimed in any preceding claims that may be covered in material and padding to make the mat more comfortable and practical to use. This covering may either be fixed or in the form of a removable cover.
- 8) A cooling mat substantially as herein described above and illustrated in the accompanying drawings.

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DRAWINGS

FIG. 1

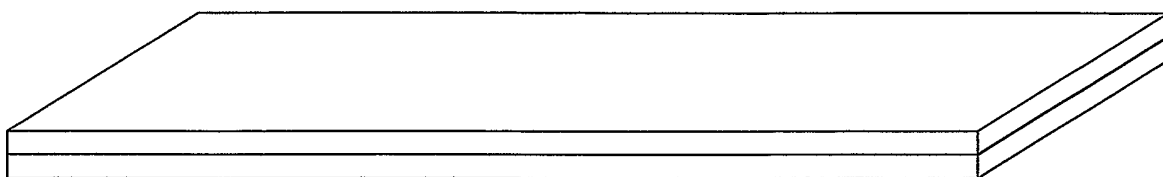
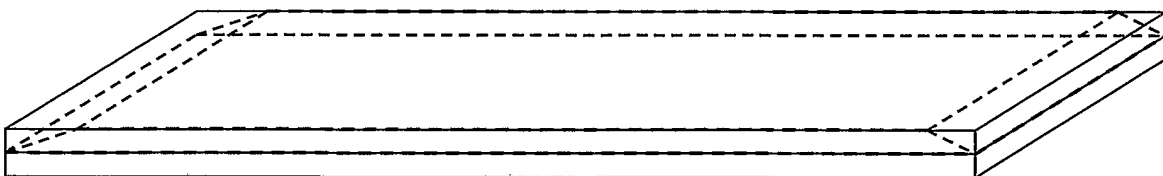


FIG. 2



INTERNATIONAL SEARCH REPORT

II onal Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A47C27/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A47C F25D D60N D06N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	US 5 366 801 A (BRYANT YVONNE G ET AL) 22 November 1994 (1994-11-22) column 3, line 10 - column 4, line 64; figures	1,4,6,7
X	US 2003/006633 A1 (CLOTHIER BRIAN L) 9 January 2003 (2003-01-09) abstract; figure 6	5
X	US 6 132 455 A (SHANG LI-JUN) 17 October 2000 (2000-10-17) column 2, line 44 - column 3, line 34; figures 1,2	3
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Further documents are listed in the continuation of box C. Patent family members are listed in annex.

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<p>*A* document defining the general state of the art which is not considered to be of particular relevance</p> <p>*E* earlier document but published on or after the international filing date</p> <p>*L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>*O* document referring to an oral disclosure, use, exhibition or other means</p> <p>*P* document published prior to the international filing date but later than the priority date claimed</p>	<p>*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>* & * document member of the same patent family</p>
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Date of the actual completion of the international search 12 November 2004	Date of mailing of the international search report 19/11/2004
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Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer <p style="text-align: center;">MacCormick, D</p>
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International Application No
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
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