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(54) **Heat storage material and its method of manufacturing.**

(57) The invention relates to a heat storage material, comprising: an immobilised phase change material (PCM), wherein the PCM is contained in at least on pouch, comprising at least one substantially flat face. The invention further relates to a method for the manufacture of a heat storage material comprising the following steps, to be executed in any suitable sequence: a) providing a first sheet of material, b) vacuum forming or embossing a multitude of dome shaped cups in a first portion of the first sheet material, c) filling the dome shaped cups with an encapsulated phase change material (PCM), d) providing a second sheet of material, e) covering the open sides of the dome shaped cups in the first sheet material with the second sheet material, f) applying a reduced pressure to the sheet materials and the PCM contained therein, g) sealing a second portion of the first sheet material surrounding the dome shaped cups to the second sheet material, such that pouches are formed, with a substantially flat surface.

NL C 2004246

Dit octrooi is verleend ongeacht het bijgevoegde resultaat van het onderzoek naar de stand van de techniek en schriftelijke opinie. Het octrooischrift komt overeen met de oorspronkelijk ingediende stukken.

Title: Heat storage material and its method of manufacturing.

The invention relates to heat storage material. More specifically, the invention relates to a heat storage material that uses the latent heat of melting and solidifying in order to maintain a surrounding temperature at a predetermined level.

Heat storage material is used in e.g. building material. The international application WO-A-00/11424 discloses for example a latent heat combined material. This material is manufactured from a porous building construction material, in which a phase change material (PCM) is incorporated in its liquid state by capillary forces.

A disadvantage of such material is that the PCM is not really having a fixed location, and when molten or dehydration water of the PCM can seep or sweat out of the construction material.

Alternatively first attempts have been performed with adding capsulated material into a matrix of concrete or gypsum. From various tests it appears that this solution was suboptimal because of the relative low thermal conductivity of these matrix materials, whereas in larger quantities, the PCM capsules within the material influenced the integrity of the material negatively.

Accordingly, even so with the capsulated PCM, a disadvantage remained the relative low latent heat capacity and the relative low thermal conductivity of the combined material.

Accordingly it is an object of the invention to mitigate or solve the above described and/or other problems of heat storage materials in the art, while maintaining and/or improving the advantages thereof. More specifically

an object of the invention can be to increase the heat storage capacity of the heat storage material, while the PCM material remains stabilised in its position.

These and/or other objects are achieved by A heat storage material, comprising an immobilised phase change material (PCM), wherein the PCM is contained in at least on pouch, comprising at least one substantially flat face.

By this arrangement, the heat storage material can be attached to a building material or structure. Thus the PCM can only be located as a cladding on the outside of the construction material. This provides an improved heat transfer and an improved exposure of the PCM, while the heat storage capacity remains high and while the structural integrity of the construction materials remains intact.

The heat storage material can further comprise a first sheet material, a second sheet material, wherein the first sheet material comprises a first portion, wherein the first portion is substantially flat, wherein the first sheet material comprises at least one second portion, wherein the at least one second portion is embossed or thermoformed in order to create a preferably dome shaped chamber which is suitable for containing material, wherein the first portion surrounds the at least one second portion, wherein the capsulated PCM is inserted in the second portion and the second sheet material is configured to cover and seal the first sheet material comprising the at least one second embossed or thermoformed portion, thus forming at least one PCM containing pouch.

Since the obtained pouches are substantially flat on one surface, they can practically be attached to any suitable surface. The attachment can be performed by applying a glue or, alternatively, the heat storage material itself can be provided with an attachment layer.

The heat storage material can comprise tear lines in the first portion of the first sheet material and/or the thereto attached first portion of the second sheet material.

Thus the separate pouches can easily be separated, without rupture of the pouches themselves. Additionally, by these perforated lines, the material can be torn in predetermined portions of heat storage material. Thus, the size of the individual portions can be designed and adapted to the specific sizes of the relevant construction material. If for instance a gypsum board is to be provided with the heat storage material, the size of a perforation dye can be adapted such that the width and the length of the heat storage material fits on the gypsum board without leaving uncovered spaces and without extending over the outer edges of the gypsum board.

The pressure of the PCM containing chambers of the heat storage material can be reduced to sub-atmospheric or can even as low as substantially vacuum. By applying a reduced pressure, the shape of the pouches is more stable and the conductive heat transfer can be optimised.

The invention further relates to a method for the manufacture of a heat storage material as described hereinabove, comprising the following steps, to be executed in any suitable sequence: a) providing a first sheet of material; b) vacuum forming or embossing a multitude of dome shaped cups in a first portion of the first sheet material; c) filling the dome shaped cups with an encapsulated phase change material (PCM); d) providing a second sheet of material; e) covering the open sides of the dome shaped cups in the first sheet material with the second sheet material; f) applying a reduced pressure to the sheet materials and the PCM contained therein; g) sealing a second portion of the first sheet material surrounding the dome shaped cups to

the second sheet material, such that pouches are formed, with at least one substantially flat surface.

By this method, the heat storage material as above described can be obtained. In order to attach the heat storage material, the substantially flat face of the heat storage material can be provided with an affixing layer. The affixing layer can be covered by a protective covering layer. The protective covering layer can be provided with an embossed pattern. Thus, the protective covering layer can be peeled off more practically.

In order to further elucidate the invention, exemplary embodiments will be described with reference to the drawing. In the drawing:

Figure 1 represents a schematic cross sectional side view of the heat storage material according to a first embodiment of the invention;

Figure 2 represents a schematic perspective view of a heat storage material according to a further embodiment of the invention;

Figure 3 represents a schematic perspective view of the lay out of the heat storage material according to figure 2;

Figure 4 represents a schematic perspective view of a continuous strip of heat storage material according to the embodiment shown in figure 2 and

Figure 5 represents a schematic sectional side view of a panel comprising the heat storage material according to the embodiment shown in figures 2-4.

The figures represent specific exemplary embodiments of the inventions and should not be considered limiting the invention in any way or form. Throughout the description and the figures the same or corresponding

reference numerals are used for the same or corresponding elements.

The expression “cladding” used herein is to be understood as, though not to be considered limited to a covering or overlaying material or composition, having a two dimensions, a length and a width that are considerably larger that its thickness.

The expression “heat storage material” used herein is to be understood as, though not to be considered limited to a substance or a composition with a relative high heat of fusion or dehydration which, is capable of reversible storing and releasing relative large amounts of energy. By choosing the appropriate composition of the heat storage material, a specific melting/fusion or dehydration temperature or a specific melting/fusion hydration/dehydration temperature range can be obtained. The heat storage capacity of PCM can be up to 14 times the heat storage capacity of conventional building materials such as brick, concrete or wood.

The expression “phase change material (PCM)” is to be considered a heat storage material as hereinabove defined.

The latent heat storage in PCM’s can be achieved by the heat of transformation from one phase into another. Examples for such phase changes are solid-solid, solid-liquid, solid-gas, liquid-gas and hydrated solid-dehydrated solid and water.

The material can be stabilized by encapsulation such that e.g. the PCM cannot migrate in the molten state or e.g. water cannot escape from a salt hydrate in its dehydrated state. Such materials re e.g. sold under the brand name Thermusol (c) by the company Capzo, based in Ootmarsum (Ov), the Netherlands. These materials are in

further detail described in the international application WO-A-2008153378, which is incorporated herein by reference in its entirety.

In figure 1, a cross sectional side view of a detail of a pouch 1 with encapsulated heat storage material 2 is presented. In this figure, the pouch 1 comprises a first sheet material 3 and a second sheet material 4, being sealed or glued together in a first portion 5 of the sheet material 3 and 4 and forming a pouch shaped chamber, in a second portion 6 of the sheet material 3 and 4. In the pouch section 6, an encapsulated phase change material 2 is contained. This van be a heat storage material as is described in WO-A-2008153378.

In figure 2, a band of heat storage material 7, comprising a multitude of pouches 1 is depicted. The band 7 comprises sections 10A-10L, each comprising an array of two pouches 1 wide and 12 pouches tall. In between the sections 10A-10L tear lines 8 and 9 are provided for a practical separation of the individual sections 10A-10L.

The tear lines are provided in the first portion 5 of the first 3 and/or the second 4 sheet material, such that after the applications of a tension force, a rupture of the material only occurs at the tear lines 8 and 9, leaving the sealed pouches in tact.

In figure 3 a schematic lay out plan for a perforation dye is presented. This lay out coincides with the pattern of tear lines 8 and 9 as presented in figure 2.

In figure 4 an endless band of heat storage material 7 is presented.

In figure 5 a cross sectional side view of an plate material such as an aluminium plate 11 is depicted. The plate 11 is provided with a first pouch layer 14 on a first side A of the plate and a second pouch layer 15 on a

second side B of the plate 11. The first pouch layer 14 comprises the pouches 1A and 1B, formed by the first sheet material 3A and the second sheet material 4A. The second pouch layer 15 comprises the pouches 1C and 1D, formed by the first sheet material 3B and the second sheet material 4B.

The pouches are glued on the flat side of the substantially flat layers 4A and 4B.

During manufacturing, the sheet material 3 can be for instance be vacuum formed, embossed, or blown.

The invention is to be understood not to be limited to the exemplary embodiments shown in the figures and described in the specification. For instance the arrays of pouches can be in any width-length combination, even such that every single pouch is surrounded by tear lines.

These and other modifications are considered to be variations that are part of the framework, the spirit and the scope of the invention outlined in the claims.

Clauses

1. A heat storage material, comprising:

- an immobilised phase change material (PCM);

wherein the PCM is contained in at least on pouch, comprising at least one substantially flat surface.

2. A heat storage material according to claus 1, comprising

- a first sheet material;

- a second sheet material;

wherein the first sheet material comprises a first portion,

wherein the first portion is substantially flat;

wherein the first sheet material comprises at least one second portion;

wherein the at least one second portion is embossed or thermoformed in order to create a chamber and is suitable for containing material;

wherein the first portion surrounds the at least one second portion;

wherein the immobilised PCM is inserted in the embossed portion;

and the second sheet material is configured to cover and seal the first sheet material comprising the at least one second embossed or thermoformed portion, thus forming at least one PCM containing pouch.

3. A heat storage material according to any of the preceding clauses, wherein the first portion of the first sheet material and/or the thereto attached first portion of the second sheet material comprise tear lines.

4. A heat storage material according to any of the preceding clauses, wherein in the PCM containing chamber a sub-atmospheric pressure resides.

5. A heat storage material according to claus 4, wherein the sub-atmospheric pressure is substantially vacuum.

6. Method for the manufacture of a heat storage material according to any of clauses 1-5, comprising the following steps, to be executed in any suitable sequence:

a) providing a first sheet of material;

b) vacuum forming or embossing a multitude of dome shaped cups in a first portion of the first sheet material;

c) filling the dome shaped cups with an encapsulated phase change material (PCM);

d) providing a second sheet of material;

e) covering the open sides of the dome shaped cups in the first sheet material with the second sheet material;

f) applying a reduced pressure to the sheet materials and the PCM contained therein;

g) sealing a second portion of the first sheet material surrounding the dome shaped cups to the second sheet material, such that pouches are formed, with a substantially flat surface.

7. Method according to claus 6, wherein the substantially flat face of the heat storage material is provided with a affixing layer.

8. Method according to clauses 6 or 7, wherein the affixing layer is covered by a protective covering layer.

9. Method according to claus 8, wherein the protective covering layer is provided with an embossed pattern.

10. Method according to any of clauses 6-9, comprising a step of providing at least one tear line in the first portion of the first and second sheet material in between the dome shaped cups.

Conclusies

1. Een warmteopslagmateriaal omvattend:

- een geïmmobiliseerd faseveranderingsmateriaal (PCM, Phase Change Material);

waarbij het PCM in ten minste één kussentje wordt gehouden omvattende ten minste één in hoofdzaak vlak oppervlak.

2. Een warmteopslagmateriaal volgens conclusie 1, omvattend:

- een eerste vliesmateriaal;
- een tweede vliesmateriaal;

waarbij het eerste vliesmateriaal een eerste deel omvat,

waarbij het eerste deel in hoofdzaak vlak is;

waarbij het eerste vliesmateriaal ten minste één tweede deel omvat;

waarbij het ten minste één tweede deel ingedrukt of onder warmtebehandeling is gevormd om een kamer te creëren en welk tweede deel geschikt is voor het houden van materiaal;

waarbij het eerste deel het ten minste ene tweede deel omsluit;

waarbij het geïmmobiliseerde PCM in het ingeperste deel wordt ingevoegd;

en het tweede vliesmateriaal is ingericht om het eerste vliesmateriaal omvattend het ten minste ene tweede ingeperste of onder warmtebehandeling gevormde deel zodanig dat ten minste één PCM houdend kussen is gevormd.

3. Een warmteopslagmateriaal volgens één van de voorgaande conclusies, waarbij het eerste deel van het eerste vliesmateriaal en/of het daaraan verbonden deel van het tweede vliesmateriaal scheurlijnen omvat.

4. Een warmteopslagmateriaal volgens één van de voorgaande conclusies, waarbij in de PCM omvattende kamer een druk heerst beneden de atmosferische druk.

5. Een warmteopslagmateriaal volgens de conclusie 4, waarbij de verlaagde druk in hoofdzaak vacuüm is.

6. Werkwijze voor de fabricage van een warmteopslagmateriaal volgens één van de conclusies 1-5, omvattende de volgende in geschikte volgorde uit te voeren stappen:

a) het verschaffen van een eerste vliesmateriaal;

b) het vacuüm vormen of indrukken van een veelvoud van koepelvormige cups in een eerste deel van het eerste vliesmateriaal;

c) het vullen van de koepelvormige cups met een ingekapselde fase veranderingsmateriaal (PCM, Phase Change Material);

d) het verschaffen van een tweede vliesmateriaal;

e) het bedekken van de open zijden van de koepelvormige cups in het eerste vliesmateriaal met het tweede vliesmateriaal;

f) het toepassen van een gereduceerde druk op de vliesmaterialen en de PCM die daarin wordt gehouden;

g) het afsluiten van een tweede deel van het eerste vliesmateriaal dat de koepelvormige cups omsluit aan het tweede vliesmateriaal, zodanig dat kussentjes worden gevormd, met een in hoofdzaak vlak oppervlak.

7. Werkwijze volgens conclusie 6, waarbij het in hoofdzaak vlakke oppervlak van het warmteopslagmateriaal is voorzien van een bevestigingslaag.

8. Werkwijze volgens de conclusies 6 of 7, waarbij de bevestigingslaag is bedekt met een beschermende deklaag.

9. Werkwijze volgens conclusie 8, waarbij de beschermende deklaag is voorzien van een ingeperst patroon.

10. Werkwijze volgens één van de conclusie 6-9, omvattend de stap van het verschaffen van ten minste één scheurlijn in een eerste deel van het eerste en het tweede vliesmateriaal tussen de koepelvormige cups.

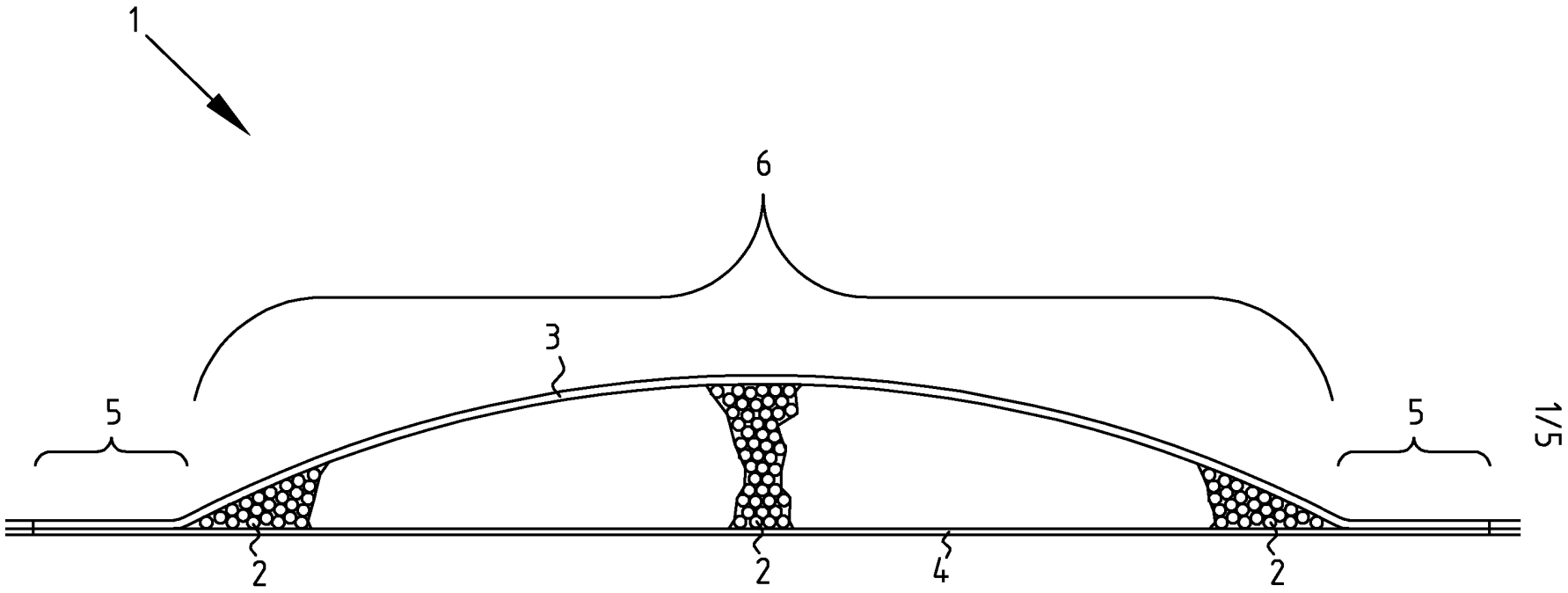


FIG. 1

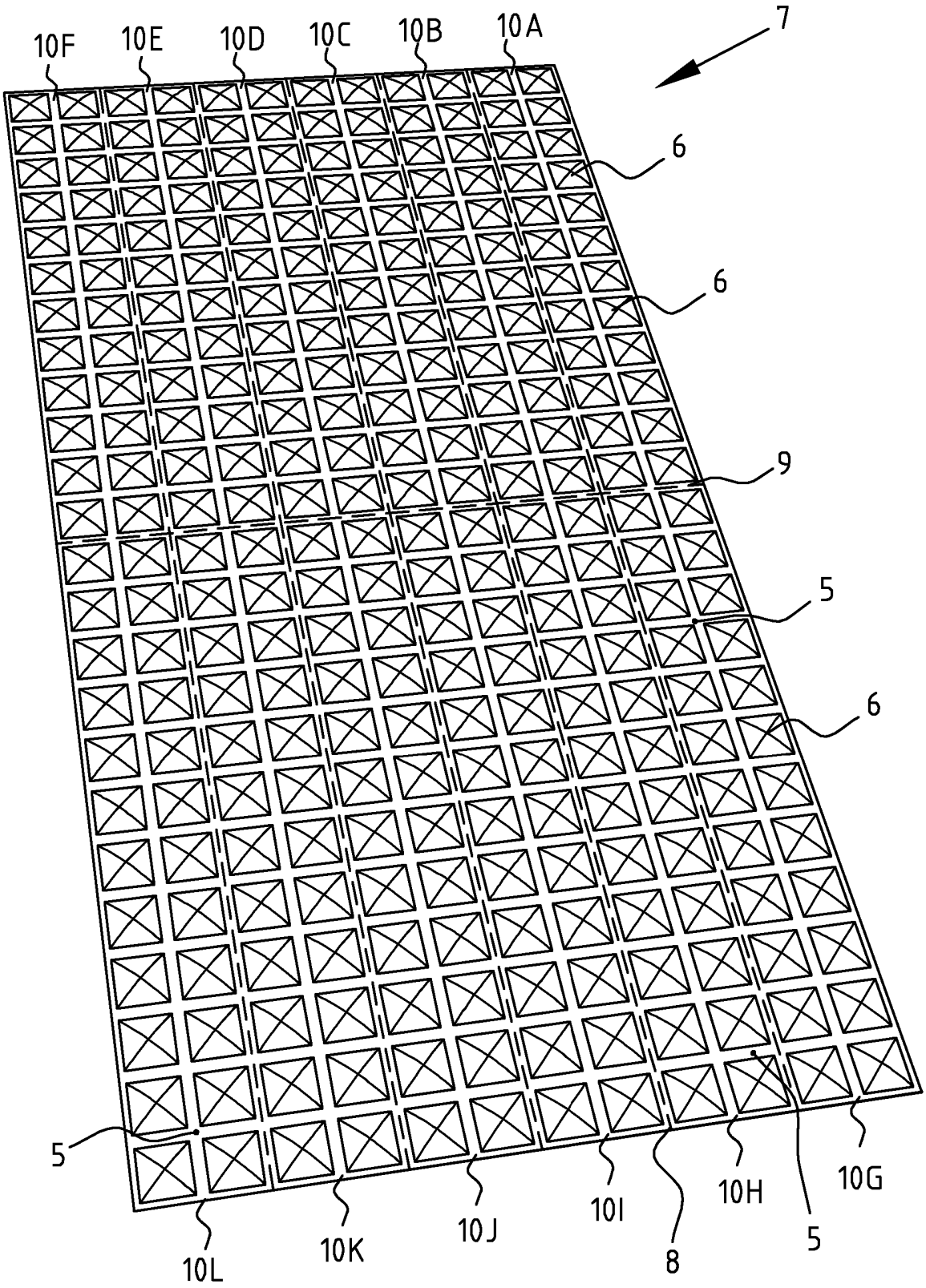


FIG. 2

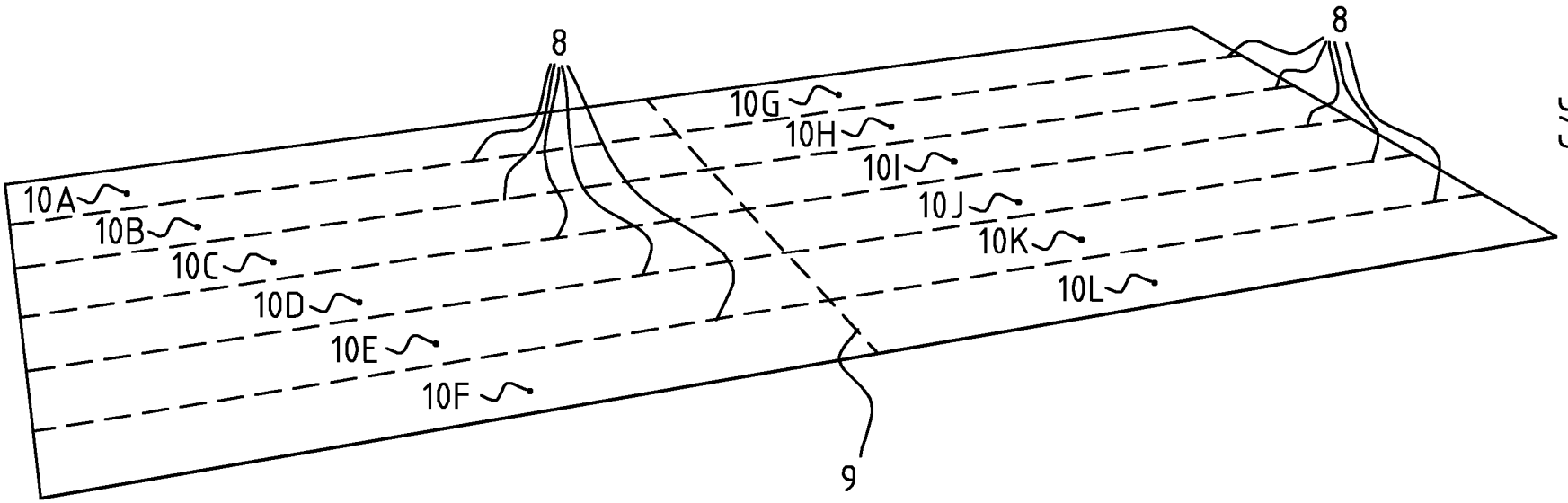


FIG. 3

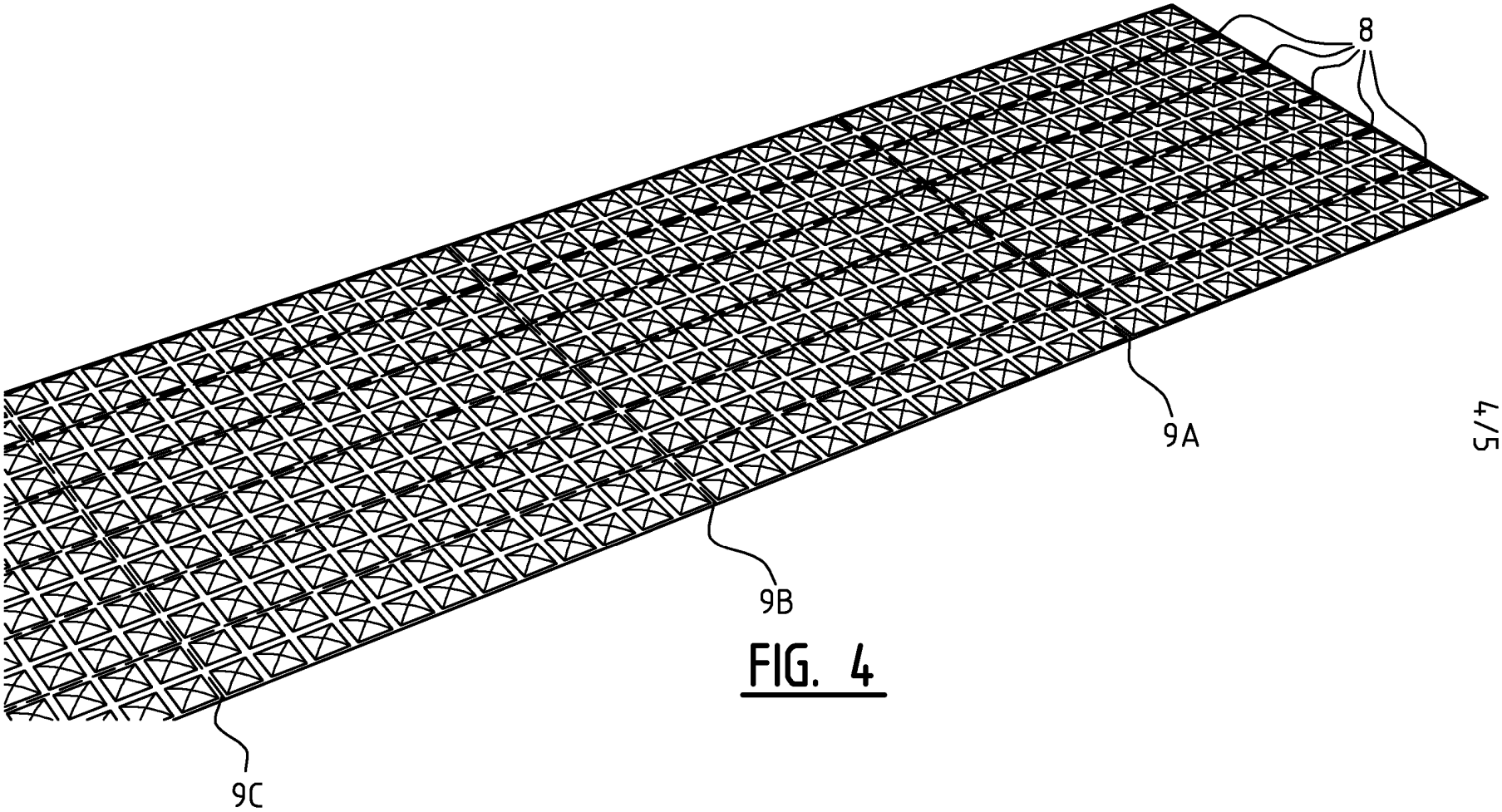


FIG. 4

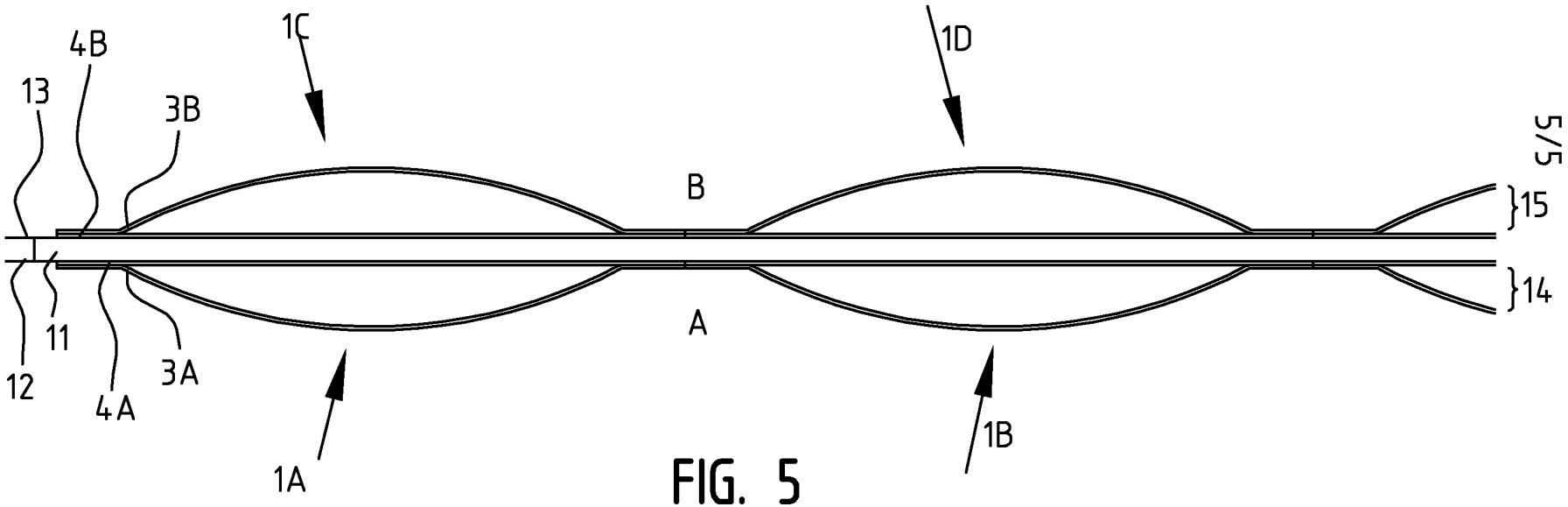


FIG. 5

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE
	3W/2IC77/MV/9
Nederlands aanvraag nr. **2004246**	Indieningsdatum **15-02-2010**
	Ingeroepen voorrangsdatum

Aanvrager (Naam)

L.G.J. Wolters Beheer Lichtenvoorde B.V.

Datum van het verzoek voor een onderzoek van internationaal type	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr.
26-06-2010	**SN 54434**

I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)

Volgens de internationale classificatie (IPC)

F28D20/02

II. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK

Onderzochte minimumdocumentatie

Classificatiesysteem	Classificatiesymbolen
IPC	**F28D C09K E04C A61F F24J**

Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

III.	☐	**GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES**	(opmerkingen op aanvullingsblad)
IV.	☐	**GEBREK AAN EENHEID VAN UITVINDING**	(opmerkingen op aanvullingsblad)

ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Nummer van het verzoek om een onderzoek naar de stand van de techniek
NL 2004246

A. CLASSIFICATIE VAN HET ONDERWERP
INV. F28D20/02
ADD.

Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.

B. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK

Onderzochte miminum documentatie (classificatie gevolgd door classificatiesymbolen)
F28D C09K E04C A61F F24J

Onderzochte andere documentatie dan de mimimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden)
EPO-Internal

C. VAN BELANG GEACHTE DOCUMENTEN

Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
X	WO 95/29057 A1 (GATEWAY TECHNOLOGY [US]) 2 november 1995 (1995-11-02)	1,2
Y	* samenvatting * * bladzijde 10, regel 32 - bladzijde 14, regel 27; figuren 6-8 *	3-10
Y	EP 0 076 897 B1 (STIFFLER MARIO) 7 mei 1986 (1986-05-07)	4-9
A	* kolom 4, regel 37 - kolom 6, regel 64; figuren 1-6 *	1
X	US 2006/233986 A1 (GUTSCHE BERNHARD [DE] ET AL) 19 oktober 2006 (2006-10-19)	1-3
Y	* alineas [0001], [0002], [0100] - [0118]; figuren 1,2 *	3,10

-/--

[X] Verdere documenten worden vermeld in het vervolg van vak C.

[X] Leden van dezelfde octrooifamilie zijn vermeld in een bijlage

° Speciale categorieën van aangehaalde documenten

"A" niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft

"D" in de octrooiaanvrage vermeld

"E" eerdere octrooi(aanvrage), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven

"L" om andere redenen vermelde literatuur

"O" niet-schriftelijke stand van de techniek

"P" tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur

"T" na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bezwarend is voor de octrooiaanvrage, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding

"X" de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur

"Y" de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geciteerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht

"&" lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie

Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid	Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type
4 november 2010	

Naam en adres van de instantie	De bevoegde ambtenaar
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Leclaire, Thomas

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ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Nummer van het verzoek om een onderzoek naar de stand van de techniek
NL 2004246

C.(Vervolg). VAN BELANG GEACHTE DOCUMENTEN

Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
X A	EP 1 947 411 A1 (HORWATH TIBOR G [US]; KOLOUCH SYLVIA [AT]) 23 juli 2008 (2008-07-23) * alinea [0008] - alinea [0032]; figuren 1-8 *	1,2 3,6-10
A	US 4 596 237 A (MELCHIOR BERND [DE] ET AL) 24 juni 1986 (1986-06-24) * kolom 4, regel 1 - kolom 5, regel 65; figuren 1-4 *	1,2,7-9
A	US 5 770 295 A (ALDERMAN ROBERT J [US]) 23 juni 1998 (1998-06-23) * kolom 1, regels 10-20 * * kolom 2, regel 66 - kolom 3, regel 20 * * kolom 5, regel 35 - kolom 6, regel 24 * * kolom 10, regel 39 - kolom 13, regel 28; figuren 5-8 *	1,2,6-8
A	US 4 931 333 A (HENRY D LINDLEY [US]) 5 juni 1990 (1990-06-05) * kolom 1, regels 10-17 * * kolom 4, regel 53 - kolom 5, regel 44 * * kolom 9, regel 42 - kolom 10, regel 26; figuren 5,10 *	1-6,10
A	US 5 435 376 A (HART RONALD L [US] ET AL) 25 juli 1995 (1995-07-25) * het gehele document *	1,6
A	DE 10 2008 004485 A1 (ZAE BAYERN [DE]) 16 juli 2009 (2009-07-16) * alineas [0001] - [0007], [0032], [0033] *	1,6

1

ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Informatie over leden van dezelfde octrooifamilie

Nummer van het verzoek om een onderzoek naar de stand van de techniek
NL 2004246

In het rapport genoemd octrooigeschrift	Datum van publicatie	Overeenkomend(e) geschrift(en)		Datum van publicatie
WO 9529057	A1 02-11-1995	AU	2362295 A	16-11-1995
		CA	2188053 A1	02-11-1995
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OCTROOICENTRUM NEDERLAND

WRITTEN OPINION

File No.	Filing date *(day/month/year)*	Priority date *(day/month/year)*	Application No.
SN54434	15.02.2010		NL2004246

International Patent Classification (IPC)
INV. F28D20/02

Applicant
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This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the application
- ☐ Box No. VIII Certain observations on the application

	Examiner
	Leclaire, Thomas

Application number

WRITTEN OPINION

NL2004246

Box No. I Basis of this opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:

   a. type of material:

   ☐ a sequence listing

   ☐ table(s) related to the sequence listing

   b. format of material:

   ☐ on paper

   ☐ in electronic form

   c. time of filing/furnishing:

   ☐ contained in the application as filed.

   ☐ filed together with the application in electronic form.

   ☐ furnished subsequently for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Yes:	Claims	4-10
	No:	Claims	1-3
Inventive step	Yes:	Claims	
	No:	Claims	1-10
Industrial applicability	Yes:	Claims	1-10
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

D1 WO 95/29057 A1 (GATEWAY TECHNOLOGY [US]) 2 november 1995 (1995-11-02)

D2 EP 0 076 897 B1 (STIFFLER MARIO) 7 mei 1986 (1986-05-07)

D3 US 2006/233986 A1 (GUTSCHE BERNHARD [DE] ET AL) 19 oktober 2006 (2006-10-19)

D4 EP 1 947 411 A1 (HORWATH TIBOR G [US]; KOLOUCH SYLVIA [AT]) 23 juli 2008 (2008-07-23)

The present application does not meet the criteria of patentability, because the subject-matter of claims 1 is not new, and the subject-matter of claim 6 is not inventive.

Claim 1

D1 discloses (cf. Fig. 6-8 and respective description) a heat storage material (50, 60, 70) comprising an phase change material (51, 61), wherein the PCM is contained in at least one pouch (52, 62), comprising at least one substantially flat surface (53, 65).

As mentioned on page 3 and page 14, the phase change material may be micro-encapsulated, so that the PCM is an immobilised PCM.

Hence, the subject-matter of claim 1 is already known from D1.

Further, D3 and D4, each, disclose such a material, whereby according to D3 and D4 the immobilisation of the PCM is realised by holding it in a sponge material inside the pouches.

Claim 6

D1 further discloses a method for the manufacture of a heat storage material (60) according to any of clauses 1-5, comprising the following steps, to be executed in any suitable sequence:

a) providing a first sheet of material (63);

b) vacuum forming or embossing a multitude of dome shaped cups (64) in a first portion of the first sheet material (63);

c) filling the dome shaped cups (64) with an encapsulated phase change material (61);

d) providing a second sheet of material (65);

e) covering the open sides of the dome shaped cups (64) in the first sheet material (63) with the second sheet material (65);

g) sealing a second portion of the first sheet material (63) surrounding the dome shaped cups (64) to the second sheet material (65), such that pouches (62) are formed, with a substantially flat surface.

Hence, the subject-matter of claim 6 differs from this known method in step

f) applying a reduced pressure to the sheet materials and the PCM contained therein.

This measure is already known from D2 (col. 6, lines 9-12) and would be applied to the method of D1 without inventive step. According to the teaching of D1, partial filling of the pouches is preferred (page 11, lines 1-5; page 12, lines 20-21) to allow expansion and contraction of the PCM during phase changes, while according to D2, the pouches are sealed under partial vacuum to form sealed cells with practically no air locks. The skilled person would chose from these known possibilities according to circumstances.

Dependent Claims

Dependent claims 2-5, and 7-10 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of novelty and/or inventive step, see documents D1-D4 and references applying to this documents cited in the search report.

D1 discloses a heat storage material (60) according to claim 1, comprising

- a first sheet material (63);

- a second sheet material (65);

wherein the first sheet material comprises a first portion,

wherein the first portion is substantially flat;

wherein the first sheet material comprises at least one second portion (64);

wherein the at least one second portion is embossed or thermoformed in order to create a chamber (62) and is suitable for containing material;

wherein the first portion surrounds the at least one second portion (64);

wherein the immobilised PCM (61) is inserted in the embossed portion (64);

and the second sheet material (65) is configured to cover and seal the first sheet material (63) comprising the at least one second embossed or thermoformed portion (64), thus forming at least one PCM containing pouch (62).

D3 also discloses (cf. Fig. 1 and 2, paragraphs 100-115) a heat storage material according to claims 1 and 2, wherein the first portion of the first sheet material and/or the thereto attached first portion of the second sheet material comprise tear lines (cf. paragraph 118).

Following the teaching of D2, a sub-atmospheric pressure resides in the PCM containing chamber, which may be substantially vacuum.

D1 further discloses (cf. page 13, line 1 to page 14, line 18) laminating protective layers to the substantially flat face of the heat storage material, so that the subject-matter of claims 7 and 8 is not new. The covering layer being provided with an embossed pattern does not seem to be inventive.

The tear line according to claim 10 is already known from D3 (paragraph 118), whereby the application of this feature to the method known from D1 does not include an inventive step, as the advantages when cutting the material from a roll (D1, page 12, lines 32-35) to a desired length is obvious.