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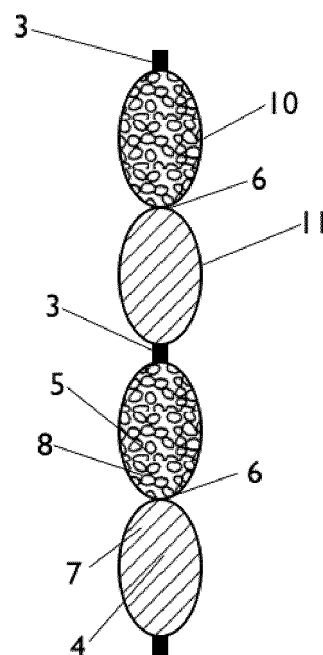
(72) Inventor: **Fatás Fernández, Paola**  
**50005 Zaragoza (ES)**

(74) Representative: **Lorca Melton, Miguel et al**  
**Balder**  
**Paseo de la Castellana 93**  
**28046 Madrid (ES)**

(71) Applicant: **Cool Everywhere SL**  
**50005 Zaragoza (ES)**

(54) **A self-heating or self-cooling pack**

(57) The present invention refers to an adaptable device comprising a plurality of elements, each element comprising a first containing means which is delimited by a first surface, and contains a first one or more reagent, in contact with or connected to a second containing means which is delimited by a second surface, and contains a second one or more reagent, wherein said first surface, said second surface or both, comprise rupturable means configured to, while maintaining the integrity of the rest of at least one of said surfaces, break upon pressure so as to produce a temperature changing reaction through contact between said first one or more reagent and said second one or more reagent, characterized in that said device comprises two or more elements and each element is separated by non-rupturable separating means configured to maintain integrity upon said pressure.



**Figure 2A**

## Description

### Field of the Invention

[0001] The present invention belongs to the field of self-heating and self-cooling devices, specially directed to provide heating or cooling means for solid and/or liquids such as, for example, cosmetics, injured tissue, beverages and food.

### Background of the Invention

[0002] Self-heating and self-cooling devices, commonly known as "hot pack" or "cold pack", respectively, are useful when no heating or cooling sources are available. They typically act by exerting their heating or cooling capacity through exothermic or endothermic reactions, respectively. In their most general configuration, they include a cavity with a liquid, usually water, separated from another cavity that contains chemical products. When squeezing both cavities they break and the liquid and chemical products are mixed reacting in an endothermic or exothermic reaction. Further additives such as gels, phase exchangers or anti-freezers are used, which stabilize temperature or provide longer heating times. Some examples of such cold packs are described in US 3,977,202 A, US 3,874,504 A, US 6,644,383 B2, US 3,804,077 A. A further example is represented by US 5,984,953, which describes a heating pack with two reagent systems separated in two zones by rupturable separators. Several pairs of zones may be provided, but they are always separated by rupturable separators, all contents of the pack being mixed upon operation, potentially resulting in messy operation, lack of adaptability and heterogeneous heating.

[0003] Current cold packs still require improvement. They comprise rigid structures with a single reaction cavity, usually specifically designed for a specific product, which are not adaptable enough and/or entail complicated systems which are expensive to manufacture. For example, some efforts have been directed to improve the efficiency of heat exchange by integrating the heating or cooling system within the object (WO 2012/113,479 A1, DE 102008015677 A1). These systems are however expensive and lack versatility, as they are specifically designed for each product.

[0004] Recent products using this philosophy are characterized by defining an inner rigid cavity configured to receive the content of the container, and defining a further external cavity separated from the internal cavity and extending inside the peripheral wall and having a second element comprising activating means (DE 1986/0944 A1, US 8,001,959 B2, US 4,895,135 A, ES 2 183 784). These rigid containers typically use heat conducting materials, such as aluminum or other metals and thus lack flexibility.

## Brief Description of the Invention

[0005] In the search of an improved design for hot and cold packs the inventor has arrived to an adaptable device which overcomes the problems of existing products. The adaptable device of the invention provides a surprisingly fast and efficient heat exchange, while significantly reducing production costs.

[0006] According to a first aspect, the present invention refers to an adaptable device comprising a plurality of elements, each element comprising a first containing means which is delimited by a first surface, and contains a first one or more reagent, in contact with or connected to a second containing means which is delimited by a second surface, and contains a second one or more reagent, wherein said first surface, said second surface or both, comprise rupturable means configured to, while maintaining the integrity of the rest of at least one of said surfaces, break upon pressure so as to produce a temperature changing reaction through contact between said first one or more reagent and said second one or more reagent, characterized in that said device comprises two or more elements and each element is separated by non-rupturable separating means configured to maintain integrity upon said pressure.

[0007] Thus, each of the plurality of elements acts independently, the content of each first containing means mixing only with the contents of the corresponding second containing means separated by the rupturable means; each element being separated from other elements by non-rupturable separating means. The division of the reacting liquids or chemical products in a plurality of independent first and second containing means provide flexibility for a better fit to the shape of the product, requiring the use of less product and leads to a faster and more homogeneous reaction. Further, such flexibility and better fit provides a greater contact surface, and thus heat or chill with greater efficiency. Even further, said plurality of elements provide shorter mixing times between the first and second one or more reagent. Such effects synergistically provide a far more efficient device in terms of heating/cooling time, energy transfer and manufacturing costs.

[0008] A further aspect of the invention includes a method of heating or cooling an object comprising contacting said object with an adaptable device of the invention, and then exercising pressure so as to break at least one of said rupturable separating means.

[0009] A further aspect of the invention is the use of the adaptable device of the invention to cool or to heat an object.

## Brief Description of the Figures

[0010]

Figure 1A displays a plurality of elements (1) prior to their activation according to an embodiment

wherein the first containing means (4) delimited by a first surface (11) and the second containing means (5) delimited by a second surface (10), share rupturable means (6).

**Figure 1B** displays a plurality of elements (1) prior to their activation according to an embodiment wherein the first containing means (4) delimited by a first surface (11) completely contains the second containing means (5) delimited by a second surface (10).

**Figure 1C** displays the plurality of elements (1) of figures 1A or 1B after activation, where the non-rupturable separation means (3) are unchanged and the rupturable separating means have broken allowing the contents of the first containing means (4) and the contents of the second containing means (5) to mix.

**Figure 2A** displays the cross-section view of the same plurality of elements (1) of figure 1A.

**Figure 2B** displays the cross-section view of the same plurality of elements (1) of figure 2B.

**Figure 2C** displays the cross-section view of the same plurality of elements (1) of figure 2C.

**Figure 3** represents one of the elements of figure 1A.

### Detailed Description of the Invention

**[0011]** The device of the present invention allows different configurations of said first and second containing means. For example, the first containing means and the second containing means may share the rupturable means (6) as shown in figures 1A, 2A, 1C, 2C and 3, which upon pressure breaks and allows contact between said first one or more reagent (7) and said second one or more reagent (8), and thus initiating the endothermic or exothermic reaction. Upon breakage of the rupturable means (6), the first (11) and second surface (10), as well as the non-rupturable separating means (3), maintain their integrity and form a new containing means (9) resulting from the combination of the first and second surfaces. Thus, according to an alternative embodiment, the present invention is an adaptable device comprising a plurality of elements (1), each element comprising a first containing means (4) which is delimited by a first surface (11), and contains a first one or more reagent (7), and a second containing means (5) which is delimited by a second surface (10), and contains a second one or more reagent (8), said first (11) and second (10) surfaces sharing rupturable means (6) configured to, while maintaining the integrity of the rest of said first (11) and second (10) surfaces, break upon pressure and allow contact between said first one or more reagent (7) and said second one or more reagent (8) so as to produce a temperature

changing reaction, characterized in that said device comprises two or more elements (1) and each element is separated by non-rupturable separating means (3) configured to maintain integrity upon said pressure.

**[0012]** In a further alternative embodiment represented in figures (1B, 2B, 1C and 2C), the first containing means (4) of each element contains said second containing means (5). According to this embodiment the second containing means (5) breaks upon pressure through the rupturable means (6). In this case the first containing means (4) maintain their integrity in order to host the temperature changing reaction between the first (7) and second one or more reactants and/or liquids (8). Thus, in this embodiment the rupturable means (6) can extend through the second surface (10) as long as the first surface (11) and the non-rupturable separating means (3) that separate each of the elements (1) do not break. The present invention also refers to an adaptable device comprising a plurality of elements (1), each element (1) comprising a first containing means (4) which is delimited by a first surface (11), and contains (i) a first one or more reagent, (7) and also contains (ii) a second containing means (5) which is delimited by a second surface (10), and contains a second one or more reagent (8), said second surface (10) comprising rupturable means (6) upon pressure while maintaining the integrity of said first surface (11) and the rest of said second surface (10) so as to produce a temperature changing reaction through contact between said first one or more reagent (7) and said second one or more reagent (8), characterized in that said device comprises two or more elements (1) and each element is separated by non-rupturable separating means (3) configured to maintain integrity upon said pressure.

**[0013]** The element (1) is designed so that said rupturable means (6) break solely by the pressure applied, without requiring any further breaking means. No further puncturing means are required, allowing for a clean and simple way to manufacture the adaptable device of the invention which can adapt to virtually any surface. Thus, the same device is suitable for any kind of product to be heated or cooled, taking advantage of scale economies in its manufacture. The device of the invention is especially advantageous due to the close fit it provides, without the need of special configurations.

**[0014]** The first (11) and second (10) surfaces can be made of any material that can maintain integrity upon pressure, and the skilled person can provide different configurations depending on the final use given to the elements (1) of the device of the invention. It is always advantageous to provide materials with optimal heat transfer properties and which allow the best fit to objects. It also preferable that the mixture formed between said first one or more reagent (7) and said second one or more reagent (8) when activating the device is as close and fit to the product as possible. This may be achieved by providing a configuration which maximizes the content of the new containing means (9) formed, and minimizes formation of air bags, which dissipate heat or cold and re-

duce heat transfer between the device of the invention and the object. In order to achieve this objective the first (4) and second containing (5) means will be usually filled to their maximum capacity. In this way, the heat transfer is optimized while maintaining adaptability to the object. According to an embodiment of the invention, said first (11) and second (10) surfaces are made of plastic, which provides an economic and convenient alternative. Examples of suitable plastics can be selected from the group consisting of polyethylene, polypropylene, polyamides, polyesters, aluminum, other metallized materials, and mixtures thereof. The material used is flexible so as to fit the surface of the product to be heated or cooled and thus maximize the contact surface. It should also be considered that heat transfer is improved with increasing intrinsic heat conductivity of the material of the first (11) and second (10) surface and with diminishing thickness. According to an alternative embodiment of the invention, the adaptable device of the invention comprises an inner face, for contact with the object, and an opposite outer face. According to such embodiment, both faces can be made of different materials with different conductivities so as to favor the energy exchange with the object, while isolating from the exterior, and thus improving the overall efficiency of the device. For example, the inner face can be made of a highly conductive material, such as aluminum or a metallized material, and the opposite outer face of a less conducting material, such as polyethylene or polyethylene. A similar effect may be achieved by using the same material on both faces, but with different thicknesses, i.e. with a thinner inner face.

**[0015]** Different chemical systems are known which provide and appropriate endothermic or exothermic reaction and the present invention may use any of them. The term "reaction" should be understood, not only as a process by which new chemical products are created by breakage and formation of bonds, but also as any processes which involves changes in said first and second one or more reagent. Non limiting examples are redox or acid base reactions, as well as mixing processes, dilution, solution, phase changes, absorption, adsorption, changes in electronic states, or changes in crystal structures. Said first and second reagent can be independently chosen from any physical state as long as they can both sufficiently mix upon activation. Such physical states can be, but are not limited to, fluids such as liquids, gels or gases, or solids whether amorphous or crystalline, and also include slurries and suspensions. According to an embodiment of the invention, said first one or more reagent (7) comprises is selected from the group consisting of urea, ammonium chloride, ammonium nitrate, potassium nitrate, sodium chloride, starch, calcium chloride, trihydrate sodium acetate, calcium oxide, hexadecan, vegetable oils and mixtures thereof, while said second one or more reagent (8) comprises a liquid selected from the group consisting of water, polyethyleneglycol, ethyleneglycol, diluted acids, such as hydrochloric acid, and diluted bases, such as sodium hydroxide. Preferred com-

binations of the invention are those wherein said first one or more reagent (7) comprises ammonium chloride and/or urea and said second one or more reagent (8) comprises water. The chemical system of the invention may additionally comprise chemicals such as gel forming reagents, phase transfer exchangers, anti-freezers, chemo-luminescent reagents or colorants.

**[0016]** It is preferred that said first containing means (4) and/or said second containing means (5) are completely full with their respective one or more reagent. This provides a more efficient use of the volumes and heat transfer.

**[0017]** The activation of the element (1) to produce heat or cold takes place when pressure is exerted over the first containing means (4) and/or the second containing means (5) by which the rupturable means (6) is broken allowing the first one or more reagent (7) to mix with the second one or more reagent (8), while maintaining the integrity of the first (11) and second (10) surfaces. Pressure may be exerted by a person in the need to heat or cool and object or by any other means, such as torsion, compression, distortion or vacuum.

**[0018]** Two or more elements (1) are used simultaneously in association so as to generate a heating or cooling device according to the invention. According to an alternative embodiment, the device of the invention comprises three or more elements (1), alternatively four or more. In an alternative embodiment, the device of the invention comprises five or more elements (1) or six or more elements (1). According to an alternative example, the device comprises between 3 and 20 elements (1). The elements (1) forming the device may have different sizes and shapes depending on the use to be given. When pressure is exerted, the plurality of rupturable means (6) present in the device break, allowing each of the plurality of first one or more reagent (7) to mix with its corresponding second one or more reagent (8), while maintaining the integrity of the first (11) and second surfaces (10). Under these operating conditions, each of the non-rupturable separating means (3) maintains its integrity isolating each element (1) and preventing the containing means with the same content (and thus not producing exothermic or endothermic reaction) to mix. In this way fast and homogeneous reaction is obtained throughout the surface of the object. Such objects can be plates, plastic food containers, bottles, glasses, jars or cans.

**[0019]** In order to facilitate simultaneous breakage of the plurality of the rupturable means (6), the device of the invention may comprise support means or jacket. Said support means can be smooth or textured and extends to part of the plurality of elements (1) or completely extends over the totality of said plurality of elements (1). When pressure is exerted upon the device, said support means evenly distributes said pressure and facilitates breakage of all or part of the plurality of rupturable means (6). According to a preferred embodiment, said support means is selected from the group consisting of plastic, neoprene, paper, cardboard, wood, metallized plastic,

metallized films or combinations thereof.

**[0020]** The support means is further advantageous because it thermally isolates the object-device system while heat transfer takes place. This heats or cools more efficiently the object for a longer time. Further, the support prevents contact between the device and the skin, making the usage experience more pleasant. An even further advantage of the support means is preventing accidental activation of the device before it is used.

**[0021]** At least one of the plurality of elements (1) which constitute the device of the invention may contain attachment means in order to better fix it to the object. In an alternative embodiment, the elements (1) may comprise attachment means between the object and the support means. Thus, according to an embodiment, the device comprises attachment means between one or more elements (1) and said support means. Attachment to the support means helps preventing collapse of the adaptable device when contacted with the object, thus acting as guide when the adaptable device of the invention is contacted with the object to be cooled or heated. This is especially useful when the adaptable device of the invention provides a cavity in which the object (e.g. a bottle or a can) is inserted. Such attachment means may comprise adhesive means for better adherence to the object to be heated or cooled. Thus, according to an embodiment of the invention, at least one of said first (11) and second (10) surfaces comprise adhesive means. At least one of said first (11) and second (10) surfaces is partially or totally covered by an adhesive material, preferably an adhesive film. In an alternative embodiment, the device is totally or partially covered by an adhesive film in one or both faces thereof. In a further embodiment, said first and/or second surfaces are made of an adhesive material. Due to ease of manufacture it is preferred to use non-adhesive materials in the manufacture of said first and second containing means and then apply an adhesive film.

**[0022]** The device of the invention is easy to manufacture and to transport. The device, and support means or jacket, if any, can be folded after manufacture in order to facilitate its transport, and can be unfolded by exerting an appropriate pressure when ready to use, creating a cavity wherein the object can be placed. Thus, the device can be given different shapes depending on the final use. For example, it can form a rectangular shape which can be wrapped around the object either when manufactured or before use. Also the elements (1) can have different shapes. In a preferred embodiment they have are longitudinal bars with elliptic or substantially flat cross-section once filled. Said longitudinal elements are according to an alternative embodiment sealed thereby creating non-rupturable separating means (3) to form rectangular pouches, in a mosaic which can be thereafter be cut to the appropriate shape.

**[0023]** Many different manufacturing means are possible for the adaptable device of the invention. An essentially rectangular configuration such as that shown in the

figures of the present invention is especially advantageous because its ease of manufacture. The mosaic of elements (1) which make the adaptable device of the invention can be manufactured with a vertical multi lane packaging machine by appropriate sealing in each case with rupturable and non-rupturable closures.

## Claims

1. An adaptable device comprising a plurality of elements, each element comprising a first containing means which is delimited by a first surface, and contains a first one or more reagent, in contact with or connected to a second containing means which is delimited by a second surface, and contains a second one or more reagent, wherein said first surface, said second surface or both, comprise rupturable means configured to, while maintaining the integrity of the rest of at least one of said surfaces, break upon pressure so as to produce a temperature changing reaction through contact between said first one or more reagent and said second one or more reagent, **characterized in that** said device comprises two or more elements and each element is separated by non-rupturable separating means configured to maintain integrity upon said pressure.
2. The adaptable device according to claim 1, comprising a plurality of elements, each element comprising a first containing means which is delimited by a first surface, and contains a first one or more reagent, and a second containing means which is delimited by a second surface, and contains a second one or more reagent, said first and second surfaces sharing rupturable means configured to, while maintaining the integrity of the rest of said first and second surfaces, break upon pressure and allow contact between said first one or more reagent and said second one or more reagent so as to produce a temperature changing reaction, **characterized in that** said device comprises two or more elements and each element is separated by non-rupturable separating means configured to maintain integrity upon said pressure.
3. The adaptable device according to claim 1, comprising a plurality of elements, each element comprising a first containing means which is delimited by a first surface, and contains (i) a first one or more reagent, and also contains (ii) a second containing means which is delimited by a second surface, and contains a second one or more reagent, said second surface comprising rupturable means upon pressure while maintaining the integrity of said first surface and the rest of said second surface so as to produce a temperature changing reaction through contact between said first one or more reagent and said second one

or more reagent, **characterized in that** said device comprises two or more elements and each element is separated by non-rupturable separating means configured to maintain integrity upon said pressure.

4. The adaptable device according to any of claims 1 to 3 comprising support means.
5. The adaptable device according to claim 4, wherein said support means is selected from the group consisting of plastic, neoprene, paper, cardboard, metallized plastic, metallized films or combinations thereof.
6. The adaptable device according any of claims 4 or 5 comprising attachment means between one or more of said elements and said support means.
7. The adaptable device according to claim 6 wherein at least one of said first and second surfaces comprise adhesive means.
8. The adaptable device according any of claims 1 to 3 wherein at least one element comprises attachment means.
9. The adaptable device according to any of the previous claims, wherein said rupturable separating means are designed to rupture solely by the pressure applied without requiring any further breaking means.
10. The adaptable device according to any of the previous claims, wherein said first and second surfaces are made of plastic.
11. The adaptable device according to claim 9, wherein said first and second surfaces are made of a plastic selected from the group consisting of polyethylene, polypropylene, polyamides, polyesters and mixtures thereof.
12. The adaptable device according to any of the previous claims, wherein said first one or more reagent is selected from the group consisting of urea, ammonium chloride, ammonium nitrate, potassium nitrate, sodium chloride, starch, calcium chloride, trihydrate sodium acetate, calcium oxide, hexadecan, vegetable oils and mixtures thereof, while said second one or more reagent comprises a liquid selected from the group consisting of water, polyethyleneglycol, ethyleneglycol, diluted acids and diluted bases.
13. Method for cooling or heating an object comprising contacting said object with an adaptable device as defined in any of claims 1 to 12, and then exercising pressure so as to break at least one of said rupturable separating means.

14. Method according to claim 13, wherein said solid is selected from the group consisting of plates, plastic food containers, bottles, glasses, jars and cans.

- 5 15. Use of the adaptable device as defined in any of claims 1 to 12 to cool or to heat a solid or liquid.

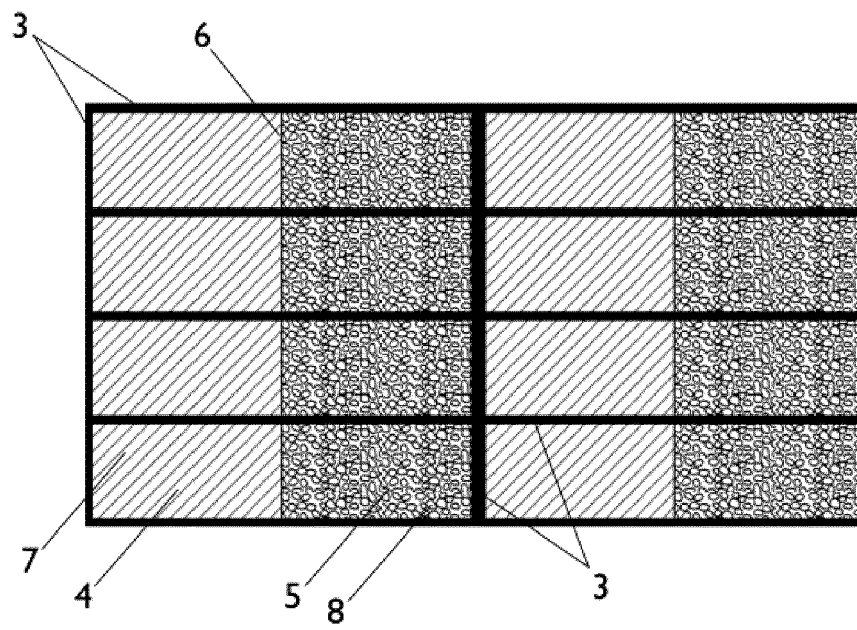


Figure 1A

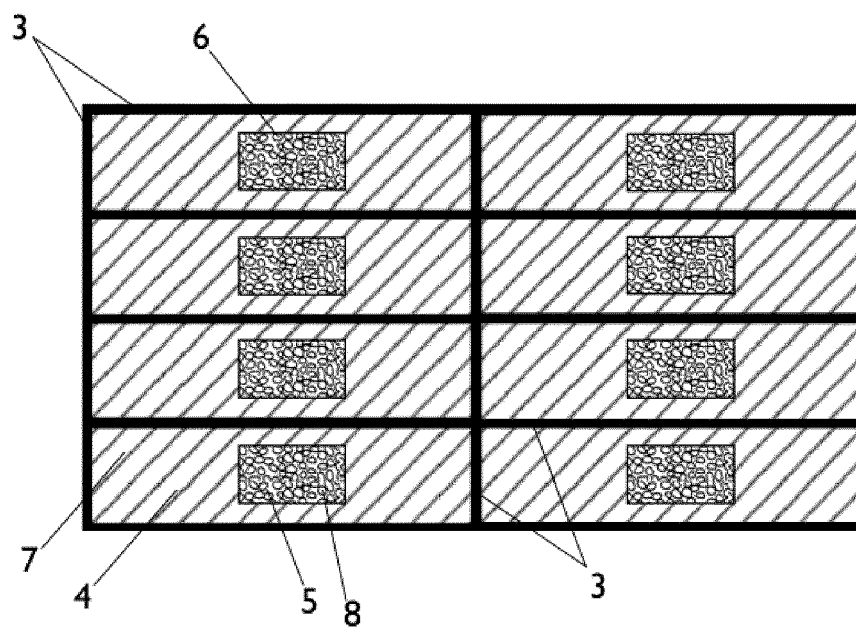


Figure 1B

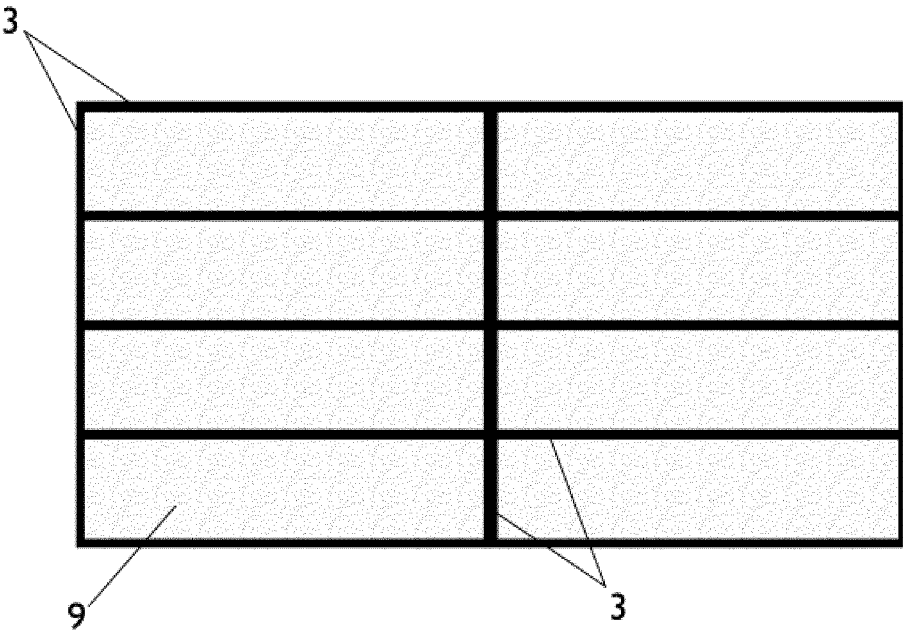


Figure 1C

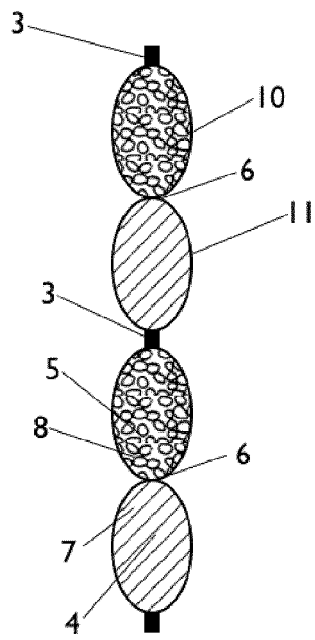


Figure 2A

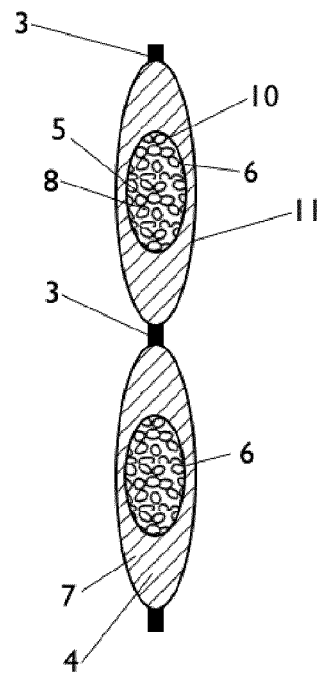


Figure 2B

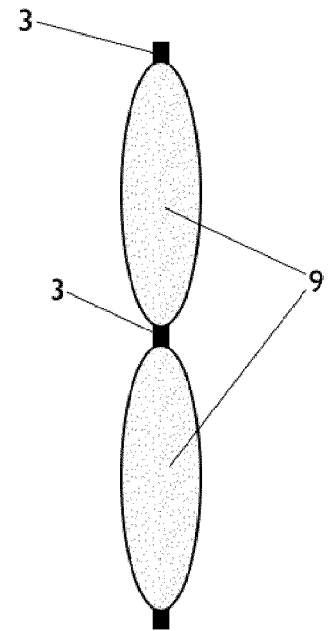


Figure 2C

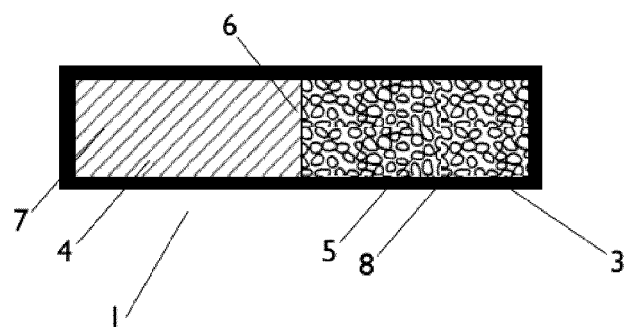


Figure 3



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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                            |                                                         |                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------------------|
| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Citation of document with indication, where appropriate, of relevant passages                                                                              | Relevant to claim                                       | CLASSIFICATION OF THE APPLICATION (IPC)                                                |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | US 2001/008072 A1 (KOHOUT DANIEL J [US])<br>19 July 2001 (2001-07-19)                                                                                      | 1,9-15                                                  | INV.<br>F24J1/00                                                                       |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | * abstract *<br>* paragraph [0036]; figure 7 *<br>* paragraph [0043] - paragraph [0053] *<br>* paragraph [0056] *<br>* paragraph [0060] *                  | 2-8                                                     |                                                                                        |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | US 6 524 331 B1 (KOHOUT DANIEL [US] ET AL)<br>25 February 2003 (2003-02-25)<br>* column 5, line 14 - column 6, line 38;<br>claims 1-3; figures 5A, 5B, 7 * | 1,3-5,<br>8-15                                          |                                                                                        |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | WO 97/39708 A2 (ALLEGIANCE CORP [US])<br>30 October 1997 (1997-10-30)<br>* page 5, line 1 - page 7, line 25;<br>figures 1,2,4, 6, 7, 8 *                   | 1-15                                                    |                                                                                        |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | US 2003/116452 A1 (SARIC JERKO [CA] ET AL)<br>26 June 2003 (2003-06-26)<br>* paragraph [0052] - paragraph [0077];<br>claims 8-11; figures 3A-3D, 5 *       | 1,2,4,<br>13,15                                         |                                                                                        |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | EP 1 079 773 A1 (TEMPRA TECH INC [US])<br>7 March 2001 (2001-03-07)<br>* page 4 - page 16; figures 1-4 *                                                   | 2                                                       |                                                                                        |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | US 3 804 077 A (WILLIAMS V)<br>16 April 1974 (1974-04-16)<br>* abstract; figures 2, 2A *<br>* column 2, line 53 - column 6, line 24 *                      | 2                                                       | TECHNICAL FIELDS<br>SEARCHED (IPC)<br><br>F24J<br>C09K<br>A61F<br>F25D<br>B65D<br>A47L |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | US 2010/126492 A1 (ST ETIENNE ROSELYN [US])<br>27 May 2010 (2010-05-27)<br>* abstract; figures 1-4 *<br>* paragraph [0003] - paragraph [0014] *            | 3-8                                                     |                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                            | -/--                                                    |                                                                                        |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                            |                                                         |                                                                                        |
| Place of search<br><b>The Hague</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                            | Date of completion of the search<br><b>13 June 2014</b> | Examiner<br><b>Berkus, Frank</b>                                                       |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |                                                                                                                                                            |                                                         |                                                                                        |

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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                              |                                                  |                                         |                                 |
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| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Citation of document with indication, where appropriate, of relevant passages                                                | Relevant to claim                                | CLASSIFICATION OF THE APPLICATION (IPC) |                                 |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | US 2007/157921 A1 (RANKIN RONALD C [US])<br>12 July 2007 (2007-07-12)<br>* figures 1,4, 5a-5c *                              | 1-15                                             |                                         |                                 |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | US 2009/090349 A1 (DONOVAN JAMES A [US])<br>9 April 2009 (2009-04-09)<br>* the whole document *                              | 1-15                                             |                                         |                                 |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | US 2002/046566 A1 (LIAO WEN HU [TW])<br>25 April 2002 (2002-04-25)<br>* abstract; figures 1,2 *                              | 1-15                                             |                                         |                                 |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | DE 22 19 332 A1 (BOWATER PACKAGING LTD)<br>1 February 1973 (1973-02-01)<br>* the whole document *                            | 1-15                                             |                                         |                                 |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | GB 1 383 536 A (KAY LABORATORIES INC)<br>12 February 1974 (1974-02-12)<br>* the whole document *                             | 1-15                                             |                                         |                                 |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | US 7 021 848 B1 (GRUENBACHER DANA PAUL [US] ET AL)<br>4 April 2006 (2006-04-04)<br>* the whole document *                    | 1-15                                             |                                         | TECHNICAL FIELDS SEARCHED (IPC) |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | EP 1 164 092 A2 (ZANINELLI MAURO [IT] PERISSINOTTO RAFFAELE [IT])<br>19 December 2001 (2001-12-19)<br>* the whole document * | 1-15                                             |                                         |                                 |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | US 2007/150033 A1 (JOHNSON CHERLIN [US] ET AL)<br>28 June 2007 (2007-06-28)<br>* the whole document *                        | 1-15                                             |                                         |                                 |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | US 2003/118779 A1 (FISH JEFFREY E [US] ET AL)<br>26 June 2003 (2003-06-26)<br>* the whole document *                         | 1-15                                             |                                         |                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                              | -/--                                             |                                         |                                 |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                              |                                                  |                                         |                                 |
| Place of search<br>The Hague                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                              | Date of completion of the search<br>13 June 2014 | Examiner<br>Berkus, Frank               |                                 |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |                                                                                                                              |                                                  |                                         |                                 |

EPO FORM 1503 03.02 (P04C01)



## EUROPEAN SEARCH REPORT

Application Number  
EP 14 15 1695

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                          |                                                                                                                                               |                                  |                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-----------------------------------------|
| Category                                                                                                                                                                                                                                                                     | Citation of document with indication, where appropriate, of relevant passages                                                                 | Relevant to claim                | CLASSIFICATION OF THE APPLICATION (IPC) |
| A                                                                                                                                                                                                                                                                            | US 2006/081000 A1 (TRINH DENNIS S [US] ET AL TRINH DENNIS SAM [US] ET AL)<br>20 April 2006 (2006-04-20)<br>* the whole document *             | 5-8                              |                                         |
| A                                                                                                                                                                                                                                                                            | US 2006/289565 A1 (MANZO STEPHEN [US] ET AL) 28 December 2006 (2006-12-28)<br>* the whole document *                                          | 1-15                             |                                         |
| A                                                                                                                                                                                                                                                                            | WO 2007/059122 A1 (HEAT WAVE TECHNOLOGIES LLC [US]; FORD JOHN M B [US]; LUND DOUGLAS M [U] 24 May 2007 (2007-05-24)<br>* the whole document * | 1-15                             |                                         |
|                                                                                                                                                                                                                                                                              |                                                                                                                                               |                                  | TECHNICAL FIELDS SEARCHED (IPC)         |
|                                                                                                                                                                                                                                                                              |                                                                                                                                               |                                  |                                         |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                   |                                                                                                                                               |                                  |                                         |
| Place of search                                                                                                                                                                                                                                                              |                                                                                                                                               | Date of completion of the search | Examiner                                |
| The Hague                                                                                                                                                                                                                                                                    |                                                                                                                                               | 13 June 2014                     | Berkus, Frank                           |
| CATEGORY OF CITED DOCUMENTS                                                                                                                                                                                                                                                  |                                                                                                                                               |                                  |                                         |
| X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document                                                      |                                                                                                                                               |                                  |                                         |
| T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |                                                                                                                                               |                                  |                                         |

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 15 1695

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

13-06-2014

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s)                                                                                                                                                                                                             | Publication<br>date                                                                                                                                                                              |
|-------------------------------------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| US 2001008072 A1                          | 19-07-2001          | NONE                                                                                                                                                                                                                                   |                                                                                                                                                                                                  |
| US 6524331 B1                             | 25-02-2003          | NONE                                                                                                                                                                                                                                   |                                                                                                                                                                                                  |
| WO 9739708 A2                             | 30-10-1997          | US 6248125 B1<br>US 2001018605 A1<br>WO 9739708 A2                                                                                                                                                                                     | 19-06-2001<br>30-08-2001<br>30-10-1997                                                                                                                                                           |
| US 2003116452 A1                          | 26-06-2003          | CA 2363979 A1<br>US 2003116452 A1                                                                                                                                                                                                      | 26-05-2003<br>26-06-2003                                                                                                                                                                         |
| EP 1079773 A1                             | 07-03-2001          | AT 316775 T<br>AU 748548 B2<br>BR 9910591 A<br>CA 2333295 A1<br>CN 1310600 A<br>DE 69929690 T2<br>EP 1079773 A1<br>EP 1733706 A2<br>ES 2255273 T3<br>IL 139764 A<br>JP 2002515579 A<br>US 5984953 A<br>WO 9959508 A1<br>ZA 200006674 A | 15-02-2006<br>06-06-2002<br>16-01-2001<br>25-11-1999<br>29-08-2001<br>20-07-2006<br>07-03-2001<br>20-12-2006<br>16-06-2006<br>31-08-2005<br>28-05-2002<br>16-11-1999<br>25-11-1999<br>01-06-2001 |
| US 3804077 A                              | 16-04-1974          | JP S4825394 A<br>JP S5719971 B2<br>US 3804077 A                                                                                                                                                                                        | 02-04-1973<br>26-04-1982<br>16-04-1974                                                                                                                                                           |
| US 2010126492 A1                          | 27-05-2010          | NONE                                                                                                                                                                                                                                   |                                                                                                                                                                                                  |
| US 2007157921 A1                          | 12-07-2007          | NONE                                                                                                                                                                                                                                   |                                                                                                                                                                                                  |
| US 2009090349 A1                          | 09-04-2009          | NONE                                                                                                                                                                                                                                   |                                                                                                                                                                                                  |
| US 2002046566 A1                          | 25-04-2002          | TW 461810 B<br>US 2002046566 A1                                                                                                                                                                                                        | 01-11-2001<br>25-04-2002                                                                                                                                                                         |
| DE 2219332 A1                             | 01-02-1973          | AU 473437 B2<br>AU 4173172 A<br>BE 783175 A1<br>CA 972172 A1<br>DE 2219332 A1<br>ES 402517 A1<br>FR 2137474 A1                                                                                                                         | 24-06-1976<br>08-11-1973<br>01-09-1972<br>05-08-1975<br>01-02-1973<br>01-11-1975<br>29-12-1972                                                                                                   |

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 15 1695

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

13-06-2014

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date         |
|-------------------------------------------|---------------------|----------------------------|-----------------------------|
|                                           |                     | GB 1393114 A               | 07-05-1975                  |
|                                           |                     | IT 957753 B                | 20-10-1973                  |
|                                           |                     | LU 65303 A1                | 23-08-1972                  |
|                                           |                     | NL 7205963 A               | 10-11-1972                  |
| -----                                     |                     |                            |                             |
| GB 1383536                                | A                   | 12-02-1974                 | NONE                        |
| -----                                     |                     |                            |                             |
| US 7021848                                | B1                  | 04-04-2006                 | NONE                        |
| -----                                     |                     |                            |                             |
| EP 1164092                                | A2                  | 19-12-2001                 | AT 356048 T 15-03-2007      |
|                                           |                     | EP 1164092 A2              | 19-12-2001                  |
|                                           |                     | IT VR20000029 U1           | 13-12-2001                  |
| -----                                     |                     |                            |                             |
| US 2007150033                             | A1                  | 28-06-2007                 | AU 2006330787 A1 05-07-2007 |
|                                           |                     | CA 2633386 A1              | 05-07-2007                  |
|                                           |                     | EP 1962749 A2              | 03-09-2008                  |
|                                           |                     | JP 2009521283 A            | 04-06-2009                  |
|                                           |                     | US 2007150033 A1           | 28-06-2007                  |
|                                           |                     | US 2009198311 A1           | 06-08-2009                  |
|                                           |                     | WO 2007076180 A2           | 05-07-2007                  |
| -----                                     |                     |                            |                             |
| US 2003118779                             | A1                  | 26-06-2003                 | AU 2002329983 A1 09-07-2003 |
|                                           |                     | BR 0215179 A               | 06-06-2006                  |
|                                           |                     | EP 1458561 A1              | 22-09-2004                  |
|                                           |                     | JP 4198600 B2              | 17-12-2008                  |
|                                           |                     | JP 2005533722 A            | 10-11-2005                  |
|                                           |                     | KR 20040066915 A           | 27-07-2004                  |
|                                           |                     | MX PA04005938 A            | 13-09-2004                  |
|                                           |                     | US 2003118779 A1           | 26-06-2003                  |
|                                           |                     | WO 03053671 A1             | 03-07-2003                  |
| -----                                     |                     |                            |                             |
| US 2006081000                             | A1                  | 20-04-2006                 | NONE                        |
| -----                                     |                     |                            |                             |
| US 2006289565                             | A1                  | 28-12-2006                 | NONE                        |
| -----                                     |                     |                            |                             |
| WO 2007059122                             | A1                  | 24-05-2007                 | AT 443465 T 15-10-2009      |
|                                           |                     | EP 1956950 A2              | 20-08-2008                  |
|                                           |                     | JP 2009515785 A            | 16-04-2009                  |
|                                           |                     | US 2007125362 A1           | 07-06-2007                  |
|                                           |                     | US 2007131219 A1           | 14-06-2007                  |
|                                           |                     | WO 2007059122 A1           | 24-05-2007                  |
|                                           |                     | WO 2007059151 A2           | 24-05-2007                  |
| -----                                     |                     |                            |                             |

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- US 3977202 A [0002]
- US 3874504 A [0002]
- US 6644383 B2 [0002]
- US 3804077 A [0002]
- US 5984953 A [0002]
- WO 2012113479 A1 [0003]
- DE 102008015677 A1 [0003]
- DE 19860944 A1 [0004]
- US 8001959 B2 [0004]
- US 4895135 A [0004]
- ES 2183784 [0004]