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(54) **HEATER PRODUCT, SYSTEM AND COMPOSITION**

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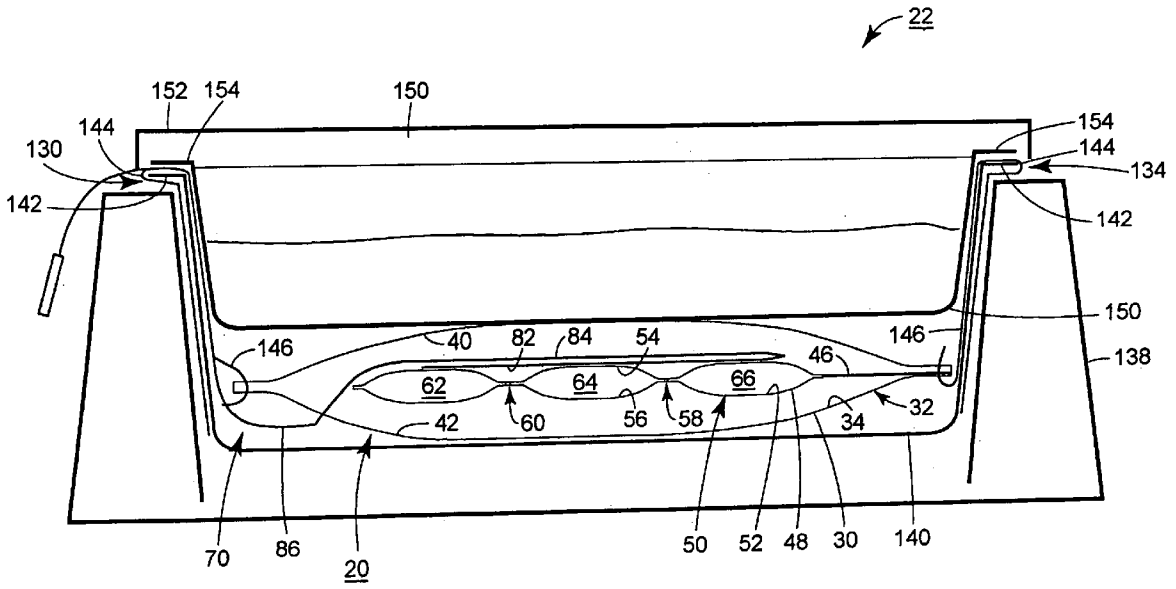
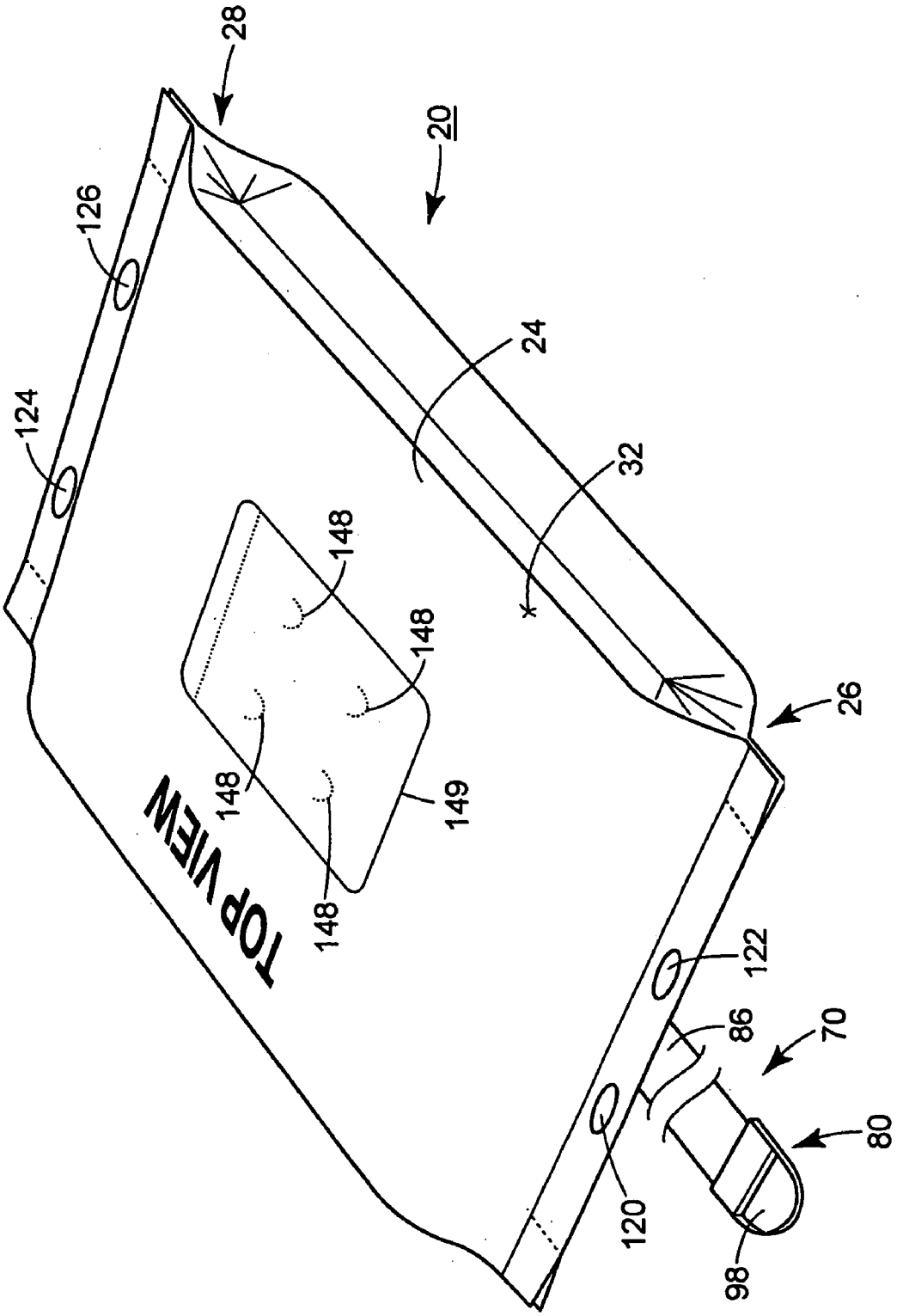
(52) **U.S. Cl.** **126/263.06**

(57) **ABSTRACT**

A heater product may have a first cavity in which a first part of a heater composition is disposed, a second cavity in which a second part of a heater composition is disposed, and a barrier between the first cavity and the second cavity, such that when the barrier is removed, the first and second parts combine to provide an exothermic reaction. A pull strip may be used to remove the barrier, and at least one reinforcing strip may be used to guide the pull strip. The first part may include calcium oxide and the second part may include water, an reaction-initiation delayer and water-release limiter.

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TOP VIEW
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FIG. 1

FIG. 2

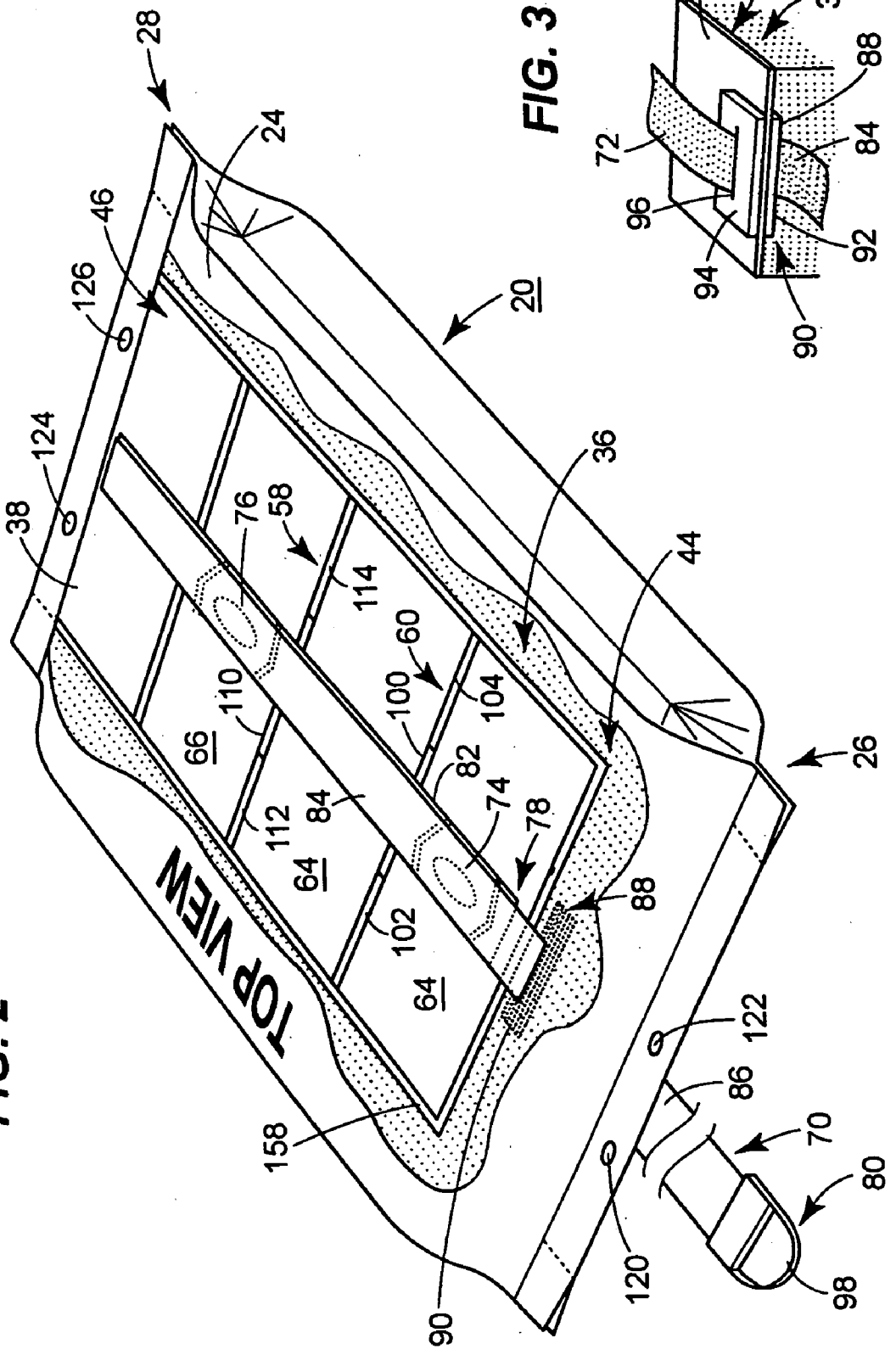
TOP VIEW
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FIG. 3

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FIG. 4

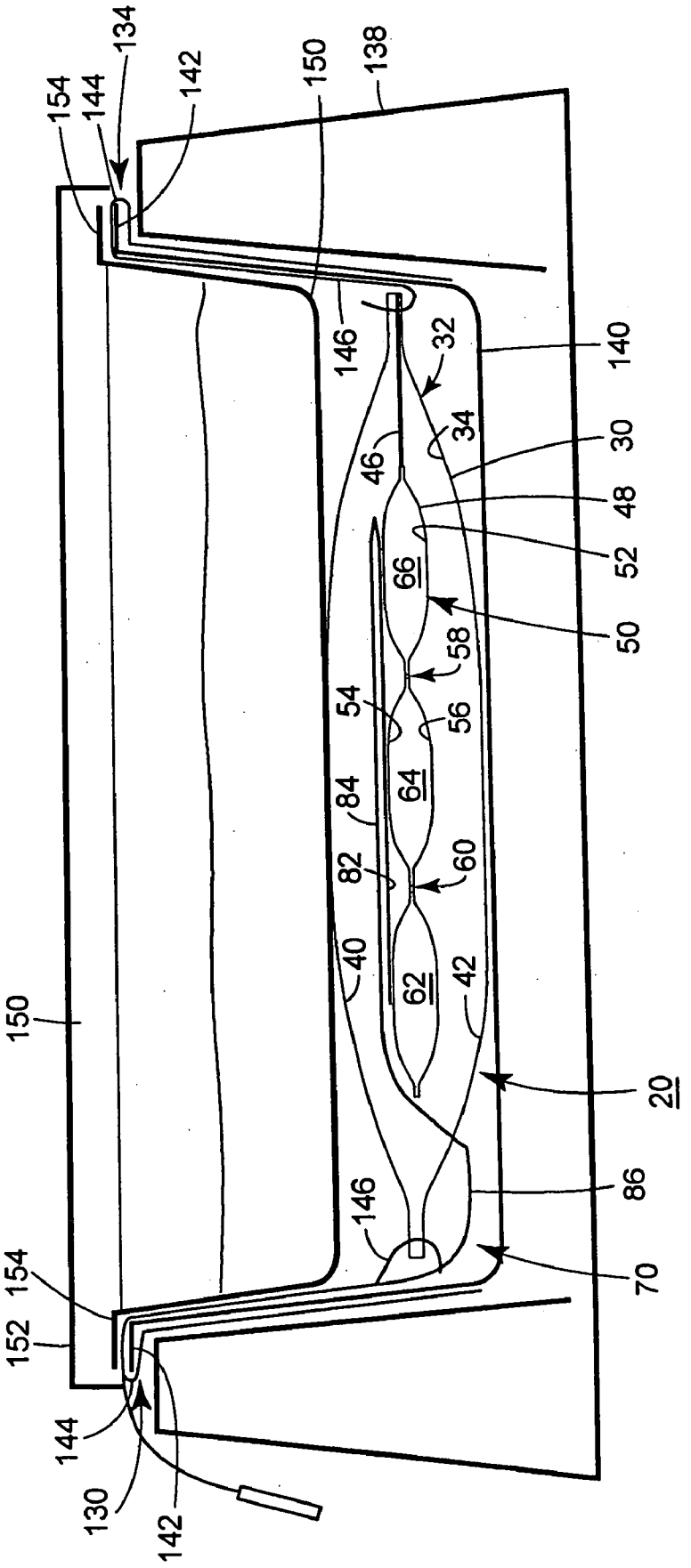
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FIG. 4A

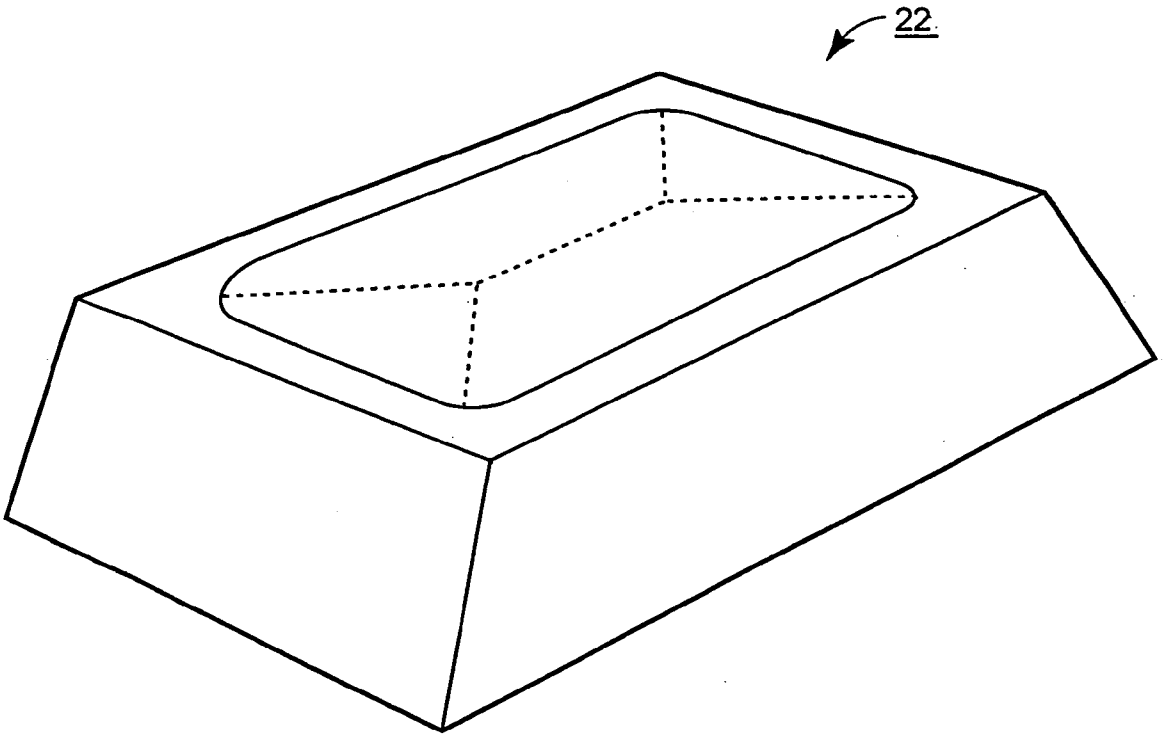


FIG. 5

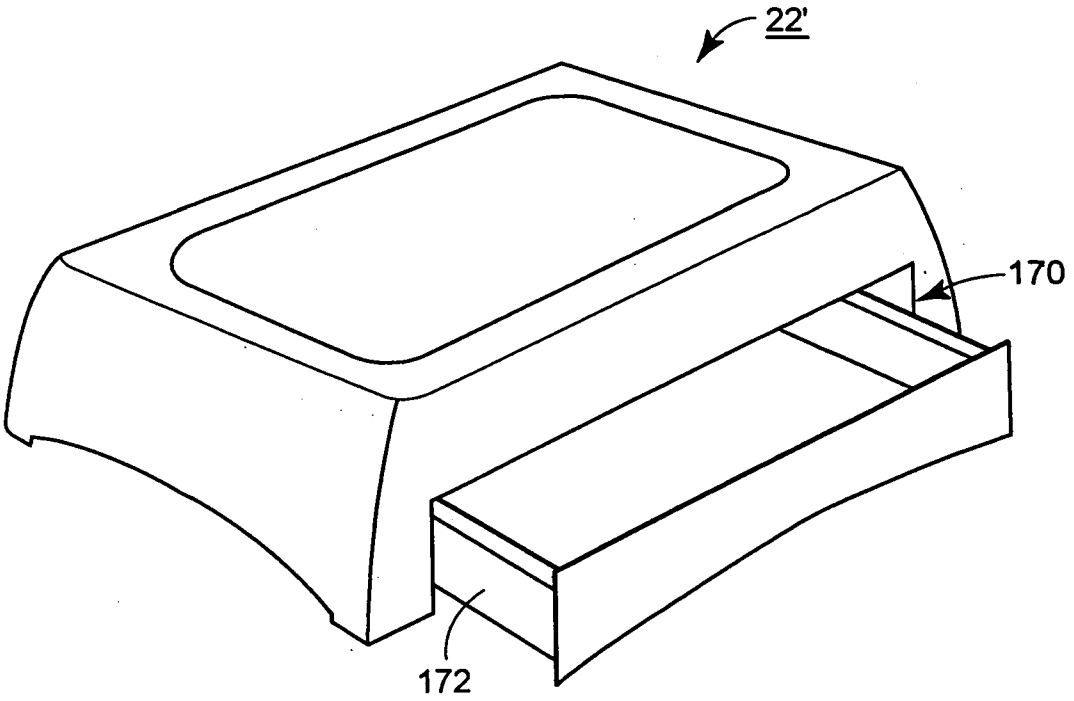


FIG. 6

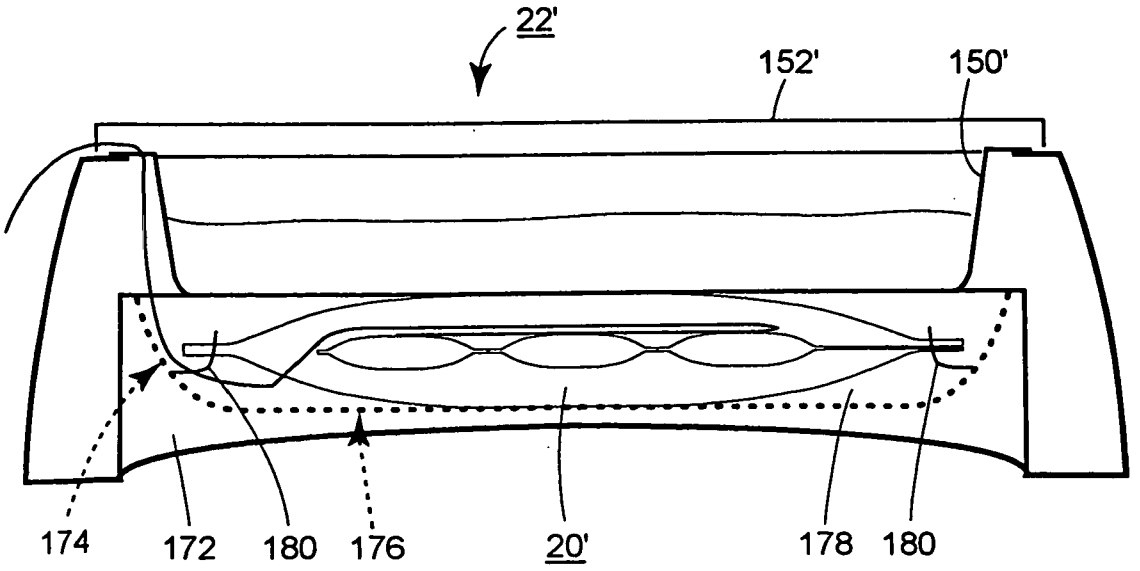


FIG. 7

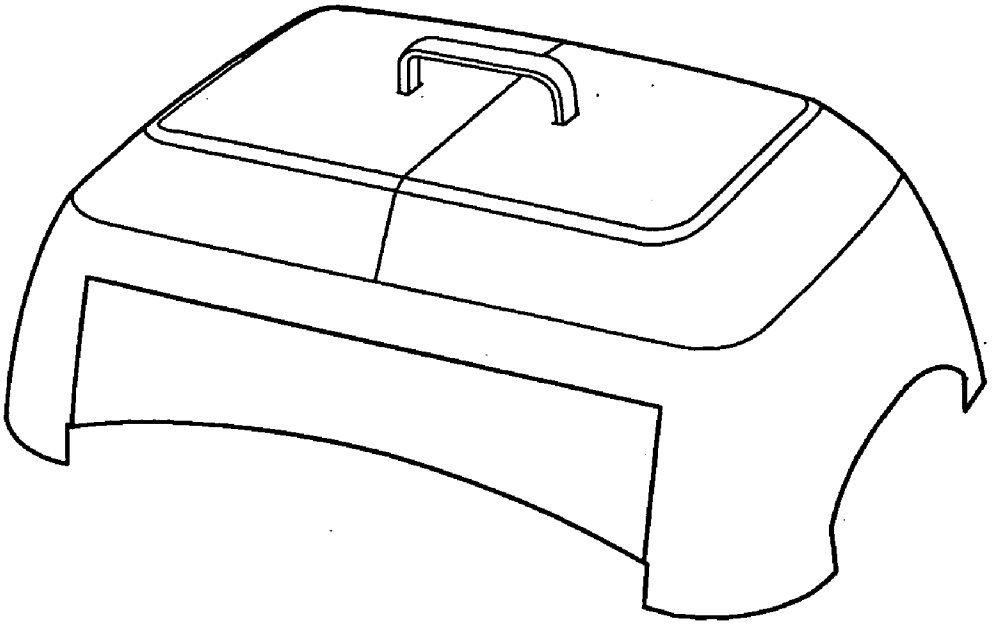


FIG. 8

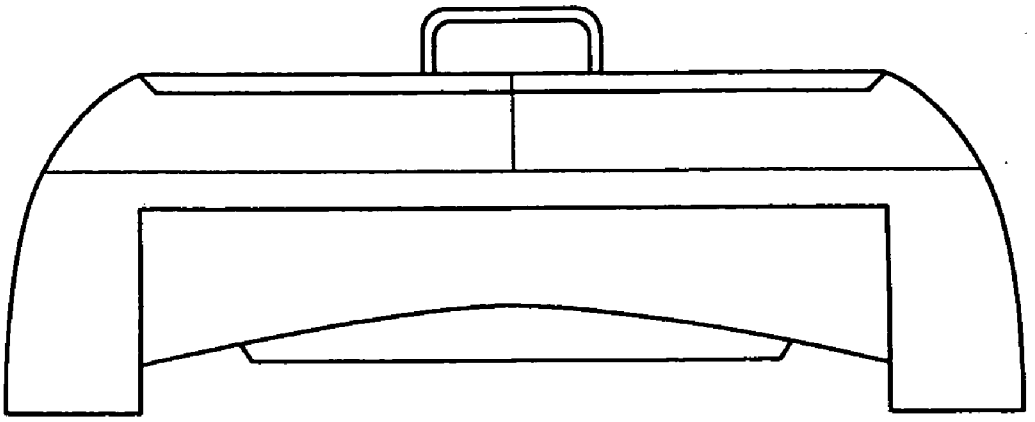


FIG. 9

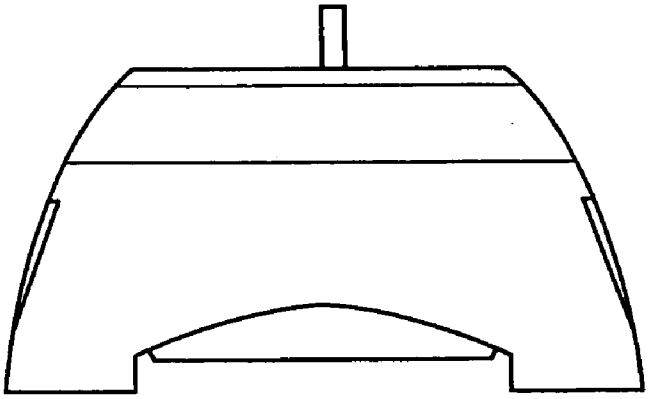


FIG. 10

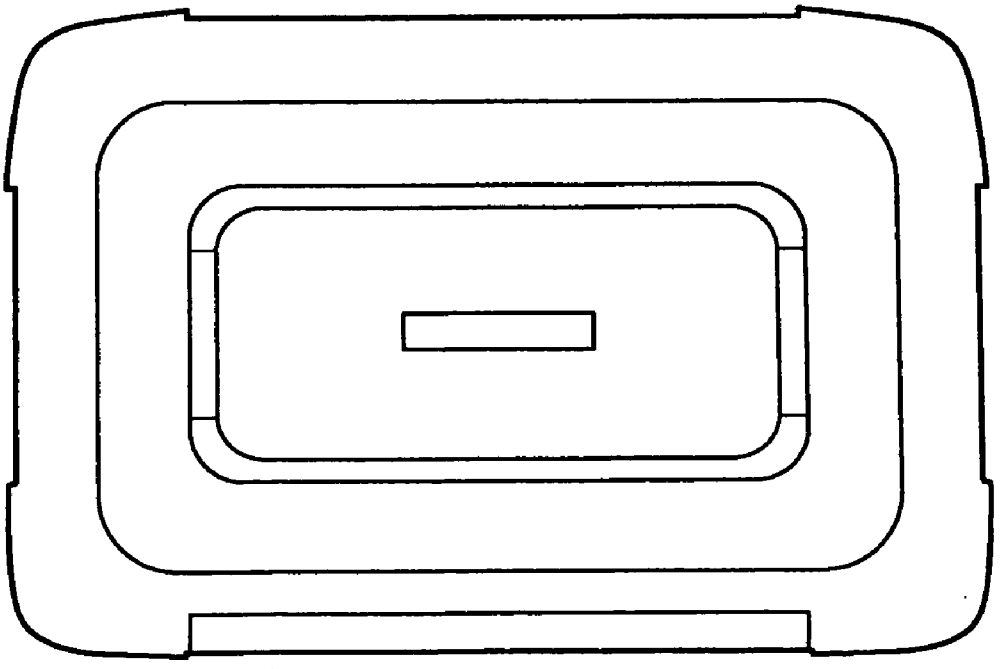


FIG. 11

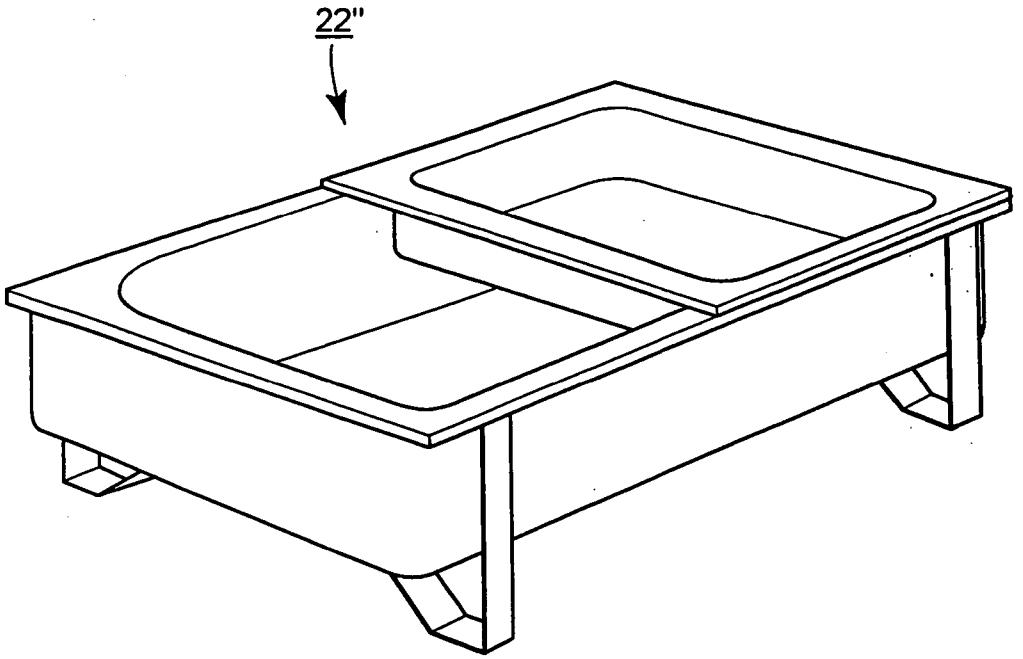


FIG. 12

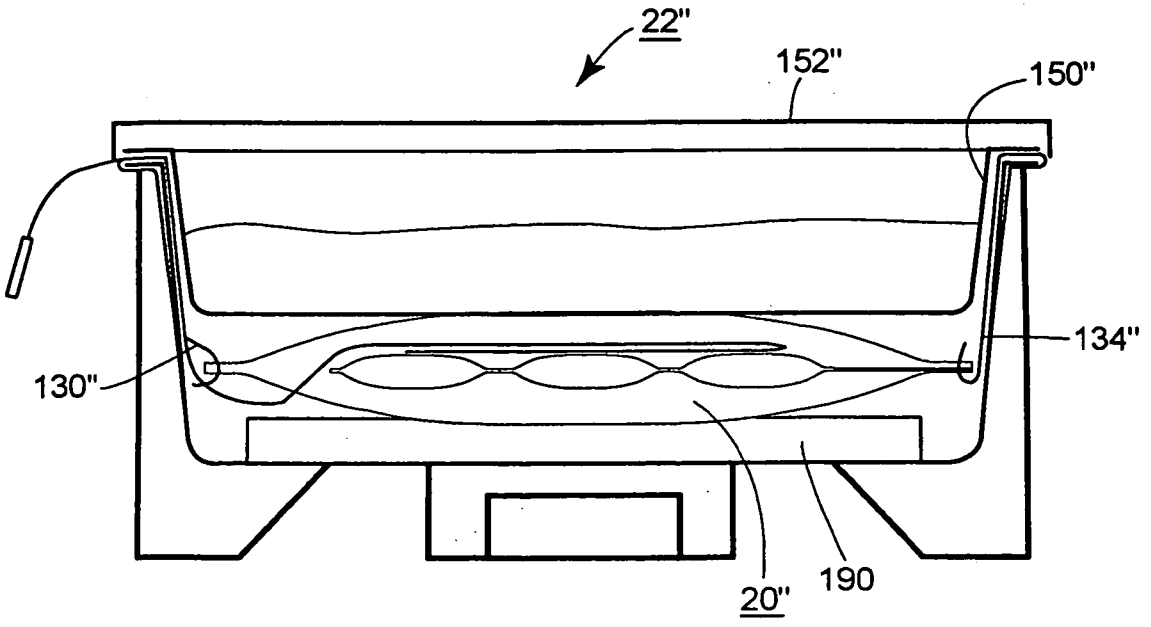


FIG. 13

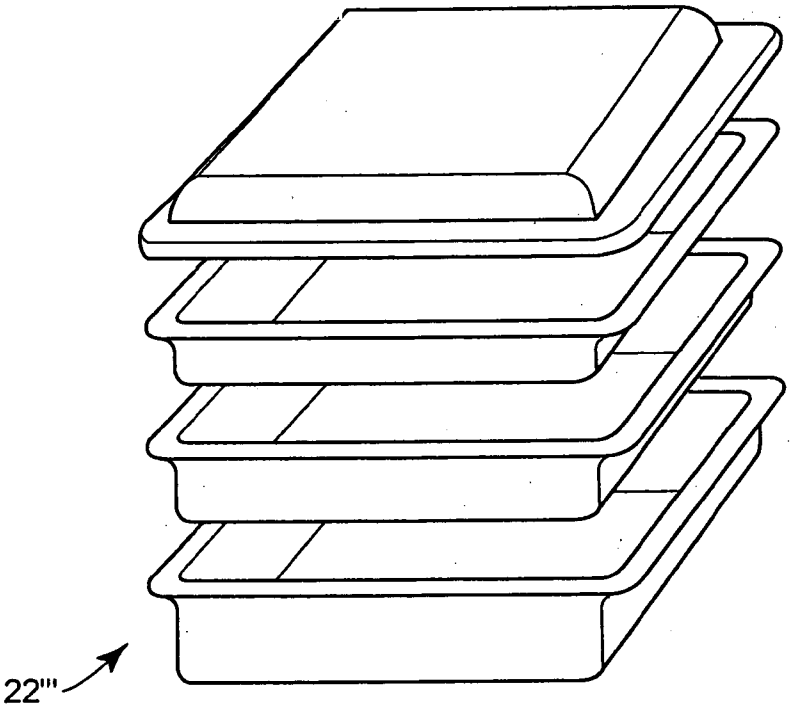
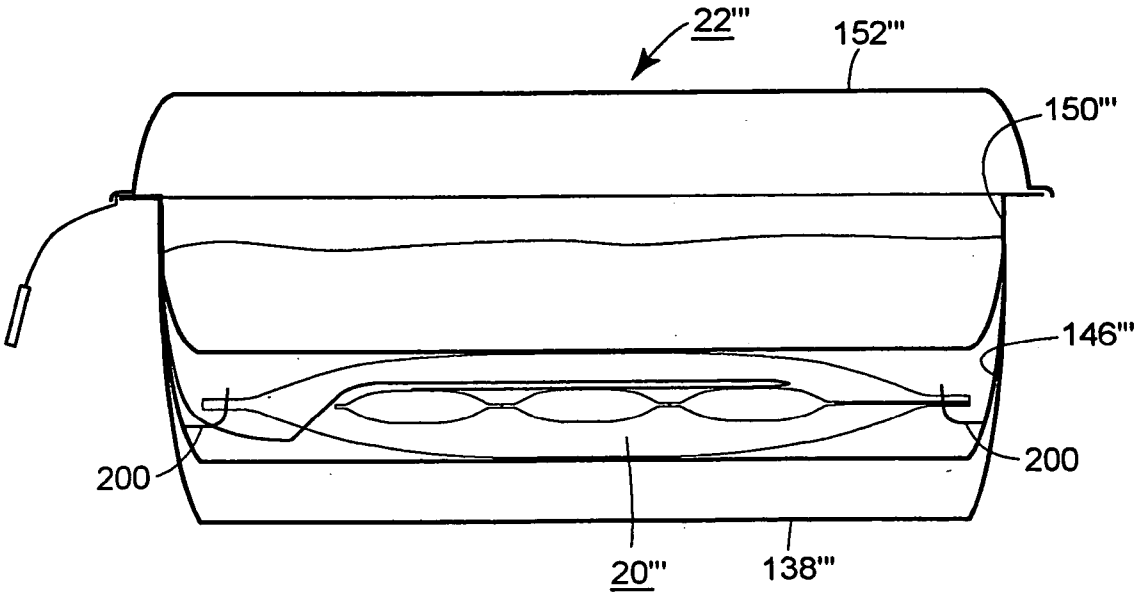


FIG. 14



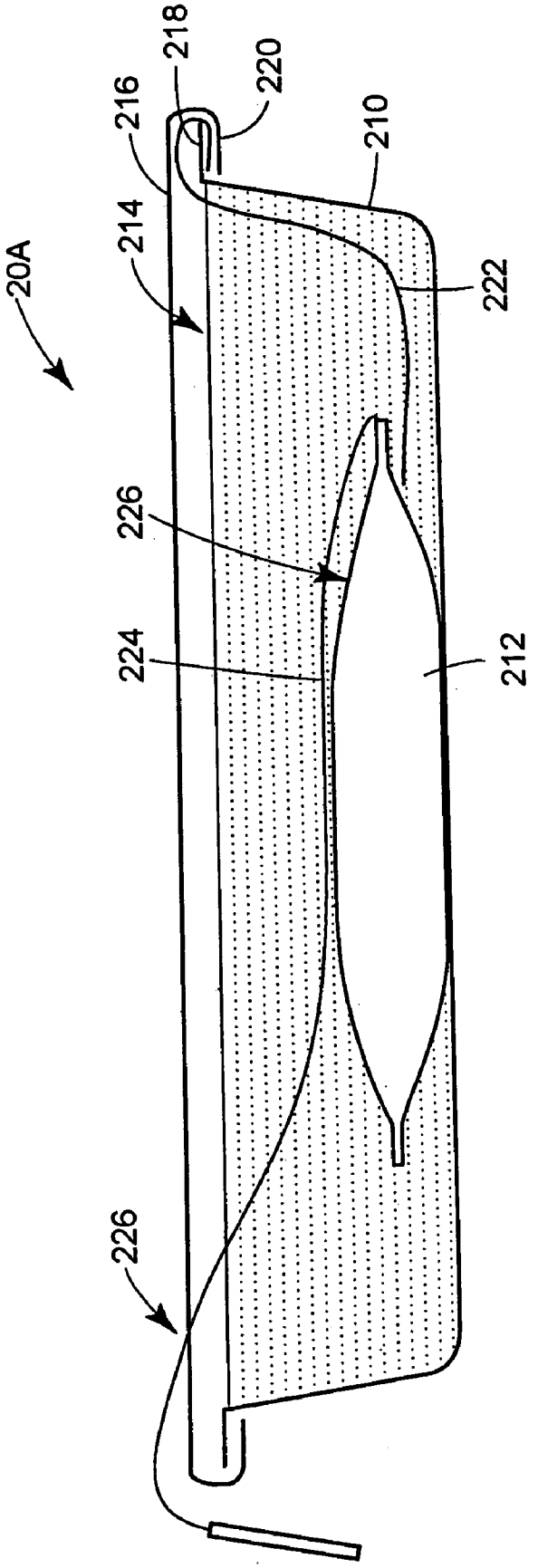


FIG. 15

FIG. 16

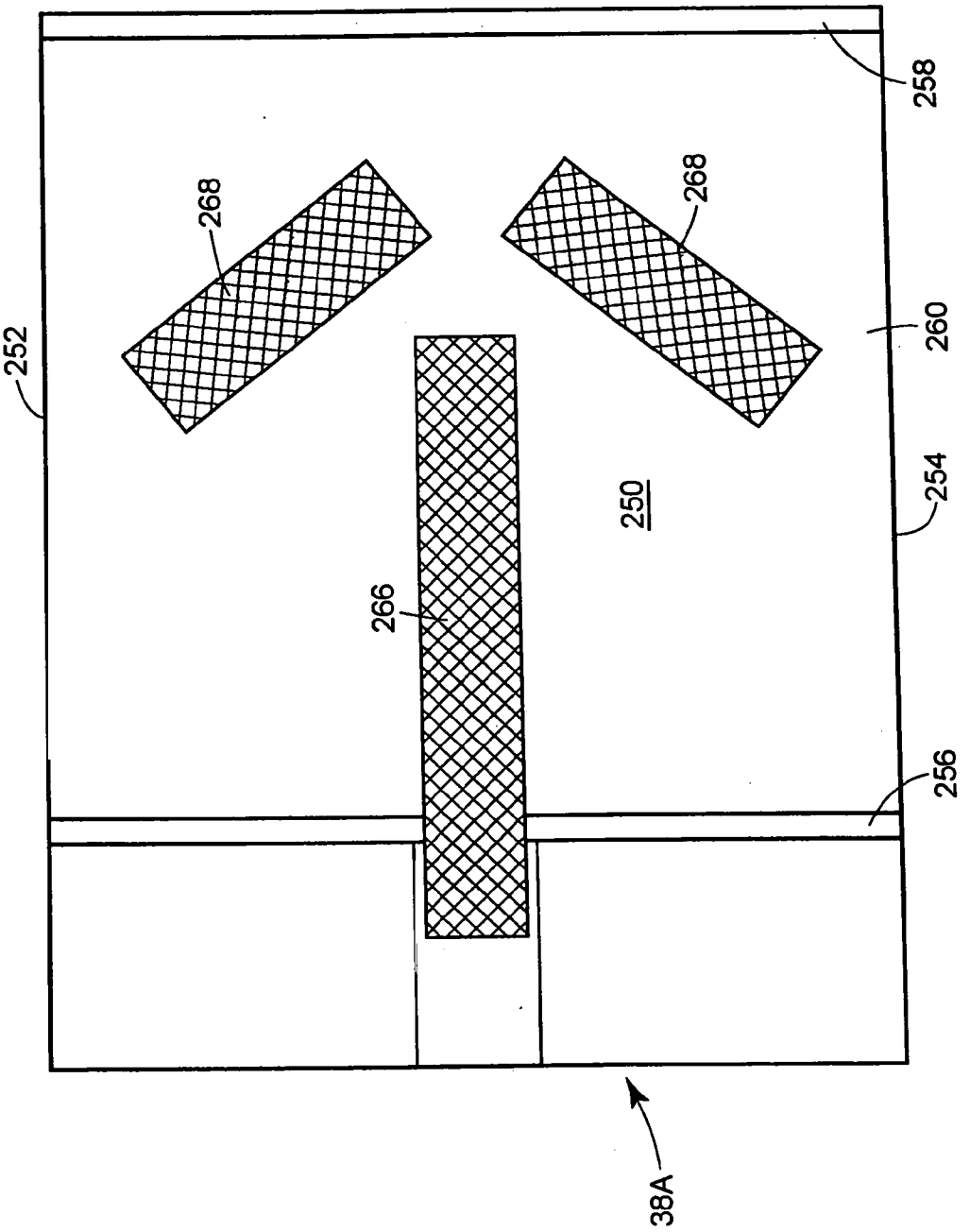
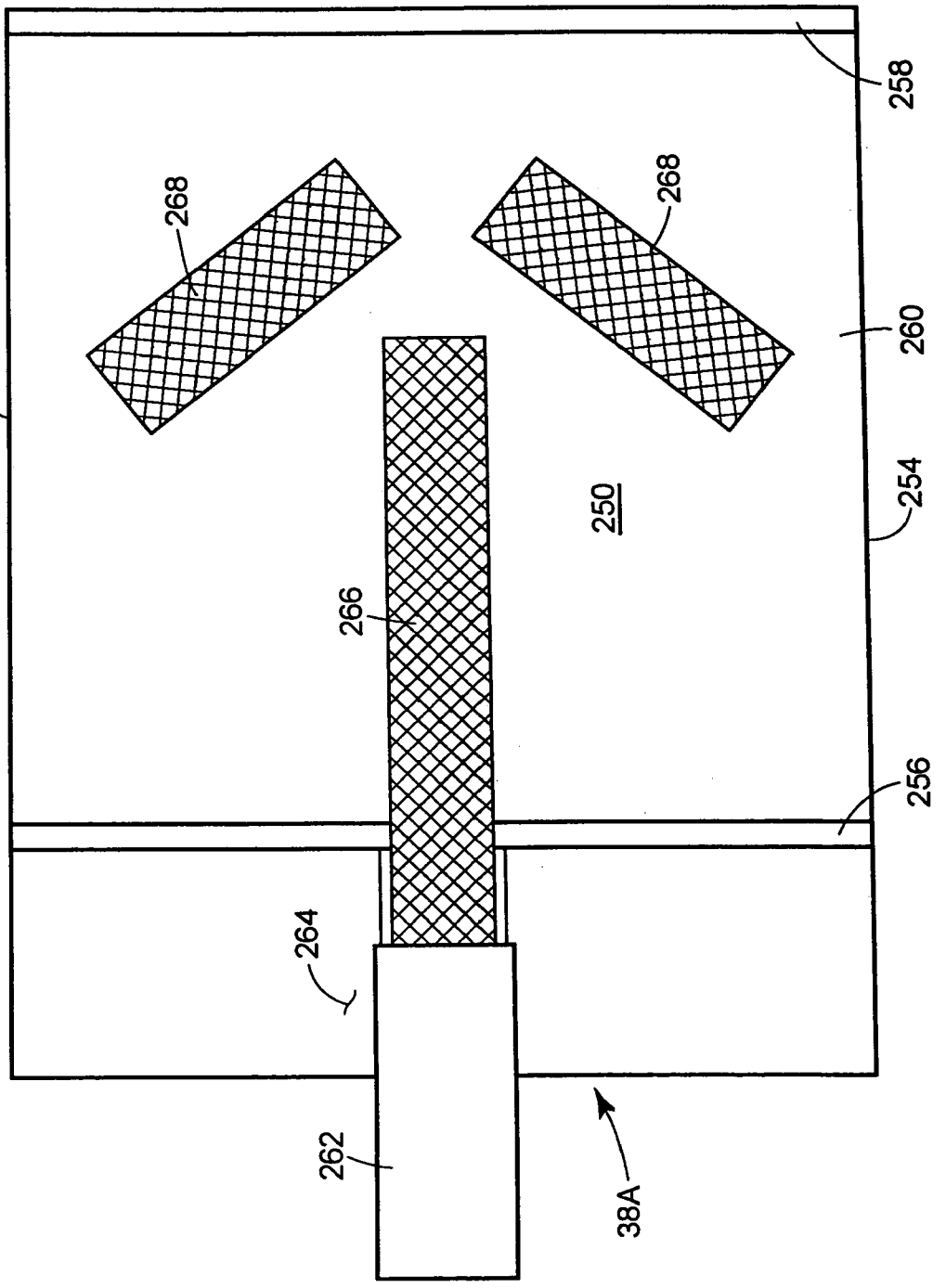


FIG. 17



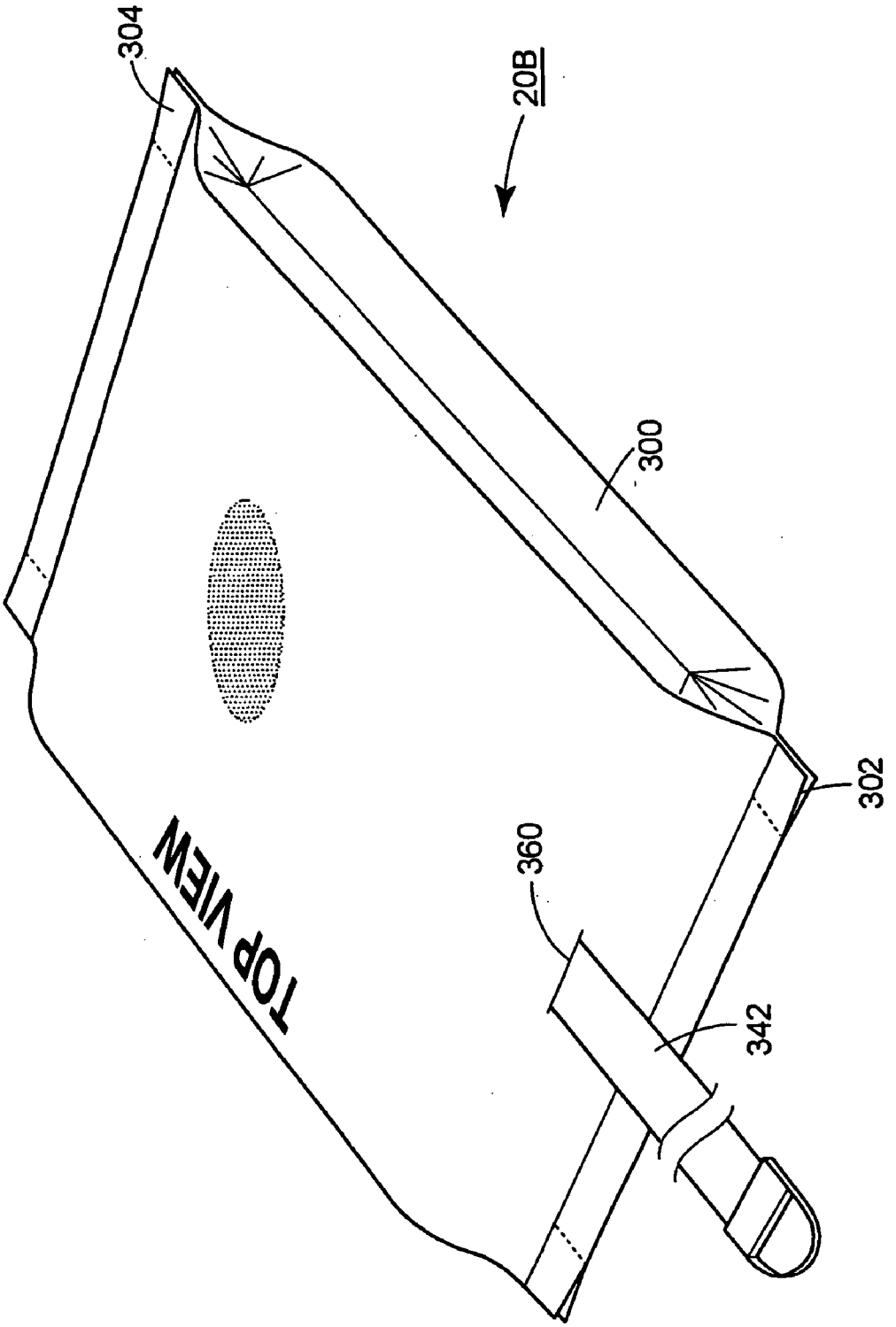
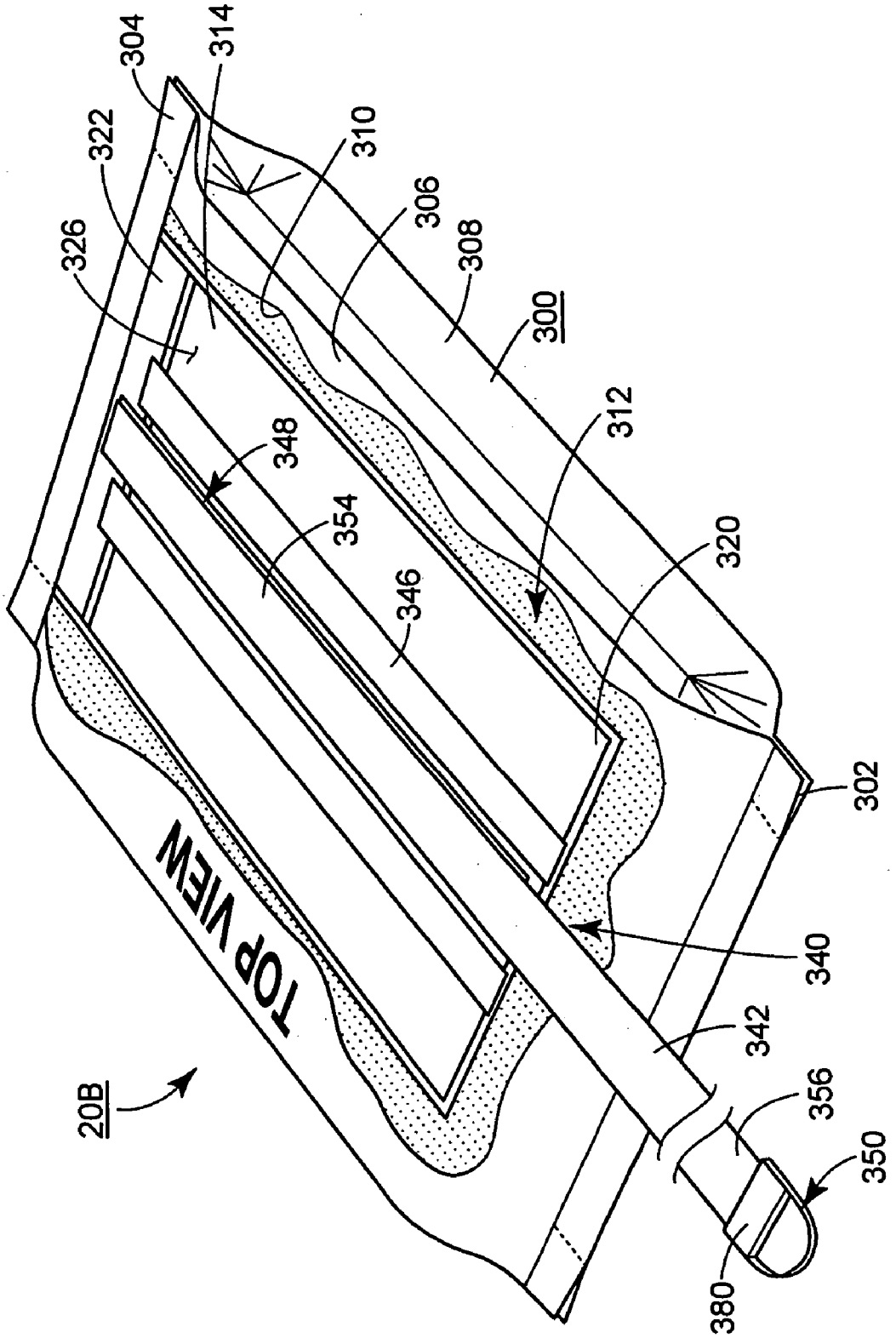


FIG. 18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TOP VIEW
20B

FIG. 19

FIG. 20A

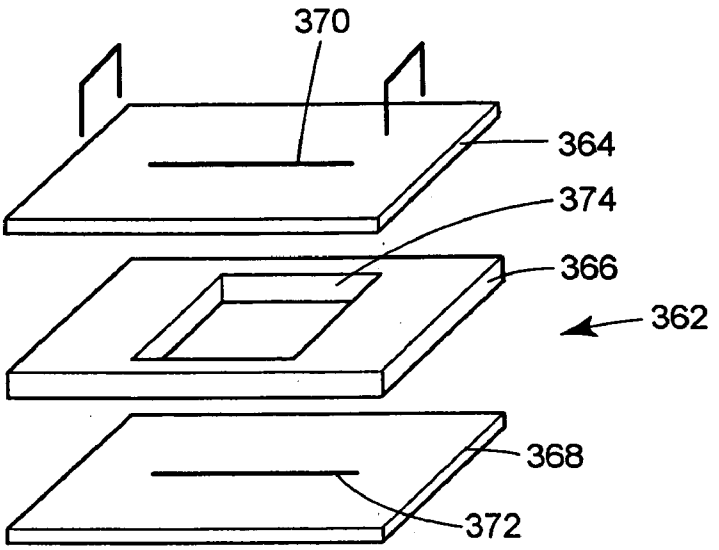


FIG. 20B

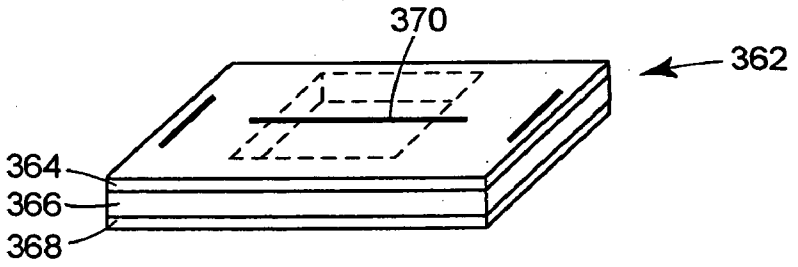


FIG. 20C

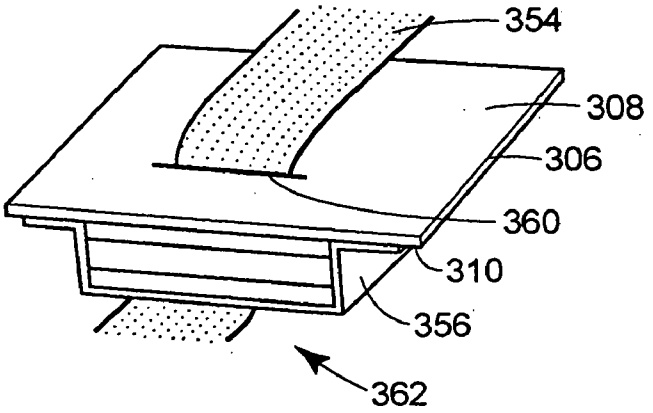


FIG. 21

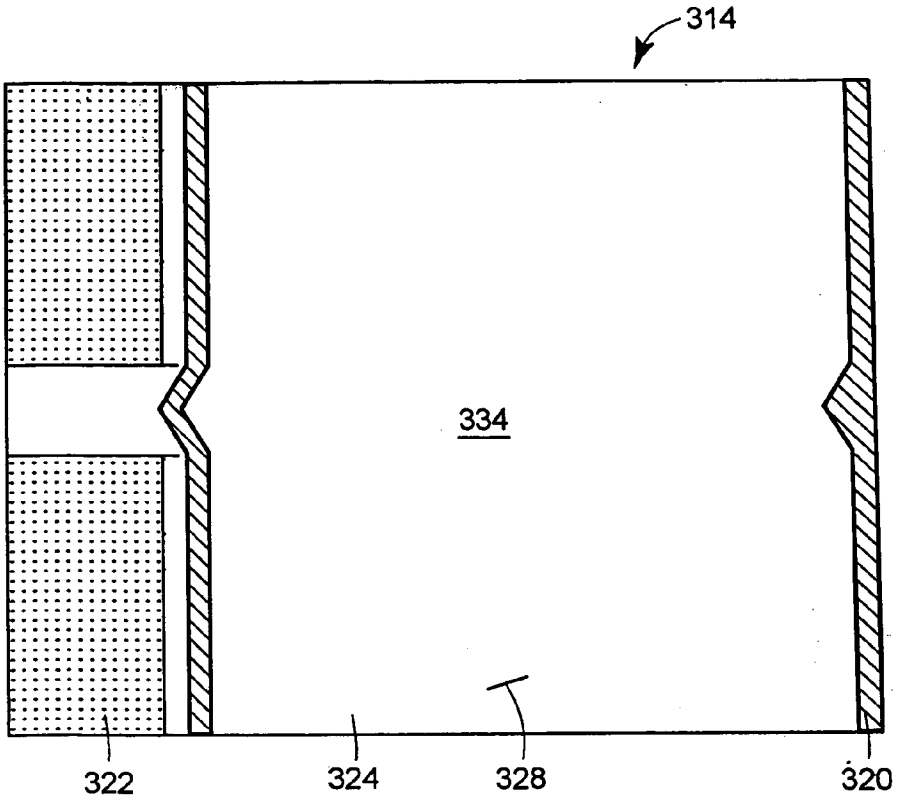


FIG. 22

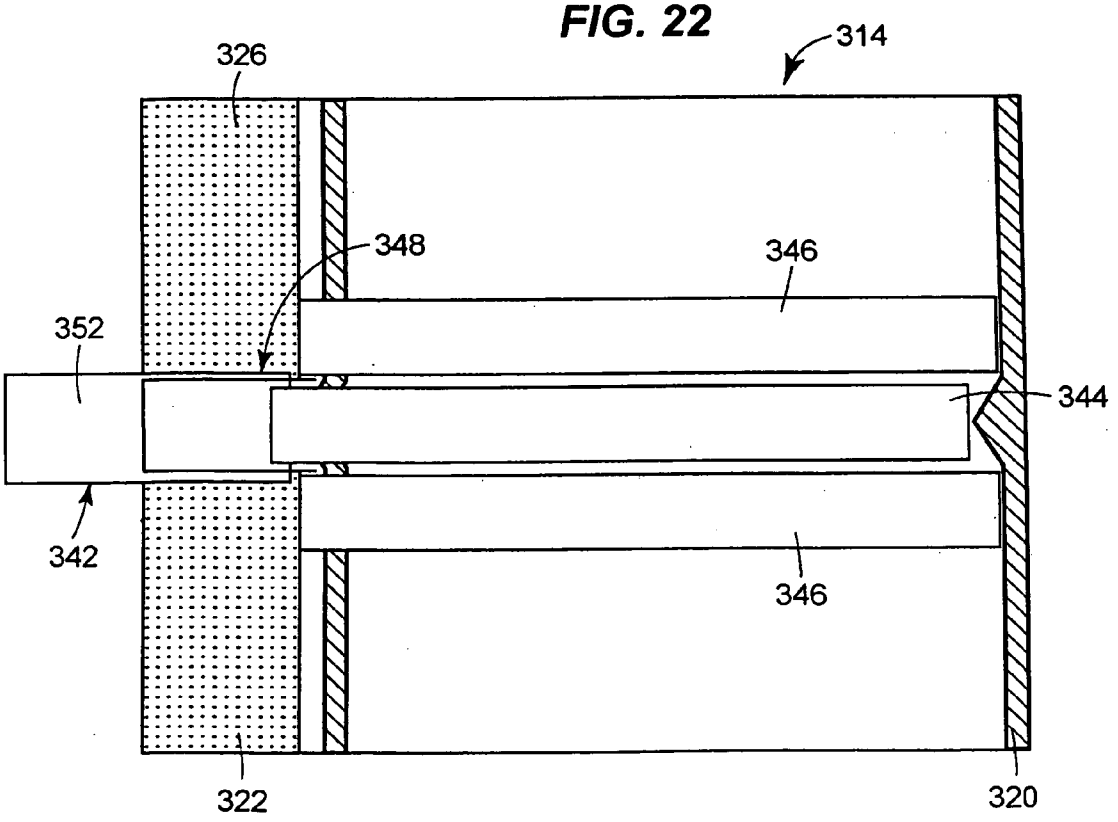
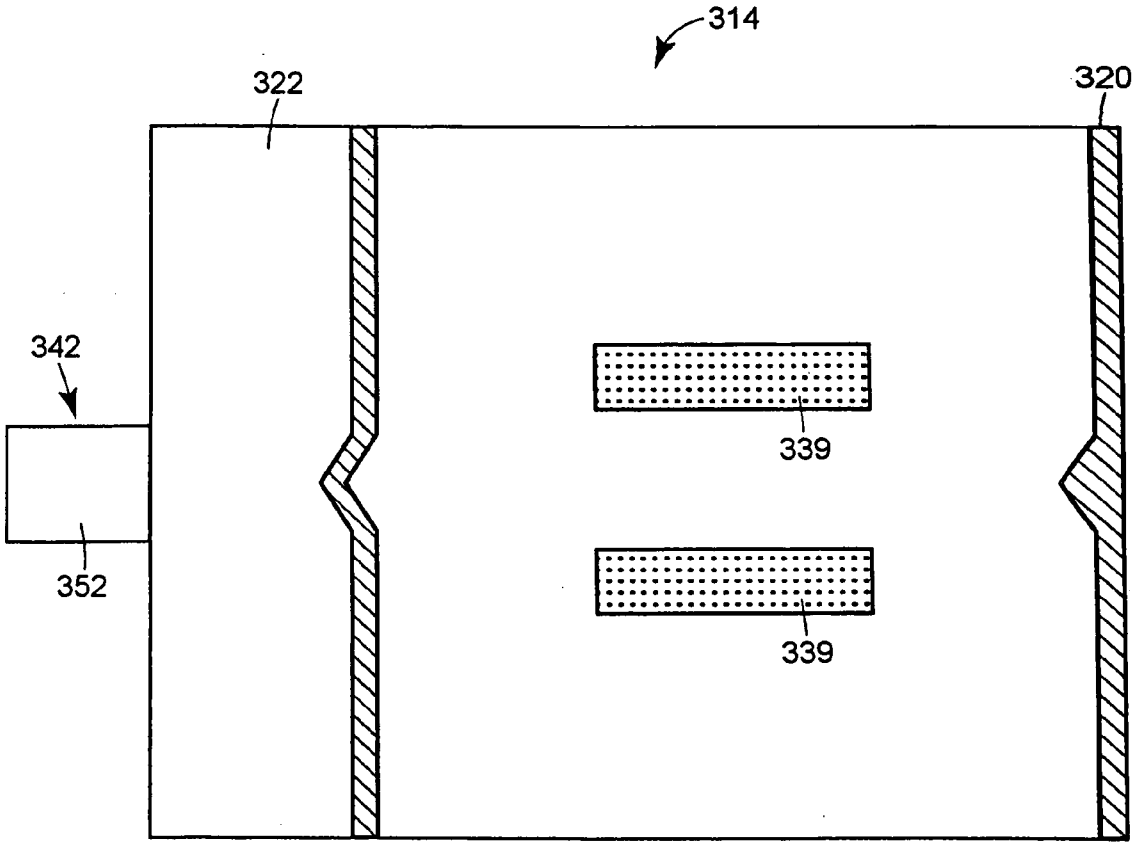


FIG. 23



HEATER PRODUCT, SYSTEM AND COMPOSITION

[0001] This application claims the benefit of U.S. Provisional Application Ser. Nos. 60/567,878, 60/641,975, and 60/642,652, which were filed May 4, 2004, Jan. 7, 2005, and Jan. 10, 2005, respectively, and which are hereby incorporated by reference in their entirety in the present application.

TECHNICAL FIELD

[0002] The present disclosure is directed to a heater product, system and composition, and in particular to a flameless heater product, system and composition.

SUMMARY OF THE INVENTION

[0003] According to one aspect of the present disclosure, a heater product is provided. The heater product has a first cavity in which a first part of a heater composition is disposed, the first part comprising calcium oxide, a second cavity in which a second part of a heater composition is disposed, the second part including water, an reaction-initiation delayer and water-release limiter, and a barrier between the first cavity and the second cavity, such that when the barrier is removed, the first and second parts combine to provide an exothermic reaction.

[0004] According to another aspect of the present disclosure, another heater product is provided. The heater product includes an outer pouch, the outer pouch having a wall with an inner surface that defines an outer pouch cavity and an opening therethrough, an inner pouch disposed within the outer pouch cavity and attached to the outer pouch, the inner pouch having a wall with an inner surface that defines at least one inner pouch cavity and an outer surface, and a pull strip with a first portion secured to the outer surface of the inner pouch and a second portion disposed through the opening in the outer pouch. At least one reinforcing strip is secured to the outer surface of the inner pouch to guide a tear formed in the wall of the inner pouch when force is applied to the pull strip. A first part of a heater composition is disposed in the outer pouch cavity and a second part of a heater composition is disposed in the inner pouch cavity, the first and second parts capable of an exothermic reaction when combined.

[0005] Additional aspects of the disclosure are defined by the claims of this patent.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] **FIG. 1** is a perspective view of a heater product according to the present disclosure;

[0007] **FIG. 2** is a perspective view, partially in section, of the heater product of **FIG. 1**;

[0008] **FIG. 3** is an enlarged, perspective view of a sealing mechanism for the releasing mechanism of the heater product of **FIG. 1**;

[0009] **FIG. 4** is a sectional view of a first embodiment of a heater system, including the heater product of **FIGS. 1-3**;

[0010] **FIG. 4A** is a perspective view of the embodiment of the heater system of **FIG. 4**, as assembled, ready to ship;

[0011] **FIG. 5** is a perspective view of a second embodiment of a heater system, with the heater product removed;

[0012] **FIG. 6** is a sectional view of the heater system of **FIG. 5**, with the heater product included;

[0013] **FIG. 7** is a perspective view of a third embodiment of a heater system similar to that shown in **FIG. 5**;

[0014] **FIG. 8** is a frontal view of the heater system of **FIG. 7**;

[0015] **FIG. 9** is a side elevational view of the heater system of **FIG. 7**;

[0016] **FIG. 10** is a plan view of the heater system of **FIG. 7**;

[0017] **FIG. 11** is a perspective view of a fourth embodiment of a heater system, with the heater product removed;

[0018] **FIG. 12** is a sectional view of the heater system of **FIG. 11**, with the heater product included;

[0019] **FIG. 13** is an exploded, perspective view of a fifth embodiment of a heater system, with the heater product removed;

[0020] **FIG. 14** is a sectional view of the heater system of **FIG. 13**, with the heater product included;

[0021] **FIG. 15** is a sectional view of another embodiment of a heater product;

[0022] **FIG. 16** is a plan view of another embodiment of an inner pouch, with the pull tab removed;

[0023] **FIG. 17** is a plan view of the inner pouch of **FIG. 16**, with the pull tab shown;

[0024] **FIG. 18** is a perspective view of another embodiment of a heater product;

[0025] **FIG. 19** is a perspective view, partially in section, of the heater product of **FIG. 18**;

[0026] **FIG. 20A** is an exploded view of a sealing mechanism for use with the heater product of **FIG. 18**;

[0027] **FIG. 20B** is a perspective view of the sealing mechanism of **FIG. 20A**, as assembled;

[0028] **FIG. 20C** is a perspective view of the heater product, in fragmentary section, of the heater product of **FIG. 18** and the sealing mechanism of **FIG. 20A**, as assembled;

[0029] **FIG. 21** is a plan view, in section, of the inner pouch of the heater product of **FIG. 18**;

[0030] **FIG. 22** is a plan view of the inner pouch of the heater product of **FIG. 18**; and

[0031] **FIG. 23** is a bottom view of the inner pouch of the heater product of **FIG. 18**.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0032] Although the following text sets forth a detailed description of numerous different embodiments of the invention, it should be understood that the legal scope of the invention is defined by the words of the claims set forth at the end of this patent. The detailed description is to be construed as exemplary only and does not describe every possible embodiment of the invention since describing every possible embodiment would be impractical, if not impos-

sible. Numerous alternative embodiments could be implemented, using either current technology or technology developed after the filing date of this patent, which would still fall within the scope of the claims defining the invention.

[0033] It should also be understood that, unless a term is expressly defined in this patent using the sentence "As used herein, the term '_____' is hereby defined to mean . . . " or a similar sentence, there is no intent to limit the meaning of that term, either expressly or by implication, beyond its plain or ordinary meaning, and such term should not be interpreted to be limited in scope based on any statement made in any section of this patent (other than the language of the claims). To the extent that any term recited in the claims at the end of this patent is referred to in this patent in a manner consistent with a single meaning, that is done for sake of clarity only so as to not confuse the reader, and it is not intended that such claim term be limited, by implication or otherwise, to that single meaning. Finally, unless a claim element is defined by reciting the word "means" and a function without the recital of any structure, it is not intended that the scope of any claim element be interpreted based on the application of 35 U.S.C. §112, sixth paragraph.

[0034] **FIG. 1** illustrates a heater product **20** for use in a heater system **22**, five embodiments of which are shown in **FIGS. 4-14**.

[0035] As shown in **FIG. 1**, the heater product **20** may include an outer pouch **24** having a first end **26** and a second end **28**. The outer pouch **24** may include a pouch wall **30**, which may be flexible, semi-rigid, rigid, etc., having an outer surface **32** and an inner surface **34**, as shown in **FIGS. 3 and 4**. The inner surface **34** of the pouch wall **30** may define a cavity **36** in which is disposed an inner pouch **38**. The inner surface **34** of the pouch wall **30** may be described as having a first section **40** and a second section **42**, which with the pouch **24** disposed as illustrated in **FIGS. 2 and 4** may be described as an upper section **40** and a lower section **42**.

[0036] The inner pouch **38** also has a first end **44** and a second end **46**. As shown in **FIGS. 2 and 4**, the inner pouch **38** also includes a pouch wall **48** having an outer surface **50** and an inner surface **52**. Moreover, the inner surface **52** of the pouch wall **48** may be described as having a first (or upper) section **54** and a second (or lower) section **56**, with the inner pouch **38** disposed in the orientation illustrated in **FIGS. 2 and 4**.

[0037] It should be noted that designations such as "upper" and "lower" are for ease of discussion only, and are not meant to limit the disclosure in any fashion, for a similar designation may be used if the pouch was inverted with the section **42** being "upper" and the section **40** being "lower" and the section **56** being "upper" and the section **54** being "lower."

[0038] As illustrated in **FIG. 2**, the wall **48** of the inner pouch **38** may be sealed at both the first and second ends **44**, **46**. As seen in **FIG. 4**, the upper and lower sections **54**, **56** of the inner surface **52** may also be joined to define at least two cavities, although a single cavity for the inner pouch **38** would also be within the scope of the present disclosure. As shown in **FIGS. 2 and 4**, the upper and lower sections **54**, **56** of the inner surface **52** may be joined to form two partitions **58**, **60** that in turn define three cavities, or chambers, **62**, **64**, **66** in which a liquid may be disposed, as will described in greater detail below. The cavities **62**, **64**, **66** may be of equal or unequal size; as shown, the cavity **64** is larger in volume than the cavities **62**, **66**.

[0039] As further illustrated in **FIG. 4**, the inner surface **34** of the wall **30** of the outer pouch **24** may be joined to itself at the first and second ends **26**, **28** of the outer pouch **24**. In particular, as shown in **FIG. 4**, as well as in **FIGS. 6, 8**, and **10**, the inner surface **34** of the outer pouch **24** may be joined at the second end **28** such that the second end **46** of the inner pouch **38** is disposed between the first and second sections **40**, **42** of the inner surface **34** of the wall **30**. In this fashion, the second end **46** of the inner pouch **38** may be attached to the second end **28** of the outer pouch **24**. The first and second sections **40**, **42** of the inner surface **34** of the wall **30** may also be joined at the first end **26** to close the first end **26** of the outer pouch **24**.

[0040] In operation, the contents of the cavities **62**, **64**, **66** are to be released into the cavity **36**. Consequently, the heater product **20** may include a release mechanism **70**, which includes a pull strip **72** (which may act as a barrier, as explained in greater detail below), holes **74**, **76**, and partitions **58**, **60** (which may act as barriers, as explained in greater detail below). As will be explained in greater detail below, the release mechanism **70** shown represents merely one possible release mechanism **70** that may be used in the heater product **20** of the present invention.

[0041] The release mechanism **70** may now be discussed in greater detail with reference to **FIGS. 2 and 4**. In particular, the pull strip **72** may have a first end **78** and a second end **80**. In between the first end **78** and the second end **80** may be a first section **82**, a second section **84**, and a third section **86**.

[0042] The first section **82** of the pull strip **72** overlies the holes **74**, **76**, preventing the material in cavities **62**, **66** from being released into the cavity **36**. The first section **82** may be releasably secured to the outer surface **50** of the inner pouch **38** through the use of, for example, a peelable seal, such as a thermally-induced peelable seal. It may not be necessary to secure the entirety of the first section **82** of the pull strip **72** to the outer surface **50** of the inner pouch **38**; for example, the first section **82** may be releasably secured to the outer surface **50** only in the area adjacent to the holes **74**, **76**.

[0043] The second section **84** may be connected to the first section **82**, and may lie back on top of the first section **82**, as best seen in **FIG. 4**, for example. The second section **84** may also be disposed through an opening **88** in the wall **30** of the outer pouch **24**. In fact, a sealing mechanism **90** may be disposed in the opening **88**, and the section **84** of the pull strip **72** may be disposed through the sealing mechanism **90**. As best seen in **FIG. 3**, the sealing mechanism **90** may include an inner piece **92** and an outer piece **94**, each of which may have a slit formed therethrough (only the slit **96** in the outer piece **94** being visible in **FIG. 3**) and both of which may be made of, for example, a high-temperature flexible material, such as silicone rubber, polypropylene, low density polyethylene (LDPE), etc. The inner and outer pieces **92**, **94** may be sealed to the wall **30** with a sealing mechanism appropriate for the materials which are used to make the inner and outer pieces **92**, **94**. The section **84** of the pull strip **72** may be disposed through the slits in the pieces

92, 94, which serve to keep the heater composition within the outer pouch 24 during shipment and to wipe the surfaces of the section 84 of the pull strip 72 as the section 84 is removed from the heater product 20.

[0044] The third section 86 may terminate in the second end 80 of the pull strip 72. The third section 86 of the pull strip 72 may be outside the outer pouch 24 of the heater product 20, and may include an enlarged region 98. The enlarged region 98 may be included to make it easier for the user of the product 20 to grip the end 80 of the pull strip 72 to apply force to the pull strip 72.

[0045] As mentioned above, the release mechanism 70 may include not only the pull strip 72 and the holes 74, 76, but also the partitions 58, 60. In particular, the partitions 58, 60 may include at least a weakened section that will permit materials to pass between the cavity 64 and the cavities 62, 66 after the weakened section has given way. For example, the partition 58 may include a middle section 100 that is weakened relative to side sections 102, 104, and the partition 60 may include a middle section 110 that is weakened relative to side sections 112, 114.

[0046] The weakened sections 100, 110 may be defined in a variety of manners. As one example, seals at the weakened sections 100, 110 may not be as resistant to a pressure differential as the sections 102, 104 and 112, 114. As a consequence, a significantly smaller pressure differential experienced across the weakened sections 100, 110 will cause those sections to fail and give way than would cause a similar behavior in sections 102, 104 and 112, 114.

[0047] As noted above, the release mechanism 70 described herein is merely one embodiment of such a release mechanism. As one alternative embodiment, the release mechanism may include a pull strip, but rather than having the pull strip expose holes in the wall 48 of the inner pouch 38, the pull strip may cause the wall 48 (which acts as a barrier in this embodiment) to separate along a section attached to the pull strip, and thereby release the contents of the inner pouch 38 into the outer pouch 24. Alternatively, the release mechanism may not be an internal release mechanism. The release mechanism may include a separate tool that may be used to puncture through the outer pouch 24 and the inner pouch 38 and release the contents of the inner pouch 38 into contact with the contents of the outer pouch 24. Moreover, the tool may be provided with the heater product 20 or heater system 22 (such as in the form of a specially-designed tool for such purpose), or the tool may be an implement that is generally available (such as a knife or a screwdriver, for example). As a further alternative, the release mechanism may include one or more seals or sealed apertures defined in the inner pouch 38 in communication with the cavities 62, 66, which seals or sealed apertures (which may act as barriers) may burst under application of sufficient pressure to the outer surface 50 of the inner pouch 38, thus removing the barrier and releasing the contents.

[0048] As further examples, there may be variation in the release mechanism 70 described above. For example, while only two holes 74, 76 are shown, the holes 74, 76 may each be replaced with a plurality of holes. Moreover, a plurality of holes may be defined in the wall 48 of the inner pouch 38, in the upper section 54 of the wall 48. These holes may be sealed until the time of release, and they may be of very small size. These holes may permit the contents of the cavity 64 to be released, preferably slowly, into the contents of the outer pouch 24.

[0049] The heater product 20 and the heater system 22 may also include mechanisms that cooperate to limit the movement of the heater product 20 relative to the remainder of the heater system 22 when the heater product 20 is assembled with the heater system 22, although such mechanisms are optional. Specifically, the heater product 20 may include holes 120, 122 at the first end 26 of the outer pouch 24 and holes 124, 126 at the second end 28. As best seen in FIG. 4, the heater system 22 may include four anchors (two of which are shown) 130, 134 that may be attached to a base 138 and the holes 120, 122, 124, 126 to thereby limit the movement of the heater product 20 relative to the remainder of the heater system 22. The heater product 20 may be stored separately from the remainder of the system 22, and may only be assembled with the remainder of the system 22, using the anchors 130, 134 for example, at the time of activation.

[0050] As shown in the system 22 illustrated in FIG. 4, the anchors 130, 134 may be shaped to be disposed about a tray 140 that may be disposed into the base 138. In particular, the tray 140 may have an L-shaped edge 142 that runs about the periphery of the tray 140 (see FIG. 3). The anchors 130, 134 may each have a first (or upper) section 144 that may be shaped to be disposed about the L-shaped edge 142. The anchors 130, 134 may also each have a second (or lower) section 146 that may be shaped to be disposed through one of the holes 120, 122, 124, 126. Although the lower sections 146 of, for example, the anchor 130 and the anchor 134 may have a different shape, the anchors may have the same shape as well.

[0051] Additionally, formed in the wall 30 of the outer pouch 24 is a plurality of holes 148 used for venting. The vent holes 148 are covered with a patch 149 that is releasably attached to the outer surface 32 of the wall 30 of the outer pouch 24. The patch 149 prevents the materials disposed in the cavity 36 from being released through the vent holes 148. As explained below, the patch 149 may be removed prior to activation; alternatively, the patch 149 may separate from the outer surface 32 under the influence of the thermal energy, pressure, steam, etc. generated in the outer pouch 24 after activation without the involvement of the user (self-opening or self-releasing).

[0052] Alternatively, a valve may be used in place of or in combination with the plurality of vent holes 148. As one such example, a valve may be used that makes an audible noise (e.g., a "whistle") with the build up of pressure, steam, etc. in the heater product 20. The valve may thus serve as an indicator, for purposes of safety or to indicate that the product is "on" or "off", for example.

[0053] Finally, as shown in FIG. 4, the heater system 22 may include a food tray 150 and a lid 152 disposed on the food tray 150. The food tray 150 may be disposed (or nestled) within the tray 140, and may have a lip 154 that cooperates with the edge 142 to keep the food tray 150 disposed over the heater product 20. While there may exist a slight spacing or a gap between the food tray 150 and the heater pouch 20, either initially or throughout the heating process, it is believed that heat transfer may be enhanced if the food tray 150 is in contact with the heater pouch 20.

[0054] As for the contents of the outer and inner pouches **24**, **38**, the structure of the heater product **20** is not limited to use with a particular type of chemical system, nor is the chemical system discussed herein limited to use in the heater product **20** described above. The heater product **20** and the chemical system enclosed therein as disclosed below may be useful separate and apart from the combination discussed in greater detail herein. For example, while the heater product **20** described above has outer and inner pouches **24**, **38**, each of which contains one part of a two-part system, explained in greater detail below, inner pouch **38** may be removed entirely, and still the two-part system discussed below may be used, with the outer pouch **24** containing one part of the two-part system and the second part of the two-part system being introduced into the outer pouch **24** by puncturing the outer pouch and pouring the second part into the outer pouch **24** or by being absorbed through the outer pouch **24**.

[0055] Therefore, according to one embodiment of this disclosure, a two-part heater composition may be disposed in the outer and inner pouches **24**, **38**, with the first part of the two-part heater composition initially disposed in the inner pouch **38** and the second part of the two-part heater composition initially disposed in the cavity **36** between the outer pouch **24** and the inner pouch **38**. When the first part is released from the inner pouch **38**, it comes in contact with the second part, and an exothermic reaction takes place.

[0056] The first part in the inner pouch **38** may include water (H_2O), and the outer pouch **24** may include a basic anhydride, such as calcium oxide (CaO) or calcium chloride ($CaCl_2$). The outer pouch **24** may also include an acidic anhydride, such as phosphorous pentoxide (P_2O_5), in addition to the basic anhydride. The first part in the inner pouch **38** may also include at least one chemical or composition that delays the initiation of the reaction when the water is released into contact with the calcium oxide. The first part in the inner pouch **38** may thus include sugar, such as sucrose, glucose, or fructose, for example. The first part in the inner pouch **38** may further include at least one chemical or composition that limits the rate at which water is released to the calcium oxide, although this may alternatively be provided by, for example, a semi-permeable membrane that may vary its permeability according to solubility, pressure and/or temperature. For example, this chemical or composition may be an absorbent, chemically-inert, thermally-resistant material, such as an absorbent, mineral-based, chemically-inert, thermally-resistant material. In this regard, the first part in the inner pouch **38** may include expanded perlite ("perlite") and/or vermiculite, for example, which material may or may not be pre-moistened. Other absorbent materials, such as charcoal and wood flour, may also be used. The first part in the inner pouch **38** may also include other chemicals or compositions that may or may be not important to the reaction or the components of the reactive system. For example, the first part in the inner pouch **38** may include a preservative for the sugar used to delay the initiation of the exothermic reaction.

[0057] The ratio of the chemicals or compositions in the two-part system described herein may have a considerable degree of variation therein. For example, the ratio of water to calcium oxide, by weight, may vary between 0.15:1 and 1.25:1. Moreover, while a material such as perlite may be used, it need not be used; consequently, the ratio of perlite (in a moisture-free or bone-dry state) to water, by weight, may vary between 0:1 and 0.67:1. Likewise, while a material such as sugar may be used, it need not be used; hence, the ratio of sugar to water, by weight, may vary between 0:1 and 0.05:1. Factors that may influence the ratios used may include, among others, the heater product used, the heater system used, and the amount of material (food mass) to be warmed. It is believed that, relative to the amount of the material to be warmed, a direct relationship exists between the amount of material to be warmed and the amount of water and calcium oxide required; i.e., a greater amount of food mass requires more water and calcium oxide to be used.

[0058] According to one group of embodiments, useful with the heater product **20** discussed above and below, the ratio of water to calcium oxide, by weight, may vary between 0.2:1 and 0.6:1, and may particularly vary between 0.25:1 and 0.35:1. Moreover, the ratio of perlite (in a moisture-free or bone-dry state) to water, by weight, may vary between 0.06:1 and 0.14:1. Further, the ratio of sugar to water, by weight, may vary between 0.01:1 and 0.02:1. While the proportions of the chemicals and compositions used may vary within this group, one embodiment according to this disclosure uses 600 g of calcium oxide, 180 g of water, 15 g of perlite, and 2.7 g of sugar to produce a sufficient amount of thermal energy to maintain the temperature of 2 kg of food mass (e.g., chili) in an aluminum tray for upwards of one hour. It has also been found, according to another embodiment of this system, that use of 1200 g of calcium oxide, 360 g of water, 30 g of perlite and 5.4 g of sugar produces a sufficient amount of thermal energy to maintain the temperature of 2 kg of food mass in an aluminum tray for upwards of two hours. According to still another embodiment of this system, it has been further found that use of 750 g of calcium oxide, 225 g of water, 18.75 g of perlite and 3.375 g of sugar produces a sufficient amount of thermal energy to maintain the temperature of 2 kg of food mass in an aluminum tray for upwards of two hours. This further embodiment also included certain preservatives (0.4 g of citric acid (anhydrous) 99%, 0.2 g of sodium benzoate 99%, and 0.2 g of potassium sorbate 99%).

[0059] Other embodiments of the composition are possible.

[0060] For example, it has been found that suitable amounts of heat (for example, to maintain the temperature of 2 kg of food mass for approximately 45-50 minutes) may be produced when 200 g of calcium oxide is combined with a liquid component that includes 100 g of water and 1.5 g of sugar, the ratio of water to calcium oxide being 0.5:1 and the ratio of sugar to water being 0.015:1. Similar compositions using the same ratio of calcium oxide, water and sugar have also been tested and found useful, such as 400 g calcium oxide, 200 g water, and 3 g sugar; 420 g calcium oxide, 210 g water, and 3.15 g sugar; 450 g calcium oxide, 225 g water, and 3.38 g sugar; 500 g calcium oxide, 250 g water, and 3.75 g sugar; and 800 g calcium oxide, 400 g water, and 6 g sugar.

[0061] Additionally, it has been found that suitable amounts of heat (for example, to maintain the temperature of 2 kg of food mass for approximately one hour) may be produced when 500 g of calcium oxide is combined with a liquid component that includes 125 g of water and 1.56 g of sugar, the ratio of water to calcium oxide being 0.25:1 and the ratio of sugar to water being 0.012:1. It has also been found that suitable amounts of heat may be produced when

600 g of calcium oxide is combined with a liquid component that includes 150 g of water and 2.25 g of sugar, the ratio of water to calcium oxide being 0.25:1 and the ratio of sugar to water being 0.015:1.

[0062] It has further been found that suitable amounts of heat (for example, to maintain the temperature of 2 kg of food mass for approximately 90 minutes) may be produced when 600 g of calcium oxide is combined with a liquid component that includes 180 g of water, 2.7 g of sugar and 15 g of perlite, the ratio of water to calcium oxide being 0.3:1, the ratio of sugar to water being 0.015:1, and the ratio of perlite to water being 0.08. Similar success was found with similar amounts of calcium oxide, water and sugar and varying amounts of perlite, including 17.5 g (0.10:1), 20 g (0.11:1), 25 g (0.14:1) and 30 g (0.17:1). Suitable amounts of heat were also produced when 1200 g of calcium oxide is combined with a liquid component that includes 360 g of water, 5.4 g of sugar and 40 g of perlite, the ratio of water to calcium oxide being 0.3:1, the ratio of sugar to water being 0.015:1, and the ratio of perlite to water being 0.11:1.

[0063] It has also been found that suitable amounts of heat (for example, to maintain the temperature of 2 kg of food mass for approximately 90 minutes) may be produced when 600 g of calcium oxide is combined with a liquid component that includes 180 g of water, 9 g of sugar and 20 g of perlite, the ratio of water to calcium oxide being 0.3:1, the ratio of sugar to water being 0.050:1, and the ratio of perlite to water being 0.11:1.

[0064] To assemble the heater product **20**, the inner pouch **38** may be initially formed with ends **44**, **46** closed and the pull strip **72** disposed over the holes **74**, **76**, but with at least one side seam **158** open. A mixture of water, perlite and sugar may be disposed into each of the three cavities **62**, **64**, **66**. According to one embodiment, the cavities **62**, **64**, **66** are filled with unequal proportions of the mixture; for example, the proportions for the cavities **62**, **64**, **66** may be 20:60:20. The side seam **158** may then be sealed. The second and third sections **84**, **86** of the pull strip **72** may then be disposed through the sealing mechanism **90**, which may already be fitted in the opening **88** of the wall **30** of the outer pouch **24**. The cavity **36** may then be filled with calcium oxide. The end **28** of the outer pouch **24** may then be sealed with the end **46** of the inner pouch **38** inside the seal, thereby attaching the inner pouch **38** to the outer pouch **24**.

[0065] It may be noted that, as shown, the orientation of the inner pouch **38** relative to the outer pouch **24** places the holes **74**, **76** facing upwards. It is believed that this orientation of the holes **74**, **76** may limit pooling of the material in the inner pouch **38** beneath the inner pouch **38** after release. Additionally, as shown, the inner pouch **38** is positioned such that it is proximate to the bottom of the outer pouch **24**. It is believed that this orientation of the inner pouch **38** relative to the outer pouch **24** prevents the inner pouch and/or the contents of the inner pouch **38** from acting as an insulator, limiting exchange of thermal energy with the food tray **150**. Moreover, the release mechanism **70** is disposed on top of the inner pouch **38** as shown. It is believe that this orientation of the release mechanism **70** may limit the resistance that the calcium oxide may present relative to removal of the release mechanism **70** from the heater product **20**.

[0066] To assemble the heater product **20** with the remainder of the heater system **22**, the anchors **130** may be disposed through the holes **120**, **122** in the first end **26** of the outer pouch **24**, with the anchors **130** already attached to the tray **140** and the product **20** oriented as shown in **FIG. 4** with the opening **88** in the wall **30** of the outer pouch **24** disposed facing the bottom of the tray **140**. The anchors **134** may then be disposed through the holes **124**, **126** in the second end **28** of the pouch **24**. The food tray **150** may then be disposed so that the lip **154** of the food tray **150** abuts and rests on the edge **142** of the tray **140**.

[0067] To activate the heater product **20**, the user may first remove the patch **149** from over the vent holes **148**. The user may then grasp the enlarged region **98** of the pull strip **72**, and may apply an outward force to the pull strip **72** until at least the holes **74**, **76** have been exposed. According to one embodiment of the disclosure, force may be applied to the pull strip **72** until the entire pull strip **72** has been removed from the heater product **20**.

[0068] As the water/perlite/sugar mixture is released into the calcium oxide, the exothermic reaction may be initially delayed by the presence of the sugar, to permit, for example, the user to assemble the heater product **20** with the remainder of the heater system **22** (e.g., by disposing the heater product **20** into the tray **140** and disposing the tray **150** on top of the tray **140** and the heater product **20**). After the initial release of water into contact with the calcium oxide, further release of water to the calcium oxide may occur in a controlled fashion by virtue of, for example, the presence of the perlite and the multiple cavities or chambers **62**, **64**, **66** of the inner pouch **38**. That is, it is believed that, as the perlite material is heated, the perlite material may release moisture in the form of steam into contact with the calcium oxide in the outer pouch **24**. Additionally, the thermal energy generated by the release of moisture in contact with the calcium oxide, may cause the water/perlite/sugar mixture in the second cavity **64**, which has remained sealed thus far, to increase in temperature. It is presently believed that, as the temperature of the mixture increases, given that the amount of mixture present is constant and the volume of the cavity **64** is relatively constant, the pressure in the cavity **64** increases and causes a pressure differential across the weakened sections **100**, **110**. It is also believed that an increase in pressure in the cavity **64** may also be caused by the interaction between the trays **140**, **150** and the heater product **20**. Further, it is believed that the seals that form the partitions **58**, **60** may begin to weaken because of the increase in temperature. Eventually, the weakened section **100**, **110** of at least one of the partitions **58**, **60** may fail and give way, causing the material in the second cavity **64** to be released, preferably slowly, into contact with the calcium oxide in the cavity **36** via at least one of the cavities **62**, **66**. As an alternate path, the material in the second cavity **64** may also be released via the plurality of small holes defined in the upper section **54** of the wall **48**, as discussed above.

[0069] It is believed that by using a system in which water and water vapor are released in a controlled fashion into contact with the calcium oxide, undesirable spiking of the temperature of the food may be avoided. That is, it is believed that the gradual release of the water to the calcium oxide, through the use of moisture-absorbent material, for example perlite, and the sequential release of the first part of the two-part system from the cavities **62**, **64**, **66** may cause undesirable spiking of the temperature of the food to be avoided, which may have the additional consequence of

avoiding charring of the food. It is also believed that the gradual release of thermal energy may improve the efficiency of the exchange of thermal energy between the heater product **20** and the food tray **150**. Further, it may improve the overall efficiency of the system **22** by minimizing the energy losses to the production of vented steam.

[**0070**] The reaction between the water and the calcium oxide continues for some amount of time, during which time thermal energy may be supplied to the food in the food tray **150**. The thermal energy may be supplied to the food in the tray **150** along a first path defined by contact between the heater pouch **20** and the food tray **150**. However, thermal energy may also be supplied to the food in the food tray **150** as a consequence of the release of, for example, steam from the heater product **20**, even if the heater product **20** is not in direct contact with the food tray **150**. Because the indirect exchange of thermal energy through steam may not be as efficient as the direct exchange of thermal energy through contact, it may be preferred to partially close the vent holes **148** through contact with the underside of the food tray **150** to prevent steam losses.

[**0071**] Having thus discussed the structure, assembly and operation of an embodiment of the heater product **20** and heater system **22**, the further embodiments of the present disclosure are discussed.

[**0072**] **FIGS. 4-15** show various alternative embodiments of the heater system **22** using a heater product **20**, as previously described. In discussing these additional embodiments, similar elements will be designated using similar reference numerals with the use of a single prime for the embodiment shown in **FIGS. 5 and 6**, a double prime for the embodiment shown in **FIGS. 11 and 12**, and a triple prime for the embodiment shown in **FIGS. 13 and 14**. While the heater product **20** is common to all four embodiments of the heater system **22**, this need not necessarily be the case, and the structure of the heater product **20** and the composition of the materials disposed in the heater product **20** may vary between and among the various embodiments.

[**0073**] While the embodiment shown in **FIG. 4** has a base **138** into which a plurality of trays **140**, **150** are nested, with the heater product **20** disposed between the trays **140**, **150**, the embodiment of the heater system **22'** shown in **FIGS. 5 and 6** includes a different mechanism for disposing the heater product **20'** proximate to the food tray **150'**. As shown, the base **138'** has an opening **170** formed in the side, as well as an opening in the top through which the food tray **150'** is disposed. Into the opening **170** is disposed a drawer **172**, which can be moved relative to the base **138'** between an open state, as shown in **FIG. 5**, and a closed state, as shown in **FIG. 6**. The drawer **170** has side walls **174** and a bottom **176**, which define a receptacle **178** into which a heater product **20'** may be placed. Rather than using the clip-like anchors **130**, **134** shown in **FIG. 4**, anchors **180** (two of which are shown in **FIG. 6**) are used that are attached to the side walls **174**. The anchors **180** cooperate with the holes **120**, **122**, **124**, **126** as the anchors **130**, **134** did in the previous embodiment.

[**0074**] The embodiment of **FIGS. 7-10** is similar to that shown in **FIGS. 5 and 6** in that a drawer is included in the base, and is moveable between an open state and a closed state. The embodiment of **FIGS. 7-10** differs from that shown in **FIGS. 5 and 6** in that a lid is included above the base, covering the food tray to prevent loss of heat.

[**0075**] The embodiment of **FIGS. 11 and 12** shows a heater system **22"** wherein the heater product **20"** is used with a conventional chafer dish arrangement. In this embodiment, anchors **130"**, **134"** (two of which are shown) similar to those used in **FIG. 4** are included to limit the movement of the heater product **20"** relative to the remainder of the system **22"**. Further, a thin platform, or spacer, **190** may be disposed under the heater product **20"** to ensure the proximity between the heater product **20"** and the food tray **150"**.

[**0076**] The embodiment of **FIGS. 13 and 14** shows a heater system **22'"**, in the form of a take-out container, wherein the heater product **20'"** is used with a nested arrangement of trays, as is shown in **FIG. 4**. However, unlike the nested arrangement of trays shown in **FIG. 4**, anchors **200** are attached, as in the embodiment shown in **FIGS. 5 and 6**, to the side walls **202** of the tray **140'"** that is disposed into the base **138'"**. For that matter, the trays need not be nested, but instead stacked one on top of the other to form a space in between into which a heater product **20'"** may be disposed.

[**0077**] Also illustrated, in **FIG. 15**, is an alternative embodiment of the heater product **20**, which will be designated with the reference numeral **20A**. Unlike the heater product **20**, the heater product **20A** may include an outer tray **210** and an inner pouch **212**. The outer tray **210** may have an opening **214** over which a lid **216** may be disposed. The outer tray **210** may have a lip **218** that extends about the periphery of the tray **210** and about which an edge **220** of the lid **216** may be secured, by crimping, for example. In particular, the inner pouch **212** may have a tail section **222** that is secured to the outer tray **210**, by securing the tail section **222** between the tray **210** and the lid **216**. The heater product **20A** may also include a release mechanism **224**, which may be of the pull-strip variety that causes a wall of the inner pouch **212** to separate to permit materials within the inner pouch **212** to be released into the outer tray **210**.

[**0078**] In assembly, the inner pouch **212** may be filled with the first part (e.g., water/sugar/perlite) of the two-part exothermic composition referenced above, although other compositions and system may be used. The inner pouch **212** may then be disposed in the outer tray **210**, with the tail section **222** disposed on the lip **218** of the tray **210**. The outer tray **210** may then be filled with other part (e.g., calcium oxide and/or phosphorous pentoxide) of the two-part system. The lid **216** may then be disposed onto the outer tray **210**, with the release mechanism (pull strip) **224** fed through an opening **226** in the lid **216**. The edge **220** of the lid **216** may then be crimped about the lip **218** of the tray **210**, thereby closing the tray **210** and securing the pouch **212** to the tray **210**.

[**0079**] In operation, an end of the release mechanism **224** may be grasped by the user, and a force applied to separate or tear the wall of the inner pouch **212** along a line of attachment of the release mechanism **224** with an outer surface **228** of the inner pouch **212**. The tearing or separation of the inner pouch **212** may cause the contents of the inner pouch **212** to be released into the material in the outer tray **210**.

[**0080**] It may be noted that because the outer tray **210** may be made of a more rigid material than the outer pouch **24** of the heater product **20**, it may not be necessarily to utilize a

system of anchors, as shown in the embodiments of the system **22**, **22'**, **22"**, **22'"**. Moreover, the rigidity of the product **20**A may also assist in maintaining a consistent area of contact between the product **20**A and a food tray disposed on top of the product **20**A, for example.

[**0081**] Additionally illustrated, in **FIGS. 16 and 17**, is an alternative embodiment of the inner pouch **38** of the heater product **20**, the alternative embodiment being designated with the reference numeral **38**A. The inner pouch **38**A may be assembled with the other components of the heater product as shown in **FIGS. 1 and 2** relative to inner pouch **38**, and as explained in greater detail below.

[**0082**] Unlike the inner pouch **38**, the inner pouch **38**A may have a single cavity **250** that may be formed by sealing (e.g., heat sealing) the inner pouch **38**A along ends **252**, **254** and **256**, **258**. Also unlike the inner pouch **38**, the inner pouch **38**A has no holes **74**, **76**, but instead relies upon rupture of the inner pouch wall **260** to release the contents therefrom.

[**0083**] In particular, a pull tab, or strip, **262** may be fixedly secured (e.g., with one or more heat seals) to an outer surface **264** of the inner pouch wall **260**, which pull tab **262** may depend from the heater product in the same or similar fashion to the pull tab **72** illustrated in **FIGS. 1 and 2**. Strips **266**, **268** of reinforcing material (such as, for example, SCOTCH-brand Reinforced Filament Tape #8981, available from 3M of St. Paul, Minn.) may also be fixedly secured to the outer surface **264** of the inner pouch wall **262**. The first strip of reinforcing material **266** may be disposed such that it is axially aligned with the pull tab **262**, while the strips **268** may be disposed at an angle to a line that passes through the pull tab **262** and the first strip **266**.

[**0084**] In use, force may be applied to the pull tab **262** causing it to move from the left to the right, across the inner pouch **38**A as shown in **FIGS. 16 and 17**. This, in turn, may cause the inner pouch wall **260** to rupture. The first strip **266** of reinforcing material, which may be partially overlapped by the pull tab **262**, may guide the tear in the inner pouch wall **260** initiated by the force applied to the pull tab **262** so as to limit the likelihood that the tear will be too small to release the contents of the inner pouch **38**A. On the other hand, the strips **268** may guide the tear in the inner pouch wall **260** to limit the likelihood that the tear will be too large such that the user will be unable to remove the pull tab **262** and associated portion of the ruptured inner pouch wall **260** from the heater product.

[**0085**] **FIGS. 18-23** illustrates an alternative heater product **20**B, with an outer pouch **300** similar to that shown in **FIGS. 1 and 2** and an inner pouch **314** similar to that shown in **FIGS. 16 and 17**.

[**0086**] As shown in **FIG. 18**, the heater product **20**B may include an outer pouch **300** (made of, for example, foil on a linear low density polyethylene sealant) having a first end **302** and a second end **304**. As shown in **FIG. 19**, the outer pouch **300** may include a pouch wall **306**, which may be flexible, semi-rigid, rigid, etc., having an outer surface **308** and an inner surface **310** (see **FIG. 20C**). The inner surface **310** of the pouch wall **306** may define a cavity **312** in which is disposed an inner pouch **314**. The inner surface **310** of the pouch wall **306** may be described as having a first section and a second section, which with the pouch **300** disposed as illustrated in **FIGS. 18 and 19** may be described as an upper section and a lower section.

[**0087**] The inner pouch **314** (made of, for example, polyester on foil on a polyethylene sealant) also has a first end **320** and a second end **322**. As shown in the Figures, the inner pouch **314** also includes a pouch wall **324** having an outer surface **326** (**FIG. 18**) and an inner surface **328** (**FIG. 21**). Moreover, the inner surface **328** of the pouch wall **324** may be described as having a first (or upper) section and a second (or lower) section.

[**0088**] It should be noted that designations such as "upper" and "lower" are for ease of discussion only, and are not meant to limit the disclosure in any fashion, for a similar designation may be used if the pouch was inverted with the second section of the outer pouch being "upper" and the first section being "lower" and the second section of the inner pouch being "upper" and the first section being "lower."

[**0089**] As illustrated in **FIG. 21**, the wall **324** of the inner pouch **314** may be sealed at both the first and second ends **320**, **322**. Thus, similar to the embodiment of the inner pouch **38**A shown in **FIGS. 16 and 17**, the inner pouch **314** has a single cavity **334**. Unlike the embodiment of inner pouch **38**A, the seals at the first and second ends **320**, **322** may have a chevron-shaped section, which chevron-shaped section may assist in lowering the pull force required to tear the wall **324** of the inner pouch **314**.

[**0090**] As further illustrated in **FIG. 19**, the inner surface **310** of the wall **306** of the outer pouch **300** may be joined to itself at the first and second ends **302**, **304** of the outer pouch **300**. In particular, as shown in **FIG. 19**, the inner surface **310** of the outer pouch **300** may be joined at the second end **304** such that the second end **322** of the inner pouch **314** is disposed between the first and second sections of the inner surface **310** of the wall **306**. In this fashion, the second end **322** of the inner pouch **314** may be attached to the second end **304** of the outer pouch **300**. The first and second sections of the inner surface **310** of the wall **306** may also be joined at the first end **302** to close the first end **302** of the outer pouch **300**.

[**0091**] The outer and inner pouches **300**, **314** may also be attached together in other ways. For example, the outer surface **326** of the inner pouch **314** may have adhesive strips **339** attached thereto, as shown in **FIG. 23**. The adhesive strips may be used to attach the outer an inner pouches **300**, **314** together to limit the space beneath the inner pouch **314** between the outer pouch **300** and the inner pouch **314**.

[**0092**] In operation, the contents of the cavity **334** are to be released into the cavity **312**. Consequently, the heater product **20**B may include a release mechanism **340**, which includes a pull strip **342** and strips of reinforcing material **344**, **346**. In this regard, the inner pouch **314** is similar to the inner pouch **38**A shown in **FIGS. 16 and 17**.

[**0093**] The release mechanism may now be discussed in greater detail with reference to **FIGS. 19 and 22**. In particular, the pull strip **342** (made of, for example, nylon laminated to a low density polyethylene sealant) may have a first end **348** and a second end **350**. In between the first end **348** and the second end **350** may be a first section **352**, a second section **354**, and a third section **356**.

[**0094**] The first section **352** of the pull strip **342** may be fixedly secured (e.g., with one or more heat seals) to the outer surface **326** of the inner pouch wall **324**. The strips **344**, **346** of reinforcing material (such as, for example,

SCOTCH-brand Reinforced Filament Tape #8981, available from 3M of St. Paul, Minn.) may also be fixedly secured to the outer surface **326** of the inner pouch wall **324**. The first strip of reinforcing material **344** may be disposed such that it is axially aligned with the pull strip **342**, while the strips **346** may be disposed parallel to and slightly offset from a line that passes through the pull strip **342** and the first strip **344**. There also exists a gap between the first strip **344** and the second strips **346**.

[**0095**] In use, force may be applied to the pull strip **342**. This, in turn, may cause the inner pouch wall **324** to rupture. The first strip **344** of reinforcing material, which may be totally overlapped by the pull strip **342** (see **FIG. 19**, only a portion of the pull strip **342** is shown in **FIG. 22** to improve clarity), may guide the tear in the inner pouch wall **324** initiated by the force applied to the pull tab **342** so as to limit the likelihood that the tear will be too small to release the contents of the inner pouch **314**. On the other hand, the strips **346** may guide the tear in the inner pouch wall **324** to limit the likelihood that the tear will be too large such that the user will be unable to remove the pull strip **342** and associated portion of the ruptured inner pouch wall **324** from the heater product.

[**0096**] The second section **354** may be connected to the first section **352**, and may lie back on top of the first section **352**, as best seen in **FIG. 19**, for example. The second section **354** may also be disposed through an opening **360** in the wall **306** of the outer pouch **300**. In fact, a sealing mechanism **362** (see **FIGS. 20A-20C**) may be disposed beneath the opening **360**, and the section **354** of the pull strip **342** may be disposed through the sealing mechanism **362** and then the opening **360**.

[**0097**] As best seen in **FIG. 20A**, the sealing mechanism **362** may include a first piece **364**, a second piece **366** and a third piece **368**, although the mechanism may be formed as a one or two-piece mechanism as well. The first piece **364** and the second piece **368** may have slits **370**, **372** formed therethrough, while the middle piece **364** may have a larger slot **374** formed therethrough. All three pieces **364**, **366**, **368** may be made of, for example, low density polyethylene (LDPE). The three pieces **362**, **364**, **368** may be joined together, for example through the use of fasteners, such as staples, as shown in **FIG. 20B**. As shown in **FIG. 20C**, the assembly of pieces **362**, **364**, **366** may then be attached to the inner surface **310** of the wall **306** through the use of an attachment patch **376**, as shown, the attachment patch **376** also having a slit (not shown) formed therethrough. In operation, the cavity defined by the slot **374** may act as a "catch" to receive any material that is not removed from the strip **342** by the third piece **368**, but that is removed by the first piece **362**.

[**0098**] The third section **356** may terminate in the second end **350** of the pull strip **342**. The third section **356** of the pull strip **342** may be outside the outer pouch **300** of the heater product **20**B, and may include an enlarged region **380**. The enlarged region **380** may be included to make it easier for the user of the product **20**B to grip the end **350** of the pull strip **342** to apply force to the pull strip **342**.

[**0099**] The embodiment of heater product **20**B may also differ from that shown in **FIGS. 1 and 2** in that the vent holes **148** have been replaced with a number of pinholes **390** (see **FIG. 18**). In fact, the several hundred pinholes may be made in the wall **306** of the outer pouch **300**. These pinholes **390** may permit steam to escape from the outer pouch **300** during operation. While the holes **390** should be small enough to prevent the escape of materials from the outer pouch **300**, the holes **390** (and the opening **360**) may be covered by a removable adhesive label that prevents loss of material in shipment and may be removed prior to activation.

1. A heater product comprising:

a first cavity in which a first part of a heater composition is disposed, the first part comprising calcium oxide;

a second cavity in which a second part of a heater composition is disposed, the second part comprising water, an reaction-initiation delayer and water-release limiter; and

a barrier between the first cavity and the second cavity, such that when the barrier is removed, the first and second parts combine to provide an exothermic reaction.

2. The heater product according to claim 1, wherein the reaction-initiation delayer comprises sugar.

3. The heater product according to claim 2, wherein the sugar comprises sucrose, glucose or fructose.

4. The heater product according to claim 1, wherein the water-release limiter comprises an absorbent, chemically-inert, thermally-resistant material.

5. The heater product according to claim 4, wherein the water-release limiter comprises perlite.

6. The heater product according to claim 5, wherein the reaction-initiation delayer comprises sugar.

7. The heater product according to claim 6, wherein the ratio of water to calcium oxide, by weight, may vary between 0.15:1 and 1.25:1, the ratio of sugar to water, by weight, may vary between 0:1 and 0.05:1, and the ratio of the perlite to water, by weight, may vary between 0:1 to 0.67:1.

8. The heater product according to claim 7, wherein the ratio of water to calcium oxide, by weight, may vary between 0.2:1 and 0.6:1, the ratio of sugar to water, by weight, may vary between 0.01:1 and 0.02:1, and the ratio of the perlite to water, by weight, may vary between 0.06:1 to 0:0.14.

9. The heater product according to claim 8, wherein the ratio of water to calcium oxide, by weight, may vary between 0.25:1 and 0.35:1, the ratio of sugar to water, by weight, may vary between 0.01:1 and 0.02:1, and the ratio of the perlite to water, by weight, may vary between 0.06:1 to 0:0.14.

10. The heater product according to claim 8, wherein the ratio of water to calcium oxide, by weight, is 0.3:1, the ratio of sugar to water, by weight, is 0.015:1, and the ratio of the perlite to water, by weight, is 0.083:1.

11. The heater product according to claim 10, further comprising preservatives.

12. A heater product comprising:

an outer pouch, the outer pouch having a wall with an inner surface that defines an outer pouch cavity and an opening therethrough;

an inner pouch disposed within the outer pouch cavity and attached to the outer pouch, the inner pouch having a

wall with an inner surface that defines at least one inner pouch cavity and an outer surface;

a pull strip with a first portion secured to the outer surface of the inner pouch and a second portion disposed through the opening in the outer pouch;

at least one reinforcing strip secured to the outer surface of the inner pouch to guide a tear formed in the wall of the inner pouch when force is applied to the pull strip;

a first part of a heater composition disposed in the outer pouch cavity and a second part of a heater composition disposed in the inner pouch cavity, the first and second parts capable of an exothermic reaction when combined.

13. The heater product according to claim 12, further comprising first and second reinforcing strips, the first and second reinforcing strips secured on either side of the pull strip.

14. The heater product according to claim 13, wherein the first and second reinforcing strips are parallel to the pull strip substantially along the first portion.

15. The heater product according to claim 12, wherein the first portion of the pull strip is aligned with and overlaps the at least one reinforcing strip.

16. The heater product according to claim 12, wherein the at least one reinforcing strip comprises at least one strip of reinforced tape applied to the outer surface of the inner pouch.

17. The heater product according to claim 12, wherein the first part comprises calcium oxide and the second part comprises water.

18. The heater product according to claim 17, wherein the second part comprises a reaction-initiation delayer and a water-release limiter.

19. The heater product according to claim 18, wherein the reaction-initiation delayer comprises sugar and the water-release limiter comprises perlite.

20. The heater product according to claim 12, further comprising a sealing mechanism disposed proximate to the opening, the sealing mechanism including first and second pieces each with a slit formed therethrough and the second portion of the pull strip disposed through the slits in the first and second pieces.

21. The heater product according to claim 20, wherein the sealing mechanism includes a third piece disposed between the first and second pieces, the third piece having a slot formed therethrough that is larger than the slits formed in the first and second pieces, the slot defining a cavity to receive material removed from the pull strip.

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