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(54)

APPARATUS AND METHOD FOR PROVIDING HEAT TRANSFER

(57) In order to overcome the limitations and problems that earlier apparatus and methods have experienced, a bag for dry ice (46) is proposed, comprising:

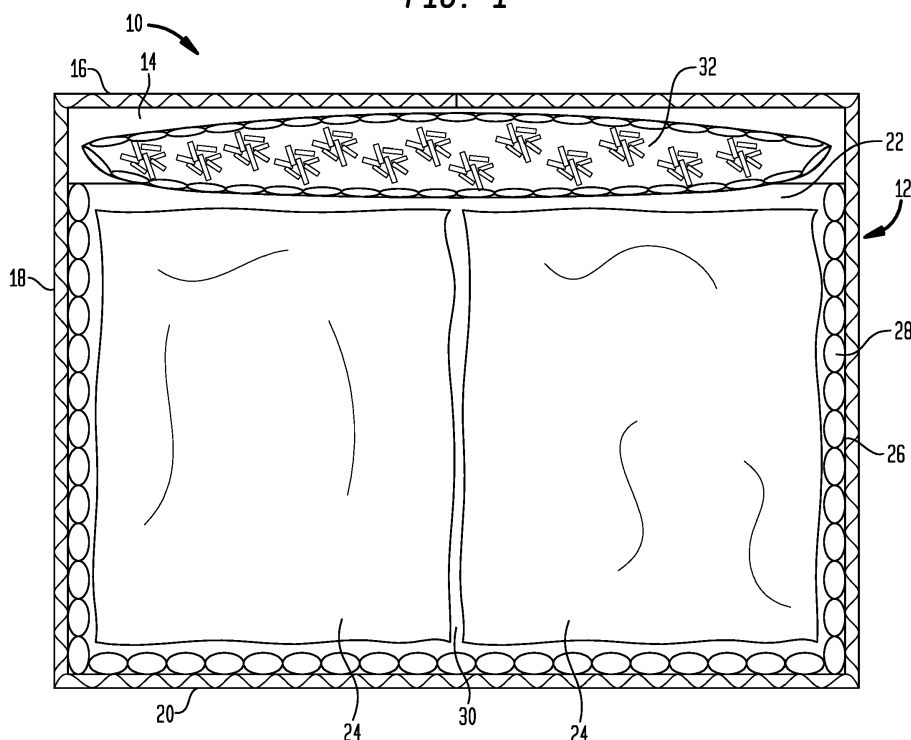
- a container having a chamber (44) therein for receiving the dry ice (46);
- a first layer (52) of insulation at the chamber (44) constructed and arranged to provide a first heat transfer rate;

and

- a second layer (50) of insulation at the chamber (44) spaced apart from the first layer (52) of insulation, and constructed and arranged to provide a second heat transfer rate greater than the first transfer rate.

 A related method of providing heat transfer is also provided.

FIG. 1



Description

Technical field of the present invention

[0001] The present invention relates to apparatus and methods to transport perishable products such as for example food products which must remain chilled or frozen for delivery to recipient locations.

Technological background of the present invention

[0002] Delivery of products, such as for example home delivery of grocery products, has many challenges in order to deliver the food in a non-perishable state. One challenge is to provide a cost effective, nonreturnable container for the food product capable of maintaining same in a chilled or frozen state when the container with groceries will be exposed to external or ambient temperatures during transport to and at the recipient location, such as a home or business.

Disclosure of the present invention: object, solution, advantages

[0003] Starting from the disadvantages and shortcomings as described above as well as taking the prior art as discussed into account, an object of the present invention is to overcome the limitations and problems that earlier apparatus and methods have experienced.

[0004] This object is accomplished by an apparatus comprising the features of claim 1 or of claim 9 as well as by a method comprising the features of claim 11. Advantageous embodiments, expedient improvements and other optional features of the present invention are set forth herein and disclosed in the respective dependent claims.

[0005] The present invention basically provides for a delivery container, in particular for a disposable food product transport box and ice pouch, designed for inexpensive construction and which can be mass produced at low cost, and which can be reuseable, non-returnable, and/or recyclable.

[0006] There is therefore provided a bag for dry ice, which includes a container having a chamber therein for receiving the dry ice; a first layer of insulation, especially of bubble wrap, at the chamber constructed and arranged to provide a first heat transfer rate; and a second layer of insulation, especially of bubble wrap, at the chamber spaced apart from the first layer of insulation, and constructed and arranged to provide a second heat transfer rate greater than the first transfer rate.

[0007] According to an advantageous embodiment of the present invention, a top may be constructed and arranged to seal the chamber with the dry ice therein; in particular, the top may have a releasably engageable seal of for example tongue and groove construction, mechanical crimping, heat sealing, pressure sealing or any other method of mechanical closure, in order to close off

or seal access to the chamber after the dry ice has been deposited into the chamber.

[0008] A pre-determined amount of the dry ice may be loaded into the snow bag either manually or via automation.

[0009] In an expedient embodiment of the present invention, a first sidewall may be positioned to support the first layer, a second sidewall may be positioned to support the second layer, and at least one vent hole in the second sidewall may permit vapour from the dry ice to be exhausted from said chamber. The construction of the snow bag permits only the escape or exhaust of vapour through the vent hole(s) and thereby prevents a user or handler of the snow bag from physically contacting the dry ice and being subjected to ice burn.

[0010] In order to enable the snow bag to be of flexible construction, the container and the first and second layers may favourably be constructed of flexible material.

[0011] According to a preferred embodiment of the present invention, a transport container may have a space therein for receiving the bag, and a cover to close-off the space when the bag is disposed therein. The transport container may advantageously be constructed of cardboard, in particular comprising a substance to facilitate biodegradation of said cardboard.

[0012] Construction of the transport container with corrugated cardboard provides for natural ventilation from the container without adversely impacting the truck, shipping container, etc. that is transporting the apparatus or a plurality of apparatus for many different recipients.

[0013] In an expedient manner, the transport container may comprise a plurality of compartments, each one of said plurality of compartments, especially differently, sized and shaped to receive a corresponding bag. That is, the transport container may favourably be compartmentalized so that one of the grocery bags is in its own compartment having the necessary one of the snow bags deposited thereon to provide for a chilled atmosphere; while the other grocery bag is in its own compartment within the transport container and has another snow bag deposited thereon to maintain the food products in the grocery bag in a frozen state.

[0014] According to a preferred embodiment of the present invention, the transport container may comprise insulation material lining the space; to facilitate control of an atmosphere at the interior space, an inner surface of the sidewalls of the transport container may advantageously be provided with insulation material, for example selected from the group consisting of bubble wrap, high density foam, and a combination thereof.

[0015] There is also provided a dry ice bag for transporting groceries, which includes a flexible pouch having a space therein for containing dry ice; a plurality of insulation liners in the space, each of said insulation liners providing a separate and distinct heat transfer rate; at least one hole in the flexible pouch proximate one of the plurality of insulation liners having a lowest heat transfer rate and through which vapour from the dry ice may be

exhausted from the space; and optionally an opening to the space, said opening sealed closed after the dry ice is delivered into said space.

[0016] There is further provided a method of providing heat transfer for products, in particular for groceries or other food products, to be transported, which includes positioning the product for transport; providing a container having a chamber therein for receiving, in particular a (pre-)determined amount of, the dry ice, a first layer of insulation at the chamber constructed and arranged to provide a first heat transfer rate, and a second layer of insulation at the chamber spaced apart from the first layer of insulation, and constructed and arranged to provide a second heat transfer rate greater than the first transfer rate; and orientating the container with one of the first and second layers facing the product, in particular contacting the container with the products.

[0017] In an advantageous manner, the chamber may be sealed closed after the receiving of said dry ice in said chamber, especially by a releasably engageable seal of for example tongue and groove construction, mechanical crimping, heat sealing, pressure sealing or any other method of mechanical closure, in order to close off or seal access to the chamber after the dry ice has been deposited into the chamber.

[0018] The container may expediently be transported to a remote location for receipt of the products, and may favourably be returned for subsequent use.

Brief description of the drawings

[0019] For a more complete understanding of the present embodiment disclosures and as already discussed above, there are several options to embody as well as to improve the teaching of the present invention in an advantageous manner. To this aim, reference may be made to the claims dependent on claim 1 as well as on claim 9 as well as on claim 11; further improvements, features and advantages of the present invention are explained below in more detail with reference to particular and preferred embodiments by way of non-limiting example and to the appended drawing figures taken in conjunction with the following description of exemplary embodiments, of which:

FIG. 1 shows a cross-section side plan view of a disposable transport apparatus embodiment according to the present invention, said apparatus working according to the method of the present invention;

FIG. 2 shows a side perspective view of an element of the apparatus shown in FIG. 1;

FIG. 3 shows a cross-section top plan view of the element shown in FIG. 2; and

FIG. 4 shows a stop perspective view in cross-section

of the apparatus of FIG. 1.

[0020] In the appended drawing figures, like equipment is labelled with the same reference numerals throughout the description of FIG. 1 to FIG. 4.

Detailed description of the drawings; best way of embodying the present invention

[0021] Before explaining the inventive embodiments in detail, it is to be understood that the present invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the present invention is capable of other embodiments and being practiced or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

[0022] In the following description, terms such as horizontal, upright, vertical, above, below, beneath and the like, are used solely for the purpose of clarity illustrating the present invention and should not be taken as words of limitation. The drawings are for the purpose of illustrating the present invention and is not intended to be to scale.

[0023] The present embodiments provide a disposable food product transport box which does not have to be returned by the recipient and is manufactured from recyclable materials.

[0024] In general and referring to FIG.1 to FIG. 4, an apparatus 10 of the present inventive embodiments includes a transport box, such as for example a corrugated cardboard box, used as the outer shell of the container for the apparatus. The container includes an open end having for example a top or flaps which can be opened for access to the interior of the container and closed for shipment of the products, such as grocery products, to the recipient.

[0025] An interior space of the container is provided with an insulation material liner, such as for example bubble wrap, to line the bottom and sides of the container. The insulation liner can be a single piece precut to the interior volume of the container or alternatively, the insulation liner can be a plurality of inserts each also precut and nested inside the container at specific regions to line the bottom and sidewalls of same.

[0026] If bubble wrap is used for the insulation liner, the size of the bubbles and density of same can be selected based upon the atmosphere in the container that is to be used to ship the food products, groceries, etc., providing a chilled or frozen atmosphere.

[0027] The apparatus 10 also includes a snow bag or pouch having a relatively thin profile constructed from, for example bubble wrap and in which is contained a predetermined amount of CO₂ snow or pellets. That is, the snow bag, as more clearly shown in FIG. 2 and in FIG. 3, includes a space or chamber therein in which the CO₂ snow or pellets are contained.

[0028] Referring to FIG. 2 and to FIG. 3, the snow bag is shown in more detail when it is filled with dry ice and thereafter sealed for use in the container when the grocery products are shipped. As shown in FIG. 2 and in FIG. 3, a top and bottom of the snow bag is sealed to the sidewall to provide the bag or pouch, and bubble wrap is disposed at an interior of the sidewall as more clearly shown in FIG. 3 for a purpose described hereinafter.

[0029] One sidewall of the bag is provided with relatively thin or smaller sized bubble wrap and has at least one and for most applications, a plurality of holes through the sidewall in fluid communication with an interior space of the pouch wherein the CO₂ snow or pellets is disposed. An opposite side of the wall has relatively larger sized or thicker bubble wrap and is without holes.

[0030] The effect of the sidewall with the holes and the relatively thinner bubble wrap allows for the escape of CO₂ vapour during the sublimation of dry ice in the pouch. That same side of the bag provides for an increase in heat flux for greater heat removal with respect to grocery products facing or in close proximity to such sidewall.

[0031] The opposite sidewall with the thicker bubble wrap and no holes therethrough provides for less heat removal from the grocery products when placed in close proximity or facing same.

[0032] Referring in particular to FIG. 1, the apparatus 10 is shown constructed as a transport box 12 which, in effect, can be an open ended container having an open end 14 disposed for most applications, at a top 16 of the transport box. Such construction facilitates loading of the apparatus 10. The transport box 12 is formed from a plurality of sidewalls 18, one of such sidewalls providing a bottom 20 of the box.

[0033] The sidewalls 18 define an interior space 22 or chamber for the transport box 12. The interior space 22 is sized and shaped to receive at least one and for many applications a plurality of grocery bags 24 or other food products. The top 16 is movable in and out of position with respect to the open end 14 and the interior space 22 to provide access to same for loading and discharge as will be described hereinafter.

[0034] The sidewalls 18, including the top 16 and the bottom 20, may be constructed of thermally insulateable material. Alternatively, or in addition thereto, an inner surface 26 of the sidewalls 18 may be provided with insulation material 28. The insulation material 28 may include bubble wrap, high density foam, or a combination, by way of example only, to line the inner surface 26 of the transport box 12 to facilitate control of an atmosphere 30 at the interior space 22.

[0035] A snow bag 32 is constructed and arranged to be disposed at the interior space 22 of the transport box 12. The snow bag 32 as mentioned above contains a predetermined amount of CO₂ snow 46 or pellets (dry ice).

[0036] Referring also to FIG. 2 and to FIG. 3, the snow bag 32 is shown with more specificity. The snow bag 32 may be of flexible or firm construction. As shown in FIG.

2 and in FIG. 3, the snow bag 32 includes opposed sides 34, 36, a top 38 and a bottom 40. The top 38 is provided with an opening 42 in communication with a chamber 44 within the snow bag 32. The opening 42 is provided for introduction of the CO₂ snow 46 or pellets into the chamber 44.

[0037] The top 38 may have a releasably engageable seal 48 of for example tongue and groove construction, in order to close off or seal access to the chamber 44 after the CO₂ snow 46 has been deposited into the chamber. A pre-determined amount of the CO₂ snow 46 or pellets is loaded into the snow bag 32 either manually or via automation.

[0038] An interior surface of each one of the sides 34, 36 is provided with a layer of insulation material such as for example bubble wrap. Referring in particular to FIG. 3, the side 34 is provided with a bubble wrap layer 50, while the side 36 is provided with another bubble wrap layer 52. The bubble wrap layer 50 is of a lesser or thinner construction than the bubble wrap layer 52. In effect, the bubble wrap layer 50 provides for greater heat removal or heat flux with respect to food products at the interior space 22 of the transport box 12.

[0039] In contrast, the bubble wrap layer 52 provides for less heat removal, i. e. for a lesser amount of heat removal or a reduced heat flux of the food products at the interior space 22 of the transport box 12 as will be described hereinafter. That is, there will be provided a greater amount of heat removal to occur at the side 34 of the snow bag 32, as compared to the heat removal which will occur at the side 36 of the snow bag 34.

[0040] The side 34 is also provided with a plurality of vent holes 54 positioned either randomly or in an arranged pattern at the side 34 shown for example in FIG. 2. The vent holes 54 may have a diameter ranging of, for example, from 2 mm to 5 mm.

[0041] In FIG. 4 there is shown the transport box 12 arranged to deliver the grocery bags 24 which are positioned at the interior space 22 of the transport box and a pair of the snow bags 32 deposited on top of each one of the grocery bags for providing heat transfer depending upon whether the food products need to be chilled or frozen.

[0042] That is, the transport box 12 may be compartmentalized so that one of the grocery bags 24 is in its own compartment having the necessary one of the snow bags 32 deposited thereon to provide for a chilled atmosphere; while the other grocery bag 24 is in its own compartment within the transport box 12 and has another snow bag 32 deposited thereon to maintain the food products in the grocery bag 24 in a frozen state. The compartments may be of different sizes and shapes.

[0043] During use of the disposable food product transport box apparatus 10 of the present invention, either the chilled or frozen groceries 24 are loaded into the interior space 22 within the confines of the insulation material 28. The transport box can be any size depending upon the amount or volume of the grocery products to be

shipped.

[0044] Construction of the transport box 12 with corrugated cardboard provides for natural ventilation from the container without adversely impacting the truck, shipping container, etc. that is transporting the apparatus 10 or a plurality of apparatus for many different recipients.

[0045] If the groceries 24 being shipped are of a chilled variety, the snow bag 32 is disposed at the top of the transport box 12 with the larger bubble wrap side without the holes facing downward exposed to and possibly in contact with the groceries when the top 16 is or the flaps are closed. This will maintain the groceries in a chilled condition. Such an arrangement allows for less heat transfer between the groceries and the snow bag 32 and keeps the groceries 24 in a chilled state.

[0046] If, on the other hand, the groceries being transported are required to be frozen, the snow bag 32 will be disposed onto the top of the groceries in the container with the sidewall 34 of the bag having the smaller bubble wrap 50 and plurality of vent holes 54 facing the groceries when the top 16 is or the flaps are closed. This arrangement of the snow bag 32 with respect to the groceries provides for greater heat transfer between the groceries and the snow bag and maintains a frozen temperature for the groceries in the container.

[0047] The snow bag 32 can be sealed by mechanically crimping the top 38 at the opening 42 to the chamber 44 such as for example by using the tongue and groove construction, mechanical crimping, heat sealing, pressure sealing or any other known method of mechanical closure.

[0048] The construction of the snow bag 32 permits only the escape or exhaust of CO₂ vapour through the vent holes 54 and thereby prevents a user or handler of the snow bag from physically contacting the dry ice and being subjected to ice burn.

[0049] The transport box 12 can be constructed of inexpensive, readily available shipping materials such as for example cardboard and bubble wrap as described above. This will lower costs considerably of the apparatus 10 over existing systems which employ plastic totes and plastic shipping boxes. Such plastic constructions are expensive and must be returned for reuse.

[0050] In contrast, the corrugated cardboard and bubble wrap can be disposed of for being subsequently recycled, such as after home delivery. Alternatively, it is possible to infuse or incorporate into the cardboard other substances to make the cardboard biodegradable, thereby further reducing the footprint of disposable materials with respect to the environment.

[0051] The transport box 12 may also be constructed of plastic components with same being sized and shaped to permit stacking for easy storage and recycling of same for use as constructed.

[0052] It will be understood that the embodiments described herein are merely exemplary, and that a person skilled in the art may make variations and modifications without departing from the spirit and scope of the present

invention. All such variations and modifications are intended to be included within the scope of the present invention as described and claimed herein. It should be understood that the embodiments described above are not only in the alternative, but can be combined.

List of reference numerals

[0053]

- | | |
|----|--|
| 10 | apparatus, in particular disposable food product transport box apparatus |
| 12 | box or container, in particular transport box or transport container |
| 14 | open end |
| 16 | cover or top of box or container 12 |
| 18 | sidewall of box or container 12 |
| 20 | bottom of box or container 12 |
| 22 | interior space or chamber |
| 24 | product, in particular food product or grocery |
| 26 | inner surface of sidewall 18 |
| 28 | insulation material |
| 30 | atmosphere at interior space or chamber 22 |
| 32 | bag or box or container or pouch, in particular snow bag or snow box or snow container or snow pouch |
| 34 | second side or second sidewall of bag or box or container or pouch 32 |
| 36 | first side or first sidewall of bag or box or container or pouch 32 |
| 38 | top of bag or box or container or pouch 32 |
| 40 | bottom of bag or box or container or pouch 32 |
| 42 | opening of top 38 |
| 44 | chamber or space within bag or box or container or pouch 32 |
| 46 | chilling substance, in particular dry ice, for example CO ₂ snow or CO ₂ pellets |
| 48 | releasably engageable seal of top 38 |
| 50 | second insulation layer or second insulation liner, in particular second bubble wrap layer or second bubble wrap liner, at second side or second sidewall 34 |
| 52 | first insulation layer or first insulation liner, in particular first bubble wrap layer or first bubble wrap liner, at first side or first sidewall 36 |
| 54 | hole, in particular vent hole, at second side or second sidewall 34 |

Claims

1. A bag for dry ice (46), comprising:

- a container having a chamber (44) therein for receiving the dry ice (46);
- a first layer (52) of insulation at the chamber (44) constructed and arranged to provide a first heat transfer rate; and
- a second layer (50) of insulation at the chamber

- (44) spaced apart from the first layer (52) of insulation, and constructed and arranged to provide a second heat transfer rate greater than the first transfer rate.
2. The bag according to claim 1, further comprising
- a first sidewall (36) positioned to support the first layer (52) of insulation,
 - a second sidewall (34) positioned to support the second layer (50) of insulation,
 - at least one vent hole (54) in the second sidewall (34) for permitting vapour from the dry ice (46) to be exhausted from said chamber (44), and/or
 - a top (38) constructed and arranged to seal the chamber (44) with the dry ice (46) therein.
3. The bag according to claim 1 or 2, wherein the container and the first and second layers (52, 50) of insulation are constructed of flexible material.
4. The bag according to at least one of claims 1 to 3, wherein the first and second layers (52, 50) of insulation each comprise bubble wrap.
5. The bag according to at least one of claims 1 to 4, further comprising a transport container (12) having a space (22) therein for receiving the bag, and a cover (16) to close-off the space (22) when the bag is disposed therein.
6. The bag according to claim 5, wherein the transport container (12) is constructed of cardboard, said cardboard in particular comprising a substance to facilitate biodegradation of said cardboard.
7. The bag according to claim 5 or 6, wherein the transport container (12) comprises a plurality of compartments, each one of said plurality of compartments sized and shaped to receive a corresponding bag.
8. The bag according to at least one of claims 5 to 7, wherein the transport container (12) comprises insulation material (28) lining the space (22), said insulation material in particular selected from the group consisting of bubble wrap, high density foam, and a combination thereof.
9. A dry ice bag for transporting at least one product (24), in particular comprising groceries or other food product, comprising:
- a flexible pouch having a space (44) therein for containing dry ice (46);
 - a plurality of insulation liners (52, 50) in the space (44), each of said insulation liners (52, 50) providing a separate and distinct heat transfer rate; and
 - at least one hole (54) in the flexible pouch proximate one of the plurality of insulation liners (50) having a lowest heat transfer rate and through which vapour from the dry ice (46) may be exhausted from the space (44).
10. The dry ice bag according to claim 9, further comprising an opening to the space (44), said opening sealed (48) closed after the dry ice (46) is delivered into said space (44).
11. A method of providing heat transfer for at least one product (24), in particular comprising groceries or other food product, to be transported, comprising:
- positioning the product (24) for transport;
 - providing a container having a chamber (44) therein for receiving the dry ice (46), a first layer (52) of insulation at the chamber (44) constructed and arranged to provide a first heat transfer rate, and a second layer (50) of insulation at the chamber (44) spaced apart from the first layer (52) of insulation, and constructed and arranged to provide a second heat transfer rate greater than the first transfer rate; and
 - orientating the container with one of the first and second layers (52, 50) facing the product (24).
12. The method according to claim 11, wherein the providing further comprises determining an amount of the dry ice (46) to be received in said chamber (44).
13. The method according to claim 11 or 12, further comprising sealing (48) the chamber (44) closed after the receiving of said dry ice (46) in said chamber (44).
14. The method according to at least one of claims 11 to 13, further comprising transporting the container to a remote location for receipt of the product (24), and returning the container for subsequent use.
15. The method according to at least one of claims 11 to 14, wherein the orientating comprises contacting the container with the product (24).

FIG. 1

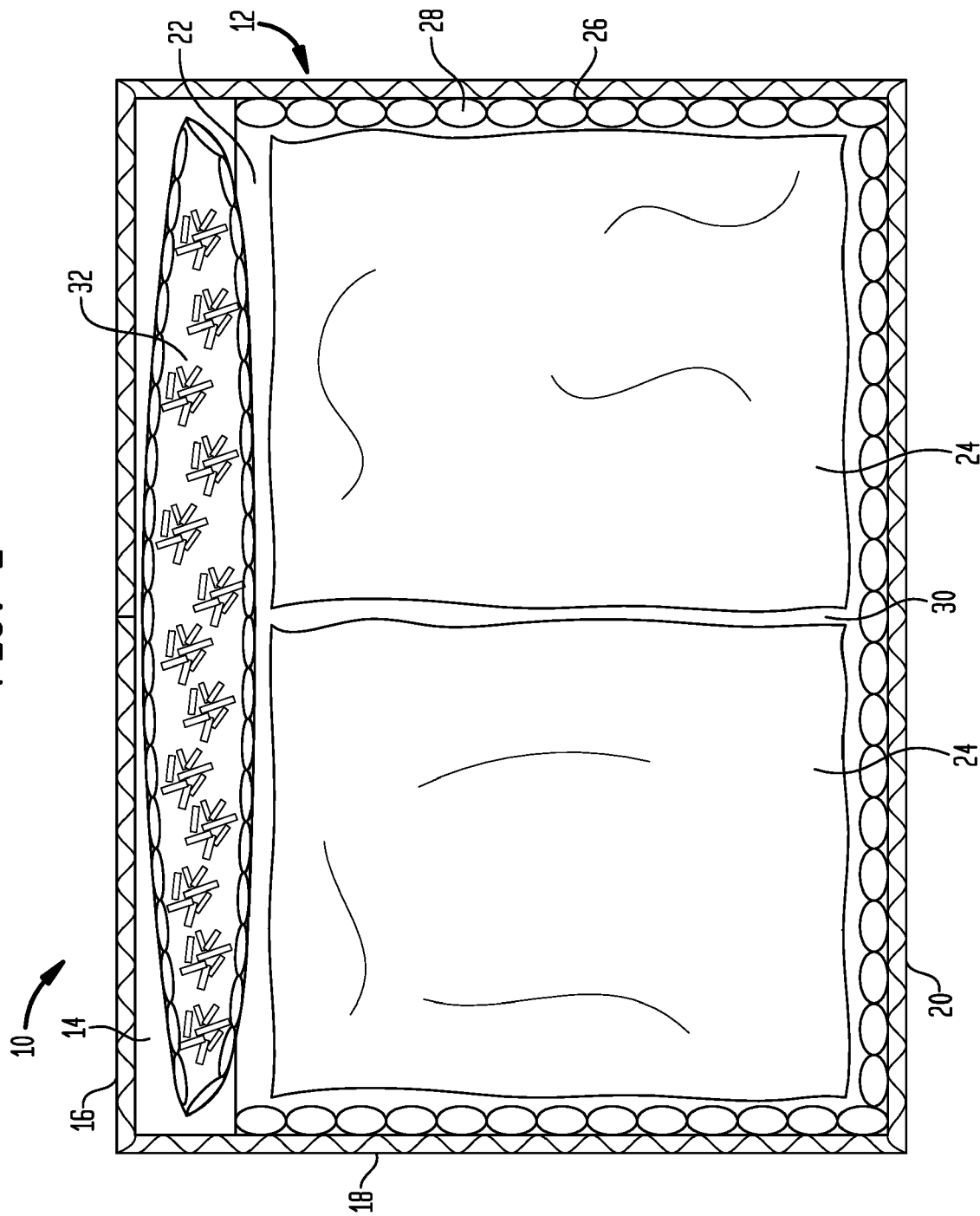


FIG. 2

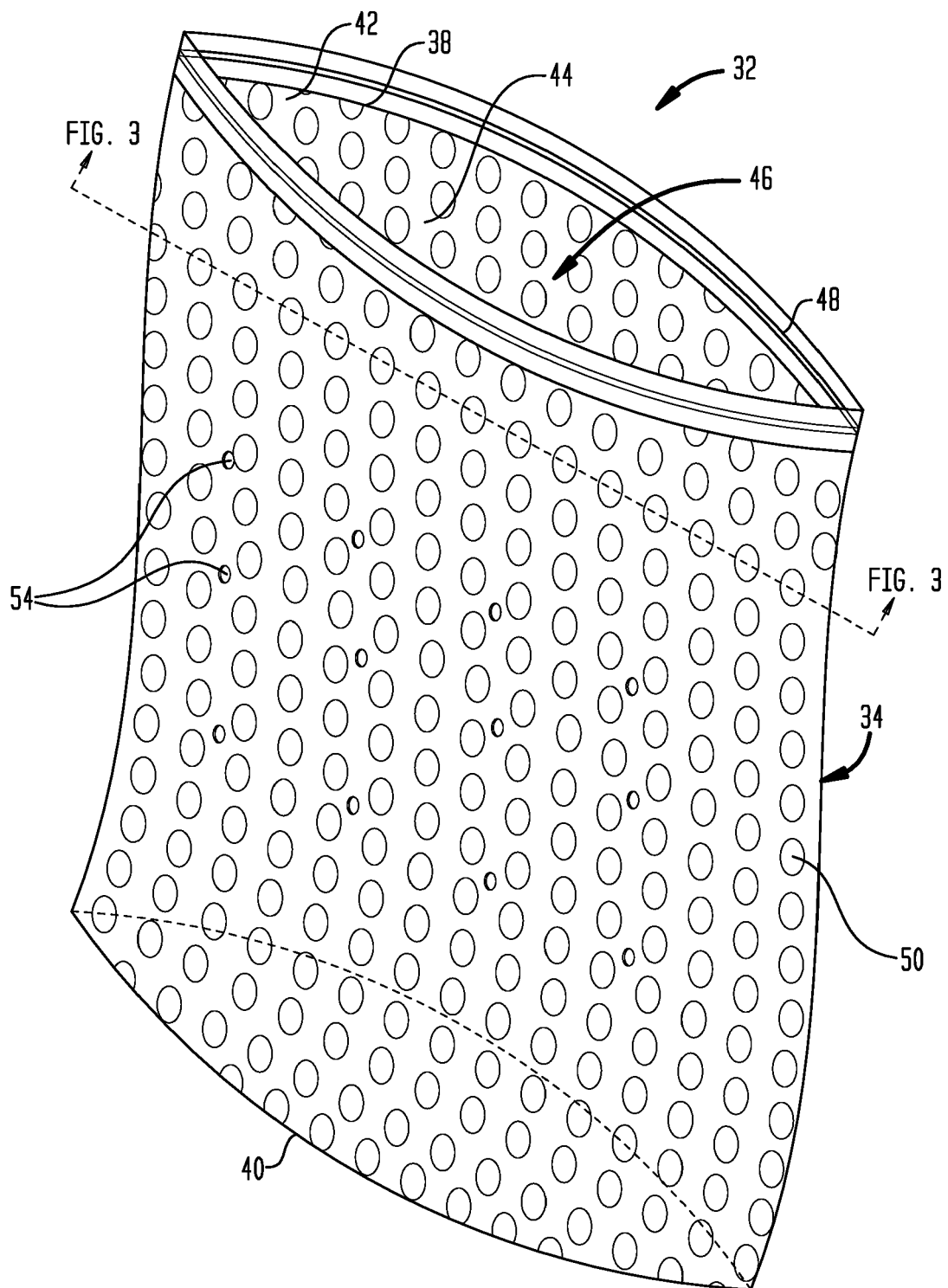


FIG. 3

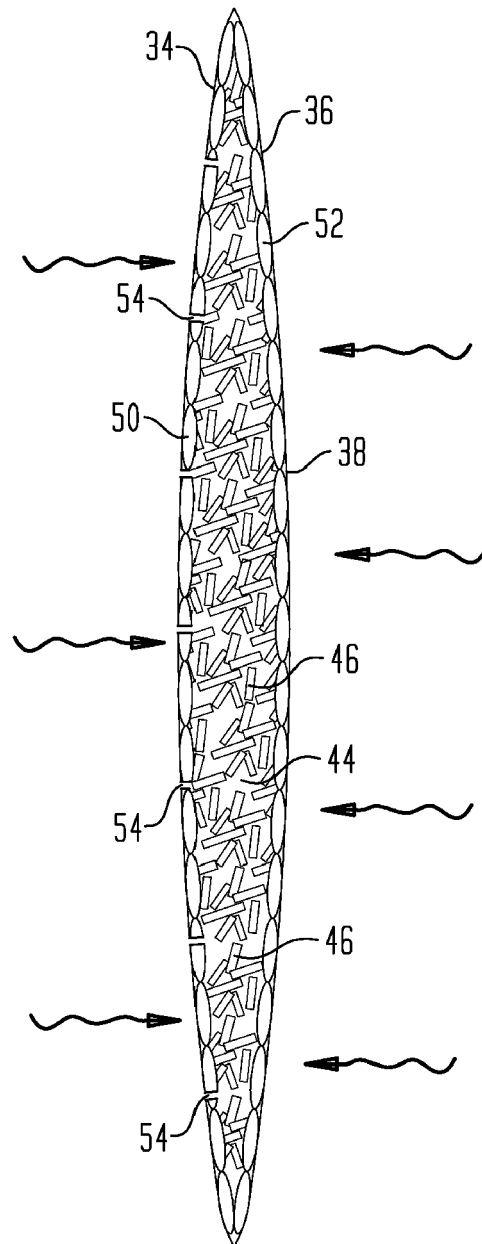
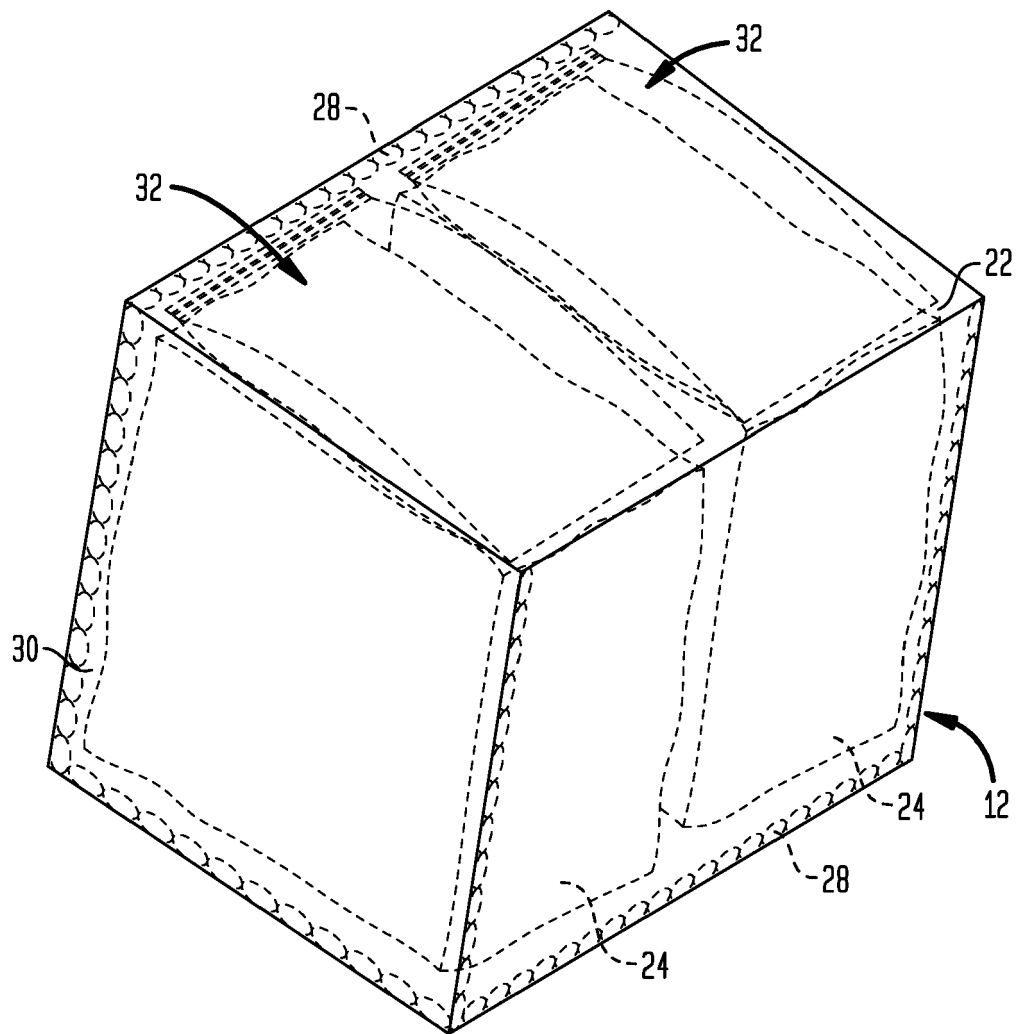


FIG. 4





EUROPEAN SEARCH REPORT

Application Number
EP 16 16 1818

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CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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