ABSTRACT

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"FOOD CONTAINER FOR EXTREMELY LOW TEMPERATURE CONDITIONS"

Disclosed is a food container. The food container comprises an outer container made of high density polyethylene (HDPE) and an inner container configured within the outer container. The outer container has a first base and a first peripheral wall and the inner container has a second base and a second peripheral wall bounding a chamber. The inner container is made of polypropylene and has a similar configuration and smaller size as compared to the outer container such that the inner container is disposed within the outer container in a spaced apart manner so as to configure a space between the first peripheral wall and the second peripheral wall. The food container also comprises a casing, having a cavity adapted to receive food, disposed within the chamber. An inner lid is provided to to be secured to the casing for covering the cavity and an outer lid is provided to be configured over the outer container for covering the inner lid.

Fig. 1

We claim:

1. A food container comprising:

an outer container made of high density polyethylene (HDPE), the outer container having a first base and a first peripheral wall extending from the first base;

an inner container configured within the outer container, the inner container having a second base and a second peripheral wall extending from the second base, the second peripheral wall bounding a chamber, the inner container being made of polypropylene and having a similar configuration and smaller size as compared to the outer container such that the inner container is disposed within the outer container in a spaced apart manner so as to configure a space between the first peripheral wall and the second peripheral wall;

a casing disposed within the chamber, the casing having a cavity adapted to receive food material therein;

an inner lid adapted to be secured to the casing for covering the cavity; and

an outer lid adapted to be configured over the outer container for covering the inner lid.

2. The food container as claimed in claim 1, wherein the space between the first peripheral wall and the second peripheral wall is filled with rigid polyurethane foam to act as a heat insulator.

3. The food container as claimed in claim 1, wherein the inner lid is a double walled hollow structure filled with rigid polyurethane foam.

4. The food container as claimed in claim 1, wherein the inner lid is configured to have a lid base and a lid top, the lid base adapted to be secured to the casing for covering the cavity.

5. The food container as claimed in claim 4, wherein the lid base of the inner lid is configured to have an annular heat resistant rubber gasket for enabling the lid base of the inner lid to be secured to the casing in a snug-fit manner.

6. The food container as claimed in claim 5, wherein the lid base comprises a channel configured on a base portion thereof adapted to receive the annular heat resistant rubber gasket therein.

7. The food container as claimed in claim 4, wherein the lid top of the inner lid is configured to have a vacuum release mechanism for enabling pressure to be released from the cavity of the casing through the inner lid.

8. The food container as claimed in claim 7, wherein the vacuum release mechanism comprises a vacuum release stopper and a vacuum release channel fluidically connected to the casing for enabling release of pressure vacuum therefrom.

9. The food container as claimed in claim 1, wherein the inner lid is made from polypropylene.

10. The food container as claimed in claim 1, wherein the outer lid is adapted to be secured to the outer container by means of an attachment mechanism.

11. The food container as claimed in claim 1, wherein the attachment mechanism comprises external and internal threads configured on the outer container and the outer lid respectively.

12. The food container as claimed in claim 1, wherein the casing is adapted to receive at least one food box having a lid, the at least one food box capable of storing food material therein.

13. The food container as claimed in claim 12, wherein the at least one food box comprises four food boxes, each having lids, disposed in a stackable manner within the casing with the help of a clamp.

14. The food container as claimed in claim 14, wherein the at least one food box, the lid and the clamp is made of stainless steel.

15. The food container as claimed in claim 1, wherein the outer container is configured to have a holding means attached thereto for enabling a user to hold the food container.

Dated this 20th day of March, 2012.

(Ramesh C. Dhawan)
Of LALL LAHIRI & SALHOTRA
AGENTS FOR THE APPLICANT

ORIGINAL 0795/DEL/12

DIRECTOR GENERAL, DEFENCE RESEARCH & DEVELOPMENT ORGANISATION
No. /DEL/2012

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SHEET-1

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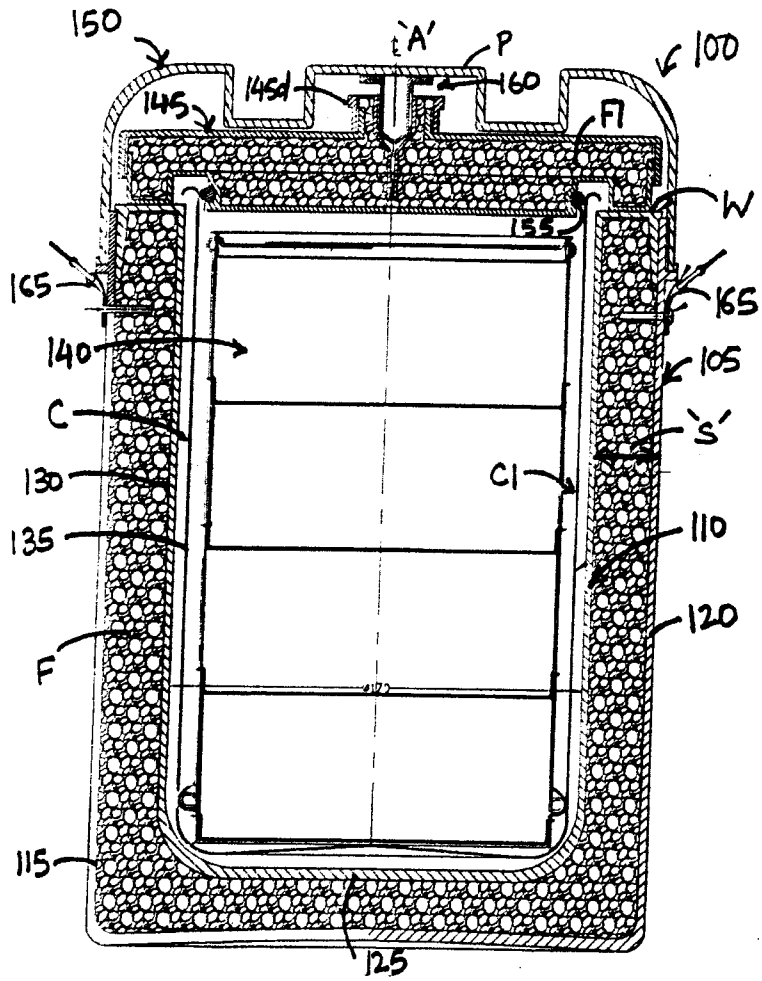

FIG. 1

(Ramesh C. Dhawan)
of LALL LAHIRI & SALHOTRA
AGENTS FOR THE APPLICANT

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0793DEL12

DIRECTOR GENERAL, DEFENCE RESEARCH & DEVELOPMENT ORGANISATION
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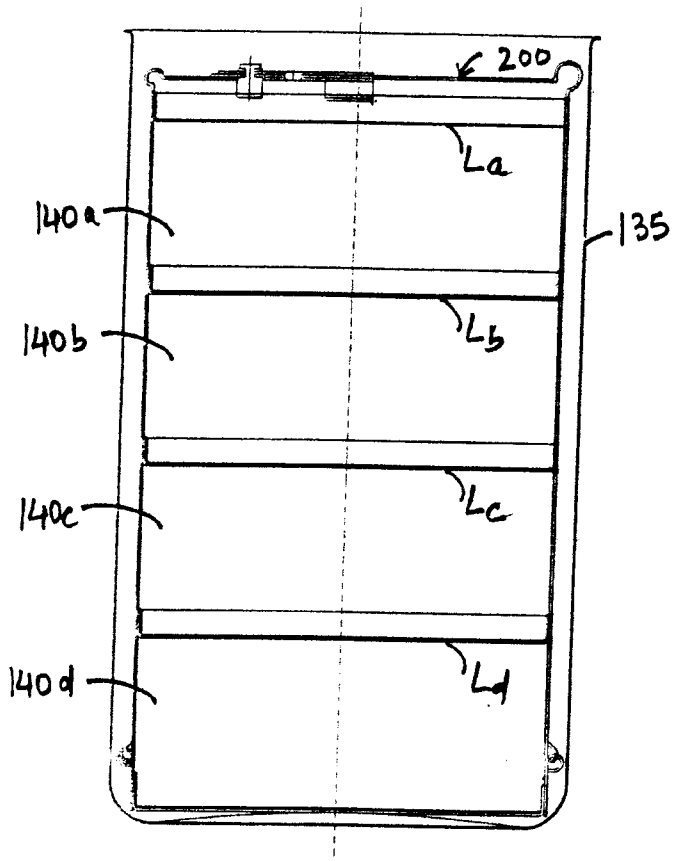

FIG. 2

(Ramesh C. Dhawan)
of LALL LAHIRI & SALHOTRA
AGENTS FOR THE APPLICANT

ORIGINAL 0793DEL12

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No. /DEL/2012

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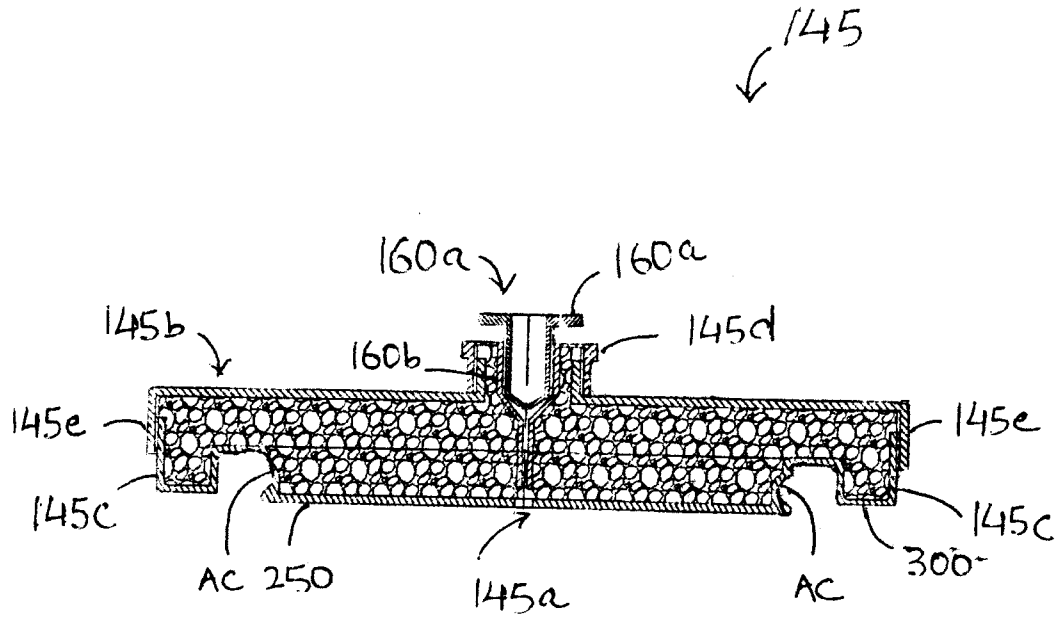

FIG. 3

(Ramesh C. Dhawan)
of LALL LAHIRI & SALHOTRA
AGENTS FOR THE APPLICANT

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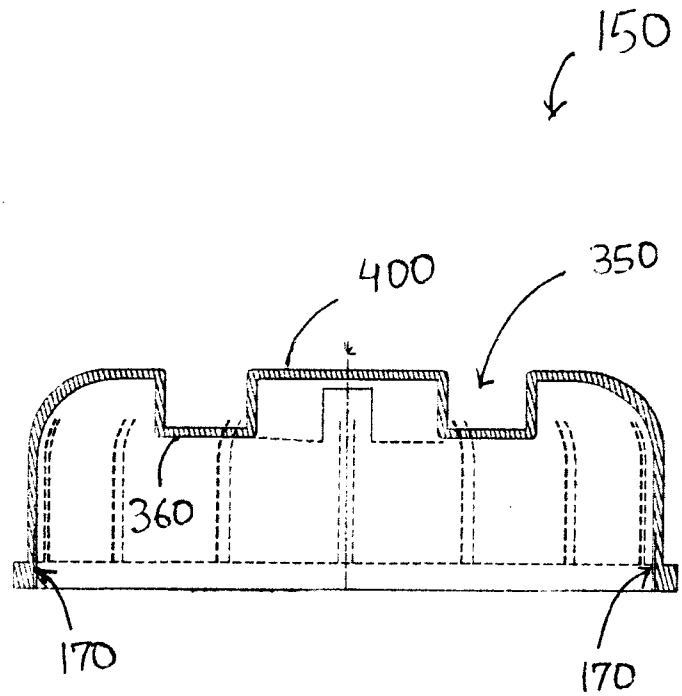

FIG. 4

(Ramesh C. Dhawan)
of LALL LAHIRI & SALHOTRA
AGENTS FOR THE APPLICANT

FIELD OF INVENTION

This invention relates to food containers, and more particularly to food containers for extremely low temperature conditions.

BACKGROUND

Food containers are required to store food and keep the contents warm for a longer duration of time. Various types of food containers are known in the art. For instance, US patent application no. 11/605,416 teaches about a portable food container for carrying and heating a food article stored therein. The food container includes an outer surface, a cavity for receiving food articles and an in-built heat source for heating the food article. Also, the container comprises a thermal insulator, i.e. aluminized powder, between the cavity and the outer body. Other US patents, viz. US 3808401, US 4037081, US 6144016 and the like, are known which teach about different types of food containers. US 3808401 relates to a portable food storage chest comprising a an insulated chamber for storing food in cold conditions and a chamber for warming or heating food. The chest also includes an electrical means for heating the heated chamber, the electrical means being adapted to receive electrical power from main source or an automobile battery. US 4037081 relates to a lunch bucket containing an electric heating coil that can be plugged into a household electric outlet, so to heat up a compartment in the bucket for holding hot foods. Another compartment is provided so to contain cold foods. Further, US 6144016 relates to a temperature insulated lunch box having an upwardly open heated food chamber and an upwardly open unheated food chamber. A cover is provided to close the food chambers. The lunch box includes an electrical circuit including a heating element , a battery, a switch controlling power to the heating element, an externally accessible connector for receiving AC power and a power converter which charges the battery from the AC source.

However, these conventional food containers have a drawback that they require a heat source for keeping the food warm for longer duration and are generally adapted to keep

food warm for at the most 2 to 3 hours. Thus, such food containers have limited usage such that the food containers are ineffective in the absence of availability of any power source, such as at remote places. Also, such food containers will not be useful in high altitude regions, such as areas where the environmental temperature is in sub-zero range, which would result in the food contained in the food container becoming cold very fast.

Accordingly, there exists a need for a food container that is adapted to keep food warm even in sub-zero temperature conditions.

There also exists a need for a food container that is adapted to keep food warm for longer duration without requiring any heat source.

OBJECTS OF THE INVENTION:

In view of the foregoing disadvantages inherent in the prior art, the general purpose of the present invention is to provide a food container for use in extremely low temperature conditions.

Accordingly, an object of the present invention is to provide a food container that is adapted to keep food warm for longer duration of time as compared to conventionally known food containers and that is effective even in sub-zero temperature conditions.

Another object of the present invention is to provide a food container that is adapted to keep food warm for longer duration, as compared to conventionally known food containers, without requiring any heat source.

These and other objects and advantages of the invention will be clear from the ensuing description.

SUMMARY:

In light of the above objects, a food container is disclosed. The food container comprises an outer container made of high density polyethylene (HDPE) and an inner container configured within the outer container. The outer container has a first base and a first peripheral wall extending from the first base and the inner container having a second base and a second peripheral wall bounding a chamber. The inner container is made of polypropylene and has a similar configuration and smaller size as compared to the outer container such that the inner container is disposed within the outer container in a spaced apart manner so as to configure a space between the first peripheral wall and the second peripheral wall. The food container also comprises a casing disposed within the chamber. The casing has a cavity adapted to receive food material therein. An inner lid is provided to to be secured to the casing for covering the cavity and an outer lid is provided to be configured over the outer container for covering the inner lid.

In another embodiment of the present invention, the space between the first peripheral wall and the second peripheral wall is filled with rigid polyurethane foam to act as a heat insulator.

In yet another embodiment of the present invention, the inner lid is a double walled hollow structure filled with rigid polyurethane foam.

In still another embodiment of the present invention, the inner lid is configured to have a lid base and a lid top, the lid base adapted to be secured to the casing for covering the

cavity.

In still another embodiment of the present invention, the lid base of the inner lid is configured to have an annular heat resistant rubber gasket for enabling the lid base of the inner lid to be secured to the casing in a snug-fit manner.

In still another embodiment of the present invention, the lid base comprises a channel configured on a base portion thereof adapted to receive the annular heat resistant rubber gasket therein.

In still another embodiment of the present invention, the lid top of the inner lid is configured to have a vacuum release mechanism for enabling pressure to be released from the cavity of the casing through the inner lid.

In still another embodiment of the present invention, the vacuum release mechanism comprises a vacuum release stopper and a vacuum release channel fluidically connected to the casing for enabling release of pressure vacuum therefrom.

In still another embodiment of the present invention, the inner lid is made from polypropylene.

In still another embodiment of the present invention, the outer lid is adapted to be secured to the outer container by means of an attachment mechanism.

In still another embodiment of the present invention, the attachment mechanism comprises external and internal threads configured on the outer container and the outer

lid respectively.

In still another embodiment of the present invention, the casing is adapted to receive at least one food box having a lid, the at least one food box capable of storing food material therein.

In still another embodiment of the present invention, the at least one food box comprises four food boxes, each having lids, disposed in a stackable manner within the casing with the help of a clamp.

In still another embodiment of the present invention, the at least one food box, the lid and the clamp is made of stainless steel.

In still another embodiment of the present invention, the outer container is configured to have a holding means attached thereto for enabling a user to hold the food container.

These aspects together with other aspects of the present invention, along with the various features of novelty that characterize the present invention, are pointed out with particularity in the claims annexed hereto and form a part of this present invention. For a better understanding of the present invention, its operating advantages, and the specific objects attained by its uses, reference should be made to the accompanying drawing and descriptive matter in which there is illustrated an exemplary embodiment of the present invention.

BRIEF DESCRIPTION OF ACCOMPANYING DRAWINGS:

The advantages and features of the present invention will become better understood with reference to the following detailed description and claims taken in conjunction with the accompanying drawings, in which:

Fig. 1 illustrates a front sectional view of a food container configured in accordance with an embodiment of the present invention.

Fig. 2 illustrates a front sectional view of a casing and at least one food box adaptable to be disposed within the food container of Fig. 1, in accordance with an embodiment of the present invention.

Fig. 3 illustrates a front sectional view of an inner lid of the food container of Fig. 1.

Fig. 4 illustrates a side view of an outer lid of the food container of Fig. 1.

DETAILED DESCRIPTION OF INVENTION WITH REFERENCE TO DRAWING:

The exemplary embodiments described herein detail for illustrative purposes are subject to many variations in structure and design. It should be emphasized, however, that the present invention is not limited to a particular food container as described. It is understood that various omissions and substitutions of equivalents are contemplated as circumstances may suggest or render expedient, but these are intended to cover the application or implementation without departing from the spirit or scope of the claims of the present invention.

The terms "a" and "an" herein do not denote a limitation of quantity, but rather denote the presence of at least one of the referenced item. Further, the terms "first," "second," and the like, herein do not denote any order, quantity, or importance, but rather are used to distinguish one element from another.

Fig. 1 illustrates a front view of a food container 100 sectioned along a longitudinal axis 'A' thereof. The food container 100 includes an outer container 105 and an inner container 110 configured within the outer container 105 in a spaced apart manner so as to configure a space 'S' therebetween. Particularly, the inner container 110 is coupled to the outer container 105 in a spaced apart manner with the help of connecting annular wall 'W' therebetween such that the space 'S' is configured. As shown in Fig. 1, the outer container 105 is configured to have a first base 115 and a first peripheral wall 120 extending from the first base 115. Also, the inner container 110 is configured to have a second base 125 and a second peripheral wall 130 extending from the second base 125. The second peripheral wall 130 of the inner container 110 bounds a chamber 'C', as shown in Fig. 1. The present invention envisages that the inner container 110 is similar in configuration to the outer container 105 but comparatively smaller in size such that when the inner container 110 is configured within the outer container 105, the space 'S' is formed between the first peripheral wall 120 and second peripheral wall 130, and the first base 115 and the second base 125, respectively. Further, in an embodiment of the present invention, the outer container 105 is made of high density polyethylene (HDPE) and the inner container is made of polypropylene. Furthermore, in an embodiment of the present invention the space 'S' is filled with rigid polyurethane (PU) foam 'F' that helps in acting as a heat insulator between the inner container 110 and the outer container 105. In an embodiment of the present invention, the PU foam 'F' is moulded simultaneously with the inner container 110 being *insitu* foamed within the outer container 105.

Further, in an embodiment of the present invention, the inner container 110 may have a capacity of around 6 liters. However, the present invention should not be construed to be limited to the described embodiment only. The inner container 110 may be configured to have any desired volume. It will be apparent that the dimensions of the outer container 105 would appropriately change in relation to the changes made to the dimensions of the inner container 110.

Referring again to Fig. 1, the food container 100 further includes a casing 135 adapted to be disposed within the chamber 'C' of the inner container 110, an inner lid 145 adapted to be disposed over the casing 135 and an outer lid 150 adapted to be configured over the outer container 105 in such a manner so as to cover the inner lid 145, as will be explained in following paragraphs. The casing 135 is adapted to hold food material therein. Particularly, the casing 135 has a cavity 'C1' adapted to receive at least one food box 140 therein. The food box 140 is adapted to receive food material therein and includes a lid for closing the food box 140. Fig. 2 illustrates a specific embodiment of the present invention having four food boxes 140 a-d (having lids La, Lb, Lc, Ld respectively) disposed in a stackable manner within the casing 135 with the help of a stainless steel clamp 200. In an embodiment of the present invention, the casing 135, the food boxes 140a-d and the clamp 200 are made of stainless steel. It shall be evident that the food boxes 140a-d and lids La-d shall be made of food grade stainless steel so as to enable food storage for longer duration without causing degradation of either the food or the food boxes 140a-d.

Referring to Figs. 1 and 3, configuration of the inner lid 145 and attachment thereof to the casing 135 for covering the cavity C1 shall be explained. Fig. 3 illustrates an enlarged view of the sectioned inner lid 145 shown in Fig. 1. In an embodiment of the present invention, shown in Fig. 3, the inner lid 145 is configured to have a lid base 145a and a lid top 145b configured on the lid base 145a. The inner lid 145 has a hollow structure bound by the lid base 145a and the lid top 145b with rigid polyurethane foam F1 filled within the hollow structure. Further, the lid base 145a is adapted to be received over the cavity C1, thereby enabling the lid 145 to cover the same, as shown in Fig. 1. It is to be noted that Fig. 1 illustrates an embodiment of the food container 100 having a circular outer container 105, inner container 110 and casing 135. In the described embodiment, the inner lid 145 includes the lid top 145b having a circular shape configured over the lid base 145a. The lid base 145a is also configured to have a circular shape but is smaller in diameter than that of the lid top 145b. Furthermore, the lid base 145a includes a base portion 250 having a concentric peripheral annular channel 145c configured around the same. As shown in Fig. 3, the

annular channel 145c projects downwardly in respect to the lid top 145b. In addition, the lid top 145b includes a upwardly projecting hollow portion 145d and a downwardly extending annular wall 145e. The diameter of the annular wall 145e is slightly greater than the external diameter of the annular wall 145c such that the lid top 145b may be configured over the lid base 145a by abutting an outer wall W1 of the annular channel 145c against the annular wall 145e, as shown in Fig. 3.

Further, the lid base 145a includes a channel 'AC' configured on the periphery of base portion 250 of lid base 145a. The channel AC is is adapted to receive an annular heat resistant rubber gasket 155 (Fig. 1) therein. The rubber gasket 155 enables the lid base 145a, and consequently the lid 145, to be secured to a top portion of the casing 135 in a snug-fit manner so as to cover the cavity C1 when required. Particularly, the lid base 145a has a diameter comparatively smaller than that of the cavity C1 and the rubber gasket 155 has an appropriate thickness such that when the lid base 145a is disposed over the casing 135 for covering the cavity C1, it may snugly fit over the top portion of the casing 135. Further, a surface 300 (Fig. 3) of the annular wall 145c rests on the annular wall 'W' configured between the inner container 110 and the outer container 105 when the lid base 145a is disposed over the casing 135, as shown in Fig. 1.

In addition, the lid top 145b is configured to have vacuum release mechanism 160 configured in the hollow projecting portion 145d of the lid top 145b. The vacuum release mechanism 160 is adapted to prevent creation of vacuum lock between the casing 135 and the inner lid 145. As shown in Fig. 3, the vacuum release mechanism 160 includes a vacuum release stopper 160a and a vacuum release channel 160b. The vacuum release channel 160b is adapted to be fluidically connected to the cavity C1 of the casing 135 when the inner lid 145 is secured to the casing 135, as shown in Fig. 1. Particularly, the vacuum release channel 160b extends through the body of the inner lid 145 to the base portion 250 such that when the inner lid 145 is disposed over the casing 135, the vacuum release channel 160b opens into the casing 135 through an opening provided in the base portion 250. The stopper 160a normally blocks the vacuum release channel 160b. To release pressure from the casing 135, the stopper

160a may be raised by a user, thereby unblocking the channel 160b and releasing the pressure from the cavity C1 and preventing creation of vacuum lock.

In an embodiment of the present invention, the inner lid 145 is made from polypropylene.

Further, in an embodiment of the present invention, the outer lid 150 is adapted to be configured over the outer container 105 in such a manner so as to cover the inner lid 145. As will be evident, the outer lid 150 is configured to be hollow so as to be able to cover the inner lid 145 when disposed over the same. In this regard, reference is made to Fig. 4 that illustrates the side view of the outer lid 150. Particularly, the outer lid 150 is circular in shape and has approximately the same external dimensions as that of the outer container 105. In an embodiment of the present invention, the outer lid 150 may be made of the HDPE, similar to the outer container 105. Further, as shown in Fig. 4, the outer lid 150 may include an annular channel 350 configured around a raised portion 400. The raised portion 400 is hollow from inside, as is evident from Fig. 1, so as to be disposed over the projecting portion 145d of the inner lid 145. Also, the depth of the annular channel 350 is such that when the outer lid 150 covers the inner lid 145, the bottom surface 360 of the annular channel 350 presses against the lid top 145b as shown in Fig. 1, thereby further tightening the connection between the inner lid 145 and the casing 135.

Furthermore, in an embodiment of the present invention, the outer lid 150 is adapted to be secured to the outer container 105 by means of an attachment means. In an embodiment of the present invention, the attachment means includes external and internal threads configured on the outer container 105 and outer lid 150 respectively. In an embodiment of the present invention, knuckle threads – 3 numbers and 6 mm in pitch – multistart are configured on the outer container 105 and the outer lid 150. Fig. 4 illustrates knuckle threads 170 configured on the outer lid 150. The external and internal threads together with the raised portion 400 and the annular channel 350 configured on the outer lid 105 help a user to secure the outer lid 150 to the outer

container 105 and also in removing it therefrom for the purpose of using the food container 100, as will be explained in the ensuing paragraph.

To use the food container 100, a user may position his fingers between the raised portion 400 and annular channel 350 so to grip the outer lid 150. The user may thereafter rotate the outer lid 150 in appropriate direction, thereby unscrewing it from the outer lid 105. Thereafter, the food boxes 140a-d, containing food and closed by lids La-d, are disposed in a stackable manner using the clamp 200 within the cavity C1 of the casing 135. The inner lid 145 is then snugly fit to the top portion of the casing 135 with the help of the rubber gasket 155, thereby covering the cavity C1. Subsequently, the outer lid 150 is disposed over the outer container 105 so as to cover the inner lid 145. The user may then grip the outer lid 150 by placing his fingers between the raised portion 400 and annular channel 350 and rotate the outer lid 150 in an appropriate direction so as to engage the internal threads 170 of the outer lid 150 with the complementary external threads (not shown) of outer container 105, thereby securing the outer lid 150 to the outer container 105. As the outer lid 105 is tightened, the bottom surface 360 of the annular channel 350 presses against the lid top 145b, thereby tightly fitting the lid 145 to the casing 135. Consequently, the food boxes 140a-d are secured within the outer container 105 in a leak proof manner for enabling easy transportation of food.

Further, in an embodiment of the present invention, the food container 100 includes a holding means (not shown) configured on the outer container 105 for enabling a user to hold the food container 100 for transportation. The holding means may include two web handle loops 165 configured on the peripheral wall 120 of the outer container 105. A strap (not shown) of nylon, plastic or cloth is connected to the web handle loops 165 for enabling the user to hold the food container 100 for transportation.

The food container 100, as described herein, has been subjected to a series of tests to ensure the reliability and effectiveness thereof. In one such test – for testing thermal

efficiency – water preheated to about 90 ± 2°C was filled in the casing 135 up to the brim, i.e. the top portion of the casing 135, and thereafter the casing 135 was closed with the inner lid 145. The casing 135 was thereafter positioned within the chamber 'C' of the inner container 110 and the outer lid 150 was secured. The food container 100 was subsequently subjected to low temperature, around -25°C. The temperature of water was checked after expiry of 6 hours and it was observed that temperature of water did not fall by a value more than 29 °C. It is thus evident that the food container 100 is capable of maintaining temperature of the contents thereof for long duration even in sub-zero temperature conditions.

A leakage test of the food container 100 was also carried out by filling the casing 135 with water to its nominal capacity and thereafter closing the casing 135 with the inner lid 145. The casing 135 was subsequently disposed within the chamber 'C' of the inner container 110 and the outer lid 150 was secured. The food container 100 was thereafter held upside down and shaken thrice and leakage from the food container 100 was checked. It was observed that the water did not leak from the food container 100 and thus the configuration of the food container 100 enables leak proof transportation of food articles.

In a drop test of the food container 100, the food boxes 140a-d were filled with water at room temperature and thereafter placed inside the casing 135. The inner lid 145 was secured to the casing 135 and the casing 135 was subsequently disposed within the chamber 'C' of the inner container 110 after which the outer lid 150 was secured. The food container 100 was thereafter dropped from a height of 1.5 meters on a smooth concrete floor or flat surface of steel in the following manner:

a. A vertical drop on the first base 115.
b. A drop at an angle of 45° on an edge of the first base 115.
c. A drop on the peripheral wall 120.

Subsequent to the three drops, a visual examination of the food container 100 was carried out, which revealed that there were no cracks either in the body of the food container 100 or the casing 135 and the food boxes 140a-d. Thus, it is evident that the configuration of the food container 100 renders it a sturdy structure.

Finally, a staining test was carried out on the food container 100 in which the food boxes 140a-d, the casing 135 and the inner lid 145 were dipped for around 16 hours in the following solutions:

a. 10 grams of Glacial Acetic acid (99%) dissolved in distilled water to make 100 ml solution; and
b. 5 grams of pure sodium chloride in distilled water to make 100ml solution.

It was observed that the food boxes 140a-d, the casing 135 and the inner lid 145 did not shown any sign of staining or corrosion after removal from the two solutions. It is thus evident that the food container 100 is corrosion resistant and may be useful even in adverse environmental conditions.

In view of the foregoing, the food container, as described hereinabove, has many advantages. Particularly, owing to the outer container and the outer lid having been made of HDPE the food container, as described, is sturdy and tough to withstand the impact of drop. Consequently, the food container may be effectively used for providing food in high altitude areas by dropping the food container, such as from helicopters. Further, the food container is adapted to keep food warm for longer duration owing to the double walled configuration thereof and the rigid polyurethane foam filled between the outer and the inner containers. This polyurethane foam checks the heat loss from the stored food even in extremely cold environmental conditions. In addition, the food container is corrosion resistant and thus can be used even in adverse environmental conditions, such as where subzero conditions exist.

Further, while the present invention has been described with reference to the outer container, the inner container, the outer lid and the inner lid having a circular shape, the present invention should not be construed as limited to particular shape only. The said features of the food container may be configured to have any other convenient shape, such as square, rectangle and the like.

The foregoing descriptions of specific embodiments of the present invention have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the present invention to the precise forms disclosed, and obviously many modifications and variations are possible in light of the above teaching. The embodiments were chosen and described in order to best explain the principles of the present invention and its practical application, and to thereby enable others skilled in the art to best utilize the present invention and various embodiments with various modifications as are suited to the particular use contemplated. It is understood that various omissions and substitutions of equivalents are contemplated as circumstances may suggest or render expedient, but such omissions and substitutions are intended to cover the application or implementation without departing from the spirit or scope of the claims of the present invention.