PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 3: B65D 90/04	A1	(11) International Publication Number: WO 80/01483
		(43) International Publication Date: 24 July 1980 (24.07.80)

(21) International Application Number: PCT/US80/00029

(22) International Filing Date: 14 January 1980 (14.01.80)

(31) Priority Application Number: 002,875

(32) Priority Date: 12 January 1979 (12.01.79)

(33) Priority Country: US

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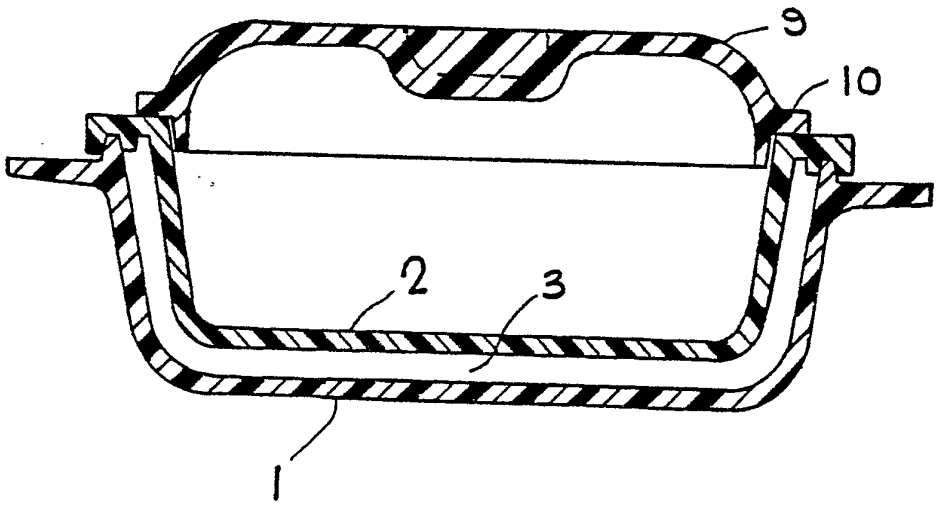
(81) Designated States: AT (European patent), CH (European patent), DE (European patent), FR (European patent), GB (European patent), JP, LU (European patent), NL (European patent), SE (European patent).

Published
With international search report
With amended claims and statement

(54) Title: INSULATED DISH AND LID FOR MICROWAVE COOKING



(57) Abstract

Thermally insulated container for cooking, serving, and storing of foods and beverages, particularly adapted for use in microwave cooking units. A double-walled vessel is provided, including an outer jacket (1) and a removable inner liner (2) both having substantially similar shapes. The liner is supported by a grooved flange (4) extending outward from its upper rim which rests on the upper rim of the outer container. The inner and outer walls are separated by a narrow gap (3) forming an enclosed air cavity. The flange groove (7) and rim are designed to allow air to escape from the cavity to relieve the pressure caused by hot foods or beverages in the vessel, and to resist air flow into the cavity as the vessel cools. A raised lid (9) is further provided, fitting over the inner liner vessel, and having a flat top and a recessed handle (12), to allow several vessels to be stacked on each other for cooking or storing.

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DESCRIPTION

1. Title: Insulated Dish and Lid for Microwave Cooking

2. Technical Field

This invention pertains generally to the field of apparatus for food and beverages, more particularly to cookware and dishes for cooking, warming, serving, storing, and refrigerating foods and beverages, and especially to cookware designed for use with microwave ovens and induction heating devices.

3. Background Art

Conventional cookware containers such as pots, pans, and roasters, are usually formed out of a single integral piece of material. These containers have the drawback that they become hot when the food is cooked in them, and therefore they require pot holders, hot pads, or other heat insulation devices for handling them when it is desired to serve the cooked food. When these hot containers are placed on a dining table, they create the danger of burns if they are touched inadvertently.

A second drawback of such containers is that when they are removed from the oven or stove, they lose heat very rapidly. As a result, the food in them tends to cool quickly, and subsequent servings during a meal are consequently degraded in taste. One conventional solution to this problem is to return the container to the oven, or to employ a hot plate or warming device, and to subject the food to low intensity heat to keep it warm during the meal.

This solution entails the necessity of having such a heating device proximately available during the meal, and it normally causes the food to suffer deterioration in quality.

The problem of handling hot dishes during a meal may be alleviated by transferring the cooked food from the cooking vessel to a serving dish to be placed on the dining table. This causes the food to cool even more rapidly, since it loses heat immediately upon contact with the dish. The dish can be warmed in advance in a heating device to offset this cooling partially. Such pre-heating may result again in the danger of having a hot dish on the dining table. Further, the use of separate vessels for cooking and serving foods causes additional and unnecessary inconvenience.

Thermos bottles and double-walled insulating dishes have been used to store and handle hot (and cold) foods and beverages to maintain their temperature at a constant level over an extended period of time. Such containers are unsuitable for cooking food in conventional stoves or ovens because of the thermal resistance of the container walls to heat flow, which is the primary physical mechanism for heating the food in these ovens. Conversely, double boilers are double-walled containers in which the food is cooked by heating a liquid residing in the space between the walls, and therefore these boilers do not alleviate the problems of handling hot containers or rapid cooling of the food because of the low thermal resistance of their walls.

In principle, microwave ovens offer advantages over conventional ranges which could solve the problems discussed above. A microwave oven heats or cooks the food by induction heating through the direct application of microwave radiation inside the oven. The cooking vessels used in these ovens are fabricated from materials which are generally transparent to this radiation, such as polycarbonate or polysulfone plastic. The radiation therefore heats the food directly without heat flow through the container walls. Of course, the container itself becomes hot during

the cooking process, since it is in contact with the food. However, in theory a double-walled vessel can be used to cook or heat food in a microwave oven, and when it is removed the outer wall will remain cool to the touch and the food will remain hot in the dish for an extended period of time.

An alternative version of such a double-walled microwave cooking vessel has an inner wall that is constructed out of a material which absorbs microwave radiation and is thermally conductive, or partially conductive. The inner surface is heated by the radiation, and it cooks or heats the food by conduction.

The difficulty with conventional double-walled containers which are suitable for microwave cooking is that they are sealed off, so that the space between the walls is entirely isolated. When the air in this space is heated by the inner wall in contact with the food, it increases in pressure and tends to expand. This creates stresses in the walls that will deform them, causing the dish to bend out of shape, and may even result in cracking. Also, with the walls fastened together at a sealed joint, additional thermal stresses are developed when the inner wall is heated, causing further deformation of the dish.

Therefore, a conventional double-walled dish must be provided with sturdy mechanical supports to resist this wall deformation. This may be accomplished by designing the walls to be very thick, or by filling the space between them with a mechanically strong heat-insulating material, or even by providing support struts across this space. These measures result in a heavier, bulkier, and costlier dish with decreased thermal insulating efficiency and less food capacity, and some residual wall deformation.

An alternative measure is to provide vent holes to allow air to escape from the interior of the gap upon heating, thereby relieving much of the stress in the walls. However, foreign material may enter the gap through these holes, and water may become trapped there when the dish is washed. This again reduces the thermal insulating effi-

ciency of the dish, and further leads to a cleaning problem for the gap interior. In short, no satisfactory design has been found for heat insulated cookware, despite many past attempts.

A further problem with conventional dishes is that space in most ovens is generally limited, and it is often difficult to fit more than one dish inside. It is desirable to provide a lid for oven cookware so that the containers can be stacked on each other in order to cook more than one food in the oven simultaneously. However, conventional lids for such cookware have handles or other upward projections which preclude the stacking of these dishes.

4. Disclosure of Invention

The present invention is a dish for cooking, storing and serving of foods and beverages. This dish is particularly suitable for cooking or heating with microwave ovens or other induction heating devices. The dish is a double-walled vessel with a narrow air space between the walls to provide thermal insulation. The inner vessel is supported by a flange around its upper rim extending outward and resting on the rim of the outer container, thereby allowing the two vessels to be separated easily. The rim of the outer vessel fits into a groove on the underside of this flange. The rim and groove are designed to allow air to escape from the space between the walls while the food is being cooked, and to form a seal which prevents the influx of air into the gap after the dish is removed from the oven. The dish is further provided with a lid which rests on the rim of the inner vessel and is raised above this rim. The lid has a handle which is recessed into this raised space, so that the upper surface of the lid is flat with no upward projections.

It is an object of this invention to provide a heat insulated container for cooking and heating foods and beverages in a microwave oven, such that while the contents are hot the outer surface of the container remains cool to

the touch.

A second object of this invention is to provide a heat insulated container for cooking and heating foods and beverages in a microwave oven, such that the temperature of the heated contents will be maintained at a constant level for an extended period of time when the container is removed from the oven.

Another object of this invention is to provide a heat insulated container for cooking and heating foods and beverages in a microwave oven, such that the container is relatively light-weight, thin-walled, non-bulky, simple and inexpensive in construction, and unsusceptible to thermal deformation.

The above objects are not limited strictly to use of the container in a microwave oven, but they also encompass its use with induction heating devices and other cooking and heating devices which do not depend for their operation on the flow of heat through the walls of the container.

Another object of this invention is to provide a container for cooking and heating foods and beverages that is aesthetically and functionally suitable for serving and storing the contents during and after a meal.

A further object of this invention is to provide a container for cooking and storing foods and beverages with a lid such that a plurality of containers may be stacked on each other in order to conserve space.

These and other objects, characteristics, and features of this invention may be better understood by examining the following drawings, together with the detailed description.

5. Brief Description of Drawings

Figure 1 is a plan view of the preferred embodiment of an assembled heat insulated cookware container with a lid.

Figure 2 is a sectional elevation view of the container taken along the lines 2 - 2 in Figure 1, showing

the double-walled construction of the container with the lid in place.

Figure 3 is a magnified fragmentary view of the rim and groove forming the joint between the inner and outer vessels in Figure 2.

Figure 4 is a sectional elevation view of the lid taken along the lines 4 - 4 in Figure 1, showing the construction of the recessed handle.

Figure 5 shows an exploded view of the container assembly in this embodiment.

6. Best Mode of Carrying Out the Invention

Referring to the drawings, the preferred embodiment of this invention comprises three distinct parts: an outer jacket vessel 1, an inner liner vessel 2, and a lid 9. The jacket and liner are thin-walled vessels having substantially similar geometric shapes and being open on top. The liner vessel is slightly smaller to allow it to fit into the jacket vessel with sufficient clearance to leave a narrow gap 3 between the walls of the two vessels.

The upper rim of the liner vessel has a flange 4 extending outward from this rim around its circumference, projecting sufficiently far to cover entirely the rim of the outer jacket vessel 8 when the two vessels are nested together. The underside of this flange is provided with inner and outer parallel ridges, 5 and 6 respectively, around the circumference, extending a short distance downward, with a narrow groove 7 between them. These ridges are located such that the upper rim of the outer vessel 8 fits snugly into the groove 7 when the vessels are nested. Thus, the inner liner vessel is supported solely by this flange groove resting on the upper rim of the outer jacket vessel.

The portion of the rim 8 lying between the ridges 5 and 6 is slightly wedge-shaped; that is, the inner and outer lateral surfaces of this rim between the ridges are slightly oblique relative to each other, so that the upper edge of the rim is slightly thinner than the wall in the

main body of the outer vessel. The lateral surfaces of the ridges adjacent to the groove are beveled correspondingly parallel to these oblique rim surfaces, so that the inner and outer lateral surfaces of the rim and the ridges fit flush against each other when the dish is assembled. The downward force on the inner liner vessel arising from its own weight plus the weight of its contents thereby produces a very close fit in the joint between the two vessels.

This design of the flange groove and rim has the desirable feature of one-way action on the air in the space 3 between the two vessels. When the contents of the dish are heated, the inner liner wall becomes hot, and the temperature and pressure of the air in this gap increase. This pressure tends to force the liner vessel upward, dislodging the flange from the rim slightly and allowing the heated air to escape across the groove joint. The stresses in the walls produced by the air pressure are thereby relieved. When the dish is removed from the oven and the air in this space begins to cool, its pressure falls below that of the atmosphere. The atmospheric pressure on the two vessels in combination with the weight of the liner and its contents forces the flange groove downward against the rim and produces a joint so tight that the cavity between the vessels becomes hermetically sealed. Air is prevented from flowing into this space and the gap remains under a partial vacuum for an extended period of time, thereby enhancing the heat insulating characteristics of the dish.

A lid 9 is also provided, fitting over the open top of the inner liner vessel and having a flange 10 around its circumference extending a short distance outward and resting on the upper rim of this vessel, which is the upper surface of the flange 4, when the lid is in place. The lid arches upward from this flange, and the central portion of the lid has a flat upper surface which is raised above the level of the flange 10. In the center of the lid is an indented region where the surface is recessed below this flat upper surface, forming a well 11. A thin vertical slab 12 extends across, and projects upward from, the bottom of this

well, and the upper edge of this slab lies flush in the plane of the flat upper surface of the lid. The slab thereby forms a recessed handle for the lid.

This lid design allows the flat bottom of one dish to be placed on the flat lid surface of another dish, so that the dishes can be stacked to achieve greater economy of space. The raised lid ensures that there is sufficient space between the contents of stacked dishes so that when they are placed in a microwave oven these contents will cook simultaneously. With several such dishes it is possible thereby to utilize the cooking space in the microwave oven with maximum efficiency.

A preferred material for this dish is polysulfone plastic, sold by Union Carbide Corporation under the trademark Udel. The components of the container may be fabricated from this plastic by the injection mold process, a technique which is well-known to persons skilled in the relevant art. This material has the features of being transparent to microwave radiation, safe in contact with foods, resistant to chemical attack by grease, and aesthetically pleasing in appearance. The material is further able to withstand temperatures as high as 204 degrees Centigrade, and indeed the dish may be used even to cook foods in conventional ovens up to this temperature. The material is strong, rigid, and resistant to mars and scratches. However, the invention is not limited in any way to this material, and embodiments employing all other suitable materials are included in its scope. The material must be nonmetallic, and it should be preferably non heat conducting.

From the above description, it is seen that this invention is suitable for serving food during a meal and for storing food as well as for cooking or heating. The inner liner vessel may be removed with the lid and contents stored in a refrigerator, while the outer jacket vessel may be used for any other purpose, such as cooking with another liner vessel. With several such dishes the liner and jacket vessels may be used interchangeably, providing great flexibility and convenience. This invention provides a means for

cooking, serving and storing foods and beverages in a single container. This feature, as well as the desirable heat insulating properties of the dish, make it a very useful cookware device.

CLAIMS

What is claimed is:

1. A double-walled vessel, comprising:

an outer container having nonmetallic floor and walls,

an inner container of similar shape to said outer container, having nonmetallic floor and walls, removably positioned within said outer container and having support means for resting in said outer container such that the walls and floors of the two containers are separated by a gap defining a cavity between the two containers, and

valve means communicative with said cavity for allowing air to escape from it when subjected to heating.

2. A double-walled vessel as recited in claim 1, wherein said valve means further prevent air from entering said cavity when subjected to cooling.

3. A double-walled vessel as recited in claim 1 or claim 2, wherein said vessel is constructed out of polysulfone plastic.

4. A double-walled vessel as recited in claim 1 or claim 2, wherein said support means and said valve means together comprise:

an upper rim forming the upper periphery of said outer container, and

a flange extending outward from and circumscribing the upper periphery of said inner container beyond said rim, such that said flange rests flush against said rim around its entire circumference when properly in place.

5. A double-walled vessel as recited in claim 4, wherein said vessel is constructed out of polysulfone

plastic.

6. A double-walled vessel as recited in claim 4, wherein the underside of said flange has two parallel ridges around its circumference projecting downward, thereby defining a groove between said ridges, said ridges being positioned immediately on either side of said rim such that this rim thereby fits into said groove.

7. A double-walled vessel as recited in claim 6, wherein said vessel is constructed out of polysulfone plastic.

8. A double-walled vessel as recited in claim 6, wherein said ridges have lateral sides adjacent to said groove which are oblique relative to each other, being nearer to each other at their top edges, which are adjacent to the root of said groove, than at their bottom edges, which are adjacent to the crests of said ridges, and wherein each of the two lateral sides of the portion of said rim between said ridges lies parallel to and flush against the corresponding lateral side of the ridge facing it, said portion of the rim forming a wedge-like section fitting snugly into said groove.

9. A double-walled vessel as recited in claim 8, wherein said vessel is constructed out of polysulfone plastic.

10. A double-walled vessel as recited in claim 1, having a flat bottom and an open top, further comprising a lid fitting over said top having an upper surface which lies in a horizontal plane at the uppermost elevation of said surface, the uppermost planar portion of said surface further surrounding a downwardly indented portion of said surface forming a well-shaped region, said region having a projection in its interior extending upward to a height not in excess of the elevation of said uppermost planar portion of

said surface.

11. A vessel as recited in claim 10, wherein said vessel is constructed out of nonmetallic material.

12. A vessel as recited in claim 11, wherein said vessel is constructed out of polysulfone plastic.

AMENDED CLAIMS
(received by the International Bureau on 20 May 1980 (20.05.80))

What is claimed is:

1. A double-walled vessel, comprising:
an outer container having nonmetallic floor and walls,
an inner container of similar shape to said outer container, having nonmetallic floor and walls, removably positioned within said outer container and having support means for resting in said outer container such that the walls and floors of the two containers are separated by a narrow gap of uniform width defining a cavity between the two containers, and
valve means communicative with said cavity for allowing air to escape from it when subjected to heating.

2. A double-walled vessel as recited in claim 1, wherein said valve means further prevent air from entering said cavity when subjected to cooling.

3. A double-walled vessel as recited in claim 1 or claim 2, wherein said vessel is constructed out of polysulfone plastic.

4. A double-walled vessel as recited in claim 1 or claim 2, wherein said support means and said valve means are defined by the same elements, comprising:
an upper rim forming the upper periphery of said outer container, and
a flange extending outward from, and circumscribing, the upper periphery of said inner container beyond said rim, such

that said flange rests flush against said rim around its entire circumference when properly in place.

5. A double-walled vessel as recited in claim 4, wherein said vessel is constructed out of polysulfone plastic.

6. A double-walled vessel, comprising:
an outer container having nonmetallic floor and walls, and having a horizontal upper rim,
an inner container of similar shape to said outer container, having nonmetallic floor and walls, removably positioned within said outer container and having support means for resting in said outer container such that the walls and floors of the two containers are separated by a gap defining a cavity between the two containers, and
a flange extending outward from the wall of said inner container beyond said rim, such that said flange rests flush against said rim, said flange and rim together providing said support means, wherein the underside of said flange has two parallel ridges around its circumference projecting downward, thereby defining a groove between said ridges, said ridges being positioned immediately on either side of said rim such that this rim thereby fits into said groove.

7. A double-walled vessel as recited in claim 6, wherein said vessel is constructed out of polysulfone plastic.

8. A double-walled vessel as recited in claim 6, wherein said ridges have lateral sides adjacent to said groove which are oblique relative to each other, being nearer to each other at their top edges, which are adjacent to the root of said groove, than at their bottom edges, which are adjacent to the crests of said ridges, and wherein each of the two lateral sides of the portion of said rim between said ridges lies parallel to and flush against the corresponding lateral side of the ridge facing it, said portion of the rim forming a wedge-like section fitting snugly into said groove.

9. A double-walled vessel as recited in claim 8, wherein said vessel is constructed out of polysulfone plastic.

10. A double-walled vessel as recited in claim 1, having a flat bottom and an open top, further comprising a lid fitting over said top having an upper surface which lies in a horizontal plane at the uppermost elevation of said surface, the uppermost planar portion of said surface further surrounding a downwardly indented portion of said surface forming a well-shaped region, said region having a projection in its interior extending upward to a height not in excess of the elevation of said uppermost planar portion of said surface, the height of said lid being not in excess of two inches.

11. A vessel as recited in claim 10, wherein said vessel is constructed out of nonmetallic material.

12. A vessel as recited in claim 11, wherein said vessel is constructed out of polysulfone plastic.

STATEMENT UNDER ARTICLE 19

Claim 1 has been amended by restriction of the cavity described therein to a narrow gap of uniform width to distinguish and avoid the prior art disclosed in U. S. Patent No. 1,499,364 (Goodrick), U. S. Patent No. 2,681,211 (Reynolds), and U. S. Patent No. 3,349,941 (Wanderer), cited in the International Search Report.

Claim 4 has been amended to describe more precisely the support means and valve means disclosed therein, and particularly to set forth explicitly that these means are defined by the same elements.

Claim 6 has been rewritten in independent form, thereby omitting the restrictions of amended claim 1 on the cavity to a narrow gap of uniform width, described above. Claim 6 has been amended further to describe more precisely the location of the flange disclosed therein.

Claim 10 has been amended by restriction of the lid described therein to a height of not more than two inches to distinguish and avoid the prior art disclosed in U. S. Patent No. 3.794,090 (Commisso), cited in the International Search Report.

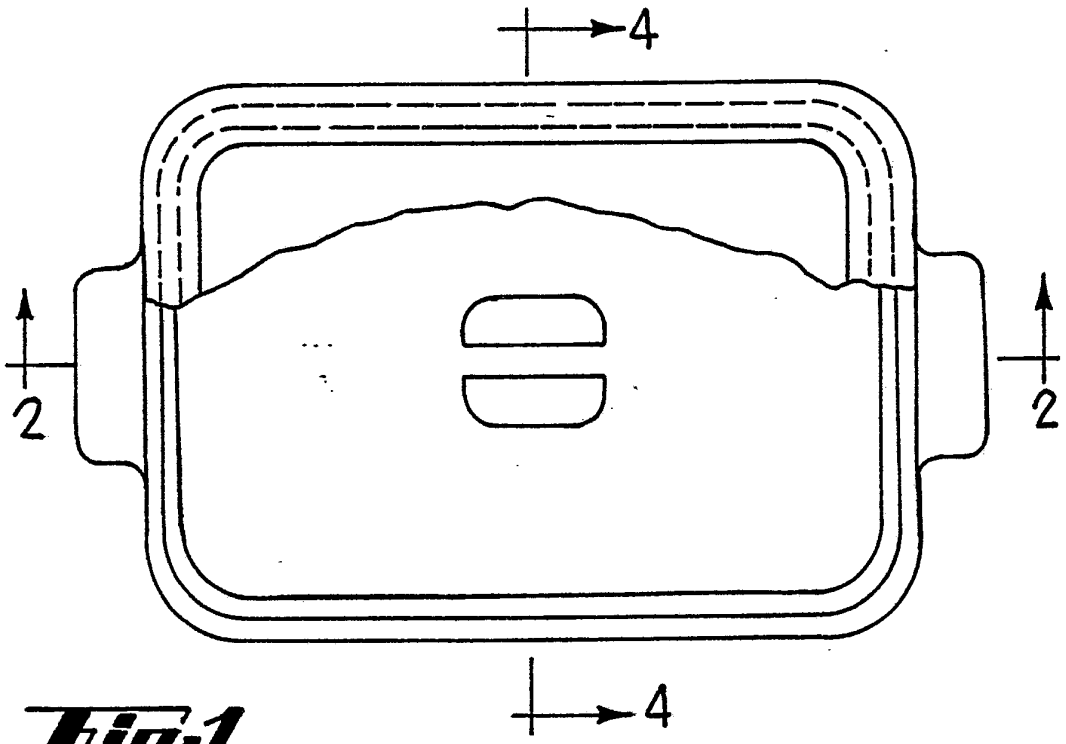


Fig.1

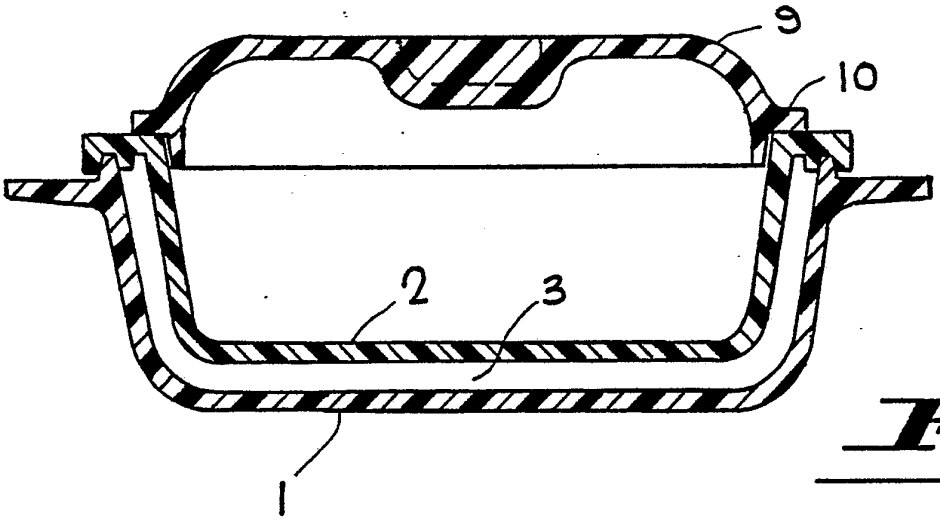


Fig.2

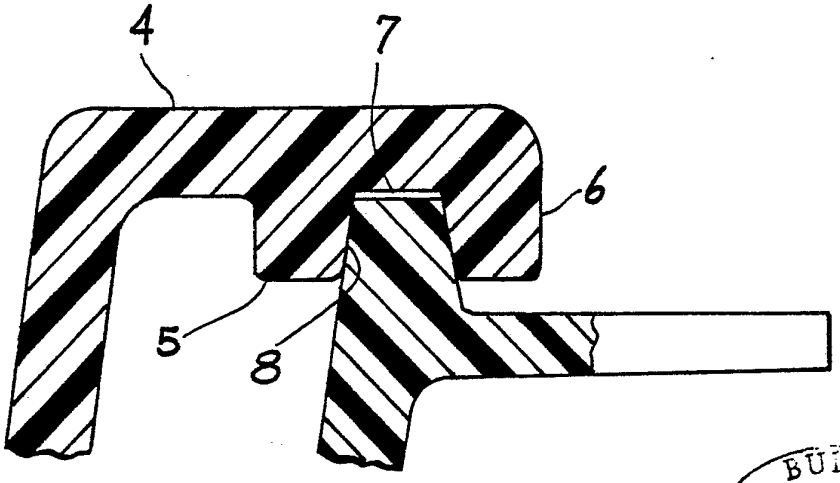


Fig.3

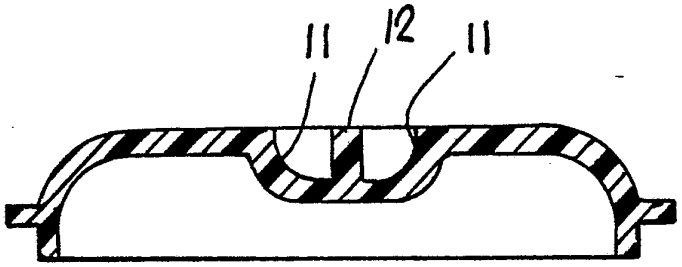
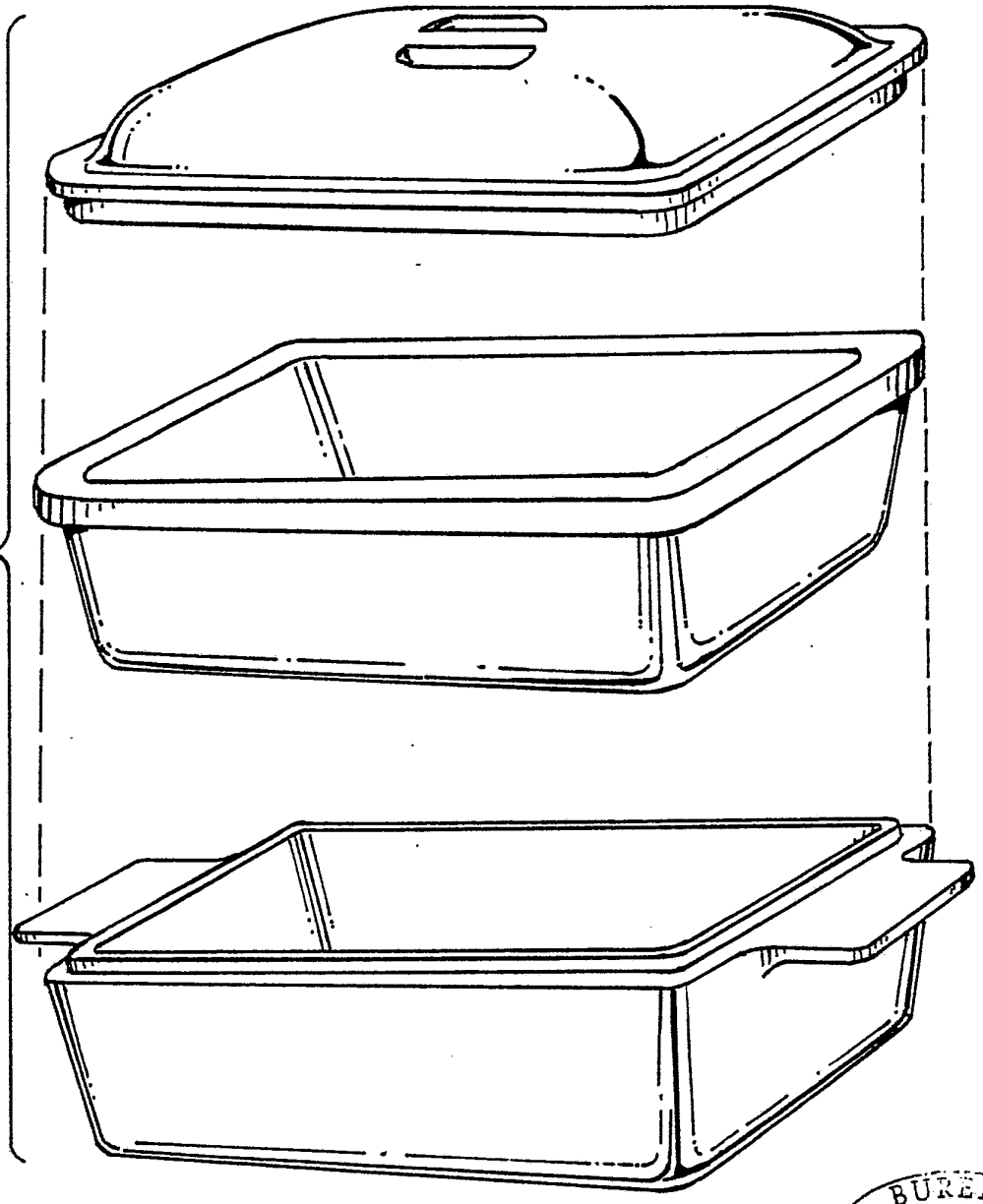


Fig. 4

Fig. 5



INTERNATIONAL SEARCH REPORT WO 80/01483

International Application No PCT/US80/00029

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

US. CL. 220/410,208,469; 219/10.55E; 126/378,390

INT. CL.[3] B65D 90/04

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
U.S.	126/389,390,373,377,378; 220/208,366,410,428,469, 408; 219/10.55E

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
X	US, A 1,499,364 Published 01 July 1924 Goodrick	1-3,10 - 12
X	US, A 2,681,211 Published 15 June 1954 Reynolds	1-3,10 - 12
X	US, A 3,349,941 Published 31 October 1967 Wanderer	1-5
X	US, A 3,794,090 Published 26 February 1974, Commisso	10 - 12
X	US, A 4,047,633 Published 13 September 1977, Trumbly	1,2,4,6,8
A	US, A 1,541,799 Published 16 June 1925, Dodge	--
A	US, A 2,298,814 Published 13 October 1942, Weis	--
A	US, A 1,330,868 Published 17 February 1920, Harrison	
A	US, A, 3,302,632 Published 07 February 1967 Fichtner	--

* Special categories of cited documents: [15]

"A" document defining the general state of the art

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"T" later document published on or after the international filing date or priority date and not in conflict with the application, but cited to understand the principle or theory underlying the invention

"X" document of particular relevance

IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
20 February 1980	07 MAR 1980
International Searching Authority [1]	**Signature of Authorized Officer [20]**
ISA/US	Stephen P. Garbo

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

A	US, A 3,365,092 Published 23 January 1968 Blessing	
A	US, A 3,741,427 Published 26 June 1973, Doyle	
A	US, A 3,745,290 Published 10 July 1973, Harnden et al	

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE [10]

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers....., because they relate to subject matter [12] not required to be searched by this Authority, namely:

2. ☐ Claim numbers....., because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out [13], specifically:

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING [11]

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

Remark on Protest

☐ The additional search fees were accompanied by applicant's protest.

☐ No protest accompanied the payment of additional search fees.