United States Patent

Reifers et al.

[15] **3,682,365**

[45] **Aug. 8, 1972**

[54] **HIGH STRENGTH OPEN BOTTOM MEAT CONTAINER**

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[73] Assignee: **Diamond International Corporation**, New York, N.Y.

[22] Filed: **Jan. 27, 1971**

[21] Appl. No.: **109,996**

[52] **U.S. Cl.** **229/2.5**, 217/26, 206/45.33, 99/174

[51] **Int. Cl.**.....**B65d 1/00**, B65d 65/00

[58] **Field of Search**.....229/2.5, 29 F, 29 M; 206/45.33; 217/26, 30; 150/48; 99/174

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Primary Examiner—Davis T. Moorhead
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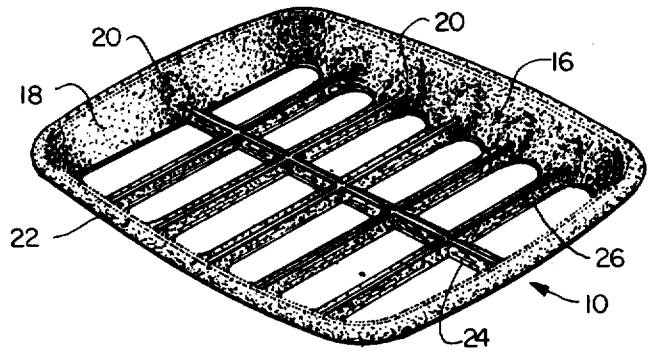
[57] **ABSTRACT**

A tray of molded pulp or the like is provided for the packaging of meat, poultry or fish in conjunction with an overwrapped plastic film. The tray is provided with a corrugated series of bowed portions projecting convexly toward the interior of the tray along the edge joining the bottom of the tray to the four side walls, and these bulges merge with a plurality of V-shaped cross sectional ribs extending across the bottom defining a plurality of open windows.

3 Claims, 20 Drawing Figures



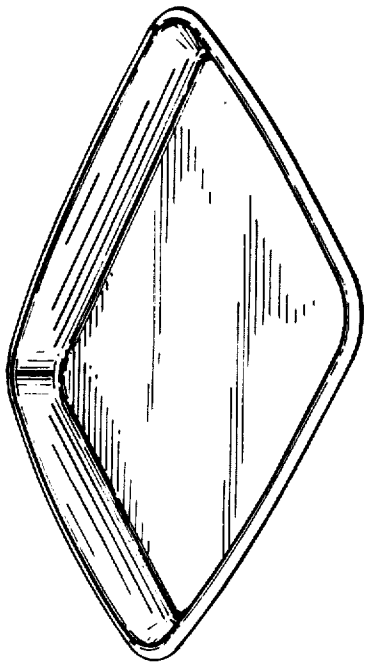


FIG. 2 (PRIOR ART)

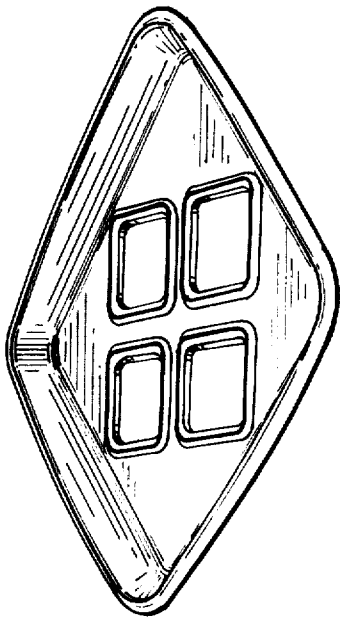


FIG. 4 (PRIOR CONSTRUCTION)

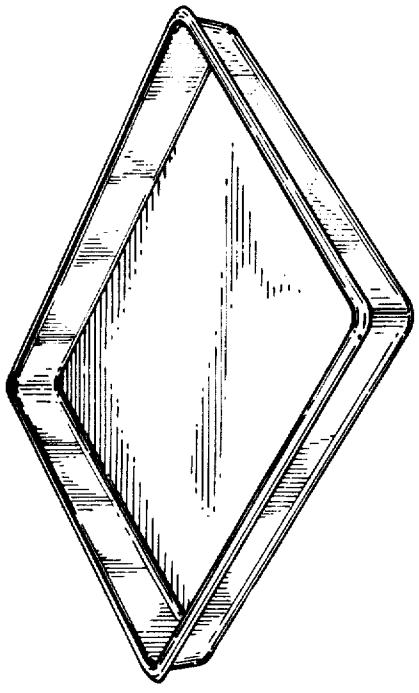


FIG. 1 (PRIOR ART)

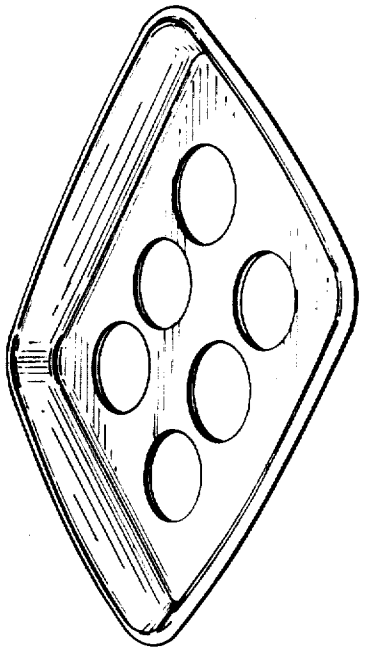


FIG. 3 (PRIOR CONSTRUCTION)

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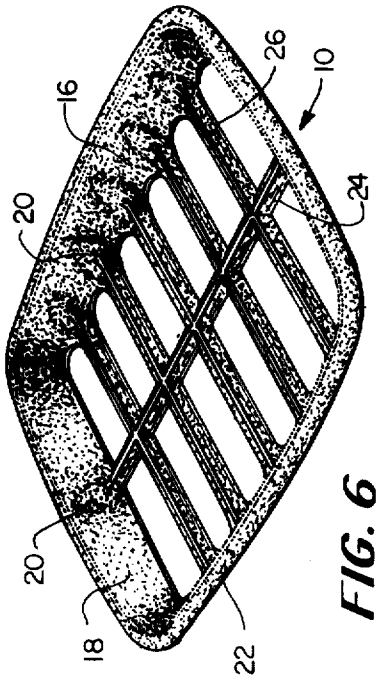

FIG. 6

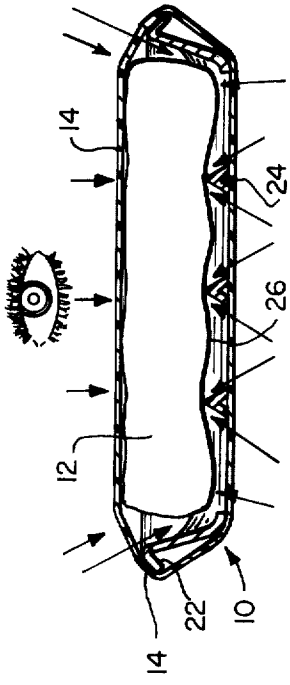

FIG. 13

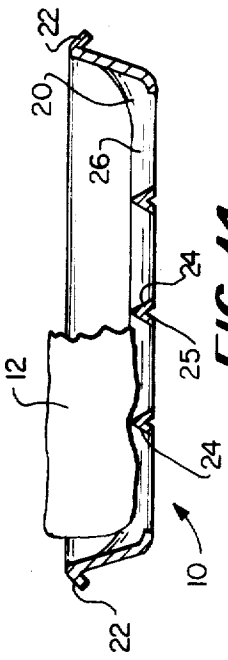

FIG. 14

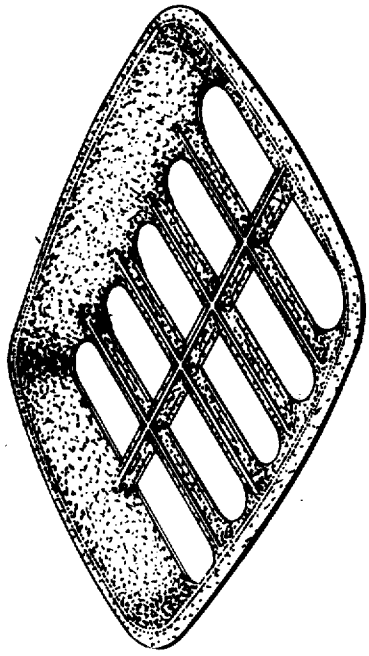

FIG. 5

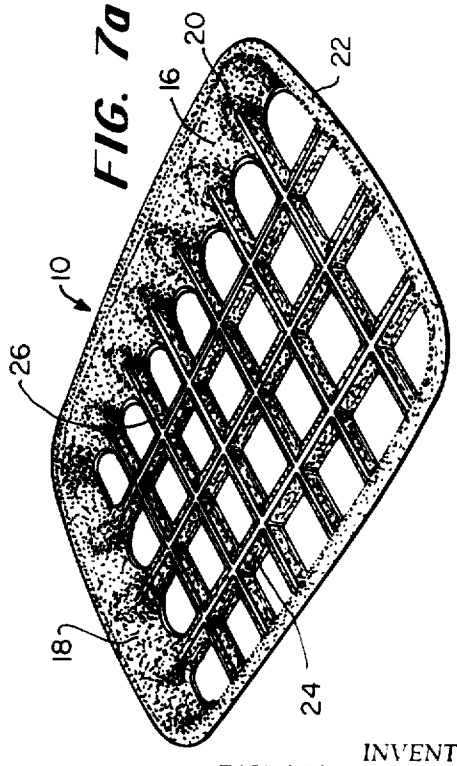

FIG. 7a

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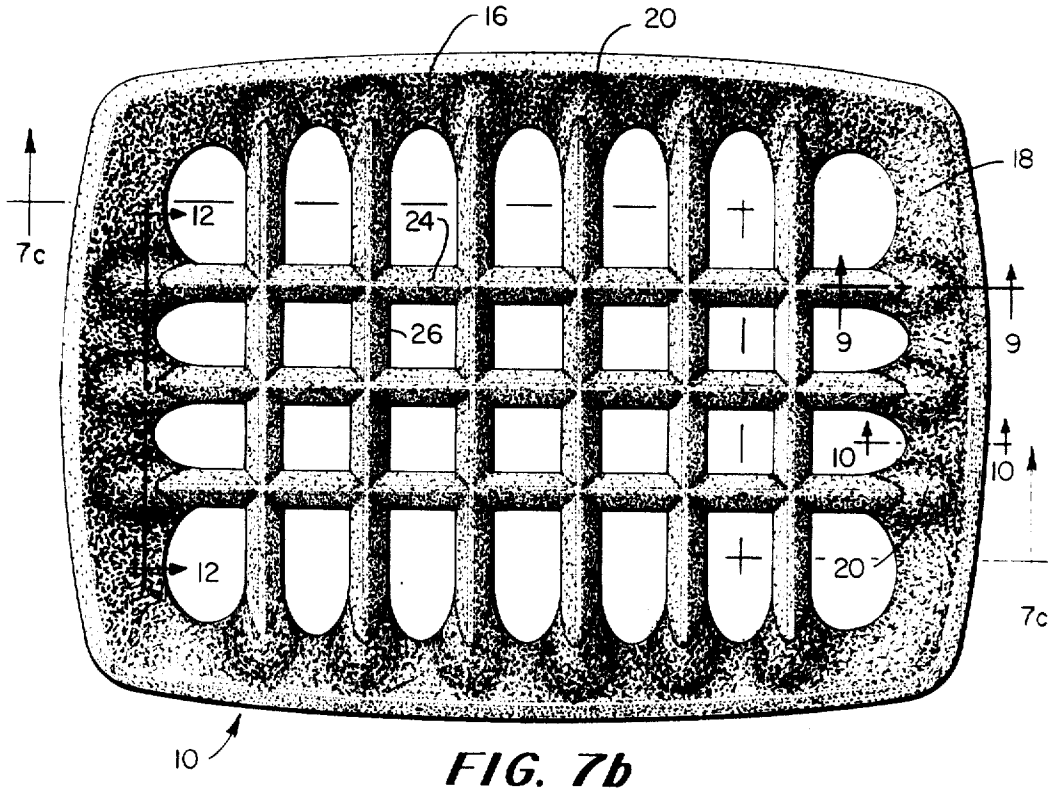

FIG. 7b

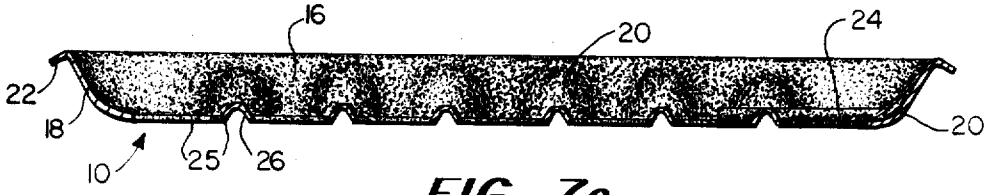

FIG. 7c

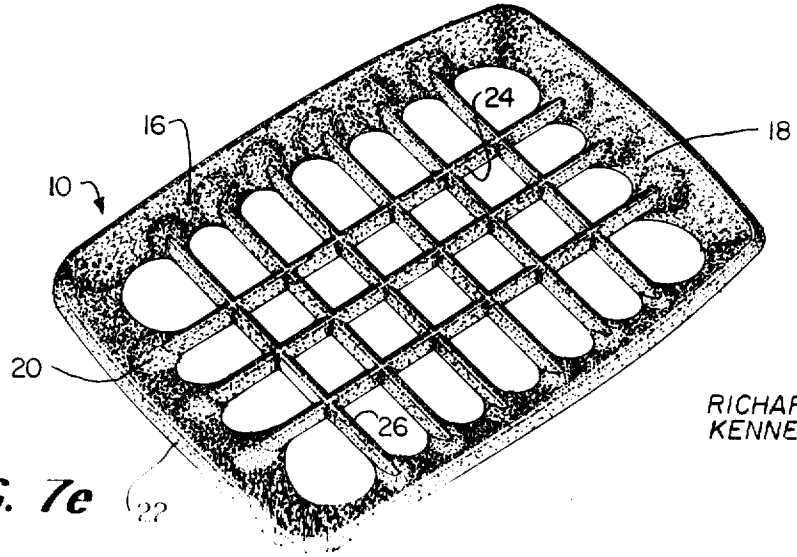

FIG. 7e

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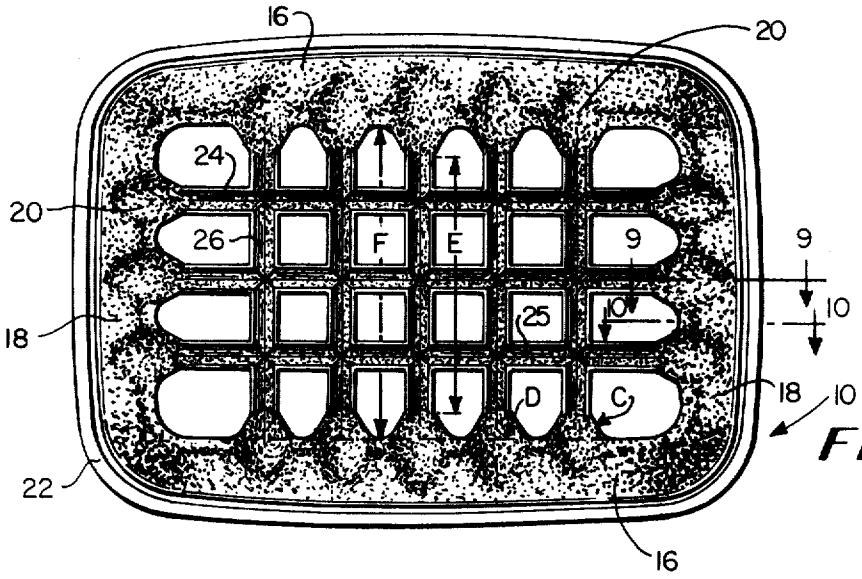

FIG. 7d

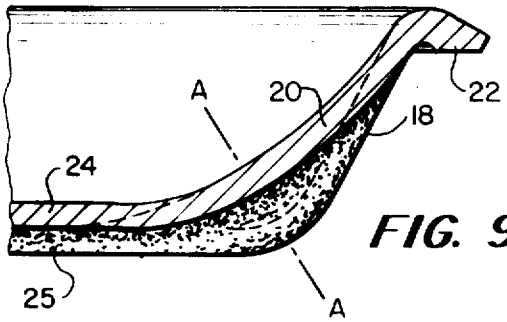

FIG. 9

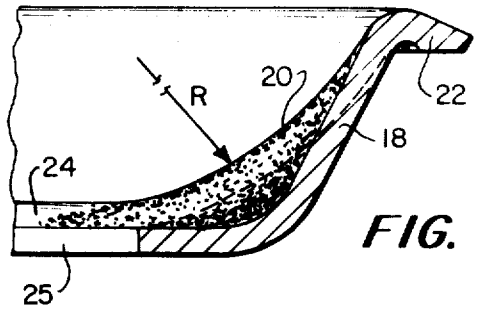

FIG. 10

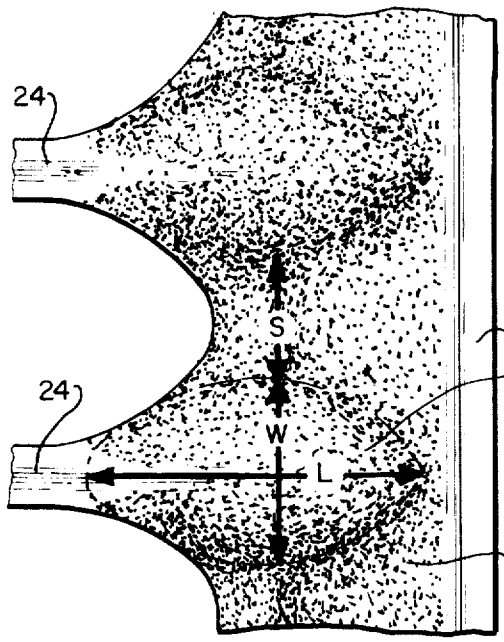

FIG. 11

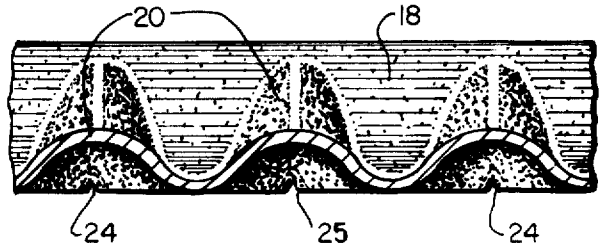

FIG. 12

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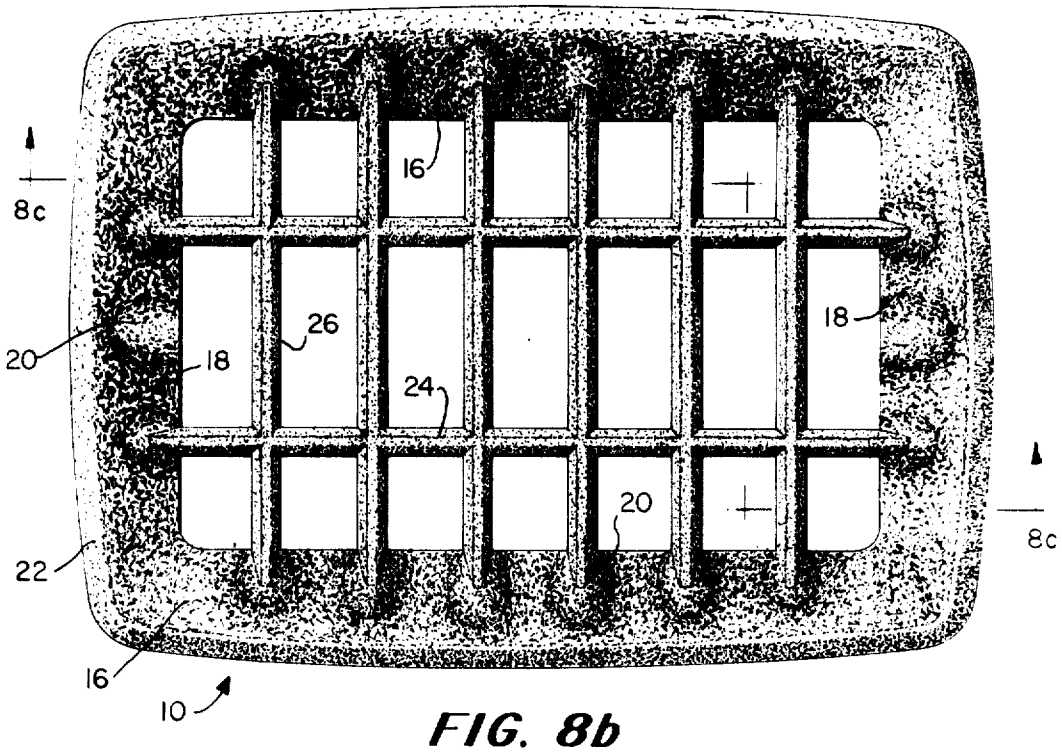

FIG. 8b

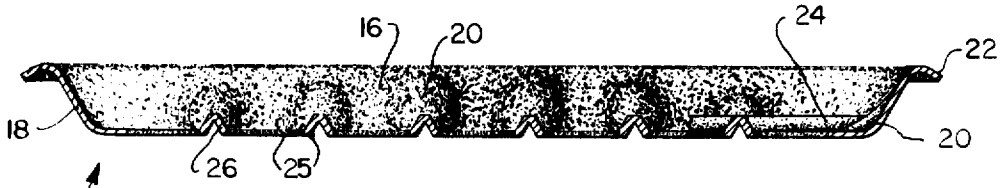

FIG. 8c

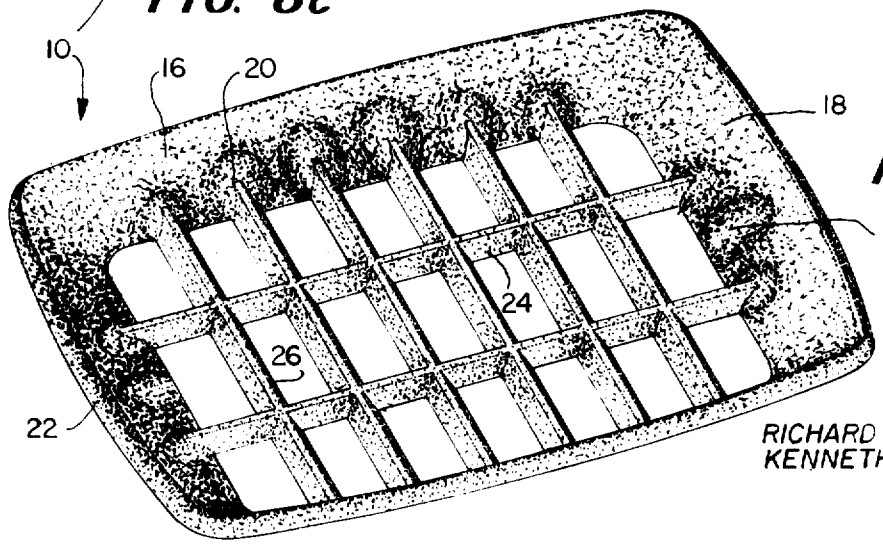

FIG. 8a

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HIGH STRENGTH OPEN BOTTOM MEAT CONTAINER

The present invention relates to an open bottom food container and, more particularly, to a food container for use for the packaging of meat, poultry and fish in conjunction with a plastic overwrap film in where the bottom wall is replaced by a plurality of open windows defined by structural beams, and the resultant high strength package so produced.

Molded pulp food trays have served the food packaging industry well for many years for the packaging of meat, fish and poultry. Such trays have the advantages, besides low price and low cost to the consumer, of being clean, sturdy and safe, of being biodegradable so as to minimize the solids pollution problem, and of being capable of accepting the liquid and juices which exude from meat, fish and poultry.

It is another object of the present invention to provide a meat tray which, although being primarily open on the bottom, is sufficiently strong so as to facilitate the handling of meat which tends to be floppy.

It is another object of the present invention to provide a meat packaging tray which is not only effective, but which is inexpensive.

It is another object of the present invention to provide a meat packaging tray which provides up to about 95 percent visibility of the meat packaged, and which also tends to absorb juices exuded by the meat.

It is a major object of the present invention to provide a high visibility meat tray having an open bottom which has increased rather than decreased strength.

It is another object of the present invention to provide a meat packaging tray which provides visibility with a minimum surface contact of the meat.

It is another object of the present invention to obviate the necessity of utilizing clear plastic food trays which provide poor visibility because of plastic distortions, which are not oxygen permeable and thus tend to discolor the meat, and which collect exuded liquids and food in pools which distort visibility and form bacteria breeding grounds.

These and other objects and the nature and advantages of the instant invention will be more apparent from the following description of certain exemplary embodiments of the invention taken in conjunction with the drawing wherein:

FIGS. 1 – 4 are schematic views of the prior constructions;

FIG. 5 is an open bottom construction in accordance with copending application Ser. No. 53,545 in the name of Kenneth D. Bixler, filed July 9, 1970;

FIG. 6 is a schematic view of a tray in accordance with the present invention;

FIGS. 7*a* and 7*e* are schematic views of another form of the tray in accordance with the present invention;

FIG. 7*b* is a top plan view of the tray of FIGS. 7*a* and 7*e*;

FIG. 7*c* is a section taken along line 7*C*—7*c* of FIG. 7*b*;

FIG. 7*d* is a bottom plan view of the tray of FIGS. 7*a* and 7*e*;

FIGS. 8*a*, 8*b* and 8*c* are views similar to FIGS. 7*e*, 7*b* and 7*c*, but of yet another form;

FIG. 9 is a section taken along line 9 — 9 of FIG. 7*b*;

FIG. 10 is a section taken along line 10 — 10 of FIG. 7*b*;

FIG. 11 is a plan view of a detail shown in FIG. 7*b*;

FIG. 12 is a section taken along line 12 — 12 of FIG. 7*b*;

FIG. 13 is a schematic sectional view of a package using the tray of the present invention; and

FIG. 14 is another schematic view prior to overwrapping.

The evolution of a meat packaging tray in accordance with the present invention is shown in FIGS. 1 – 6. The tray of FIG. 1 having essentially straight side walls and a flat peripheral lip served the trade successfully for many years. However, as the nature of plastic overwrap film changed and non-elastic cellophane was replaced with more elastic thermoplastic overwrap films the tray of FIG. 2, in accordance with Reifers U.S. Pat. No. 3,185,371 was developed, and this tray was the leader in the field.

One of the earlier attempts to provide visibility through the bottom wall of the tray is shown in FIG. 3 where openings were simply cut in the bottom of the tray. However, this was found to weaken the tray and was not a successful approach to the problem. The next attempt is shown in FIG. 4 and involved the provision of lips about the periphery of the open cut in the bottom wall of the tray, the function of the upwardly extending lips or ribs being to hold the meat upwardly, to trap juice, and to stiffen and reinforce the structure. However, this approach also was not successful as the meat tended to sag through the large openings and the structure was still too weak.

The next approach, corresponding to the invention of the Bixler application Ser. No. 53,545, is shown in FIG. 5. In this construction the bottom consists of ribs of an inverted "V" cross-section. This provides maximum visibility with minimum meat contact, and the V-shaped ribs provide for a reinforced structure; this is, in many respects, a successful approach to the problem. However, the embodiment illustrated in Bixler application Ser. No. 53,545 still suffers, under certain conditions, from some weakness; removal of pulp from the bottom wall to form the open windows, even though the inverted V-shaped ribs are structural elements, still has the tendency of weakening the overall strength of the tray, particularly at the areas where the "V" ribs meet the side walls of the tray where "fault lines" exist.

It has now been surprisingly found that the tray of the present invention, as illustrated in FIG. 6, by essentially using the open bottom construction of Bixler application Ser. No. 53,545 with the inverted V-shaped ribs, but further in conjunction with a corrugated series of bulges projecting convexly and concavely toward the interior of the tray along the edge joining the bottom of the tray to the four side walls, surprisingly produces a structure which is, in certain respects, actually stronger than the construction of FIG. 2. This is highly surprising, since previous attempts to provide openings in the bottom of the tray have resulted in a weaker structure.

Considering briefly FIGS. 6 – 14, it will be seen that a tray 10 is provided for the packaging of meat 12, fish or poultry in association with an overwrap film 14 of plastic or heat-sealable cellophane. As is conventional the food tray 10 has two upwardly and outwardly inclined opposite side walls 16 and two upwardly and outwardly inclined opposite end walls 18 which are bowed as described in the Reifers U.S. Pat No. 3,185,371. These side and end walls in turn terminate in a downwardly and outwardly extending peripheral lip 22.

Instead of having a flat bottom wall as is conventional, the tray **10** is provided with a plurality of ribs **24** extending between the bottom of the end walls **18**, and, at right angles thereto a plurality of ribs **26** extending between side walls **16**. As best seen in FIGS. *7c*, *8c*, **13** and **14**, these ribs form in cross section an inverted V-shape with their apices forming the internal bottom of the tray upon which the meat rests; it should be understood that the V-apex of each rib is not so sharp that the meat is in any way cut, bruised or otherwise damaged. At each side wall, the bottom **25** of the V-shaped ribs **24** and **26** terminate adjacent the bottom of the tray side and end walls, not taking into account, for the moment, the provision of the bulges in the side walls as described below.

One of the critical features of the present invention is the provision of the smooth internally projecting convex-concave fluted indentations or bulges. These fluted indentations or inwardly projecting bulges provide, in combination with the generally bowed side and end walls, an increased stability in the wall structure of the tray which improves resistance to and controls inward deflection to overwrapping with transparent packaging film or other overwrapping material. The smooth surfaces in no way cut, bruise or otherwise damage the meat packaged therein.

Upon careful inspection of the drawings it will be seen that each of the inverted V-shaped ribs **24** and **26** terminate at the side and end walls at a smooth bulge or fluted indentation **20**. Considering each side or end wall, it will be seen that these bulges **20** are provided in the form of a sinusoidal or corrugated pattern. The smooth bulges or fluted indentations **20** extend convexly-concavely toward the interior of the tray **10** a maximum of 0.18 inches as measured along line A — A of FIG. **9**, although in most cases it will be desirable that such indentations **20** extend toward the interior of the tray only about 0.15 inches. As will be seen from the drawings, the fluted indentations **20** are generally located along the rounded corner between each side or end wall and what would normally be the bottom wall of the tray, although such bulges **20** flow smoothly into the ribs **24** and **26**.

Careful reference to the drawings will show a number of important characteristics of such fluted indentations **20**. Thus, noting particularly FIGS. **9 – 12**, such indentations **20** are smooth. The convex nature of the fluted indentations **20** are also most apparent from FIG. **12**. Each indentation **20** is of maximum width W along the line of the rounded corner between the side or end wall and what would normally be the bottom wall, noting FIG. **11**, and the bulges **20** taper in each direction from this maximum width, i.e., each indentation **20** becomes increasingly narrower as it extends upwardly and outwardly along the side or end wall and also inwardly to its merger point with the inverted V-shaped rib **24**, **26**. Thus, the fluted indentations **20** when viewed from above as in FIGS. *7b*, *8b* and **11** provide a generally elliptical or diamond-shape pattern. Because of the bowed side walls, the fluted indentations **20** extend progressively higher up the side walls toward the middle of each side wall, and this is more apparent in the embodiment of FIG. **8** (see FIGS. *8a*, *8b* and *8c*) than it is in the embodiment of FIG. **7**.

As indicated above, each of the bulges or fluted indentations **20** have a generally convex configuration toward the interior of the tray in the sense that they project inwardly, and particularly as viewed in section along the line parallel to a side or end wall carrying such bulges **20**, such as in FIG. **12**. However, these bulges are also shaped concavely when viewed along a section passing through their longest dimension and perpendicular to a rounded corner between the side wall and the plane of the bottom, as best seen in FIGS. **9** and **10**, such concavity being determined by the radius R which is approximately 2 ⅛ to 3 ½ times the height of the tray (although it should be understood that the precise convex configuration need not be determined by a single radius, but rather by plural radii which generally approximate a single radius of 2 ⅛ to 3 ½ times the height of the tray). As an example, in a tray having a height of approximately 0.63 inches, the radius R may be 1.34 inches. The bulges **20**, being convex in one direction and concave in a direction 90° of the first direction thereby define saddle-like configurations.

When the tray **10** is viewed from the bottom, as shown in FIG. *7d*, it is seen that the bulges **20** project in the plane of the bottom in the form of a sinusoidal wave configuration. Likewise, each side or end wall meets the bulges **20** in the plane of the side or end wall in the form of a sinusoidal wave configuration when the tray **10** is viewed from the side, as best seen in FIG. **12**. Noting FIG. *7d*, it is seen that the continuous line C, sinusoidal in the area of the bulges **20**, generally outlines the flat portion of the bottom of the tray **10**. It is readily seen that this marginal profile is substantially different and encloses less area than would be enclosed if the tray were produced without the flutes or bulges **20** as indicated by the dotted line D. This results, in accelerated drying during manufacturing of the tray, increased strength by reason of the curvature at this periphery over a longer distance, and increased air circulation and heat transfer.

The relative size of the bulges **20** is another important consideration. To provide the desired advantages, such as improved strength, the indentations **20** must not be too small and, to prevent reduction of interior space, they must not be too large. Accordingly, the bulges **20** should terminate at their upper ends along the side and end walls near the upper edge thereof (particularly those toward the center of the side walls), but they should not extend entirely to the top. The length L of each flute (See FIG. **11**) should be in the range of 1 ½ to 2 ½ times the height of the tray with the maximum width W of each flute being ¾ to 7/8 of the length thereof. Additionally, each flute should be separated by a distance S from its adjacent flute by approximately ¼ to 2/5 of its maximum width; otherwise the inward projection of the bulges will be required to be too great in order to obtain the desired strength. For example, in a tray having a height of 5/8 inch, a bulge average length of 1 inch and a width of 13/16 inch and a separation of ½ inch have been found desirable.

Until the present invention, one of the problems in the use of meat trays has been the prevention of overstressing the tray when wrapping it with the overwrap plastic film. Because of the indented flutes **20**, the stretch film normally used to overwrap the tray **10** will always be subjected to uneven tension during the wrapping process because of the differences in

distances in distances that it takes to wrap the film around the tray in the width direction as shown in FIG. 7*d* by comparing distances E and F. In one embodiment the measured differential is 9/64 inch and this differential in distance around the tray will prevent overstressing the tray with the plastic film while the tray is being wrapped. It also provides a "shock absorber effect" during the wrapping operation.

It has been found that with the techniques of wrapping using the new "soft" overwrap films (e.g., PVC), proportionately more force is exerted on the tray ends during completion of film wrapping than is exerted on the side walls. To resist this increased force, proportionately more bow-out curvature is provided for the end walls compared to the bow-out for the side walls.

While the tray is preferably formed of conventional molded pulp stock and its structural advantages derive from its configuration, it will be understood that the ribs may be made of harder paper stock or other suitable material, or such ribs may be specifically pressed or otherwise treated. It will be understood that visibility to the bottom of the tray is very great on the order of 95 percent and that there is a minimum surface contact of the meat along the apices of the inverted V's.

The tray of the present invention has a number of advantages:

a. Visibility – Permits up to 95 percent view of meat. May actually result in improved visibility when compared with clear plastic trays, which introduce an added layer of plastic and do not control juices that may impair vision.

b. Strength – Added beam of structural members across bottom adds stiffening, structurally coupled to Sine Wave wall forms.

c. Breathability – For meat condition, open structure promotes oxygen transfer which maintains better meat color. Preliminary testing shows that a package formed in accordance with this invention will preserve meat quality longer than previous types of meat packaging trays.

d. Juice Control – Free juices are accepted by pulp resulting in improvements in package appearance (saleability), visibility and meat keeping.

e. Nestable – The trays **10** nest closely for economical storage and shipping.

f. Refrigeration – Beam bottom construction holds meat suspended, improved air circulation for oxygenation and cooling.

The multiple window frame construction of the tray **10** controls any seepage of liquid from the meat into the frame itself. This prevents the free flowing bloody liquid from draining into the window opening that is composed of the film alone (see FIG. **13**), as opposed to the window area, or ribbed patterns, on the non-breathable clear polystyrene trays, which are covered by the extra bottom layer or layers of breathable transparent film that is rendered useless in the breathing function, and again reduces the effective visibility of the polystyrene tray.

Just one drop of blood in the polystyrene tray creates an immediate problem in the specific window area because of distortion of remaining visibility, and additionally exposes the meat surface to a pool of bloody liquid that provides a broth for bacteria action, causing shorter shelf life in the store and in the home refrigerator. By way of contrast, the tray **10** with the multiple window feature maintain the advantage of control of blood, while at the same time taking advantage of this control to maintain excellent visibility in the windows that are breathable, maintaining great effectiveness of the transparent film over the entire surface of the package, protecting it to the maximum freshness and minimum bacteria caction.

The tray **10** also has no problem of cutting film because the film is protected by the soft edges of the pulp tray. The meat contained in the clear polystyrene plastic tray often cuts through the film particularly in corners. The meat in clear polystyrene trays is often discolored on the bottom, typical of the destructive effect of the non-breathing clear plastic.

It will be seen from inspection that the embodiments illustrated differ primarily in the spacing and arrangement of the ribs and windows.

It is to be understood that the invention is not limited to the embodiments disclosed which are offered illustratively in that modifications may be made without departing from the invention.

What is claimed is:

1. In a generally rectangular molded tray for the packaging of meat, fish or poultry in conjunction with a transparent overwrap film heat-sealed thereabout, said tray comprising a pair of upwardly and outwardly inclined sidewalls, each said side wall forming a long side of said tray; a pair of upwardly and outwardly inclined end walls, each said end wall being adjacent to ends of said side walls, and thereby forming the rectangular configuration of said tray; a generally rounded corner between each said side wall and each said end wall; and a peripheral lip extending outwardly from said side and end walls and defining the periphery of said tray, the improvement comprising:

means for supporting the meat, fish or poultry at the bottom of said tray, said support means comprising a plurality of ribs having an inverted V-shaped cross-section, some of said ribs extending across said tray between said side walls and the remainder of said ribs extending across said tray between said end walls, said ribs joining or intersecting substantial right angles and defining therebetween and a plurality of open windows of substantially rectangular shape;

means to increase the side wall compression strength of said tray when overwrapped with transparent film, comprising a series of smooth bulges extending convexly toward the interior of said tray from said end and side walls and smoothly merging with said inverted V-shaped ribs, said bulges being of maximum width along the bottom of said end and side walls and becoming uniformly increasingly narrower as they extend upwardly and outwardly along said side and end walls and inwardly as they merge with their respective ribs, each said bulge thereby defining a generally elliptical or diamond-shaped pattern when viewed from above, each said convex bulge being shaped concavely when viewed along a vertical section passing therethrough.

2. A molded tray in accordance with claim **1** formed of wood pulp.

3. A molded tray in accordance with claim 1 wherein said side walls and said end walls are of bowed construction.

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