

**May 29, 1962**

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**3,036,752**

# COUNTER-STRESSED CORRUGATED BOARD BULK CONTAINER

Filed April 30, 1959

2 Sheets-Sheet 1

Fig. 1.

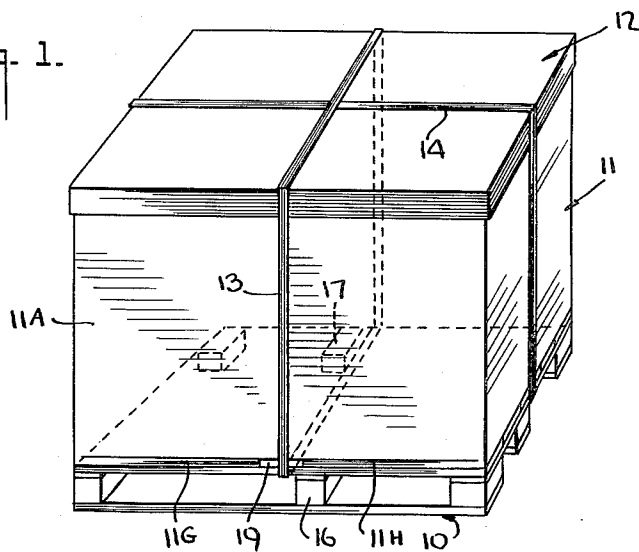
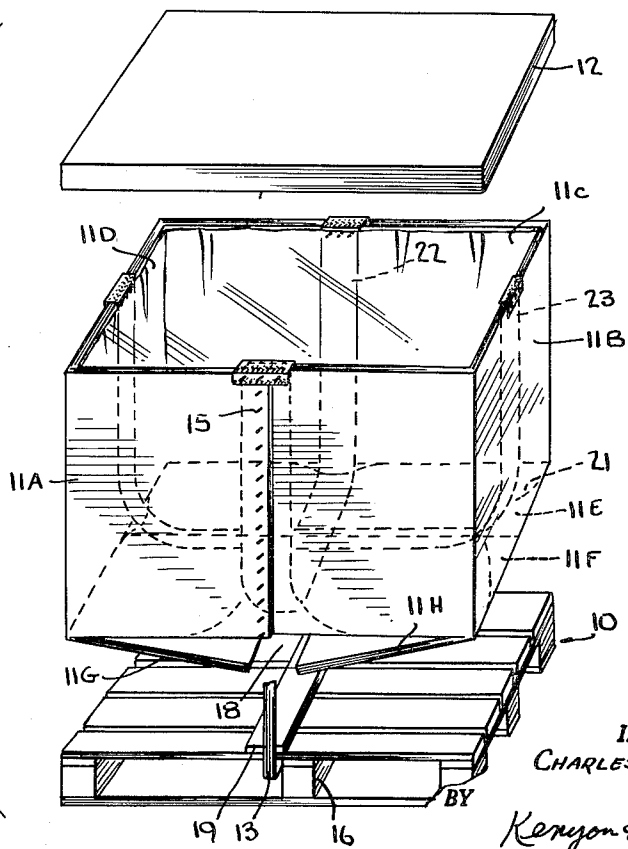


Fig. 2.



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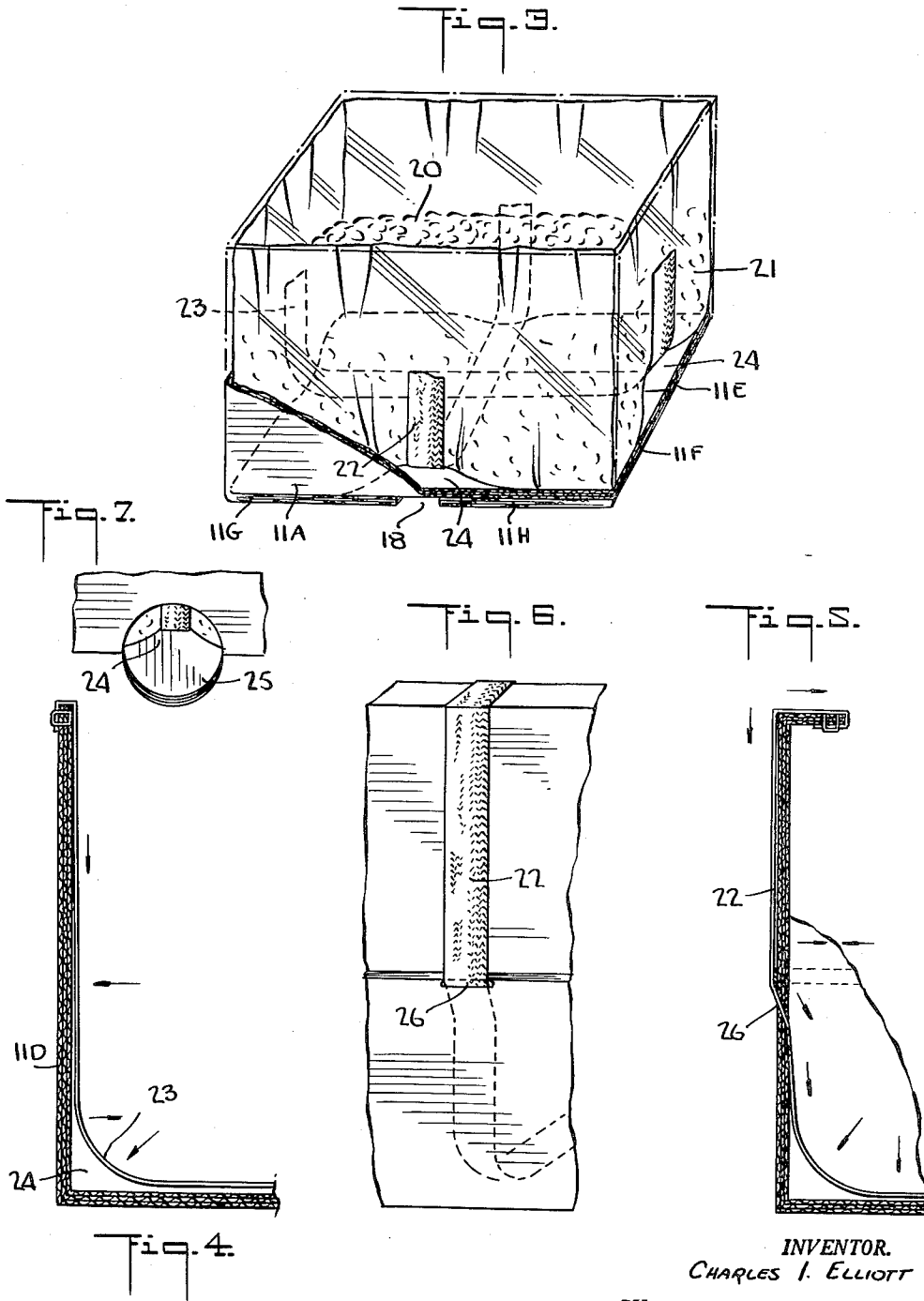
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2 Sheets-Sheet 2



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## COUNTER-STRESSED CORRUGATED BOARD BULK CONTAINER

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Filed Apr. 30, 1959, Ser. No. 810,109  
6 Claims. (Cl. 229—14)

The present invention relates generally to shipping containers formed of corrugated paper board, and more particularly to bulk square containers for the packaging of solids and liquids.

Cartons and boxes formed of corrugated paper board are widely employed as containers for shipping a variety of articles. In recent years, increased use has been made of three-ply corrugated containers for the purpose of packaging relatively heavy objects. These containers are constructed of triple-wall construction under the trademark "Tri-Wall" in accordance with the teachings of the United States patent to Goldstein No. 2,725,529, issued August 21, 1956, and in pending applications including Serial No. 686,433, filed September 26, 1957, now Patent No. 2,985,553.

Because of the superior structural and cushioning characteristics of "Tri-Wall" containers, there have in many instances supplanted boxes fabricated of plywood lumber and other standard packaging materials. Tests have shown that even if a loaded box of triple-wall corrugated construction is dropped from an elevated position, it does not shatter like wood but continues to give full protection to its contents.

It is known to make use of square or rectangular containers for the packaging of bulk materials in solid or liquid form. The use of existing corrugated board containers for this purpose has had limited success, for such containers having a tendency to bulge out when loaded. The reason for this lies in the inherent physical properties of pellets, grains, flakes, liquids and the like. Materials in loose or liquid form are free flowing and when confined they develop pressures which are exerted at the lower wall areas of square containers. These pressures break down the rigidity of the walls and cause bulging or swelling of the container.

Such bulging creates serious shipping problems, for when a carrier is fully stacked with loaded containers, should the container walls give way under bulk pressures the resultant swelling causes the containers to lock against each other and makes removal of the containers very difficult.

Various expedients have been proposed to overcome this problem. Attempts have been made to apply external straps or bands to the cartons, but the results have not been satisfactory with rectangular shapes. Another approach has been to use containers of cylindrical shape because of the resistance offered by this form to bulging pressures. But cylindrical containers, when stacked, produce a loss in volume in the order of 20% in that substantial voids exist between adjacent containers.

Another drawback of conventional containers arises from the abrasive action produced by the stapled seams.

Ordinarily a container is constituted by a blank of corrugated sheet material which is scored, folded and wire stitched or stapled to form the box. The bulk material is placed in a protective bag or liner within the container and the row of staples engages the surface of the bag. Wire staples have relatively sharp edges and when the loaded container is shipped, vibrations and joggling actions in the course of travel produce abrasion which tears the bag.

A further difficulty encountered in conventional containers for bulk material is with respect to the placement

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of containers on shipping skids. The usual practice is to strap the containers to the skids by wire bands. Inasmuch as the bottom of the containers is smooth, there is a tendency for the containers to slip somewhat in the course of travel, even though they are strapped. This offsetting of the containers on the skid makes handling difficult.

In view of the foregoing, it is the principal object of the present invention to provide a bulk square container adapted to package large volumes of solids or liquids without distortion or bulging of the loaded container.

More specifically it is an object of the invention to provide a container having internal webbing so applied as to distribute internal bulk pressures in a direction counteracting or defraying the outwardly directed pressures produced by the material. The container in accordance with the invention is counterstressed without a substantial loss of volume.

Also an object of the invention is to provide a container and skid combination in which displacement of the container on the skid is prevented.

A significant feature of the invention resides in the use of a clover leaf or cruciform cradle within the container to receive the inner bag. The cradle acts to form safety voids in the lower portion of the container and to guide the contents of the bag away from the side wall centers and toward the relatively strong corners of the container, thereby relieving pressures in the weak center areas. Another useful feature of the container is a spout arrangement facilitating rapid discharge of the bulk contents.

For a better understanding of the invention as well as other objects and further features thereof, reference is had to the following detailed description thereof to be read in connection with the accompanying drawing wherein like components in the several figures are identified by like reference numerals.

In the drawing:

FIG. 1 is a perspective view of a skid-mounted container in accordance with the invention.

FIG. 2 in an exploded view of the container shown in FIG. 1.

FIG. 3 separately illustrates the bag liner within the container.

FIG. 4 is a section taken through the wall of the container showing the internal webbing.

FIG. 5 is a section taken through a modified form of container in accordance with the invention.

FIG. 6 is an exterior view of the container shown in FIG. 5.

FIG. 7 is a separate showing of an exhaust spout for a container in accordance with the invention.

Referring now to the figures, the principal components of the container and skid assembly in accordance with the invention is a wooden pallet or skid, generally designated by numeral 10, a half-slotted bulk square container 11 supported on the pallet, and a cover 12 enclosing the top of the container. The assembly is held together by suitable metal straps 13 and 14 which pass through the pallet and encircle the closed container.

Container 11 and cover 12 are all formed of corrugated paper board, preferably of the multiple-ply type constituted by three corrugated fluting sheets interposed between spaced liner sheets, the several sheets being intimately and securely bonded together. Such triple-ply corrugated board, when made in accordance with the above-identified Goldstein patent is rigid, strong and non-yielding—comparing favorably with wood as a packaging material.

Container 11 is constituted by four vertical walls 11A, 11B, 11C and 11D, two bottom long side flaps 11E and 11F and two bottom short end flaps 11G and 11H, the carton being open at the top. The container is formed

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from a scored and slotted blank, the box form being maintained by a vertical seam line of wire staples 15 which are centered on front wall 11A. Conventionally, the zone of staples is found at a seam adjacent one corner of the container, whereas in the present invention a centering of the seam line is preferred.

It will be noted that the strap 13 encircling the container is centered and in alignment with the vertical line of staples 15. In order to permit such centering, the intermediate legs 16 and 17 of the skids are staggered relative to the strap. Conventionally, these legs are centered, as a result of which the strap must be displaced from the center. The present arrangement acts to center all reinforcing elements, thereby providing maximum strength at the points subjected to the greatest pressures.

Another unusual aspect of the container is the manner in which the bottom flaps are folded in. Ordinarily the short flaps 11G and 11H are first folded in, and the long flaps 11E and 11F are then folded thereover to provide a smooth bottom exterior. In the present invention, the flap relationships are reversed so as to afford a smooth interior and an exterior having a transverse channel 18 formed by the space between the two short flaps. Received within channel 18 is a rib 19 secured to the top of the skid, the rib and channel combination serving to prevent displacement of the container.

It is to be understood that while for purpose of simplicity only one container is shown on the skid, in practice, however, several such containers may be mounted on a single skid, a security rib being provided for each.

As best seen in FIGS. 2 and 3, the bulk material 20, which may be any flowable substance, such as plastic pellets, soap flakes, sugar, etc., is stored in a protective bag or liner 21 accommodated within the container. Bag 21 may be fabricated of any sheeting appropriate to the material being shipped, and is preferably gusseted to allow for expansion as the bag is filled. The bag may be made of paper, cotton, polyethylene, etc. In the case of thermoplastic bag materials, the bag may be heat-sealed after being filled.

In order to relieve pressure at the lower wall areas of the rectangular container, two intersecting web strips 22 and 23 are provided. The web material may be hemp, woven cotton or any other material of sufficient strength for the intended purpose. The ends of web strips 22 are attached to the top edges of the opposing end walls 11B and 11D of the container. Web 22 is centered in the container and runs downwardly along the inner surface of the walls to a point near the bottom, at which point the web is allowed to curve gently to the bottom. Thus web 22 forms a U-shaped yoke whose base engages about two-thirds of the bottom surface of the container.

Similarly, the ends of web strip 23 are attached to the top edges of front and rear walls 11A to 11C to form a second yoke which intersects that of web 22, the two yokes together constituting a cruciform cradle on which bag 21 loosely rests. The ends of the webs are secured to the walls by the use of glue or any other means appropriate to the stresses encountered. If preferred, saddles may be applied over the web connections to strengthen the coupling.

When the bag is filled, the webs diminish bottom pressure on the side wall centers and assist in guiding or leading the contents of the bag to the stronger corner areas in the container. Thus, four small cavities 24 are formed at the bottom of the container in the areas defined by the web curvatures.

It will be observed that the pressure of the bulk material normally produces outwardly directed stresses on the walls, whereas the pressures exerted on the webs are transmitted to the walls in a counteracting direction to balance out bulging forces. Thus in place of external reinforcements, the internal webs act to exploit the load forces to hold in the side walls.

It will also be noted that the centered web 23 overlies

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the centered line of staples 13 and thereby protects the bag material from abrasive action. Internal taping of the staples, as is sometimes the practice, is therefore not necessary.

In FIGS. 5 and 6, a modified web arrangement is shown in which the web above the void area is brought outside of the container wall through a slot 26. Thus the end portions of the webs lie along the exterior surface of the wall and act to distribute the load forces along a substantial portion thereof. The ends of the web are shown attached to a small upper flap 11a rather than to the upper edge of the wall. The arrows in FIGS. 4, 5 and 6 indicate the direction of the web and bulk material forces.

Thus the webs are so arranged as to defray all bulge forces and make possible the safe and efficient shipping of bulk materials. The webs are best adapted for use with triple-wall corrugated material where the bearing strength of combined triple-wall corrugated board is sufficient to hold the downward pressures exerted on the webbing. The webs can be applied readily to the box before the box is erected so that the user of the box has merely to put the liner in place.

As shown in FIG. 7, a spout 25 formed by a perforated wall section may be opened to gain access to a void area 24. This facilitates removal of the contents simply by puncturing the bag and permitting the contents to flow out through the void area.

While there has been shown what are considered to be preferred embodiments of the invention, it will be manifest that many changes and modifications may be made therein without departing from the essential spirit of the invention. It is intended, therefore, in the annexed claims to cover all such changes and modifications as fall within the true scope of the invention.

What is claimed is:

1. A shipping container of rectangular shape having rectangular corner portions and formed by a flat bottom wall and two sets of mutually opposed interspaced flat side walls, said side walls being made of material which is relatively rigid but which tends to bulge at areas between said corner portions and under the upper portions of said side walls when pressure is applied internally thereto, and for each of said sets at least one flexible web having opposite ends respectively connected to the two side walls at locations spaced above said areas and said web having a width materially less than said two side walls and having a length less than the distance between said locations and said bottom wall plus the distance these side walls are interspaced and being long enough to form a depending loop having a base portion engaging said bottom wall, said loops connected to said two sets mutually intercrossing at their said base portions and cooperatively forming a cradle adapted to receive a flexible container at least almost filling said shipping container and containing relatively heavy fluent material and to relieve said areas from the pressure of said material and cause the latter to settle towards said rectangular corner portions.

2. The container of claim 1 in which said web connection locations are at least adjacent to the tops of said side walls and on the outsides thereof, the latter having openings below said locations and above said areas through which said web passes to the insides of said side walls to form said loop therewithin.

3. The container of claim 1 in which all of said walls are made from triple-wall corrugated paper board.

4. A shipping container of rectangular shape having rectangular corner portions and formed by a flat bottom wall and two sets of mutually opposed interspaced flat side walls, said side walls being made of material which is relatively rigid but which tends to bulge at areas between said corner portions and under the upper portions of said side walls when pressure is applied internally thereto, and for each of said sets at least one flexible web having opposite ends respectively connected to the

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two side walls at locations spaced above said areas and said web having a width materially less than said two side walls and having a length less than the distance between said locations and said bottom wall plus the distance these side walls are interspaced and being long enough to form a depending loop having a base portion engaging said bottom wall, said loops connected to said two sets mutually intercrossing at their said base portions and cooperatively forming a cradle adapted to receive a flexible container at least almost filling said shipping container and containing relatively heavy fluent material and to relieve said areas from the pressure of said material and cause the latter to settle towards said rectangular corner portions, said bottom wall being formed by flaps, connecting with and bent inwardly from the bottom of one of said sets of side walls, said flaps having their mutually adjacent edge portions interconnected to form a seam, said web connected to this set of side walls having said flaps, being located above and in registration with said seam to provide protection therefrom for said flexible container.

5. A shipping container of rectangular shape having rectangular corner portions and formed by a flat bottom wall and two sets of mutually opposed interspaced flat side walls, said side walls being made of material which is relatively rigid but which tends to bulge at areas between said corner portions and under the upper portions of said side walls when pressure is applied internally thereto, and for each of said sets at least one flexible web having opposite ends respectively connected to the two side walls at locations spaced above said areas and said web having opposite ends respectively connected to the two side walls at locations spaced above said areas and said web having a width materially less than said two side walls and having a length less than the distance between said locations and said bottom wall plus the distance these side walls are interspaced and being long enough to form a depending loop having a base portion engaging said bottom wall, said loops connected to said two sets

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mutually intercrossing at their said base portions and cooperatively forming a cradle adapted to receive a flexible container at least almost filling said shipping container and containing relatively heavy fluent material and to relieve said areas from the pressure of said material and cause the latter to settle towards said rectangular corner portions, said bottom wall being formed by flaps, connecting with and bent inwardly from the bottom of one of said sets of side walls, said flaps having their mutually adjacent edge portions interconnected to form a seam, said web connected to this set of side walls having said flaps, being located above and in registration with said seam to provide protection therefrom for said flexible container, the other of said sets of walls also having flaps connected therewith and bent inwardly therefrom but which are shorter than the corresponding dimension of said bottom wall so they terminate short of each other and form a transverse channel on the underside of said bottom wall, a pallet, and means for fastening said rectangular container to said pallet, the latter including an upwardly projecting rib extending into said channel to form an anchor against relative slipping motion by said rectangular container on said pallet.

6. The container of claim 5 in which all of said walls are made of triple-wall corrugated paper board.

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