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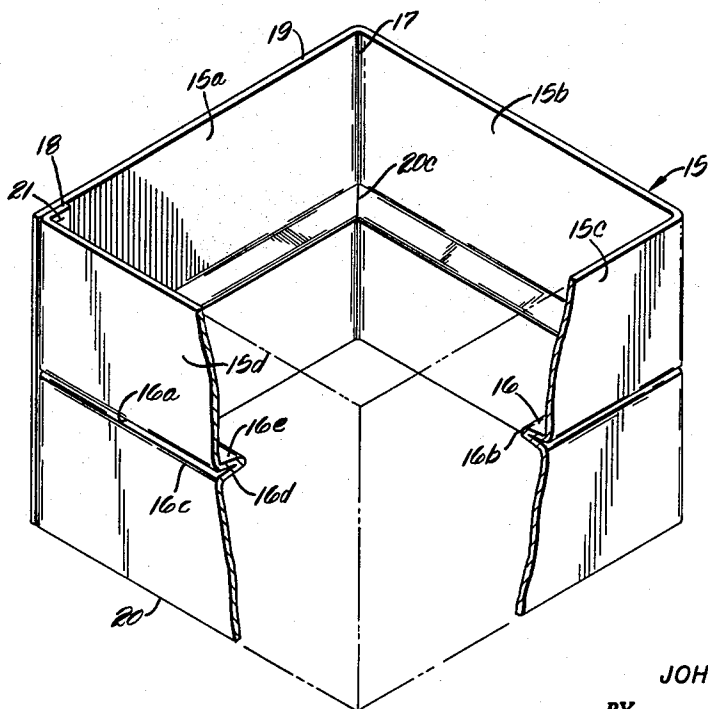
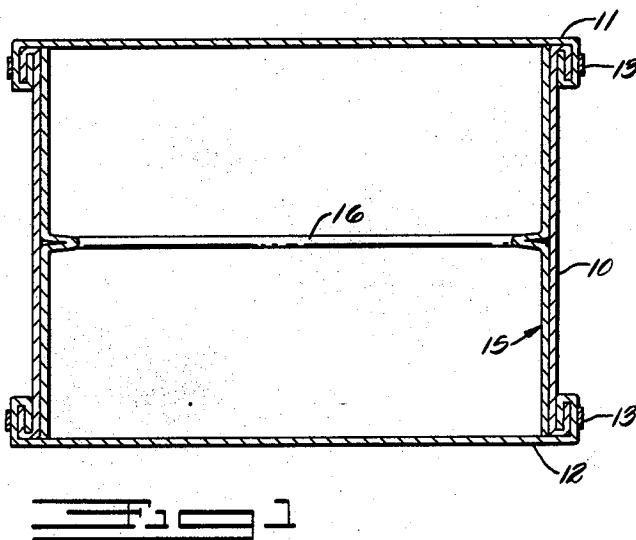
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LINER-REINFORCED PAPERBOARD CONTAINER

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2 Sheets-Sheet 1



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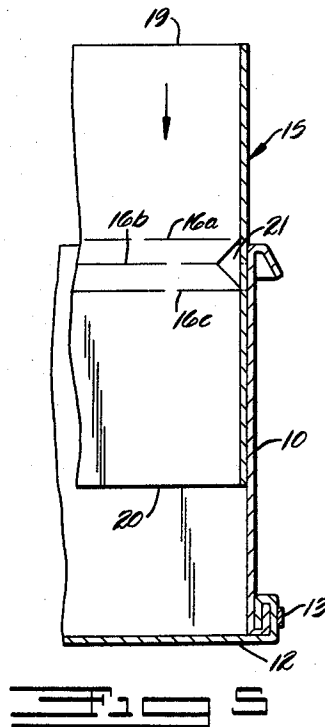
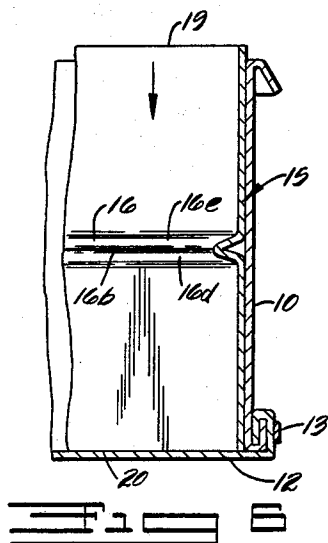
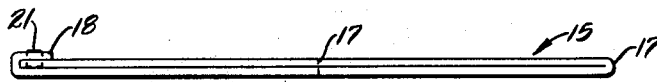
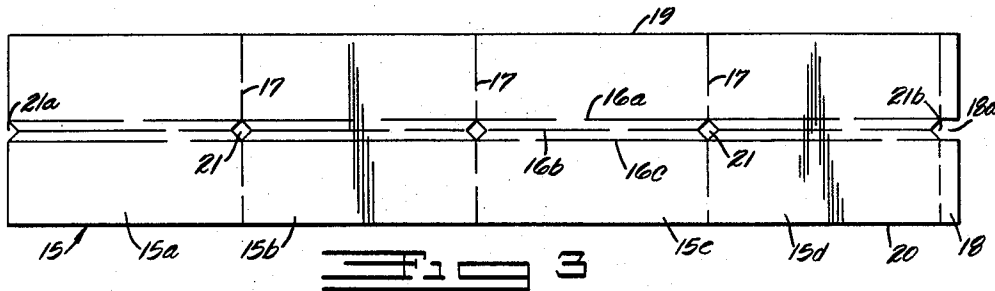
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LINER-REINFORCED PAPERBOARD CONTAINER

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3,149,768 LINER-REINFORCED PAPERBOARD CONTAINER

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This invention relates to a liner-reinforced paperboard container. It has to do, more specifically, with a heavy-duty container made of paperboard material or similar material, preferably corrugated board, and with a liner of the same type of material of such design and form that it cooperates with the surrounding shell of the container to reinforce it. Although the following description will refer to a container in the form of a corrugated box and cooperating liner, it is to be understood that the container may be of various other angular or polygonal cross-sections.

Ordinary rectangular corrugated boxes are now being used to store and ship relatively large quantities of comminuted or loose granular bulk materials such as raw plastic pellets, granulated charcoal, and the like, and it is not uncommon that the weight of bulk materials in one of such boxes will be as much as 1,000 pounds or even more. However, the primary difficulty encountered in utilizing a corrugated box of this type is that the side walls of the box tend to bulge outwardly under the pressure of the large loads of loose granular or small particle bulk material contained therein. The bulging boxes are unsightly, more difficult to handle and stack in closely adjacent relationship, and may even bulge to such an extent as to burst.

In an effort to overcome this bulging difficulty, it has heretofore been proposed to utilize a series of divider webs within the corrugated box compartment, and also to utilize an inner wall-forming liner which merely tends to double the side wall thickness of the box. However, these expedients have largely proved unsuccessful in eliminating the tendency of the side walls of the box to bulge or bow outwardly under the load of the loose contents of the box.

This present invention provides a liner construction which, in combination with the side walls of the shell of an ordinary corrugated box used in shipping and storing large masses of loose bulk materials, provides adequate reinforcing for such side walls to prevent bowing or bulging under the material load. The liner is simply formed from a flat sheet of corrugated paperboard or similar stock which is provided with properly located fold lines to permit folding into rectangular shell form. Suitable closures are provided for the box shell and these are preferably separate closures which are secured to the opposed upper and lower edges of the box shell although one or both of them may be formed from folded flaps which are a part of the box shell. The liner blank is further provided with appropriate fold lines intermediate its height so that when the folded liner shell is properly positioned within the side walls or shell of the box and the closures are positioned thereon to engage its opposed ends, a substantially continuous, inwardly projecting, reinforcing rib is produced in the liner shell and within the box compartment. This reinforcing rib so formed tends to resist outward bending or bulging of the side walls of the liner shell and surrounding box shell in which the liner is positioned. According to this invention, the design and cross-sectional shape of the rib is critical in order to obtain the proper reinforcement.

In the accompanying drawings there is illustrated a preferred form of this invention and in these drawings:

FIGURE 1 is a medial vertical sectional view taken

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through a rectangular or cubical corrugated box and liner combination embodying this invention;

FIGURE 2 is a perspective view, partly cut away, of the inner liner but showing the condition it will assume when mounted within the box as in FIGURE 1;

FIGURE 3 is a plan view of a scored and slit blank from which the liner is adapted to be formed;

FIGURE 4 is an edge view of the liner formed from the blank of FIGURE 3 but showing it in collapsed or folded condition;

FIGURE 5 is a fragmentary sectional view showing the liner being positioned within the outer shell of the box;

FIGURE 6 is a similar view but showing the rib folding into the liner as the inner edge of the liner contacts the adjacent closure of the box.

With reference to the drawings, in FIGURE 1, there is illustrated a complete corrugated box assembly embodying this invention. This box assembly comprises a primary box and a reinforcing liner which cooperate according to my invention. The primary box itself comprises the usual side wall structure 10 which, in this instance, is in the form of an upright shell 10 of rectangular cross-section. This shell 10 has the usual top and bottom closures 11 and 12 secured to the respective upper and lower edges of the side wall shell 10 by a common arrangement including the baling bands 13. Although one form of primary box structure is illustrated, it is to be understood that it may take other forms both as to cross-sectional shape and closure arrangement. It is merely necessary for this invention, that the box have a continuous side wall shell of angular or polygonal cross-section and that at the opposite ends or edges of the shell, it is provided with suitable closures.

According to this invention, positioned within the outer side wall shell 10 is the reinforcing liner shell, previously referred to, and which is designated generally by the numeral 15. This liner, when so positioned, includes the inwardly projecting, substantially continuous, reinforcing rib 16. This rib is preferably integrally formed in the liner shell 15 midway of its height and extends horizontally around the four sides of the liner shell, which is of the same rectangular cross-sectional shape as the box shell 10 and is complementary therewith. Thus, the liner shell 15, since it has a smooth outer surface, is slipped or telescoped snugly into the outer box shell 10 and the rib 16 thereof will project inwardly from the liner shell into the box compartment within the liner.

As previously indicated, the design and structure of the rib 16 are critical. As indicated in FIGURE 3, the liner with a rib-producing arrangement is shown as being formed from a single flat paperboard blank, preferably corrugated stock. This blank is properly scored to provide the side wall-forming panels 15a, 15b, 15c, and 15d, respectively, which are joined with one another along the vertical crease or fold lines 17. The end panel 15d is provided with a glue lap or stapling extension tab or flap 18 along its outer edge.

In order to provide the reinforcing rib 16, the blank is provided with three parallel horizontal fold lines 16a, 16b, and 16c, extending the full length thereof and with the center line 16b being substantially midway of the height thereof and parallel to the upper and lower edges 19 and 20, respectively, of the blank. At the juncture of the vertical fold lines 17 and the horizontal fold lines 16a, 16b, and 16c, the blank is formed with square openings or cut-outs 21 which are arranged so that one diagonal of each square opening is in alignment with the corresponding fold line 17. In the one end of the blank only one-half of a square opening is formed, as indicated at 21a, and at the other blank end a cooperating half opening 21b is formed and joins with a straight notch 18a in the tab or flap 18.

The ends of the liner blank are connected together by overlapping the flap 13 on the panel 15d with the outer edge of the flap 15a. The overlap is secured together by glue or staples, staples being shown in FIGURE 4 at 21. As indicated in this figure, the continuous liner shell 15 may be folded or collapsed into flat condition by folding along the vertical fold lines 17. At this time, the blank is not folded at the horizontal fold lines 16a, 16b, and 16c.

When the box 10 is to be assembled, the box shell 10 has the bottom closure 12 applied thereto as shown in FIGURE 5. The collapsed liner shell 15 of FIGURE 4 is then unfolded and its lower end is slipped into the upwardly opening box shell 10, as indicated in FIGURE 5, in which it will snugly fit. The liner shell 15 will not start to fold at the horizontal fold lines 16a, 16b, and 16c until the lower edge 20 thereof contacts with the bottom closure 12, as shown in FIGURE 6. Further downward pressure will cause the liner to buckle or fold inwardly at the center line or joint 16b and simultaneous folding will occur at the lines 16a and 16c. The liner 15 cannot buckle outwardly at the horizontal fold lines because of the contacting outer shell 10 and consequently there will be produced the inwardly extending rib 16. The openings 21, 21a, and 21b will permit the formation of the rib portions and will provide miter joints 20c (FIGURE 2) at the corners so that the adjacent ends of the ribs will be in substantial abutting relationship and will, in effect, produce a substantially continuous rib extending completely around the liner. The angle of the rib 16 thus being produced, as in FIGURE 6, will continue to flatten or decrease as the liner shell 15 is pushed farther down into the box shell 10 until the upper closure 11 is applied, as in FIGURE 1, to hold the liner in this condition. At this time, the liner will be held or gripped between the upper closure 11 which engages its corresponding edge 19 and the lower closure 12 which engages its corresponding edge 20. Thus, the rib 16 will be in flattened condition and will, therefore, provide a continuous inwardly projecting reinforcing rib which will adequately reinforce the side walls of the box against outward bulging. It will be understood that the loose bulk material will be deposited into the container within the liner 15 before the liner is pushed downwardly into its final position by application of the upper closure 11.

The arrangement described and shown in FIGURES 5 and 6, where the rib 16 is produced as the liner is inserted into the box, is preferred but the liner could have the rib 16 preformed into it so that it would be in the condition shown in FIGURE 2 even before insertion into the box.

It has been found that in order to give adequate reinforcement, the angle of the rib 16 should be such that the sides or flanges 16d and 16e of the rib are joined directly at the joint or fold line 16b and are at a flat angle relatively, being at an acute angle substantially less than a right angle. When the box and liner are assembled and the compartment within the liner is filled, the angle of the rib 16 will be prevented from expanding because of the engagement of the closures 11 and 12 with the opposed edges of the liner shell 15. Thus, the flat rib will always project inwardly and provide the necessary reinforcement against bulging of the liner shell side walls and box shell side walls by the contents of the container which is particularly important with loose bulk material.

It will be apparent that this invention provides a structure having many advantages. Some of these advantages have been discussed above and others will be apparent.

Having thus described this invention, what is claimed is:

1. In combination, a container of paperboard or the like comprising side walls which are joined together to provide an outer shell of polygonal cross-sectional form, closure structures at the opposed ends of said shell cooperating therewith, and an inner liner having side walls joined together to provide an inner shell of comple-

mental polygonal cross-sectional form and size so that the side walls of the liner shell have outer faces which are in flat contact with and cooperate with inner faces of the side walls of the outer shell, said liner shell having its opposite end edges in contact with said closure structures, a reinforcing rib in each of said liner shell side walls intermediate the ends thereof in spaced relationship to the end edges thereof projecting laterally inwardly from the inner faces of said liner shell, said rib being of angular cross-section with the sides of the rib joined directly to each other at an acute angle to thereby provide reinforcement to resist outward bending of the side walls of the liner shell and cooperating outer shell from outward pressure within the liner shell.

2. In combination, a container of paperboard or the like comprising side walls which are joined together to provide an outer shell of polygonal cross-sectional form, closure structures at the opposed ends of said shell cooperating therewith, and an inner liner shell having side walls joined together to provide an inner shell of complementary polygonal cross-sectional form and size so that the side walls of the liner shell have outer faces which are in flat contact with and cooperate with inner faces of the side walls of the outer shell, said liner shell having its opposite end edges in contact with said closure structures, a reinforcing rib of V-cross-section in each of said liner shell side walls intermediate the ends thereof and parallel with the end edges of the liner shell projecting laterally inwardly from the inner faces of said liner shell, said rib having sides joined directly to each other at a flat acute angle substantially less than a right angle to thereby provide reinforcement to resist outward bending of the side walls of the liner shell and cooperating outer shell by outward pressure from within the liner shell.

3. The combination of claim 2 including miter joints in the rib at the corner angles in the liner shell which correspond to the corners of the outer shell so that the rib is substantially continuous.

4. In combination, a container of paperboard or the like comprising side walls which are joined together to provide an outer shell of polygonal cross-sectional form, closure structures at the opposed ends of said shell cooperating therewith, an inner liner shell having side walls joined together to provide an inner shell of complementary polygonal cross-sectional form and size so that the side walls of the liner shell have outer faces which are in flat contact with and cooperate with inner faces of the side walls of the outer shell, said liner shell having its opposite end edges in contact with said closure structures, a reinforcing rib of V-cross-section having converging flanges in each of said liner shell side walls intermediate the ends thereof and parallel with the end edges of the liner shell projecting laterally inwardly from the inner faces of said liner shell, said rib having said flanges joined directly to each other at a flat acute angle substantially less than a right angle to thereby provide reinforcement to resist outward bending of the side walls of the liner shell and cooperating outer shell, and loose bulk material disposed in said container within said liner shell and within the opposed closure structures and in direct contact with the flanges of said rib so that outward pressure exerted thereby aids in keeping the rib flanges in converging relationship to resist the outward pressure of said contents and thereby resist outward bulging of the liner shell and the outer shell.

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