

Nov. 29, 1960

W. G. SHEARD

2,962,159

BULK PACKAGING CONTAINER

Filed March 3, 1958

3 Sheets-Sheet 1

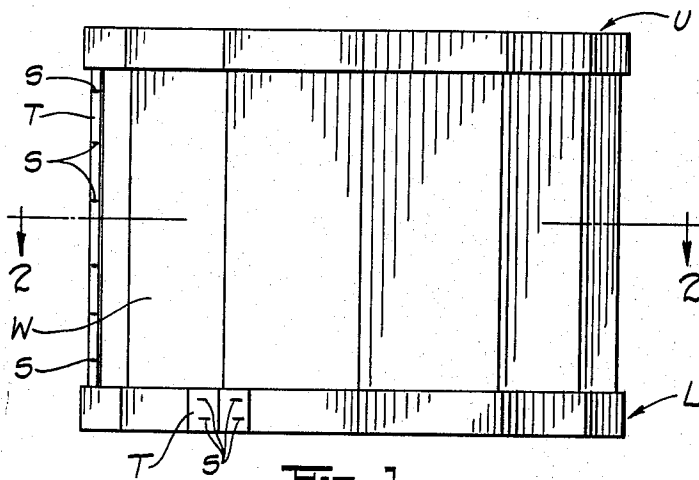


FIG. 1

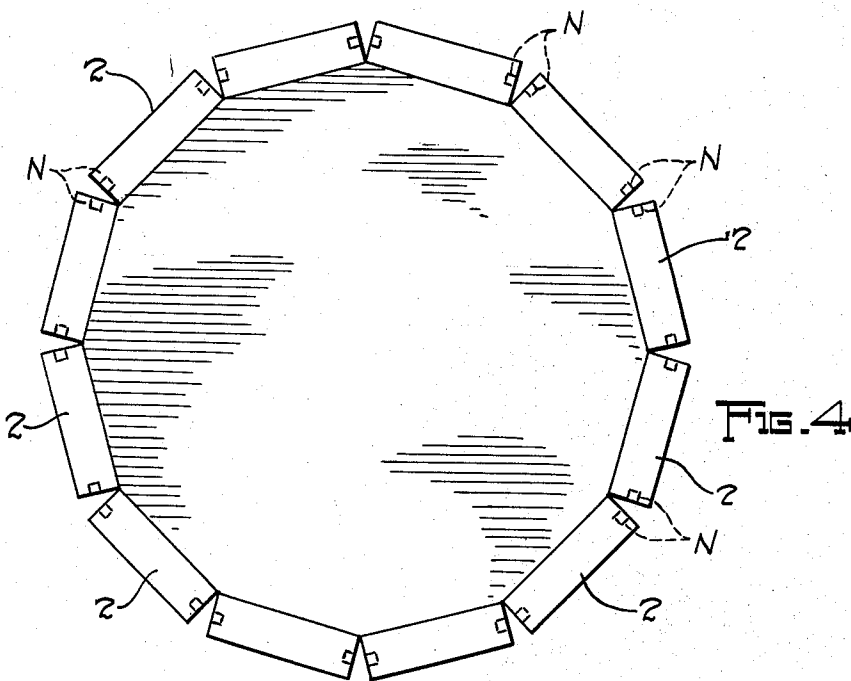


FIG. 4

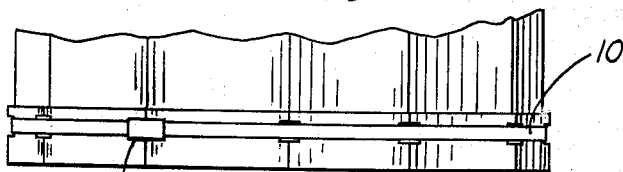


FIG. 1A

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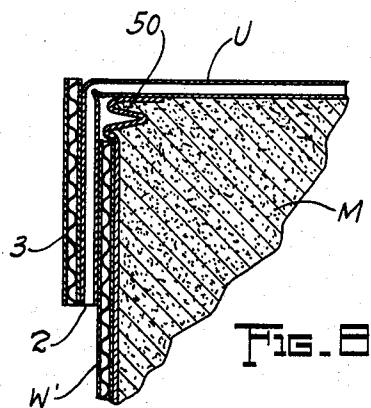
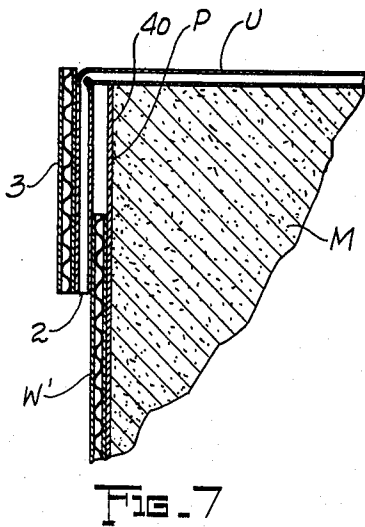
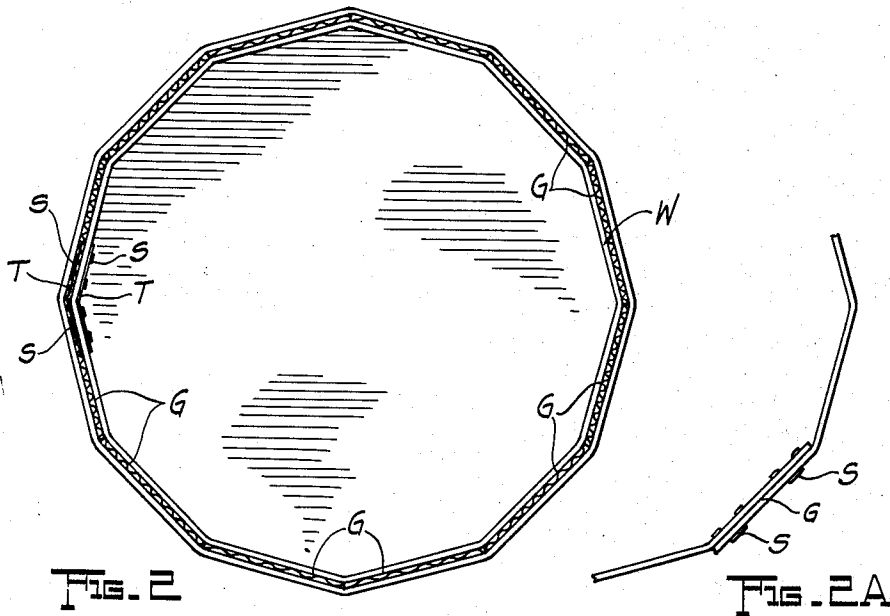
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3 Sheets-Sheet 2



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BULK PACKAGING CONTAINER

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3 Sheets-Sheet 3

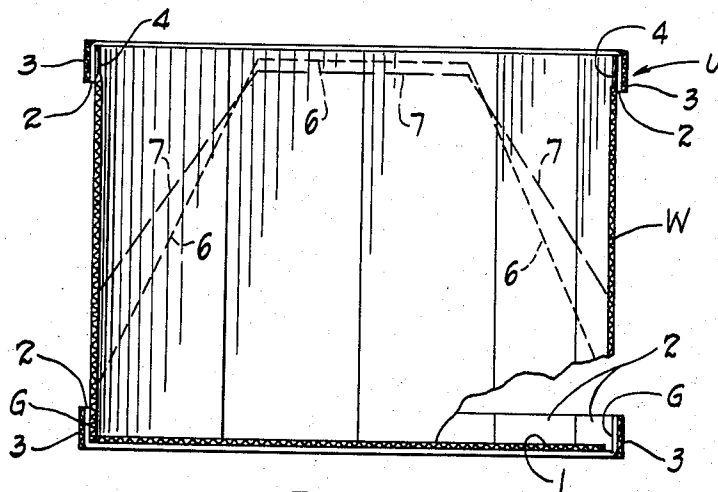


FIG. 3

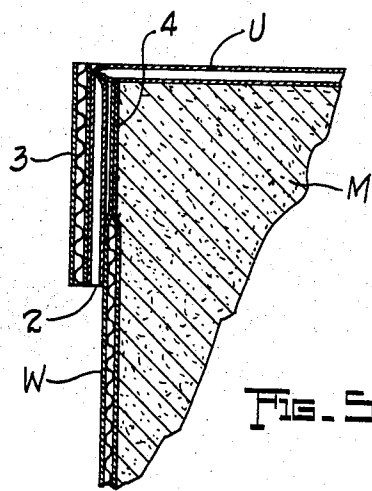


FIG. 5

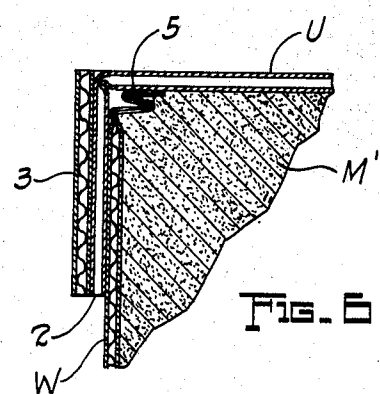


FIG. 6

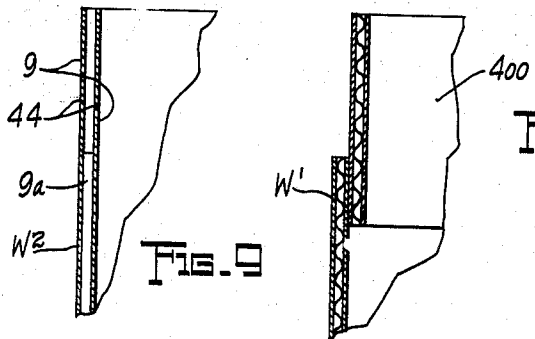


FIG. 9

FIG. 10

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2,962,159

BULK PACKAGING CONTAINER

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9 Claims. (Cl. 206—46)

This invention relates to bulk packaging and more particularly to an inexpensive, preferably, knock-down and/or disposable large, light, corrugated paper board carton or container as of about a cubic yard or a ton or more capacity, suitable for loading, shipping, handling and storing such dry, discrete and/or powdered, materials as flour, frit, cement, salt, starch, sugar, clay, sand, talc, borax and the like.

The problem solved by my invention arose in relation to the volume, kind, and mass of the material to be packaged and the size of the container. A corrugated board box or package for a pound of cement, for example, would pose no problem of strength or sufficiency for the mechanical and structural burdens of loading, handling, shipping, storage or the like, but the provision of two thousand such packages for a ton of cement would involve an extraordinary and prohibitive cost. The familiar cloth and paper packages for fifty pound lots of cement represents a known, multiple-aspect compromise between such factors as strength, cost, protection of contents, breakage, handling facility and disposability. Relative economies and facilities have been sought or sometimes gained by providing bigger and stronger packages for the handling, shipping and storage of larger unit quantities of dry bulk materials; the familiar wooden barrel and "50 gallon" hard paper board drum comprising steps in that direction. These larger packages have in turn their limitations of cost and convenience, on the one hand, and have a strict limitation of size in respect to cost; the cost becoming prohibitive if size is sought to be increased, and strength preserved, for the bulk packaging operation of the magnitude made possible and practicable by my invention.

It is among the objects of my invention to solve the problems discussed above, and, more particularly, to provide large, light, efficient and economical packages for dry bulk material.

Another object is to provide a knock-down, corrugated paper board container of unexpectedly large size for handling, storing, and shipping dry bulk material. A more specific object is to provide a paper board container so designed and constructed that it will do the work of more costly packages of much more apparent strength made according to prior practices for storing, shipping and handling dry bulk material.

Another object is to provide a corrugated paper board container for dry bulk material in which the contents of the container is caused to function as a load bearing element for support of external load to supplement and/or substitute for the vertical or columnar strength of the container as such. Another object is to provide a container with a vertical side wall disposed between upper and lower end caps, wherein the wall has an upper portion of strength sufficient to confine the contents during the filling of the container, but of sufficient weakness to permit the upper end cap to "telescope" downwardly over the side wall under external superimposed load and compact or condense the contents whereby to

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divert some or all the load or vertical component of the load from the side wall to the contents. Another object is to provide inexpensive and practicable means to transfer external load to the contents of a light, relatively weak, large and cheap bulk container. A further object is to provide for "slip" between the contents and the vertical wall of a bulk container to facilitate the transfer of external load to the contents thereof for the preservation of the wall and container.

Other objects and advantages will appear from the following description of preferred forms of my invention, reference being had to the accompanying drawing, in which:

Figure 1 is a side elevation of my container.

Figure 1a is a fragmentary view similar to Fig. 1 showing a modified form.

Figure 2 is a horizontal section taken in the plane of the line 2—2 of Figure 1.

Figure 2a is a view similar to Fig. 2 showing a modified form.

Figure 3 is a partially broken away vertical, median, longitudinal section of the container of Figure 1 in an empty condition and prior to having borne external load.

Figure 4 is a plan of a board cut to be formed into an end cap for my container.

Figure 5 is an enlarged fragmentary, vertical, longitudinal section of the upper end of the vertical side wall and the adjacent parts of the upper cap of one form of my container when the latter has been filled with dry bulk material and before an external load has been imposed on the cap.

Figure 6 is a view corresponding to Figure 5 taken after an external load has been imposed on the upper end cap.

Figures 7 and 8 are views corresponding to Figures 5 and 6 respectively showing, however, a modified form of side wall.

Figures 9 and 10 are views corresponding to Figures 5 and 7 as to the side walls and show further modifications thereof for useful coaction with end caps and contents of containers embodying my invention similar to that shown in comparison between Figures 5 and 6 or 7 and 8.

A preferred form of my invention, Figures 1—4, inclusive, comprises a flat-foldable, polyangular (12-sided as shown) cylindrical vertical side wall W, made of double-faced corrugated paper board, having its lower end snugly and telescopically fitted within a lower end cap L and its lower edge bearing upon or fitting snugly upon the margin of a reinforcing liner 1 interiorly of the lower end cap. An upper end cap U which may be the same as the lower end cap lacking the liner 1 if desired, telescopically fits over the upper end of the wall W and closes the container.

The wall W is adapted to be unfolded and snap-fitted into the lower cap L snugly at the time and place of use, i.e. just prior to filling the container. At that time I prefer that glue or adhesive G be applied to the lower outer surface of the wall adjacent the cap L and/or to the inner surface of the cap that is to engage and support the wall, Figures 2 and 3 whereby to join the wall and cap L securely together; the outward thrust of the contents aiding the adhesion of the wall and cap to each other when the filling promptly follows the gluing.

The end caps are each preferably formed of stout double-faced corrugated paper board; a sheet being cut and creased as shown in Figure 4 with a plurality (12 in this example) of integral tabs 2 being foldable up to right angles with the main body of the sheet, see Figures 3, 5, 6, etc., in which position they are held by and preferably stapled or otherwise secured to an encircling hoop or belt 3. The belts 3 are also preferably made of stout double-faced corrugated board. The belts like

the wall W are conveniently made of flat sheet material properly creased for easy folding and bending along the crease lines for flat-folded shipment and preliminary handling. Abutting ends of the belt 3, Figure 1, like abutting ends of the wall W, Figures 1 and 2, may be firmly and bendably joined together as with adhesive tape T and/or tape and staples S. Alternatively the "ends" of the wall W and/or belt 3 may be joined in a lap joint, Figure 2a, preferable with a full panel overlap, glue G and/or staples S.

In Figures 1a and 4 an alternative form of cap construction is illustrated; the tabs 2 being notched as at N as suggested in dotted lines in Figure 4 and solid lines in Figure 1a so that when the tabs are bent upwardly the notches serve to locate a metal strap 10, tied or buckled at 11, snugly holding the tabs upright and preferably in glued engagement with the lower part of the wall W, and strongly reinforcing the whole bottom structure of the container.

As shown in Figures 3 and 5 to 10 inclusive, an appreciable part of the upper end of the wall W is (1) weakened in bending and in resistance to vertical load bearing strength, or made of relatively telescoping parts, Figure 10, while (2) preserving its vertical and circumferential continuity and integrity and its ability to contain bulk material up to the full height and brim of the wall.

In the form shown in Figures 3, 5 and 6 the upper end of the wall W, for the whole circumferential length of the wall and for a depth but slightly less than the depth of the upper cap U, is flattened as at 4 having its inner corrugated sheet crushed to weaken the wall in resistance to bending and in resistance to columnar loads imposed upon it by the cap U, when external load is imposed upon the cap. This weakness created in the upper end of the wall W serves to permit and encourage the cap U to move downwardly relative to the wall W, and telescope over the unweakened part of the wall, compare Figures 5 and 6, under external vertical load on the cap. When the container is empty the crushing and bending down of the upper part of the wall W by the upper cap U will not necessarily be advantageous. But when the container has first been filled up to the brim of the wall W with dry discrete bulk material, Figure 5, and the upper cap U fitted over the top of the wall W, Figures 3 and 5, then when external vertical load is imposed upon the cap, the upper part of the wall W will offer little or no resistance to the downward telescoping movement of the cap with respect thereto. Then the uppermost part of the weakened portion 4 of the wall will be bent and/or turned inwardly progressively as at 5, Figure 6, permitting and encouraging the cap to engage, compress and compact the contents M and thereby cause the contents to support the cap instead of causing or permitting the wall to support the cap. That is to say, it is a feature of my invention that external vertical load on the upper cap is transferred from the wall structure of the container to the contents by the intended yielding of the weakened upper part of the wall while preserving, however, the strength and integrity of the rest of the container and particularly all the other parts of the wall W.

In Figure 6, the cap has been displaced downwardly an appreciable distance accompanied by the bending of the wall W, and the contents have been compacted as suggested by the reference character M' and the more abundant dots and dashes. The extent of the movement of the cap downwardly from the initial full-but-not-compacted condition of Figure 5 to the compacted load-bearing content condition of Figure 6 will depend upon the nature of the contents, on the one hand, and variously upon the aeration or deaeration of the contents, inter alia, on the other hand. Such considerations, which can be readily ascertained, will determine the desirable extent of the telescoping motion of the upper cap relative to the wall, and, therefore, the vertical length of the side

walls of the cap and the desirable and/or corresponding length of the weakened upper portion of the side wall W. As Figure 6 suggests the length of the weakened portion 4 of the wall W may prudently exceed the bent length 5 thereof when the container is bearing its maximum intended load, such, for example, as the stacking of half a dozen, more or less, like containers, similarly loaded, upon it.

Present observations and tests suggest that one aspect of the mode of operation of my invention is that when the dry bulk contents is compacted, progressive truncated "cones of load bearing support," suggested by dotted and dashed lines respectively in Figure 3, are created depending on the weight of the applied load and, among other things, the angle of repose of the bulk material under the conditions obtaining within and about the container under a particular load. Thus, for well-deaerated, fine, dry, bulk material having high adhesion between its discrete flakes or particles, and having, therefore, a high angle of repose in my container, a medium external load would probably form a truncated cone of support about as suggested within the dotted line 6.

On the other hand, as I am presently led to believe, if the contents are more coarse and/or less minutely adhesive or less effectively compactable under load and under the conditions then obtaining, then for a same medium external load the truncated cone of support would more likely take the "fatter" form suggested by the dashed line 7 in Figure 3 accompanied by a greater downward compacting motion of upper particles with respect to lower particles of the contents and with greater telescoping motion of the upper cap relative to the side walls. Whether or not my hypotheses and conclusions are literally accurate I have observed that the telescoping action of the upper cap with respect to the container and its initially full-but-not-compacted contents does cause the contents to assume the load and become the essential load bearing element; relieving the side wall W of substantially all direct vertical load in compression but imposing circumferentially acting tensile stress in the side wall depending on the "fluidity" of the contents as reflected in the form of the "cone of support" as I have tried to describe it. The greatest circumferential tensile stress tends to be developed at and near the bottom of the wall W where it is strongly supported by the lower cap L. The twelve-sided form of the wall W approaches circular cylindrical form in its facility of exerting great strength in circumferential tension. In using the term fluidity, I suggest the general freedom of movement of particles and the distribution of forces similar to that obtaining in liquids. The more the contents of my container resemble and function like a liquid in terms of fluidity and gross incompressibility, the less fully may the functions and advantages of my invention be achieved. For example, when containers embodying my invention are filled with dry discrete or powdered material such as flour, of relatively low fluidity and appreciably high compressibility, many such containers may be stacked, one atop another and the strength thereof in support of vertical load will be developed according to the precepts of my invention. But when such containers with such contents are transported in railroad freight cars, for example, which tend to jiggle and vibrate the contents of my containers, the vibrated material may tend to gain a fluidity or likeness to fluidity, flattening the "cone of support" and tending to stress the side walls in tension almost as if the contents had acquired the flowing characteristics of a liquid.

Therefore, I employ corrugated paper board in the wall W of sufficient circumferential tensile strength, when supplemented by the caps L and U, to sustain the liquid-like loading of the wall under the vibration of transportation; stacking loads happily being small when the containers are subjected to vibration in transportation and such vibration being very small or absent when the con-

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tainers are greatly stacked. When the containers are stored and stacked in appreciable multiples, the jiggling and vibration, if any, incident to handling and storing tends to facilitate the compacting of the contents and stabilizing the cone of support preliminarily to the imposition of the stacking load and with advantage and facility to the mode of operation and results of my invention.

In the form of my invention shown in Figures 7 and 8, the wall W' is terminated at about a height corresponding to the bottom of the flattened part 4 of Figures 3, 5 and 6. Interiorly of the wall W', however, is disposed a separate, removable, heavy sheet of paper P having a free upper length 40, stout and imperforate enough to contain the material M up to the brim of the container at the uppermost edge of the sheet P, and weak enough in bending to be bent as at 50, Figure 8, as the cap U telescopes downwardly over the wall W' and sheet P, compressing the contents to the compacted state M' substantially as described above with reference to Figures 3, 5 and 6.

The sheet P is, however, preferably waxed or otherwise coated or distinguished to have a low or reduced frictional engagement with the wall W' and/or with the contents M and/or M', especially when the contents are being compacted under external vertical load. Under such conditions, certain dry bulk materials appear to have a deleteriously high adhesion to or for or high frictional attachment to the ordinary dry paper board wall W or W' of the container such that the wall tends to be engaged by the being-compacted contents, probably at or near the base of the cone of support 7, Figure 3, and then wrinkled and crunched downwardly, rupturing or tending to rupture the wall with loss of contents and other undesirable incidents. The waxed or anti-friction paper P permits the being-compacted contents to "slip" down along or relative to the wall freely or freely enough to avoid the said undesirable wrinkling and/or rupturing. The use of a separate sheet of waxed paper P is convenient for the purposes mentioned. While I've shown the sheet P with the upper portion 40, it is also practicable to employ a shorter sheet disposed inside the wall W, Figure 5, which would not participate at all in the bending of the part 4, and in some circumstances not necessarily standing any higher than about the base of the cone 7 so long as that much or little anti-friction effect is sufficient to avoid wrinkling or rupturing the wall under the conditions of stacking and material and otherwise that induces or tends to induce the same.

In Figure 9, a modified form W2 of the wall W is partly shown and suggested. There the board of the wall has its inner and/or outer liner sheets 9 extended upwardly beyond the corrugated body 9a whereby the extended portions 44 have the flexibility and other desirable characteristics of the parts 4 of the wall W and 40 of the wall W' hereinabove illustrated and described.

In Figure 10, the wall W', of Figures 7 and 8, instead of having upper flexibility related to it by parts such as 4, 40 or 44 above described, gains much the same mode of operation and results by coaction with an inner telescopically received, not necessarily inflexible board or paper band or ring 400. The ring 400 is positioned about as shown in Figure 10 for filling the container as in Figures 5 and 7 to provide a high brim for bulk contents before being compacted. Thereafter when the container is capped and externally loaded, the ring 400 may telescope down into the wall W' with and permitting the downward movement of the cap U, or the ring 400 may both telescope and bend or be flexible enough to just bend. In all events, the ring 400 will yield to downward movement of the cap U to carry out the desired mode of operation and results of transferring external vertical load from the side wall to the contents of the container for the advantages and purposes of my invention.

An example of a present commercially successful em-

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bodiment of my invention comprises a container which stands 60 inches high and has a diameter, measured from flat to flat of the polyangular wall, of 48 inches which when loaded with dicalcium phosphate of the fineness which will pass through a 300 mesh screen weighs about 3000 pounds. In this package the upper cap U has a depth of about 10 inches and the side wall has an upper brim portion which is weakened for a depth of about 8 inches. When such a container has been filled to the brim with material mentioned above and loaded with a vertical superimposed load on the upper cap of about 6000 pounds the contents will be compacted a little less than 8 inches and the container, except for the telescoping of the cap and the bending of the upper flexible part of the side wall, will have retained its entire initial shape, strength, appearance and virtue. In the use of such container with such material it was not necessary to use wax paper or other anti-friction material between the contents and the inner face of the corrugated paper board wall. The wall was, however, made of double thickness having two corrugated portions sandwiched between three stout paper liners.

While I have illustrated and described preferred forms and examples of my invention, changes and improvements will occur to those skilled in the art who come to use my invention and understand my teaching about the same. Therefore, I do not care to be limited in the scope of my patent to the forms herein specifically illustrated and described nor in any manner incommensurate with the progress to which my invention has promoted the art.

I claim:

1. A bulk packaging container filled to its capacity with not substantially less than about a cubic yard of dry bulk material contents and having strength when filled sufficient to support vertical external load exceeding the weight of its own contents, comprising a vertical right cylindrical wall of less strength in vertical compression than that required to support such an external load but having strength in circumferential tension, a bottom closure, and an upper cap telescopically overlying and receiving the upper end of said wall, means at the upper end of said wall comprising the brim thereof having strength to contain said material contents up to said brim but movably admitting downward telescoping movement of said cap relative to said wall under external vertical load without imparting vertical overload to the lower portions of said wall, said wall and said means being continuous and imperforate and adapted to confine a brimful quantity of said material contents therein prior to the closure thereof by said upper cap member, said cap member when subjected to external vertical load tending to move downwardly relative to lower portions of said wall and to lower portions of said material contents and displacing said means and bearing upon and compacting said material contents, the vertical height of the said means above said wall being not substantially shorter than the amount by which the said material contents are compacted under the load intended to be supported upon said cap whereby displacement of said means under external vertical load transfers external vertical load from said wall to the said material contents of the container and compacts said material contents and develops its load bearing strength in support of said external vertical load and in preservation of said wall.

2. The container of claim 1 with anti-friction means interposed between said contents and at least the lower portions of said wall.

3. The container of claim 1 with a sheet of flexible material having a lower frictional relation to the contents of the container than the inner surface of said wall has to said contents disposed between said wall and said contents.

4. The container of claim 3 in which said sheet also comprises said movable means.

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5. The container of claim 1 in which said means comprises a weakened portion of said wall.

6. The container of claim 1 in which said wall comprises double faced corrugated board having liners and said means comprises an extension of one of the liners thereof.

7. The container of claim 1 in which said means comprises an extension of said wall telescopically related to the upper end thereof.

8. A bulk packaging container holding as much as about a cubic yard of dry bulk material and filled with dry bulk material and having strength to support vertical external load exceeding the weight of its own contents, comprising a vertical right cylindrical wall of less strength in vertical compression than that required to support such an external load but having strength in circumferential tension, a bottom closure, and an upper cap telescopically overlying and receiving the upper end of said wall, means at the upper end of said wall comprising the brim thereof having strength to contain said material up to the brim but movably admitting downward telescoping movement of said cap relative to said wall under

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external vertical load without imparting vertical overload to the lower portions of said wall, said wall and said means being continuous and imperforate and confining a brimful quantity of said material therein prior to the closure thereof by said upper cap member, said cap member when subjected to external vertical load tending to move downwardly relative to lower portions of said wall and to lower portions of said material and displacing said means and bearing upon and compacting said material contents, whereby displacement of said means transfers external vertical load from said wall to the contents of the container.

9. The container of claim 8 with a peripheral reinforcement for the lower portion of said wall near the base of the cone of support of said material.

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