

Dec. 18, 1956

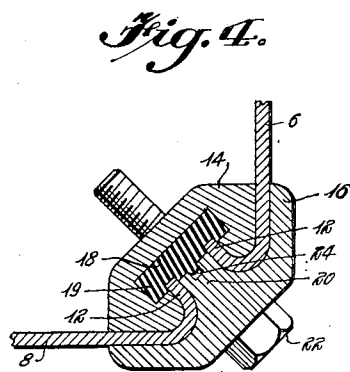
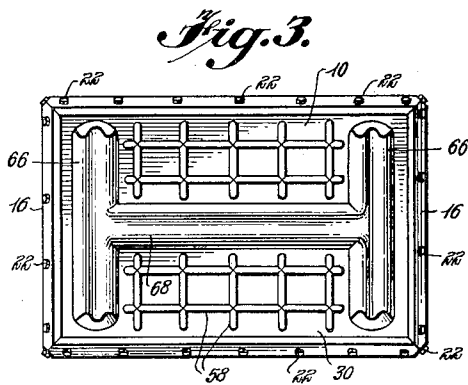
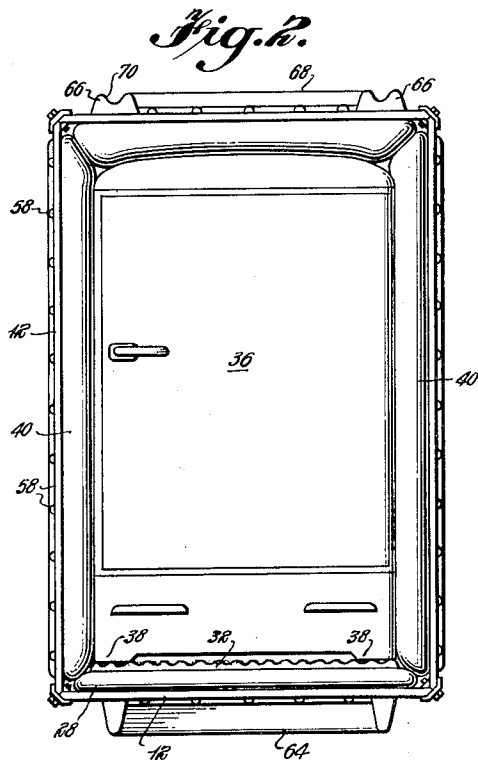
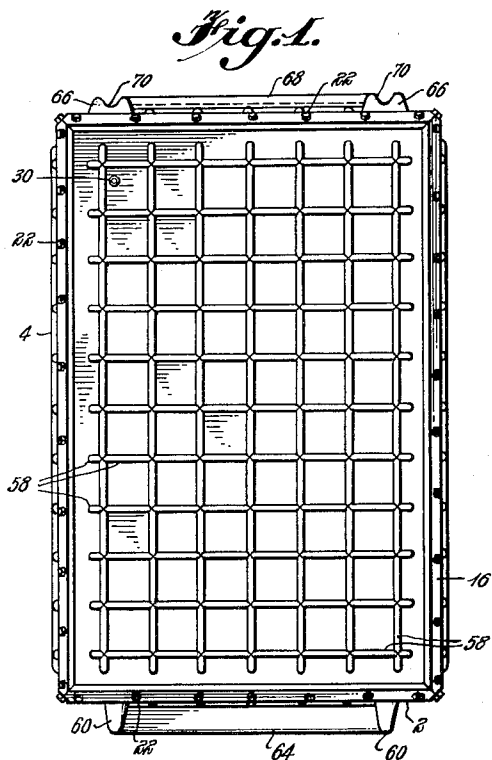
C. M. MOORE

2,774,503

CUSHIONED SHIPPING CRATE

Filed Sept. 19, 1951

3 Sheets-Sheet 1



INVENTOR

Clyde Maurice Moore

BY

Bacon & Thomas

ATTORNEYS

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Fig. 5.

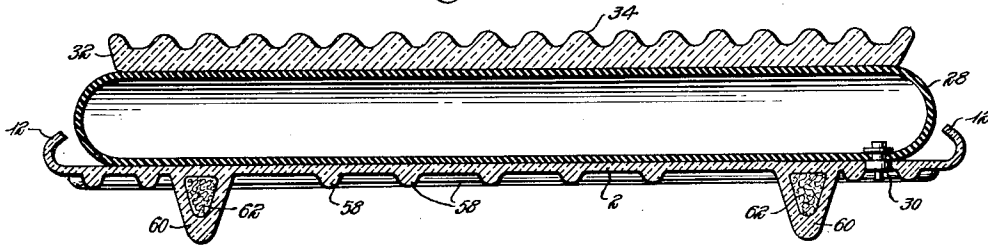


Fig. 6.

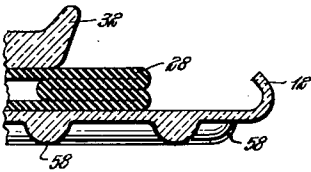


Fig. 7.

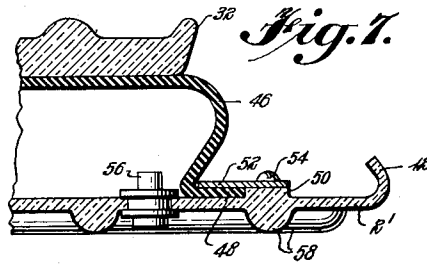


Fig. 8.

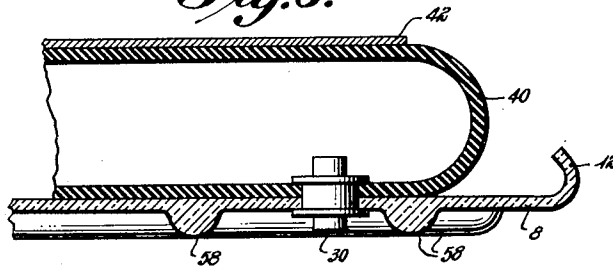
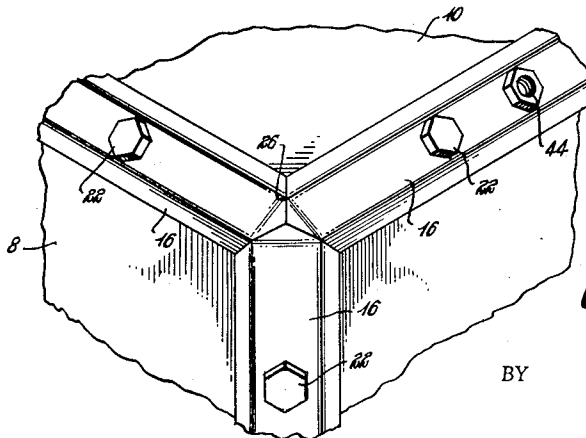


Fig. 9.



INVENTOR

Clyde Maurice Moore

BY

Bacon & Thomas
ATTORNEYS

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Fig. 10.

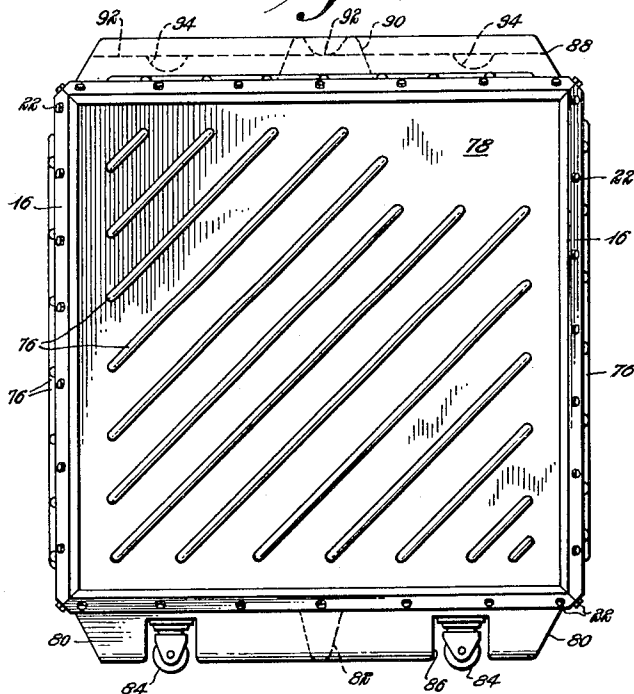
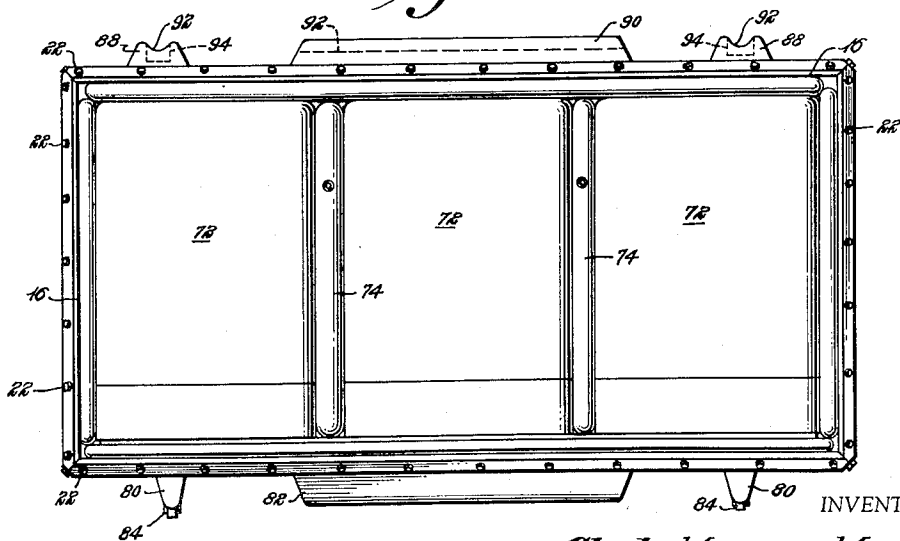


Fig. 11.



INVENTOR

Clyde Maurice Moore

BY

Bacon & Thomas

ATTORNEYS

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2,774,503

CUSHIONED SHIPPING CRATE

Clyde Maurice Moore, Richmond, Va., assignor to
Moorex Industries, Inc., Richmond, Va., a corporation
of Virginia

Application September 19, 1951, Serial No. 247,238

5 Claims. (Cl. 217—53)

This invention relates to shipping crates and particularly to demountable crates having inflatable air cushions formed as a permanent part thereof, the inflatable air cushions being provided to constitute packing to engage and support articles within the crate.

The shipment of many types of merchandise necessitates the provision of an enclosing crate structure to protect the articles and prevent damage due to shocks in handling or during transit. Such crates are conventionally made of wood and are assembled by hand, being destroyed or otherwise disposed of after a single use. In such wooden shipping crates braces or other rigid means are usually provided to engage and hold the articles being shipped immovable within the crate. Such bracing means, while preventing relative movement between the crate and article do not prevent the transmission of shock to the article when the crate is roughly handled. Many proposals have been put forward for protecting fragile articles but they have all proven quite expensive and involve considerable labor to render them effective. Furthermore, many articles or products suffer deterioration by virtue of long periods of storage or as a result of adverse weather conditions, such as high humidity.

The present invention seeks to provide a shipping crate that may be used many times, the crate being demountable into separate easily stacked and handled components incorporating as a permanent part thereof inflatable means constituting a packing and shock absorbing medium to directly contact and support articles being shipped.

Generally the shipping crate of the present invention consists of a plurality of substantially flat panels having cooperating edge portions adapted to form a rigid joint between adjacent panels and adapted to form a joint that is completely sealed to render the entire crate impervious to air. Each of the panels is itself impervious to air and substantially inert to the action of the elements and the crate may be provided with means for evacuating air from a completely assembled and packed crate to protect the contents thereof against the action of humidity or other elements that may deteriorate the merchandise in transit or even during long periods of storage.

The present packing crate consists of individual panels, each having an inflatable air cushion permanently fixed to its inner surface. Thus when the crate is completely assembled with the article or articles of merchandise packed therein compressed air may be admitted to the individual cushions through valve means accessible from the exterior of the crate to inflate each of the cushions to bear upon the article thus holding it resiliently in position within the crate and insulating it from shocks to which the crate may be subjected.

Preferably the individual panels in the crate are constructed of a reinforced plastic material. A suitable material consists of a mat of glass fibers with layers of glass fiber cloth at the outer surfaces thereof, the whole being bonded and impregnated with a suitable thermosetting resin. Such fibrous glass material is readily avail-

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able on the present market under the trade name of "Fiberglas."

The material may be satisfactorily molded and formed to provide panels of the desired shape and configuration, which panels, when cured, are substantially rigid, infusible, insoluble and resistant to all sorts of weather and temperature conditions and of high mechanical strength. While the glass fiber and resin panels are preferred, other materials may be employed, such as sheet metal or the like.

It is therefore an objective of this invention to provide a shipping crate and particularly a demountable shipping crate having inflatable cushions forming a permanent part thereof.

Another objective of this invention is to provide an air impervious shipping crate having removable panels and joint means providing a seal between the panels whereby the crate may be evacuated for the preservation of its contents.

Still another objective of the invention resides in providing a shipping crate of rugged and strong materials but having the characteristic of being demountable to facilitate storage or return for reuse.

A still further objective of the invention resides in providing a shipping crate having inflatable cushions therein with wear resistant surfaces on the portions of said cushions engaging articles in said crate.

Another objective of the invention is to provide a shipping crate having permanent pneumatic cushioning means therein and a weight-distributing panel engageable with the bottom of an article to distribute the weight thereof over one of the inflatable cushions.

A further objective of the invention is to provide a shipping crate having inflatable cushions therein which may be inflated after the crate has been packed and completely closed.

Still another objective of the invention resides in providing a shipping crate having means to facilitate stacking similar crates one upon another in a manner to prevent lateral displacement.

It is the general objective of this invention to provide a demountable cushioned shipping crate light in weight yet of rugged construction and economical to produce.

Still further objectives and advantages will appear to those skilled in the art as the description proceeds in connection with the accompanying drawings wherein:

Figure 1 is a front elevational view of a packed and assembled shipping crate constructed in accordance with the present invention;

Figure 2 is a front elevational view of the shipping crate of Figure 1 with the front panel thereof removed;

Figure 3 is a top plan view of the crate shown in Figure 1;

Figure 4 is a fragmentary sectional view through one of the joints of the crate shown in Figures 1 to 3;

Figure 5 is a vertical sectional view taken transversely through the bottom panel of a crate of the type shown in Figure 2;

Figure 6 is a fragmentary sectional view corresponding to one end portion of Figure 5, but on an enlarged scale, showing the inflatable cushion in collapsed condition;

Figure 7 is a transverse sectional view through a portion of a modified form of bottom panel;

Figure 8 is a fragmentary transverse sectional view through a side or top panel of a crate as shown in Figure 1;

Figure 9 is a perspective view of a corner portion of the crate of the present invention illustrating the manner in which the joints are mitered at a corner;

Figure 10 is an end elevational view of a modified form of shipping crate; and

Figure 11 is a front elevational view of the crate shown in Figure 10 with the front panel removed.

The crate shown in Figs. 1 to 3 of the drawings comprises a bottom panel 2, side panels 4 and 6, a front panel 8, and a rear panel similar to the front panel 8 but not shown in the drawings.

The crate is also provided with a top panel 10. Each of the panels is of generally similar construction and comprises a sheet-like member of generally planiform shape and substantially rigid. Each panel is provided at its marginal edges with inturned flanges 12 (see particularly Fig. 4). The flanges 12 cooperate with an inner sealing bar 14 and an outer clamping bar 16 to provide a sealed joint between adjacent panels. As shown in Fig. 4, the sealing bar 14 is provided with a longitudinally extending channel 18 having therein a strip of readily deformable sealing material 19. The sealing material 19 may be a strip of vulcanized natural rubber or may comprise a suitable synthetic rubber or the like. The sealing bar 14 is so configured that it snugly engages the inner marginal surfaces of adjacent panels (numbered 6 and 8 in Fig. 4 for convenience) with the terminal edges of flanges 12 extending into the channels 18. A clamping bar 16 snugly embraces the outer marginal surfaces of adjacent panels and is provided with a central rib 20 extending between the flanges 12 and into contact with sealing material 19. A plurality of fastening elements such as cap screws 22 pass freely through openings in clamping bars 16 and engage threaded openings in sealing bar 14. It will be readily apparent that sealing bar 14, portion 20 of clamping bar 16 and the terminal edges of flanges 12 define the boundary surfaces of a space completely confining the sealing material 19. As the fastening means 22 are tightened they not only effect a mechanical clamping of the panel edges but also effect compression of the sealing material 19. At the same time, the edges of flanges 12 are forced into the sealing material 19 and a completely sealed and rigid joint is formed between the panels of the crate. The portion 20 of clamping bar 16 may be provided with a longitudinal groove or channel 24 adapted to provide expansion space for the material 19 to insure that the parts may be drawn into firm mechanical contact without undue resistance from the sealing material. The cap screws 22 are provided with a threaded shank of such length that they may be loosened sufficiently to permit the clamping and sealing bars to be separated far enough to remove the panel edges from the clamping assembly without complete withdrawal of the screws 22.

Referring now to Fig. 9, the outer clamping bars 16 are shown mitered at their ends, as at 26, to abut each other and form a smooth and continuous corner joint. The inner or sealing bars 14 are similarly mitered on the inside of the crate and it will be noted that the channels 18 of the three sealing bars coming together at any corner are in communication with each other. The strips of sealing material 19 are also mitered at their ends to abut each other at the corner of the crate. During tightening of the fastening means 22 the sealing material 19 is put under pressure, which causes longitudinal expansion thereof. That longitudinal expansion of the strips 19 forces their ends into mutual pressure contact to effect a highly efficient seal at the corners of the crate.

From the above description it will be apparent that the corner joints employed for mechanically sealing all of the panels of the crate together provide a completely sealed container for articles to be packed therein.

While a particular form of joint is shown and described herein that joint does not constitute the subject matter of the present invention but is the subject matter claimed specifically in applicant's compending application Serial No. 167,793, filed June 13, 1950, and entitled "Demountable Structure." It is to be understood that other forms of sealing joint may be employed in the crate of the present invention, for instance any of the

joints disclosed in the following applications of this same inventor may be used: Serial No. 209,169, filed February 2, 1951, for "Sealed Structural Joint"; Serial No. 228,052, filed May 24, 1951, entitled "Integral Joint Structure"; Serial No. 229,173, filed May 31, 1951, entitled "Joint Clamping Means"; and Serial No. 234,831, filed July 2, 1951, entitled "Interlocking Container and Joint." While many of the forms of joint shown in some of the above compending applications do not provide a hermetic seal they may well be employed in the crate of the present invention in instances where it is not necessary that the contents be completely sealed from the outside atmosphere.

As shown in Figs. 2 and 5 to 8, each of the panels comprising the side walls, top and bottom of the present crate is provided with an inflatable cushion on its inner surface. The bottom panel 2 is shown in Fig. 5 as having an inflatable cushion 28 in abutment with substantially the entire inner surface of the panel and being cemented or otherwise permanently fixed thereto. A suitable valve 30 provides communication between the interior of the cushion 28 and the exterior of the panel 2. The valve 30 may be any conventional or desirable type of air valve through which air under pressure may be admitted to the inflatable cushion for inflating the same and retained therein. The bottom panel 2 shown in Fig. 5 will necessarily support substantially all of the weight of any article packed in the crate and therefore a rigid weight-distributing member or panel 32 is fixed to the upper surface of the cushion 28. The member 32 may be molded of the same material as used to form the outer panels of the crate or may be any other suitable material. As shown the weight-distributing panel 32 overlies substantially the entire area of the inner surface of panel 2 and may be provided with corrugations 34 constituting an antislip surface to receive the article to be crated. Fig. 2 illustrates the utility of such a rigid panel as 32 wherein the article comprises a rather heavy mechanism such as the refrigerator 36 provided with spaced feet 38. It has been found that a relatively low unit pressure in the cushions will suffice to support and cushion relatively heavy articles. The usual refrigerator may be supported satisfactorily by employing an inflating pressure in cushion 28 of about 3 pounds per square inch. Since the article rests directly on the rigid plate or panel 32 its weight may be concentrated at relatively few points on the panel while the panel itself acts to distribute that weight uniformly over the entire cushion.

Fig. 8 illustrates the type of cushion preferred for the side walls and top wall of the crate and comprises an inflatable cushion 40 of rubber or the like. The cushion 40 may be identical in all respects to the cushion 28 and may be cemented to the inner surface of the panel on which it is mounted in the same manner as described in connection with Fig. 5. Since the side walls of the crate and the top wall thereof do not directly support the weight of the crated article, it is not necessary that they be provided with the rigid weight-distributing panel employed with the bottom cushion. However, it is desirable that the face of the cushions 40 in contact with the article be held against undue stretching and protected against abrasion. To accomplish this result a layer of canvas 42 or the like may be cemented to the inner face of the cushions 40. The layer of canvas 42 prevents undue stretching of the inner face of the cushion particularly where the article may have relatively sharp projections and protects the cushion against abrasion due to shifting movement of the article when shocks are applied to the crate. Fig. 8 is intended to illustrate a type of cushion and facing therefor employed on each of the side panels and the top panel and it is to be understood that each panel is provided with a valve such as valve 30 of Fig. 5 so that the cushions may be individually inflated from the exterior of the crate after the latter has been packed and completely assembled. The cushions

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(28 and 40) are sufficiently flexible, particularly at their edge portions, to permit adaptation to the surfaces of articles of various shapes. For instance, Fig. 2 shows how the major portion of the side wall cushions engage the refrigerator over a relatively flat portion but where the marginal edges of the cushions may "bulge" to engage the curved edges of the top thereof.

It will be clearly evident that the herein described arrangement will effect efficient holding of an article in the crate and protect that article against damage due to shock or rough handling. Many and varied types of articles may be advantageously shipped in such containers. The present invention is of particular advantage in the shipment of fragile articles such as weighing scales, radios, television sets, and a multitude of other products.

In many instances the article being shipped, such as pianos, military ordnance equipment, engines for aircraft or the like and similar products must be protected against moisture. The crate of the present invention adapts itself readily to offering such protection since it provides for a completely and hermetically sealed crate not only supporting the article against shock damage but also preventing ingress of moisture. The preservation of the crated article may be further enhanced by reducing the pressure within the crate to remove most of the air and moisture therefrom. The clamping bar 16 in any one of the joints of the crate may be provided with a further valve 44 (see Fig. 9) communicating with the interior of the crate between the edges of adjacent cushions therein. After assembly of the crate and either before or after inflation of the cushions, a suitable vacuum pump may be fitted to valve 44 to evacuate the air from the crate. If desired the valve 44 may be incorporated in one of the fastening means 22 such as by providing a bore there-through and positioning a suitable valve in said bore. Clearly many other types of valves could be employed to evacuate the interior of the crate.

Fig. 7 illustrates a modified form of composite panel wherein the cushion is not a complete element in itself but comprises a molded sheet of rubber or rubberlike material 46 fastened at its marginal edges 48 to the inner surface of a panel shown in Fig. 7 as a bottom panel 2'. The panel 2' is provided with a rib 50 on its inner surface extending along the boundary of the terminal edges 48 of the sheet 46. The edge of the sheet 46 is preferably cemented to the panel 2' and a metal clamping strip 52, fastened to the panels by means of screws 54 engaging the rib 50, acts to hold the terminal edge of the sheet 46 clamped firmly against the panel 2'. While Fig. 7 illustrates this embodiment as applied to a bottom panel of the crate and having the rigid weight-distributing plate 32 thereon, it is to be understood that this same construction may be employed for any or all of the side panels and the top panel.

In the embodiment shown in Fig. 7 the panel 2' is of a molded resin material having the heretofore described Fiberglas reinforcement and such a panel is clearly impervious to air. Thus it may readily be employed to define one wall of the inflatable cushion. A suitable valve 56 extends through the panel 2' to provide means for admitting air under pressure to the space between the sheet 46 and panel 2' to effect expansion of the cushion defined thereby.

It is desirable in a shipping crate of this type to maintain the weight as low as possible without sacrificing strength and rigidity. With panels constructed of the reinforced resin described, the major portion of the panel may be in the form of a relatively thin sheet as shown in the drawings. With any thin sheet however there is danger of undue bulging of the panels when the cushions are inflated into pressure contact with the article in the crate. To minimize such bulging the panels may be provided with integrally molded ribs 58 defining a pattern, such as the grid shown in Figs. 1 and 3, over the major portion of the exterior surface of each panel. Such ribs provide rigidity and prevent undue distortion of the panels.

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Clearly the panels of any crate embodying the present invention may be constructed of other suitable materials, for instance, sheet metal. In such a case the reinforcing ribs may be impressed in the sheet and assume the form of channels or ribs which will provide the requisite rigidity.

Referring now to Figs. 1 to 3 and 5, the bottom panel is shown as provided with enlarged ribs 60 extending generally from the front to back thereof adjacent opposite edges and substantially parallel to each other. The ribs 60 may be provided with a core 62 (Fig. 5) of fibrous material such as Fiberglas or other suitable filling material and are preferably molded as an integral part of the bottom panel. The ribs 60 constitute supporting feet for the crate and hold the crate spaced from a floor or other supporting surface to facilitate ready insertion of the prongs of a lift truck. A transverse rib 64 (Figs. 1 and 2) joins the approximate mid portions of the ribs 60 to define therewith a generally H-shaped foot structure.

The top panel 10 of the crate (see Fig. 3) is also provided with integral ribs 66 directly over the ribs 60 on the bottom panel. A transverse rib 68 is also molded on the top panel and joins the mid portions of the ribs 66. Each of the ribs 66 and 68 is provided with a longitudinal groove 70 in its crest. The grooves 70 define an H-shaped seat of such proportions and dimensions as to receive the lowermost edges of the ribs 60 and 64 on a similar crate. Thus, a plurality of crates may be stacked one upon the other with the ribs 60 and 64 engaging the grooves 70 in the top panel of a lower crate and the crates are thus held against lateral shifting movement in any direction. The ribs 66 and 68 are of such large section that they act to uniformly distribute the weight of a supported crate over the entire top panel of a supporting crate.

Upon arrival of a packed crate at its destination the merchandise may be stored while still crated or may be readily unpacked by the simple expedient of releasing air pressure from the inflated cushions and then removing one of the side panels, thus permitting ready removal of the article. The crate may then be used for the return shipment of different merchandise or may be completely disassembled and the various panels thereof stacked to form a compact bundle to be returned for further use.

Figs. 10 and 11 show, respectively, end and front elevational views of a modified form of packing crate constructed in accordance with the present invention. It is often important to maintain articles of merchandise in an upright position while being handled and while in transit. It is common knowledge that the handlers of merchandise in transit are not particularly careful to maintain such articles in an upright position even though the crates are plainly marked. The embodiment of Figs. 10 and 11 is designed to insure, as nearly as possible, that the articles be maintained in the desired attitude. The crate of this embodiment is of such proportions as to contain a plurality of articles and is of such size and weight that its inadvertent tilting is extremely unlikely. The crate is designed so that it can efficiently be handled only in one position and to turn it over on its side would require a deliberate intent.

In all major respects the shipping crate of Figs. 10 and 11 is identical to that described in connection with Figs. 1 to 9. The corner joints may be the same and the panels and air cushions attached thereto may be of identical construction to those previously described. The crate is of such dimensions, however, as to receive a plurality of articles 72 to provide a bulky package not easily thrown about or inadvertently tilted. While Fig. 11 shows three articles packed side-by-side in the crate, it will be obvious that a greater or lesser number of articles may be packed in one crate and may be arranged in a plurality of tiers or layers. In packing a plurality of articles 72 in this embodiment separate inflatable cushions 74 are interposed between adjacent articles and may be

inflated after the merchandise is in place. Thus, cushioning means bear against all surfaces of each article to provide shock-free crating. The panels may be provided with diagonal ribs 76 or may have the grid of ribs as disclosed in Fig. 1. If desired, a certain area of one panel, as shown at 78 in Fig. 10, may have the ribs omitted therefrom and provide a flat space for pasting shipping instructions or the like.

The crate of this embodiment is provided with parallel enlarged ribs 80 on the bottom panel, corresponding to the ribs 60 of Fig. 1 and defining supporting feet for the crate. A transverse rib 82 is also provided for the same purpose as described in connection with rib 64 of Fig. 1. The rib 82, however, does not extend throughout the entire distance between ribs 80 but is spaced therefrom to define passageways for the receipt of prongs of a fork truck or the like. Since the crate of the dimensions and weight of this embodiment cannot be readily manipulated by hand, it may be provided with casters 84 mounted in cutaway portions 86 of ribs 80. The periphery of the caster wheels 84 projects downwardly below the lowermost edge of the ribs 80 a short distance so that the crate may be entirely supported on the caster wheels for easy movement over a supporting floor.

The top panel is provided with parallel ribs 88 and a transverse rib 90, corresponding to the ribs on the top panel of the previously described embodiment. The ribs 88 and 90 are provided with grooves 92 in their crests to receive the ribs 80 and 82 of a similar crate when stacked one upon the other. The ribs 88 are provided with additional recesses 94 to receive the caster wheels 84 of a crate stacked thereon so that the ribs 80 and 82 may rest directly on the ribs 88 and 90 respectively.

In each of the embodiments of the invention it is contemplated that the crates be so designed that their outer dimensions provide for packing a predetermined number in the standard box car with the crates occupying the entire available space in a rather snug arrangement.

While a specific embodiment of the invention has been shown and described it is to be understood that many modifications thereof may be resorted to without departing from the scope of the invention as set forth in the appended claims.

I claim:

1. A demountable shipping crate comprising; separable panels defining the walls of said crate, means releasably joining adjacent edges of adjacent panels, an inflatable cushion fixed to the inner face of each of said panels, said cushions covering substantially the entire area of their respective panels and fixed thereto around their peripheral portions, and valve means in each panel accessible from the exterior of said crate and each communicating directly with the interior of the cushion on its respective panel to provide for inflation thereof after assembly of said crate.

2. A crate as defined in claim 1 wherein said inflatable cushions are of stretchable material and wherein each is provided, on its inner face, with a non-stretchable and wear resisting facing fixed thereto.

3. A crate as defined in claim 1 wherein the cushion on one of said panels, constituting the bottom wall of said crate, is provided on its inner face with a rigid bearing member fixed thereto, said bearing member covering substantially the entire area of said inner face of said cushion.

4. A composite wall panel for a shipping crate comprising; a generally planiform substantially rigid panel member, means at the marginal edges thereof engageable with joint means to form a rigid joint between similar panels, an air impervious movable wall overlying substantially all of one face of said panel, flexible and stretchable air impervious walls extending from the marginal edges of said movable wall to said panel and being sealed thereto and defining an inflatable chamber for moving said movable wall away from said panel, and means for admitting air under pressure through said panel directly to said chamber.

5. A composite wall panel for a shipping crate comprising; a generally planiform substantially rigid panel member, means at the marginal edges thereof engageable with joint means to form a rigid joint between similar panels, said panel being substantially impervious to air, a sheet of air-impervious flexible material overlying substantially all of one face of said panel, the marginal edges of said sheet being fixed to said panel face in sealing engagement therewith to define an inflatable chamber between said sheet and panel, and means for admitting air under pressure through said panel directly to the space between said sheet and panel.

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