

**3,040,925**

GENERAL CARGO SHIPPING CONTAINER

Filed Jan. 2, 1959

11 Sheets-Sheet 1

FIG-1

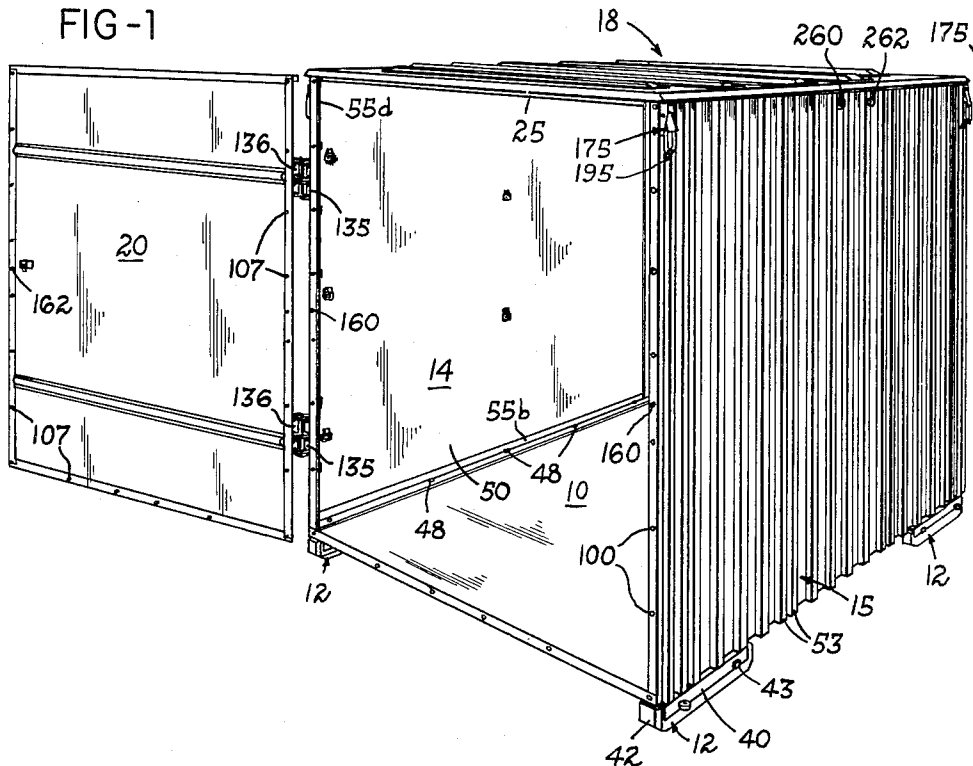


FIG-2

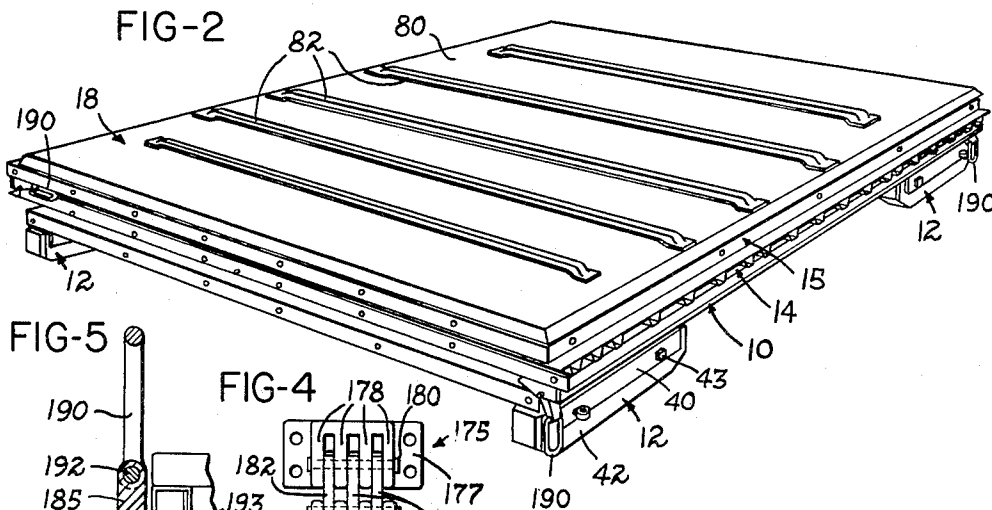


FIG-5

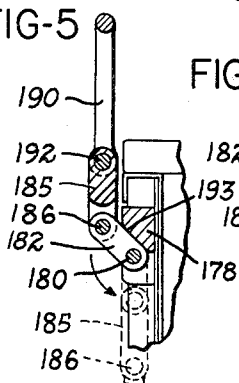
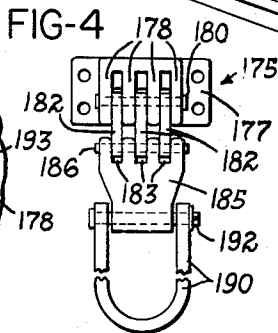


FIG-4



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**ATTORNEYS**

**June 26, 1962**

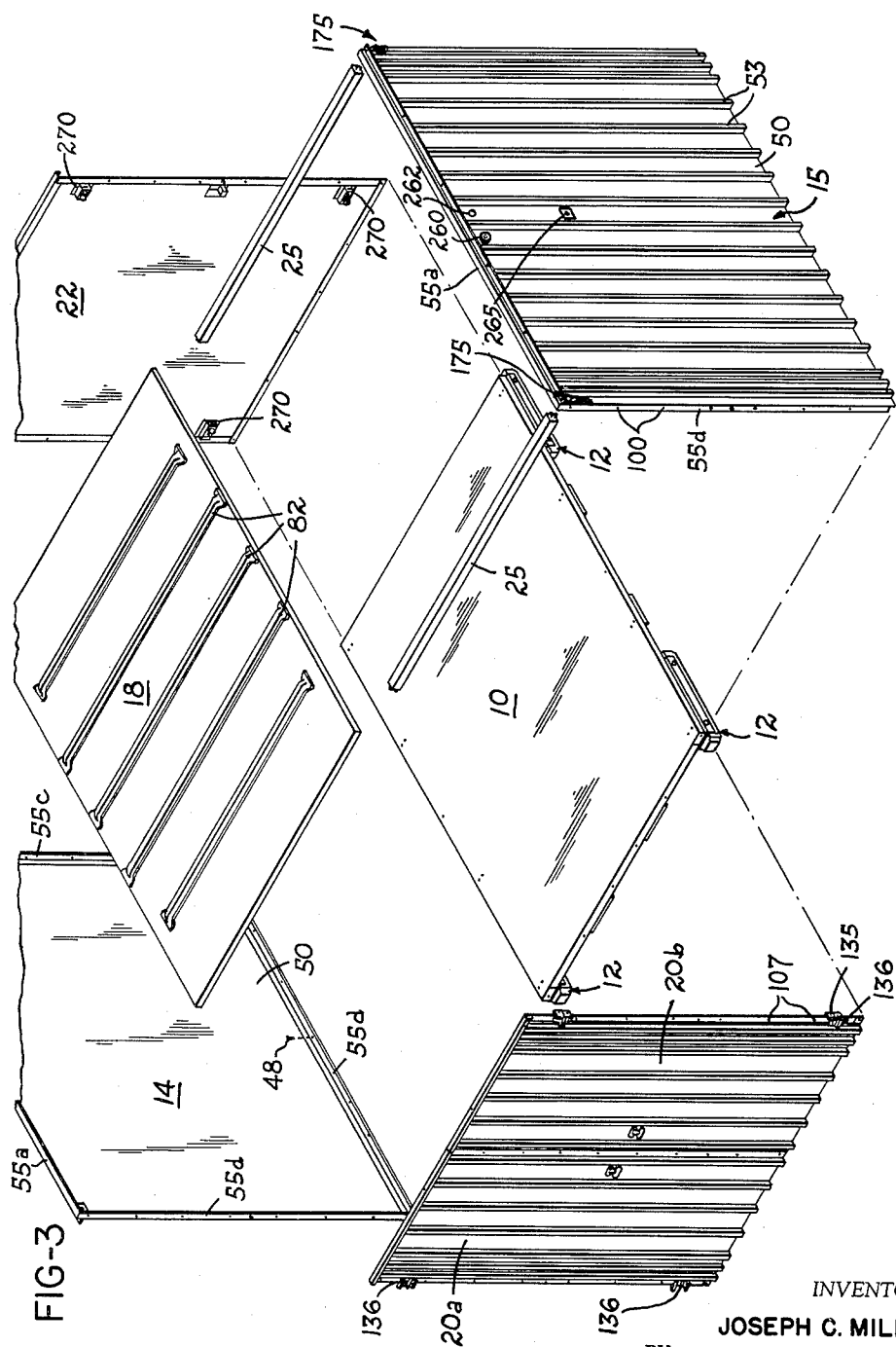
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11 Sheets-Sheet 2



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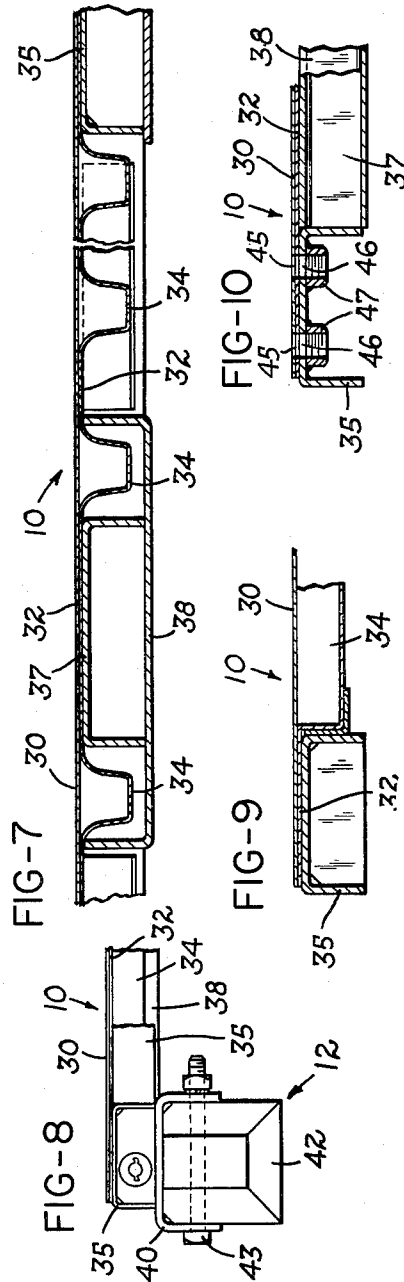
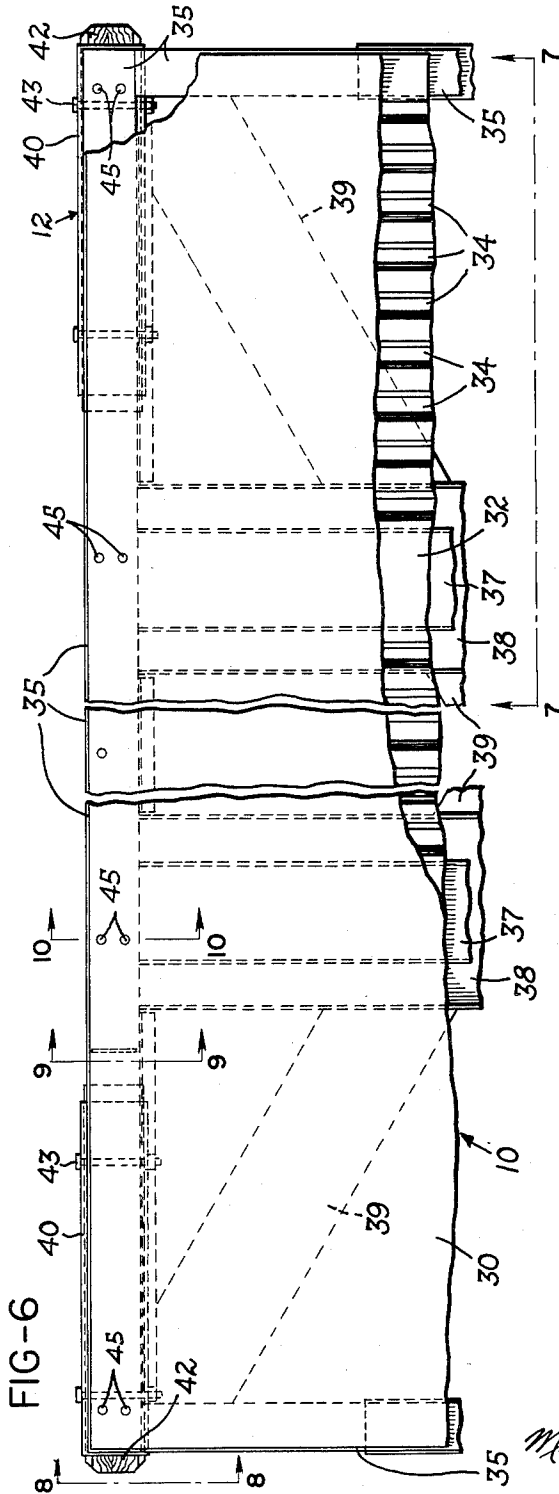
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GENERAL CARGO SHIPPING CONTAINER

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11 Sheets-Sheet 3



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3,040,925

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FIG-12

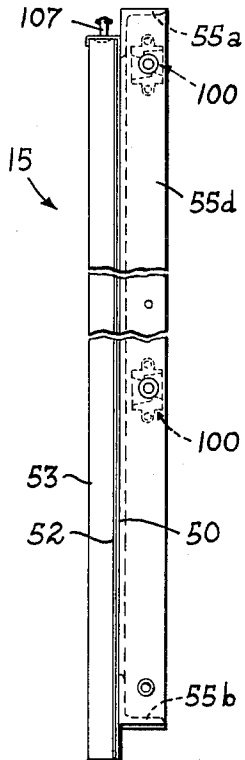


FIG-11

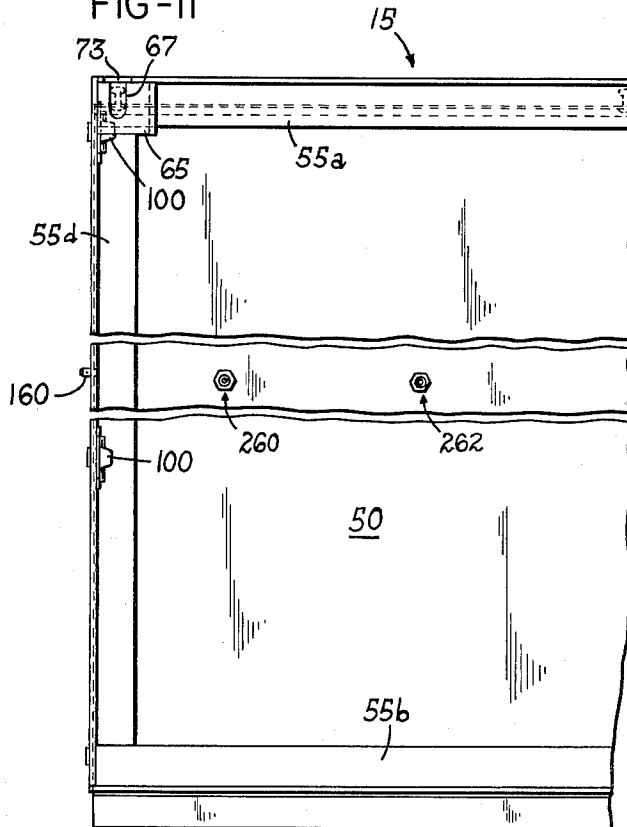


FIG-13

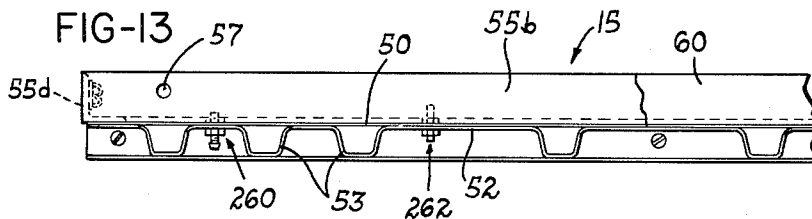


FIG-14

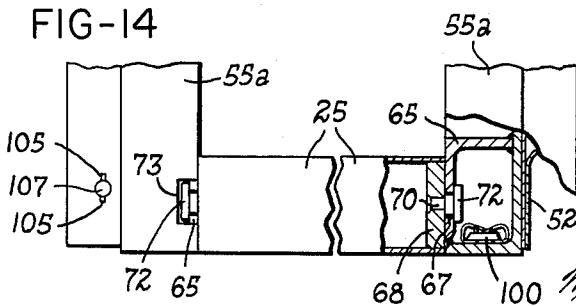
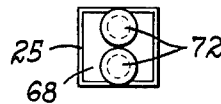


FIG-15



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FIG-16

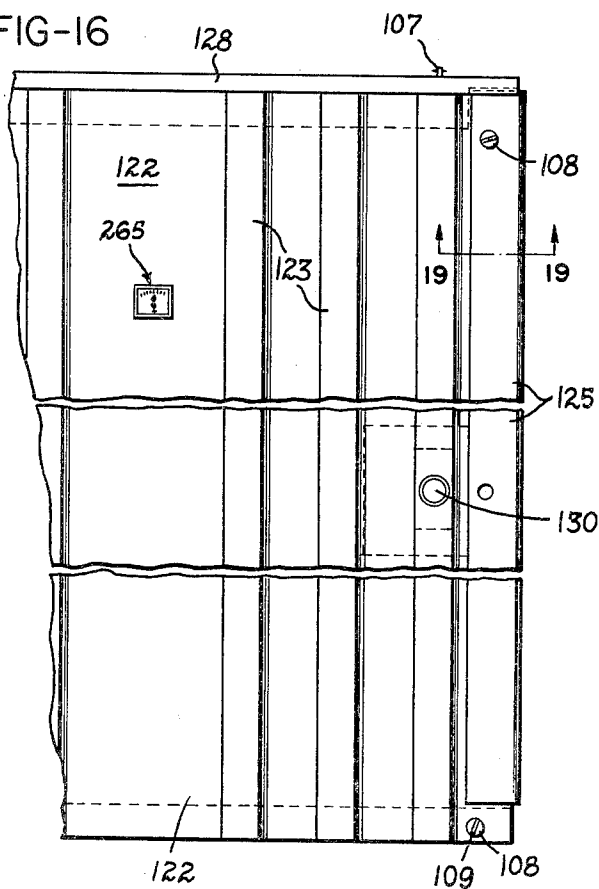


FIG-17

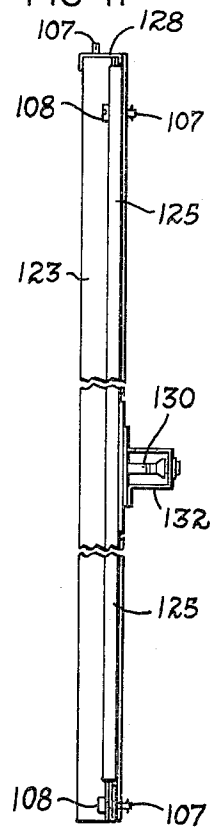


FIG-18

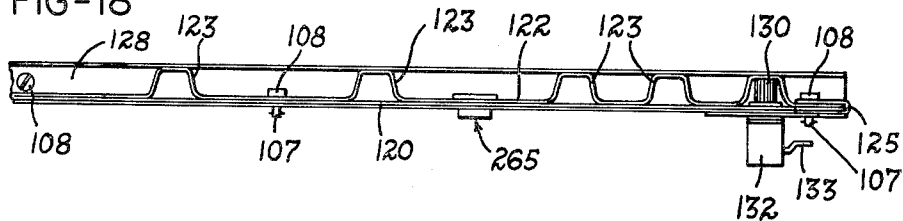
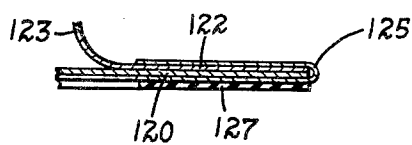


FIG-19



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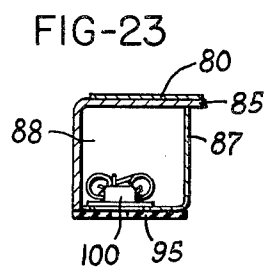
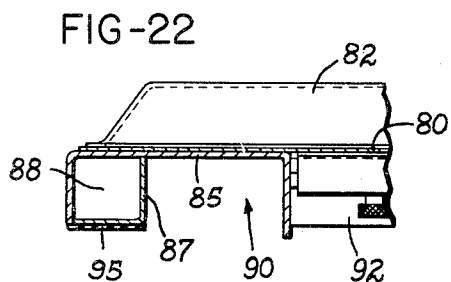
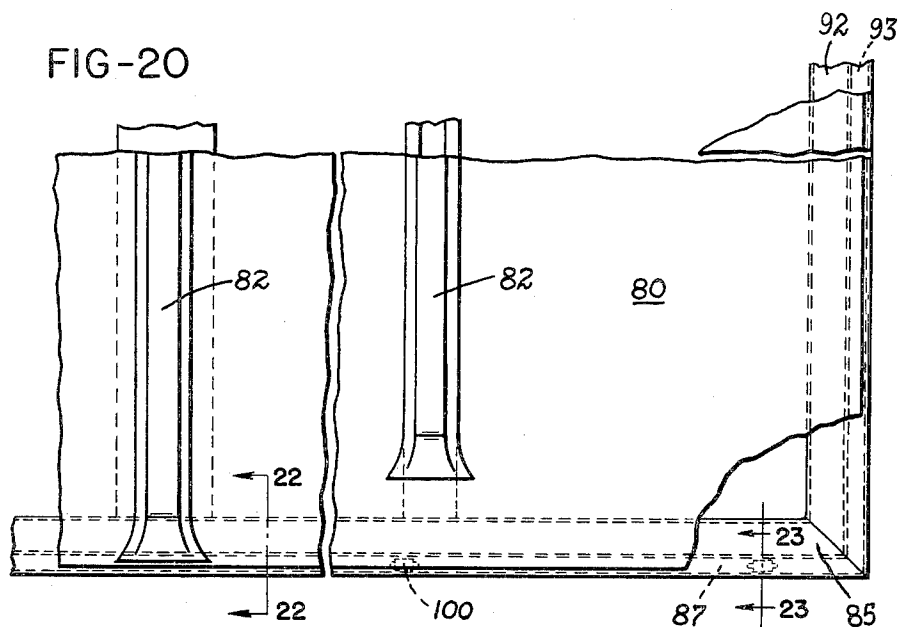
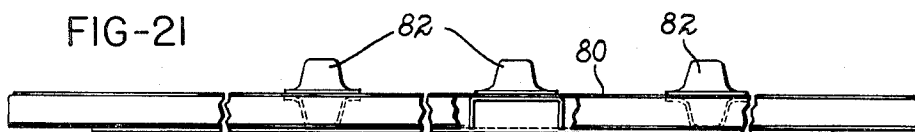
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GENERAL CARGO SHIPPING CONTAINER

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11 Sheets-Sheet 6



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GENERAL CARGO SHIPPING CONTAINER

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FIG-24

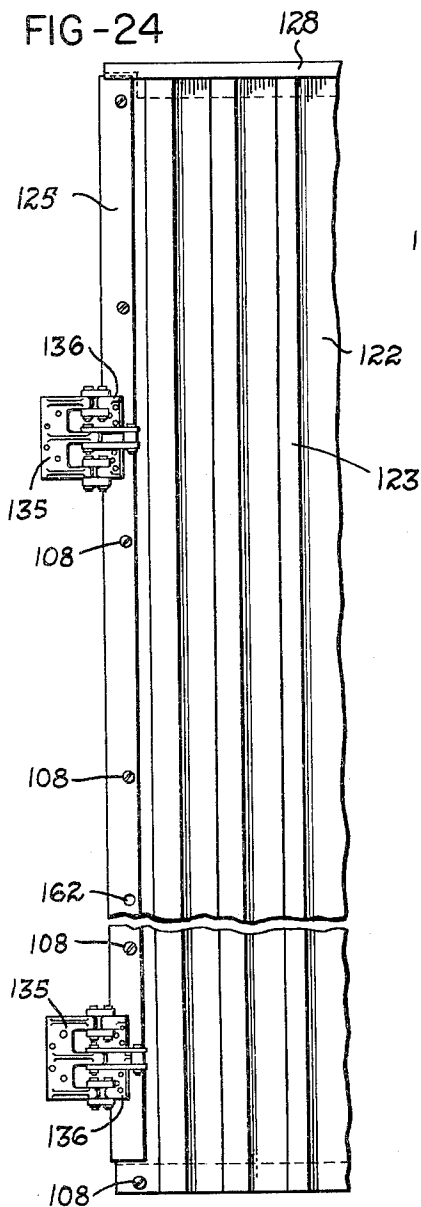


FIG-25

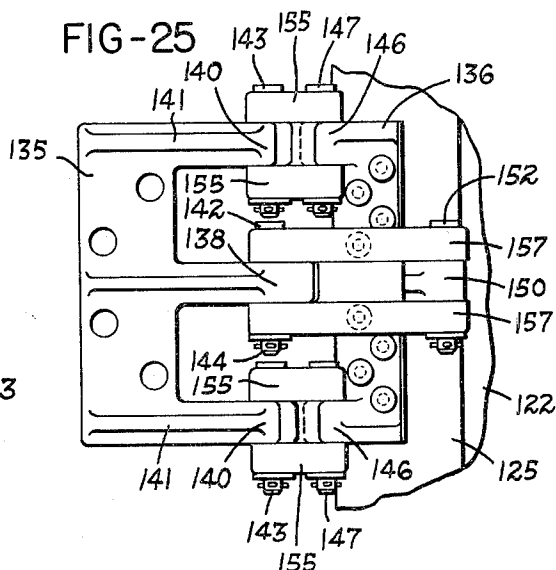


FIG-26

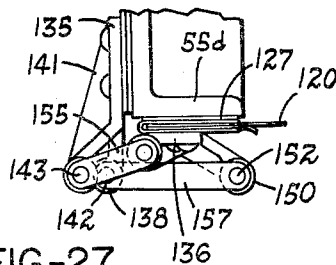


FIG-27

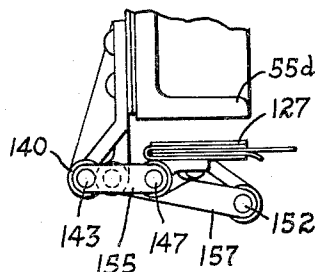
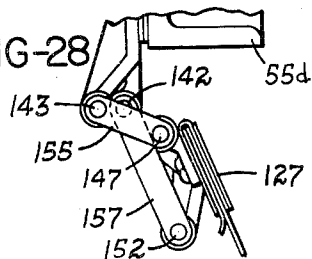


FIG-28



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FIG-29

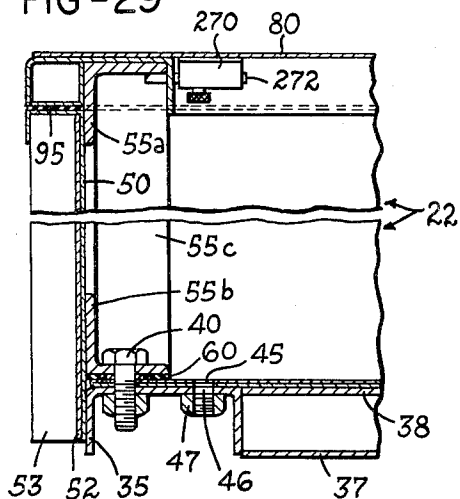


FIG-30

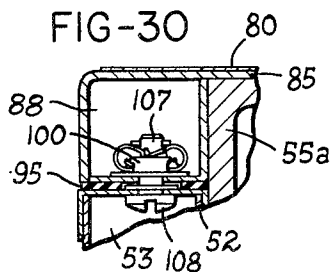


FIG-31

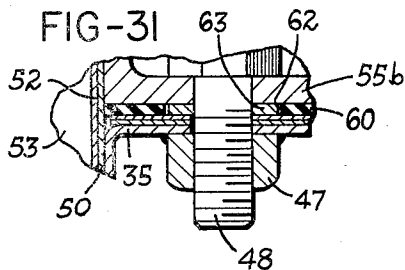


FIG-32

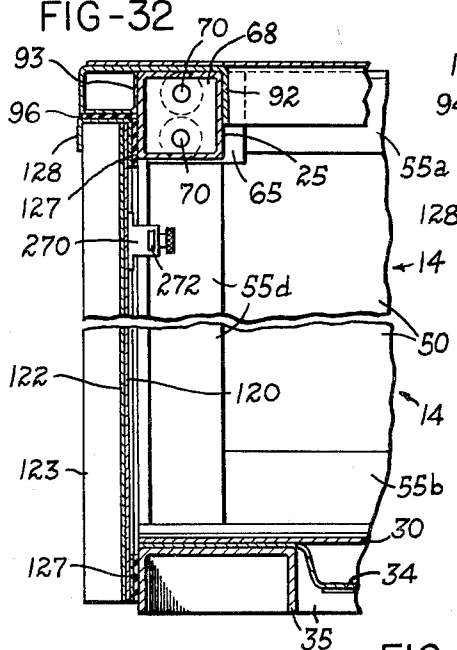


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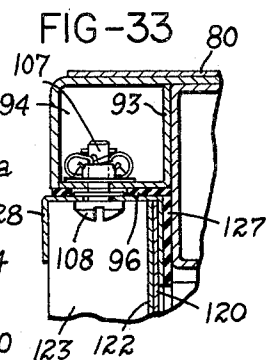


FIG-34

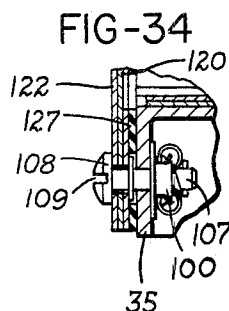


FIG-35

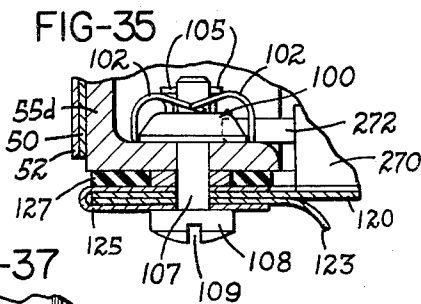


FIG-36

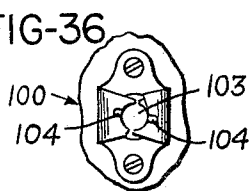
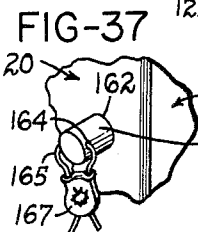


FIG-37



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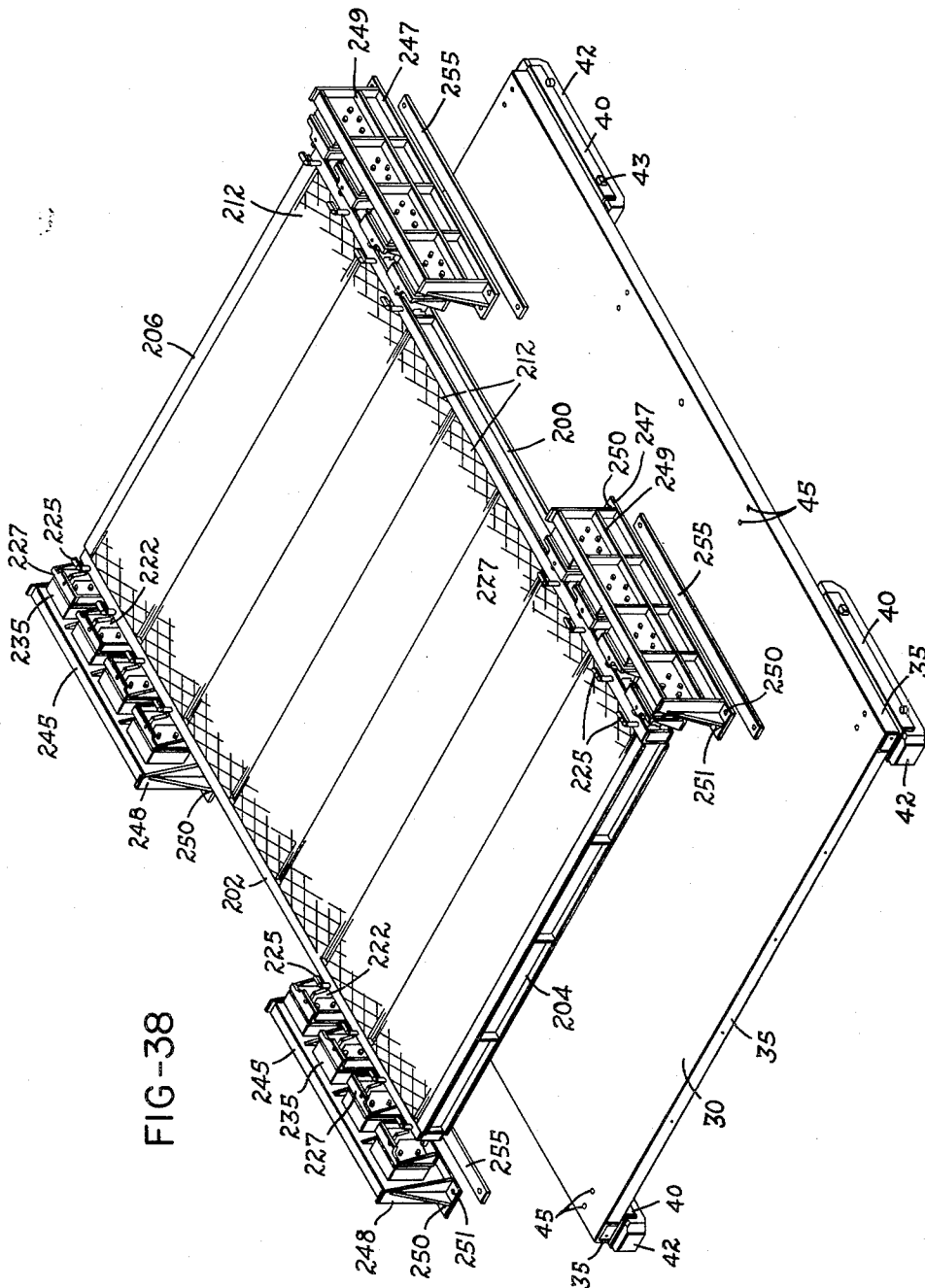


FIG-38

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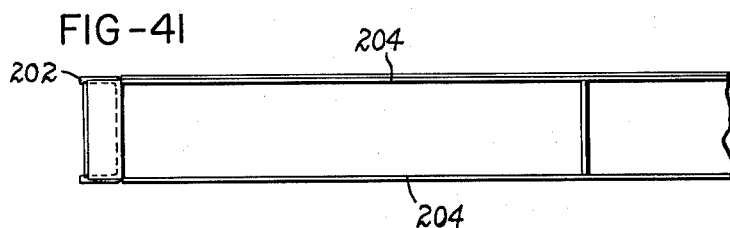
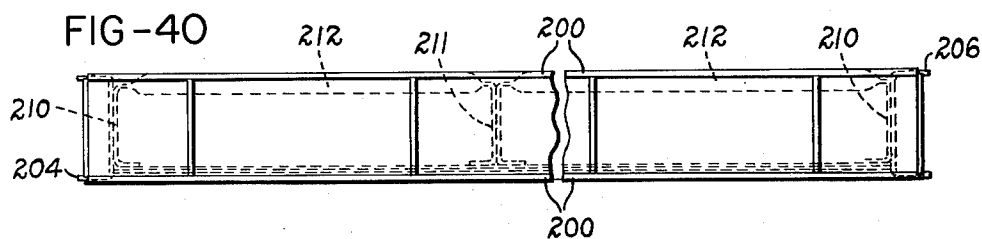
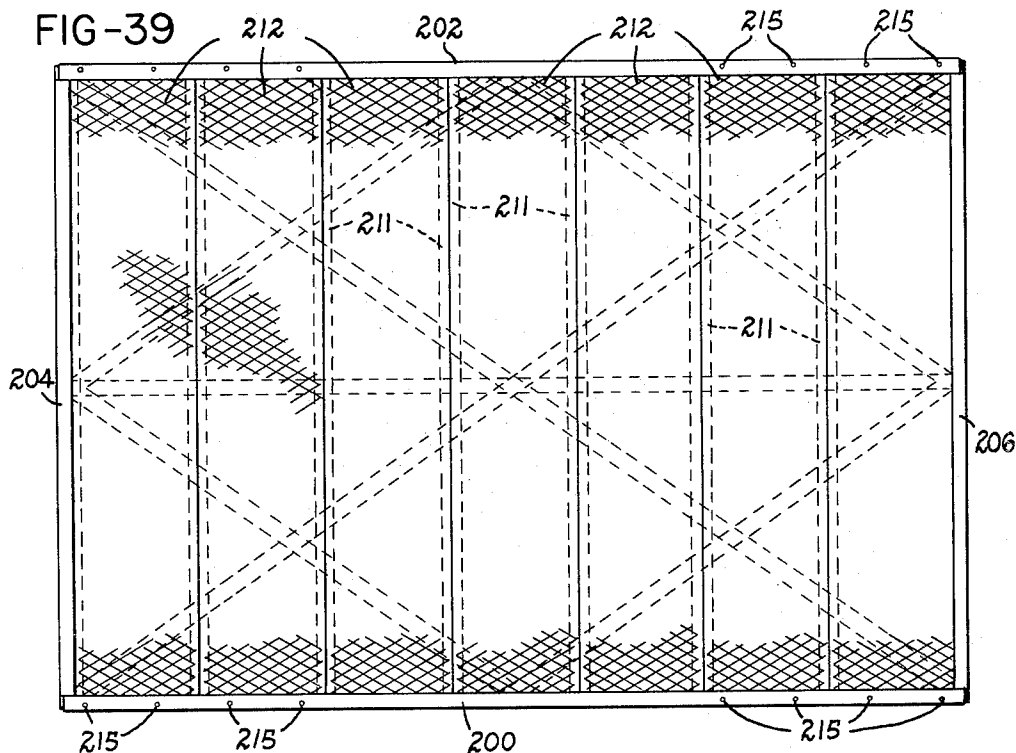
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GENERAL CARGO SHIPPING CONTAINER

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11 Sheets-Sheet 10



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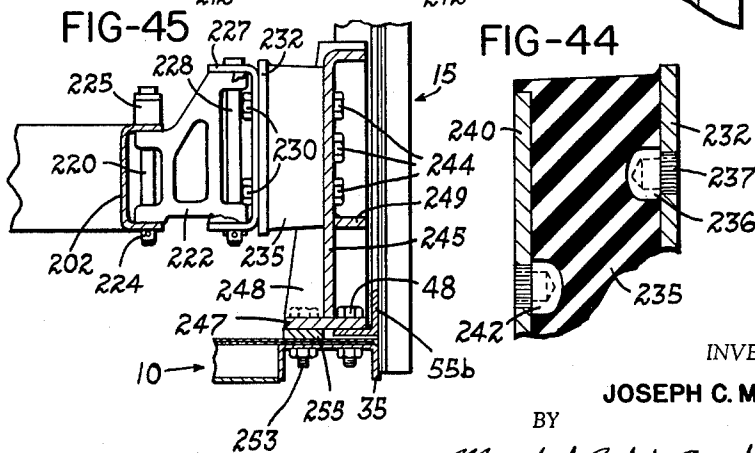
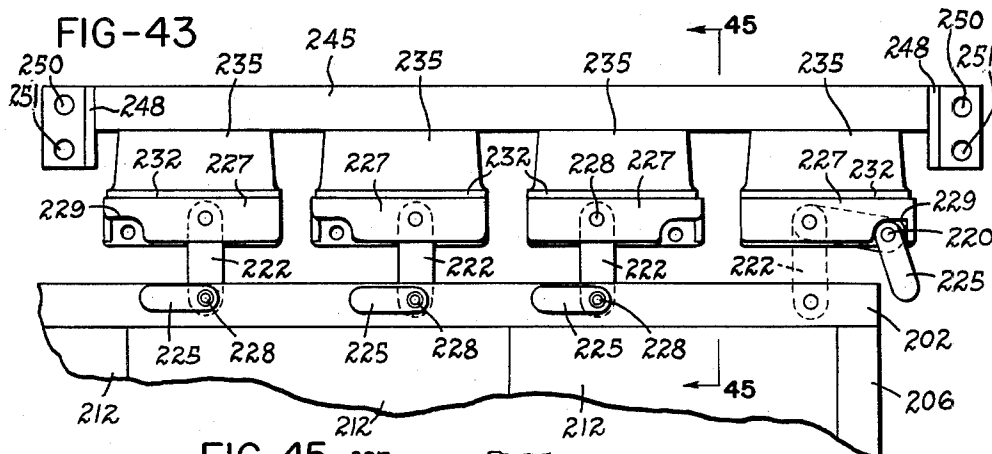
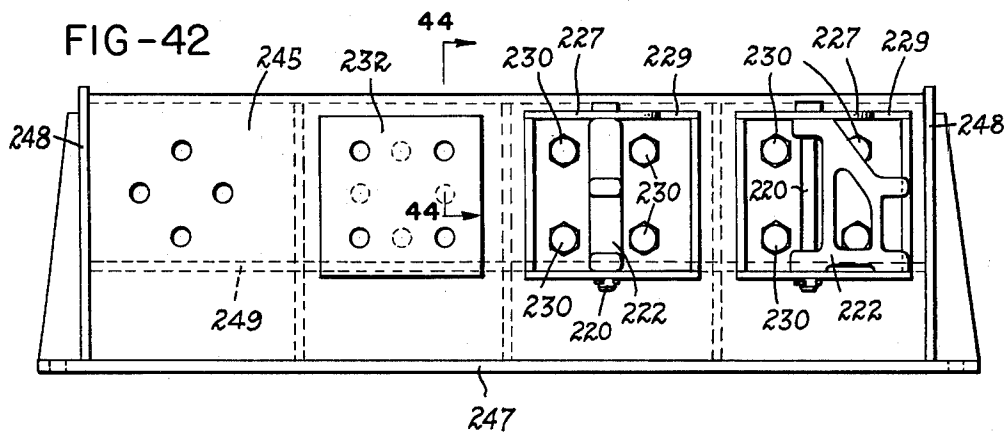
J. C. MILLS

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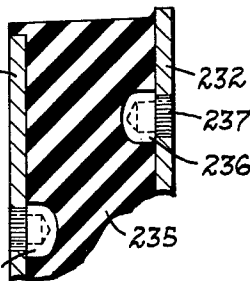
GENERAL CARGO SHIPPING CONTAINER

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**FIG-44**



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3,040,925

## GENERAL CARGO SHIPPING CONTAINER

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Filed Jan. 2, 1959, Ser. No. 784,586

6 Claims. (Cl. 220-1.5)

This application relates to a collapsible protective shipping and storage container for transport of general cargo, which is capable of maintaining a protective atmosphere interiorly thereof, and which may include shock isolation equipment for protection of relative delicate cargo from shock damage.

Handling and transportation of general cargo, and also in certain cases items which require shock protection, requires considerable care and much time consuming labor in packing, stowing and unloading, handling, etc., of many different relatively small items. While it is possible to provide large cartons or containers to "group" or "homogenize" general cargo, and accordingly to reduce handling problems and cost, often the return of such containers to the original shipper is so disadvantageous, due to space requirements of empty crates or the like during return, that any advantages gained during the shipping phase of the operation are lost during return passage because of the dead space occupied by an empty crate or container.

Furthermore, the containers should have a relatively low tare weight, yet be capable of accommodating and protecting a substantial load, in order to minimize the weight and space occupied by the container itself. In utilizing "homogenized" shipping methods as above described, certain further characteristics are desirable such as protection of the contents from damage due to moisture condensation or corrosive atmospheres, therefore it is desirable to provide a container which may be completely sealed when readied for shipment, maintaining an independent atmosphere therein. Such sealing characteristics, however, must be such as not to interfere with ready assembling and disassembling of the container to permit its being taken apart and stacked for return shipping or temporary storage, occupying minimum volume at such times.

The container provided by the present invention is of modular construction, formed of a plurality of independent panel members which may be substituted for individually, and which have individual structural rigidity. These panels are secured to each other in tightly sealed relation to provide a hermetically sealed container which is completely weatherproof, and which may be locked against pilferage. The panels may be readily assembled and disassembled, and when disassembled they may be stacked to occupy a minimum volume, as for return shipping.

Since the containers are hermetically sealed, they are capable of maintaining a protective atmosphere therein, for example air at superatmospheric pressure, thus avoiding problems arising from condensation and moisture damage, or from corrosive action in corrosive atmospheres, such as surrounding salt water. The containers preferably are constructed in convenient sizes, for example of rectangular cross-section having a volume equivalent to one-fourth of a van load. They have a relatively low tare weight, for example 1200 pounds for a one-quarter van container, with respect to their load carrying capacity, in the neighborhood of ten thousand pounds for the aforementioned container.

Provision is made for ready access to the container from either end or the top, or from opposite sides if desired, and thus the containers may be loaded and unloaded from any of five directions as convenient. They may

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be handled by any convenient method, being capable of accommodating fork lifts, from either sides or ends, or they may be hoisted as by a crane or the like.

If the cargo is of such delicate nature as to be susceptible to shock damage during handling, provision may be made for accommodating a novel isolation tray which is adjustable through a wide range of weight and shock isolation requirements, and the details of which are a separate part of the present invention.

Accordingly, the primary object of this invention is to provide a collapsible shipping and/or storage container capable of maintaining a protective atmosphere interiorly thereof.

A further object of the invention is to provide such a container which may be readily assembled and disassembled, to minimize the space occupied by the container parts when unloaded, and which may be hermetically sealed during assembly.

Another object of this invention is to provide a collapsible protective shipping container of modular construction which is readily adaptable to handling by a variety of convenient cargo handling mechanisms without danger of damage either to the container itself or to the cargo packaged therein.

An additional object of the invention is to provide such a container which is completely weatherproof and which may be locked against pilfering.

Another object of this invention is to provide a shipping and/or storage container which may be collapsed to occupy minimum space when not in use, which upon assembly provides access to its interior from one or more of five different directions, and which includes individually replaceable panels each having substantial structural strength independent of the other panel members making up the complete container structure.

A further object of the invention is to provide a collapsible shipping container which possesses relatively great structural strength and rigidity to protect cargo packaged therein, but which has a relatively low tare weight with respect to its load carrying capability.

Another object of the invention is to provide a novel shock isolation system which may be adapted to use in shipping containers or the like.

An additional object is to provide such a shock isolation system which has variable shock isolating capability over a relatively wide range of weight and shock absorbing requirements.

Another object of this invention is to provide a novel hinge structure especially adapted for use in containers having sealed doors and the like, whereby the door may move substantially directly away from its jamb about the entire periphery thereof before the door is pivoted open about a hinge axis.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings:

FIG. 1 is a perspective view of a collapsible shipping container in accordance with the invention, showing an end panel, operating as an access door, in open position;

FIG. 2 is a perspective view of the container in collapsed and stacked relation;

FIG. 3 is an exploded perspective view illustrating the mode of assembly and disassembly of the various panel members comprising the container;

FIGS. 4 and 5 are enlarged detail views of a suitable lifting clevis which may be attached to side panels of the container providing for hoisting thereof;

FIG. 6 is a partial detail view on an enlarged scale, with parts broken away showing construction details of the floor panel;

FIG. 7 is an enlarged partial section taken on line 7—7 of FIG. 6;

FIG. 8 is a detail view taken on line 8—8 of FIG. 6;

FIG. 9 is an enlarged partial section taken on line 9—9 of FIG. 6;

FIG. 10 is a further enlarged partial section taken on line 10—10 of FIG. 6;

FIG. 11 is an enlarged partial view, broken and in elevation, looking at the interior of one side panel member of the container;

FIG. 12 is an end view of a side panel member, as seen from the left of FIG. 11;

FIG. 13 is a bottom plan view of the side panel shown in FIG. 11;

FIG. 14 is an enlarged and broken detail view showing one of the upper cross rails and its connections with opposite corners of the container side panels;

FIG. 15 is a detail view of one end of the cross bar;

FIG. 16 is an enlarged detail view, similar to FIG. 11, of a portion of an end panel member;

FIG. 17 is an end view of the panel member shown in FIG. 16;

FIG. 18 is a bottom plan view of the end panel member shown in FIG. 16;

FIG. 19 is an enlarged partial section taken on line 19—19 in FIG. 16;

FIG. 20 is an enlarged and broken partial plan view of the top panel of the container;

FIG. 21 is an end view of the top panel with parts broken away to show construction details;

FIG. 22 is an enlarged partial section taken on line 22—22 of FIG. 20, showing details of the periphery of the roof panel where it overlaps the side panel members;

FIG. 23 is an enlarged partial section taken on line 23—23 of FIG. 20, showing the female part of one of the fasteners with which the top and side panel members are connected, and also showing details of the sealing gasket therebetween;

FIG. 24 is a broken partial elevational view of one corner of an end panel member having special hinges attached thereto for hinge mounting thereof to an adjacent side panel member;

FIG. 25 is an enlarged plan view of one of the hinge members;

FIG. 26 is a top plan view of the hinge member with the end panel or door in closed position;

FIG. 27 is a view similar to FIG. 26 showing the door after initial opening movement thereof;

FIG. 28 is a further view of the hinge with the door in a partially open position;

FIG. 29 is a broken sectional view on an enlarged scale illustrating the joining of a side panel member with the bottom and top panels, respectively;

FIG. 30 is an enlarged detail section showing a typical fastener employed to secure a side panel member to the roof panel;

FIG. 31 is an enlarged detail section of the joint between the side panel member and the bottom or floor panel;

FIG. 32 is an enlarged broken sectional view, similar to FIG. 29, showing the mounting of an end panel member in sealing relation to the top panel and bottom or floor panel;

FIG. 33 is an enlarged detail view of a fastener securing the end panel to the roof or top panel;

FIG. 34 is a view similar to FIG. 33 showing a fastener securing the end panel in sealing relation to the bottom or floor panel parts;

FIG. 35 is a detail sectional view of a suitable fastener securing one edge of an end panel to a side panel member;

FIG. 36 is a detail plan view of the female or cam-lock part of a typical fastener used in securing the panel members together in sealing relation;

FIG. 37 is a perspective detail view of an alignment pin on a side panel member, projecting through a rim

portion of an end panel member, and having a suitable lock seal attached thereto.

FIG. 38 is an exploded perspective view showing the shock isolating tray provided by the invention and its arrangement with respect to the floor or bottom panel;

FIG. 39 is a plan view of the load carrying surface of the tray shown in FIG. 38;

FIG. 40 is a side elevational view, broken and on an enlarged scale, of the tray as shown in FIG. 39;

FIG. 41 is an end elevational view of a fragment of the tray;

FIG. 42 is a side view on an enlarged scale of the adjustable shock mountings for the tray;

FIG. 43 is a top plan view of one of the shock mountings, illustrating connection thereof to the associated portion of the tray;

FIG. 44 is a section on an enlarged scale taken on line 44—44 of FIG. 42; and

FIG. 45 is a section taken on line 45—45 of FIG. 43.

Referring to the drawings, which illustrate preferred embodiments of the present invention, a container in accordance with the invention is shown somewhat schematically in FIGS. 1 and 3. The container is formed of a plurality of reinforced panel members providing a bottom or floor 10 having supporting feet or skids 12 at the corners thereof, opposite side panel members 14 and 15, a top 18, and end wall panel members 20 and 22, respectively. With reference to FIG. 3, it should be noted that in place of the end panel 20, which serves also as a door in the container shown in FIG. 1, there is a split or twin door construction provided by separate half size end wall panels 20a and 20b.

The side members 14 and 15 are adapted for securing to the side edges of bottom panel member 10, and to insure proper rigidity in the assembled container cross bars or rails 25 extend between the upper corners of the side panel members, being detachably secured thereto in a manner which is described in detail below. The bottom and top and side panel members preferably are of substantially equal rectangular dimensions, and are adapted in the unassembled or knocked down form to be stacked on the bottom with the rails 25 and the end wall panels 20 and 22 sandwiched therewithin, as shown in FIG. 2. Thus, the disassembled and stacked container as shown in FIG. 2 occupies considerably less volume than in the assembled form such as shown in FIG. 1, and a number of the knocked down containers can be stored or return shipped in the space required by a single erected container.

Each of the panel members is constructed of a laminated or built-up plurality of parts which provides independent structural rigidity in each of the panel members and also provides a substantially smooth and unobstructed surface which may face the interior of the assembled container, providing an entirely smooth interior thereof. Thus, referring to FIGS. 6—10, the bottom panel is formed of an inner surface sheet 30, for example of sheet steel, and an outer reinforcing sheet 32 having integral longitudinal ribs 34 formed therein at spaced intervals. The particular cross section of ribs 34 shown in FIG. 7 is preferred, since this configuration affords optimum strength. The sheet metal members 30 and 32 are secured to each other, for example by spot welding, to form an integral panel.

The bottom panel is provided with a peripheral rim formed from inverted channel members 35 which extend about the entire periphery of the channel member and are secured thereto as by welding. Transversely of the under surface of bottom panel member 10 are further reinforcing parts formed from an inverted channel member 37 and a wider upright channel member 38, which are secured to each other and to the surface of the outer sheet metal part 32 as shown in FIGS. 6 and 7, providing wide reinforced undersurfaces which can be engaged by the forks of a lift truck or the like for moving the

entire container. Diagonal braces 39 (FIG. 6) also are welded to the under surface of the bottom panel member, extending from the corners toward the center to reinforce the bottom panel against twisting.

At the four corners of the bottom member are inverted short lengths of channel 40 which receive wooden or similar supporting feet 42, held within the channel parts 40 by suitable bolts 43. These feet serve as supporting skids which space the bottom panel above a deck or surface upon which the container rests, providing access for lifting equipment under the container.

At the sides of the bottom panel the sheet metal members 30 and 32 are perforated, as by drilling, to form aligned holes 45 which register with corresponding holes 46 in the adjoining surface of the rim channel member 35. Inside this channel member threaded nuts are welded in place aligned with the through passage provided by holes 45 and 46 for engagement with suitable bolts 48 (FIG. 29) for securing the side panel members to the bottom or floor.

The side panels are similarly formed from an inner sheet member 50 (FIG. 13) and an outer sheet member 52 having reinforcing corrugations 53 and spot welded to form an integral unit. The interior panel 50 is provided with a surrounding rim formed of angle members 55a, 55b, 55c, 55d, which are fixed, as by welding, to the surface of the sheet member 50. Referring to FIG. 29, at the bottom of the side panel members the appropriate angle member 55b is spaced above the bottom edge of the panel member, whereas at the top the corresponding angle member 55a extends beyond the adjacent edge of the panel member for some distance. The bottom rim angle 55b is provided with spaced apertures or holes 57 aligned with the apertures 45 and 46 in the bottom panel. A compressible gasket member 60 is secured to the under surface of angle member 55b for providing a hermetic seal between the end panel member and bottom panel. In the area of the apertures 57 the gasket includes an enlarged opening 62 (FIG. 31) into which may be inserted a washer 63 of relatively hard material, and of approximately the same thickness as the gasket. This washer thus serves to prevent undue tightening of the bolt 48 which would provide a non-uniform seal along the length of the connection between the side and bottom panel members.

At the upper corners of the angle members 55c and 55d, respectively, there are welded inverted angle brackets 65 (FIGS. 11, 14 and 32) provided with vertically extending slots 67. The rails 25 are of hollow rectangular cross-section, as shown in FIG. 32, and in opposite ends thereof end plates 68 are secured, as by welding. These end plates carry fastening pins 70 having enlarged heads 72 of greater diameter than the width of the slots 67. The appropriate corners of angle member 55a are slotted at 73 for passage of these pins and heads, and thus the rails may be lowered into place, with the enlarged heads 72 engaged within the angle brackets 65 to retain the side panel members in proper spaced alignment, and to add to the rigidity of the structure.

The top or roof panel is shown in detail in FIGS. 20-23 as including a sheet member 80 having inverted reinforcing channels 82 spot welded or otherwise suitably secured to the outer or top surface of sheet member 80. Along the sides of the top panel member are inverted channels 85 having an angle members 87 secured to the interior outward portions thereof, defining an enclosed spaced 88 and an elongated recessed opening 90 extending the full length of sides of the top panel. Between the ends of the side panels 85 extend further inverted channel members 92 and further angle members 93 are secured to the outward parts thereof forming enclosed passageways 94 and open cross passages which receive the rails 25, as shown in FIG. 32. The bottom surfaces of angles 87 and 93 carry gaskets 95 and 96, respectively, for providing a

hermetic seal between the top and side panel members and between the top and end panel or door members.

The top or roof panel 18 is securely fastened to the side panel members, in hermetic sealing relation, by cam-type-locking fasteners such as shown in detail in FIGS. 30 and 33-36. These fasteners are commercial items which include a femal member 100 having upwardly and inwardly extending spring arms 102 extending over the central aperture 103 (FIG. 36) and including slots 104. These slots provide for passage of the pins 105 projecting from the end of a male fastener part 107 having a suitable operating head 108. The head may include a conventional slot 109 for receiving a screw driver bit, or any other suitable receptor for an operating tool, such as a hex-head socket for an Allen wrench, or similar.

As will be noted particularly in FIGS. 30, 33 and 35, the male fastener parts are projected through the female members and rotated to bring the pins 105 over the cam surface provided by the ends of spring members 102, and as these spring members thus bow centrally inward toward the main body 100, they exert a biasing force which maintains the parts so secured in tight sealing relation. Thus, with fasteners of this type arranged at regular intervals along the interengaging parts of the panel members which form the container, and with appropriate gasket or sealing members in between, when the fasteners are all properly tightened the gaskets or seals are compressed sufficiently to form an air-tight seal between the engaging parts of the channel members.

As previously explained, the end panel members or door panels may be constructed either as a single unit (FIG. 1) or as complementary double units (FIG. 3). In either case, referring to FIGS. 16-19, the end or door panels each comprise an inner sheet metal member 120 and an outer ribbed sheet metal member 122 having suitable reinforcing ribs 123. At the side edges where these panels are joined in abutting relation they are surrounded by a strip 125 of generally elongated U-shape, shown in detail in FIG. 19, and having a suitable gasket seal 127 secured to the inner face thereof. At the top of the end panels there is a longitudinally extending channel member 128 (FIGS. 16, 17 and 32) which provides a sealing surface for closing against the gasket seals 96, and for carrying the male parts of the cam-lock fasteners as shown in the drawing. The end or door panel preferably includes a conventional lock member 130 mounted in a bracket 132 on the interior of the end panel, and including a lock arm 133 which may be swung into position engaging behind the portion of a side panel member angle 55d against which the end or door panel is secured.

In some instances it may be preferable to have one or more of the door or end panels hinged, rather than merely secured in place by the aforementioned fasteners. In such circumstances special hinge members are provided which permit the door panels to move linearly away from the edges of the side panels and the top and bottom panels, clearing the male parts of the fasteners from their receptacles or corresponding female parts before the door is rotated about the hinge axis. Details of a suitable hinge structure are disclosed in FIGS. 24-28.

The hinge construction includes hinge plates 135 and 136, adapted to be bolted or otherwise secured to the side panel member and end panel or door, respectively. The plate 135 includes a first central boss 138 and a pair of offset bosses 140 at the top and bottom, reinforced by webs 141. The central boss includes a through bore for receiving a hinge pin 142, and similarly the bosses 140 are bored to receive pins 143, each of these pins being secured in place by a cotter pin, or the like, 144. The hinge plate 136 includes bosses 146 aligned at the top and bottom thereof and having bores for receiving hinge pins 147 which are aligned vertically. The central boss 150 on plate 136 extends outwardly thereof and to the other side, as shown particularly in FIGS. 25 and 26, and receives a pin 152.

The main hinge lengths are of substantially identical form, and are provided by bars 155 of equal length and having equally spaced apart holes for passage of the pins 143 and 147, respectively. A longer or guide link is provided by a pair of link bars 157 which extend between the bosses 138 and 150 and receive opposite ends of the pins 142 and 152.

With this linkage arrangement, the plate 136 partakes of a compound movement when the door panel is opened, as shown in FIGS. 26-28 which illustrate sequential positions of the hinge members during opening of the door. Thus, with the door closed as in FIG. 26, and assuming that all of the locking fasteners have been released about the periphery of the door, the door when pulled open moves linearly away from sealing relation with the edges of the side panels and top and bottom panels, to the position shown in FIG. 27. During such movement the shorter link bars 155 pivot about pins 143 and also pivot somewhat relative to the pins 147, while the longer link bars 157 pivot about pin 142 and guide the outer pin 152 linearly away from the closed position. Then, when the link bars reach the position shown in FIG. 27 the bars 157 engage the adjacent surface of plate member 136 and the door panel is hinged open with the outer pin 152 rotating about the axis of pin 142, and the inner pins 147, together with the shorter link bars 155, rotating about the axis of pins 143.

As will be apparent from the drawings, the initial linear movement of the door or end panel serves to clear the male parts 107 of the cam-lock fasteners from their associated sockets and prevents any damage to the fasteners during opening of the door. The door may then be swung fully open, moving through substantially 270° until it is moved back substantially parallel to the side panel member to which it is hinged.

Under some circumstances it may be desirable to provide a shipping seal, as when contents are to be inspected for passage through Customs offices, or whenever it is desirable to have the shipment under seal from the time it leaves the shipper until it reaches the consignee. For this purpose a guide pin 160 (FIG. 37) is provided extending from the edge surface of the side panel 15 against which the edge of the door panel 20 is closed. Pin 160 passes an aperture 162 formed in the edge of door panel 20, and includes a transverse hole 164 at its outer end for receiving the wire 165 of a shipping seal 167. Thus the pin 160, in addition to assisting in alignment of the door panel in its closed position, also provides a convenient place for attachment of the shipping seal should such be necessary.

From the foregoing description, it will be apparent that the various side, end, top and bottom panels each are independent structural units of substantial strength and rigidity, and that they may be substituted for individually, as in the case of damage to one or more of the panel members. They may be assembled to form a complete container enclosure, such as shown in FIG. 1, in approximately fifteen minutes, and conversely may be knocked-down or disassembled and stacked in the relation shown in FIG. 2 for purposes of return shipment or storage, occupying only a small fraction of the volume of an erected container. In the disassembled condition the end panels, as hinged, may be folded backwardly around their hinges to rest beneath the adjacent side panel member, thereby avoiding disassembly of the hinges.

As mentioned previously, the bottom panel includes reinforcements providing for engagement thereof by a lift fork, or by passage of a sling or the like beneath the assembled container. In some circumstances it might be desirable to engage the container with lifting hooks, and for this purpose retractable clevis members are secured to the upper corners of the side panel members. These clevis members are designated in FIG. 1 by the

general reference numeral 175, and are shown in detail in FIGS. 4 and 5.

Each of them includes a mounting bracket 177 which may be bolted or otherwise secured to the side panel members, and which includes integral spaced raised finger parts 178 having an aligned passage through them for receiving a hinge pin 180. Preferably, the thickness of the finger parts 178 is no greater than the height of the reinforcing panels or corrugations 53 in the outer wall surface of the side panel members.

A plurality of link bars 182 are engaged with the hinge pin 180, and at their other ends these bars pass into the openings 183 in one edge of a connecting link 185, being secured therein by a further hinge pin 186. The clevis part 190 is provided by a U-shaped member connected through a further hinge pin 192 to the opposite end of the link 185. When not used, the entire structure hangs from the bracket 177, as shown in FIG. 4 and indicated in dotted lines in FIG. 5.

When it is desired to lift the container with these clevis members they may be swung to the upright position shown in FIG. 5, with the connecting bars 182 engaging the tapered surface 193 of the bracket between the finger portions 178. A suitable retaining spring catch 195 is positioned on the side panel member immediately below the clevis parts, such that the U-shaped member 190 may be engaged behind the retainer to hold the entire structure flat against the side panel member, in protective relation between the raised corrugations or reinforcing parts.

In connection with packaging and protection of cargo, it often is necessary to provide a shock mounting which can effectively control the shock load imparted to the packaged item or items due to shock and/or vibration resulting from handling and transportation. In a shipping container of the type described above, the various items which can be accommodated therein may have different shock protection requirements over a relatively wide range. Accordingly, one of the purposes of the present invention is to provide a shock isolation system which may be included in the shipping container if such shock protection is desired. This system may include a tray provided with adjustable shock mountings which can be varied in accordance with the shock protection desired for the packaged item. As an example, the tray may accommodate a load within a range of from 200 to 9200 pounds, and will protect such loads from shock forces up to a range of approximately 11 to 18 G's, depending on the load weight, as well as controlling vibration to a low natural frequency of the tray mounting system ranging from 7.8 to 11.3 c.p.s.

A typical system of this type is shown in FIGS. 38 to 45, wherein the load carrying tray member itself includes an outer framework of channel members 200, 202, 204 and 206 and a plurality of floor units each provided by a channel member 210 and parallel channel 211 spanned by floor material of, for example, expanded sheet metal 212 which is welded to the channel members 210 and 211. These flooring units are assembled in side to side relation, as shown in FIGS. 38 and 39, to provide a complete floor unit for the tray.

At each of the four corners of the tray there are formed a series of four apertures 215 preferably extending through the upper and lower legs of the outer framework channels 200 and 202. These apertures 215 accommodate pin members 220 carried in the ends of mounting arms 222. Each pin member 200 includes an outwardly spring biased detent member 224 at its lower end, and a laterally extending handle 225 at its upper end. Each of the mounting arms 222 is in turn mounted in hinged relation within a short length of mounting channel 227 through mounting rods 228, and a recess 229 is cut into one corner of the upper edge of the mounting channel brackets 227 for accommodating the associated handle 225 of the mounting pin. Thus, each of the mounting

arms 222 can swing from a retracted position, shown by the mounting unit at the right hand side in FIGS. 42 and 43, and an operative position as shown by the other units in FIG. 43, and also in FIG. 45.

Each of the mounting angle brackets 227 is secured through bolts 239 to a carrying plate 232 which is bonded to one surface of an elastic shock absorbing block 235. Accommodation for the mounting bolts 230 is provided by the internally threaded heads 236 which are press fitted to plate 232 at 237, and include an enlargement which engages the rearward face of the plate 232. On the opposite side of block 235 there is a similar mounting plate 240 including similar mounting heads 242 secured thereto, and these mounting heads are engaged by bolts 244 for securing the shock absorbing units to the upright plate 245 of a mounting pedestal.

The pedestal or standard structure includes a base plate 247 to which the lower edge of plate 245 is welded, and end plates 248 which provide reinforcement therefor, together with web parts 249 welded to the unit for further strengthening. Each of the pedestal units includes a pair of holes 250 and 251 through opposite ends of its base plate 247. The holes 250 are spaced to receive the side panel mounting bolts 48, and further mounting bolts 253 extend through the holes 251 and through a spacer bar 255, the purposes of which is to provide a spacer equivalent to the thickness of the adjacent leg of a side panel angle member 55b and its associated gasket 60. Thus, the mounting pedestals may be secured directly to any suitable mounting, for example to the floor or bottom panel and to the side panel members of the container.

Each of the four blocks 235 carried on a pedestal member has a different modulus of elasticity, and since the mounting arms 222 and pins 220 provide releasable connections between each resilient block 235 and the tray structure, the total number of resilient connections between the tray structure and the structural parts of the container can be adjusted in accordance with the load. This provides an adjustment in the shock absorbing mounting of the tray in accordance with the requirements for whatever items are secured thereto, and the expanded metal floor structure of the tray provides a convenient means for engaging straps, hooks or the like to fasten the items to be protected directly and securely to the floor of the tray.

Obviously, the load supporting tray and its mounting pedestals or standards may be added to the container or removed therefrom, and may be utilized with other containers or load carrying equipment, depending whether or not shock isolation equipment is desired. If the tray is employed, the present container still may be broken down or disassembled to substantially the same form as shown in FIG. 2, with the top, side walls, and end panels being upon the shock isolation tray which may remain attached to the floor or bottom panel.

The assembled container provides a hermetically sealed enclosure for the items packaged therein. A suitable desiccant, for example of any well known commercial type which is available in cloth bags or other suitable containers, may be placed within the container prior to sealing thereof. This will provide sufficient moisture absorption capacity during transport of the container to prevent unduly high humidity conditions within the container. Furthermore, a suitable check valve 260, shown diagrammatically in FIGS. 11 and 13 is provided for admitting air or other gas under pressure to the interior of the hermetically sealed container to maintain an atmosphere therein of slightly greater than atmospheric pressure, thus effectively preventing passage of air or the like into the interior of the sealed container. This valve may be of any suitable well-known type, employing a spring seated stem, for example of the type employed as filling valves in automobile tires.

Likewise, a suitable pressure relief valve, shown schematically at 262 in FIGS. 11 and 13, is also provided to

prevent any abnormal increase in pressure within the sealed container. Another feature provided is a conventional humidity indicator, shown diagrammatically at 265 in FIGS. 16 and 18, whereby the humidity of the interior atmosphere of the sealed container can be determined from the outside.

It is of course desirable to have the closed, sealed container completely tamper-proof, such that it cannot be entered even by partial disassembly once the contents have been loaded and the door or doors sealed shut. Therefore, the top or roof panel and the end panel opposite from the door are each provided with internal safety latches (FIGS. 29, 30, and 35) including a base 270 and slidable bolt 272 which may engage with the side panel rim or frame angles 55a and 55d, as shown, to lock the roof and end panels in place. The side panels, of course, are fixed to the base by bolts 48 from the interior of the container. These bolts may be moved into locked position when the container is erected, preferably before loading, to preclude disassembly of the loaded and sealed container.

As will be apparent from the foregoing specification, the present invention is advantageous to the shipping industry for a number of reasons. It permits handling and shipping of a variety of relatively small pieces of general cargo as a homogenized or single unit, thereby reducing handling problems and costs. If it is necessary to seal the shipment, for Custom's purposes or otherwise, it is possible to do so immediately at the shipping point, when the container is loaded, and the sealed container can pass directly from pier to shipboard, and vice versa, without the need of further Customs' inspection. Obviously, assembly of many small general cargo items into homogenized packages reduces by considerable extent the labor, time and cost in loading, storing, and unloading carriers, and since the containers have similar dimensions the space occupied in the carrier, for example in the hold of a ship, may be utilized to greatest advantage.

From the above advantages it follows that there is a considerable reduction in time and cost due to elimination of rehandling individual general cargo items at shipping transfer points, and accordingly there is a substantial saving in paper work since detailed shipping lists and in-transit checking can be either eliminated or considerably reduced. A further labor saving feature results from the availability of the individual containers at loading and unloading stations, where the laborers can apply themselves to loading or unloading the individual containers, if so desired, when trucks, ships, or railroad cars, as the case may be, are not available for receiving the packed and sealed containers.

The containers provide substantially greater physical protection to general cargo items than can be obtained with ordinary shipping practices. The container structure itself provides a protective surrounding for the cargo, and the shock isolation tray construction provided by the invention may be employed if desired to isolate the cargo from damaging shocks or vibrations. Since the containers are sealed they maintain a protective atmosphere around the cargo which eliminates corrosive action due to moist air, salt water, etc.

The modular construction of the containers permits substitution of individual units of the panel members if they are damaged, thereby providing for reconditioning of damaged containers at minimum cost. In some cases the containers may also present a favorable tare weight to load capacity ratio with respect to the same ratio for individual general cargo items, since the tare weight of the packages for individual items may accordingly be reduced in many cases because of the protection provided by the collapsible shipping container. Obviously, the fact that the containers can be collapsed to occupy a substantially reduced volume of return shipping or storage represents an important saving in itself.

While the forms of apparatus herein described con-

stitute preferred embodiments of the invention, it is to be understood that the invention is not limited to these precise forms of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A shock protection system adaptable to protect a variety of cargo item from shock damage, comprising a load receiving tray, a floor member for carrying said tray, a plurality of standards fixed to said floor member, a plurality of connectors mounted on each said standard, each said connector including selectively operable means for attachment to said tray forming a connection between said tray and the associated said standard independent of the other said connectors, resilient members incorporated in each of said connectors providing a non-rigid support between said floor member and said tray to isolate a load on said tray from shocks applied to said floor member, and each of said resilient members associated with the same standard having a different predetermined resistance of known value to flexing providing for different shock absorbing connections between said tray and said floor member by engagement of different combinations of at least one of said connectors on each of said standards to vary the total resistance to flexing in the mounting support, of said tray on said standards.

2. A collapsible protective shipping and storage container for general cargo capable of supporting a load isolated from shocks directed against said container, comprising a bottom member having supporting feet on the under surface thereof, side members detachably joined to opposite side edges of said bottom, rails connecting the opposite upper edges of said side members to maintain said side members in predetermined spaced relation, a top releasably secured to said side members and interfitting with said rails, end walls releasably secured to the end edges of said bottom and said top and said side members, a load receiving tray providing a mounting for different cargo items to be shipped, a plurality of standards fixed to said bottom, a plurality of selectively engageable connectors on each of said standards and each capable of forming a supporting connection between the associated said standard and said tray independent of the other said connectors, and a resilient member having predetermined known resistance to flexing incorporated in each of said connectors forming a predetermined amount of shock protection to items on said tray when the associated said connector is secured between said tray and its associated standard.

3. A collapsible protective shipping and storage container capable of supporting a variety of different types of cargo isolated from shocks directed against said container, comprising a bottom member having supporting feet on the under surface thereof, side members detachably joined to opposite side edges of said bottom, rails connecting the opposite upper edges of said side members to maintain said side members in predetermined spaced relation, a top releasably secured to said side members and inter-

fitting with said rails, end walls releasably secured to the end edges of said bottom and said top and said side members, a load receiving tray providing a mounting for cargo to be shipped, a plurality of standards fixed to said bottom, a plurality of connectors mounted on each said standard, each said connector including pivotable selectively movable arms for fixed attachment to said tray, resilient members of known resistance to flexing incorporated in each of said connectors providing a non-rigid support between said bottom and said tray which is variable by selective operation of said connectors to isolate a load on said tray from shocks of an expected magnitude applied to said container, seal means extending the full length of the adjoining edges of said top, said bottom, said side members and said end walls, and means securing all of said seal means in the erected container to provide a complete hermetic seal isolating the interior of the closed container from the surrounding atmosphere.

4. A load supporting shock isolation device having a predetermined variable shock absorbing capacity, comprising a generally flat tray capable of holding a variety of items requiring protection against shock, a plurality of standard members for supporting said tray in spaced relation to a supporting surface such as a container bottom, a plurality of selectively engageable connectors on each of said standard members and each capable of forming a supporting connection between the associated said standard member and said tray independent of the other said connectors, and a resilient member having predetermined known resistance to flexing incorporated in each of said connectors forming a predetermined amount of shock protection to items on said tray when the associated said connector is secured between said tray and its associated standard member.

5. A device as defined in claim 4 wherein said resilient members are fastened to said standard members, and each resilient member carries a pivotally mounted arm movable toward and away from said tray and selectively connectable to said tray to incorporate its associated resilient members as an active part of the shock protection system.

6. A device as defined in claim 4 wherein said tray is provided with a floor structure of expanded metal forming a convenient means for engagement with straps and the like to secure a variety of items directly to said tray.

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UNITED STATES PATENT OFFICE  
CERTIFICATION OF CORRECTION

Patent No. 3,040,925

June 26, 1962

Joseph C. Mills

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 13, for "relative" read -- relatively --;  
column 3, line 52, for "illusttrating" read -- illustrating --;  
column 5, line 65, after "having" strike out "an"; same column  
5, line 67, for "spaced" read -- space --; column 6, line 7,  
for "femal" read -- female --; column 9, line 53, after "being"  
insert -- stacked --; column 10, line 24, for "reason" read  
-- reasons --; column 11, line 8, for "item" read -- items --;  
line 21, for "valve" read -- value --; same column 11, lines  
25 and 26, after "support" strike out the comma.

Signed and sealed this 6th day of November 1962.

(SEAL)

Attest:

ERNEST W. SWIDER

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