Sept. 28, 1965 C. E. KRIDLE ETAL 3,208,619

DEMOUNTABLE SHEET METAL SHIPPING CONTAINERS

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FIG_1

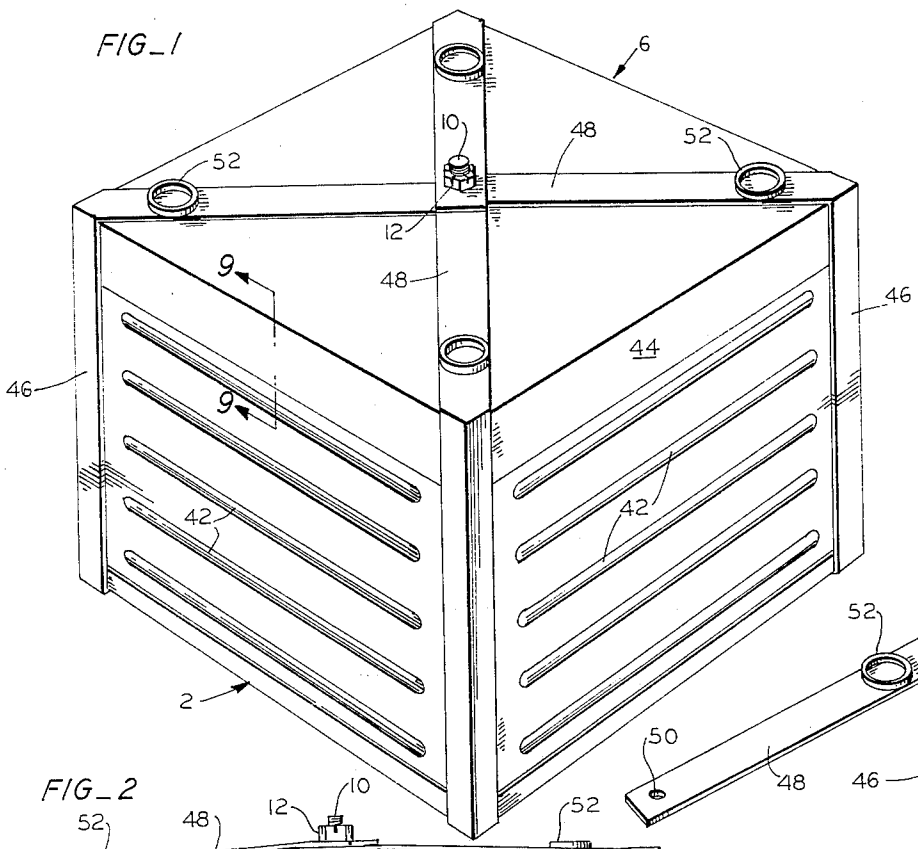


FIG_2

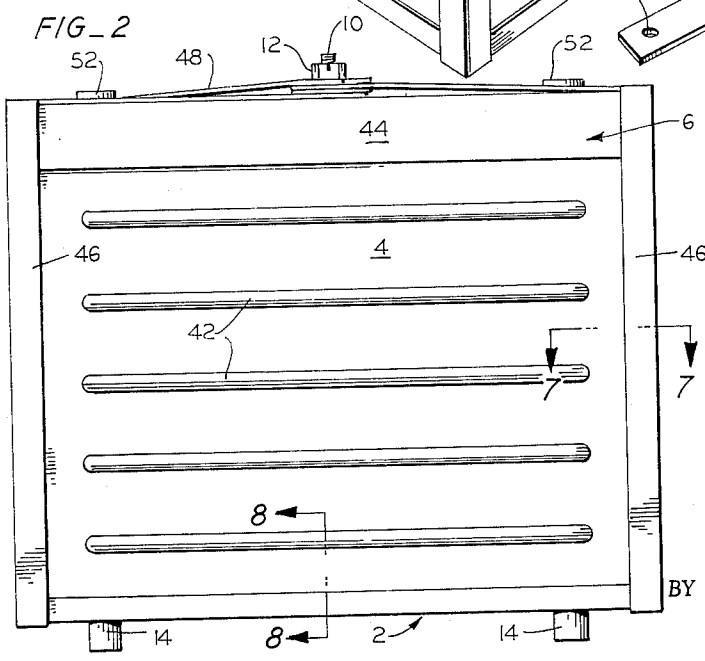
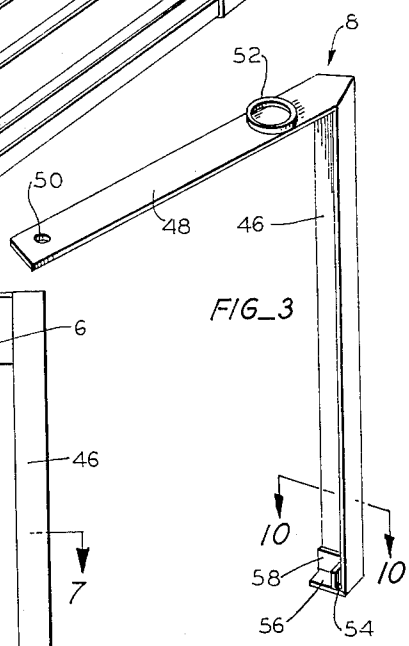


FIG_3



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FIG_4

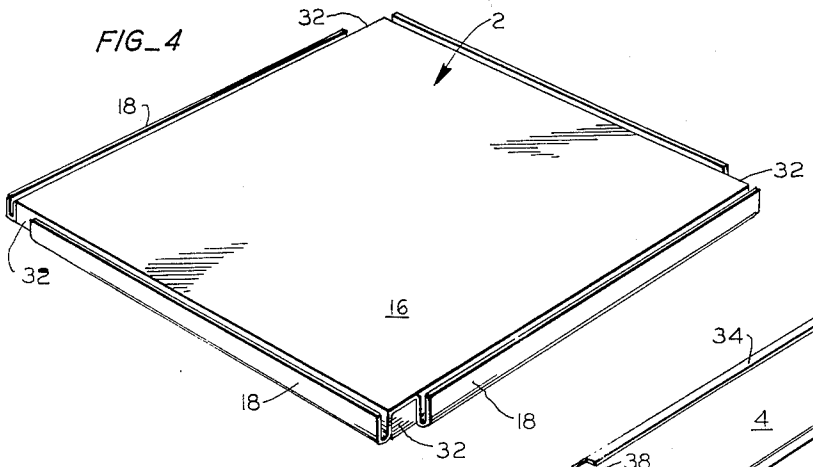


FIG_6

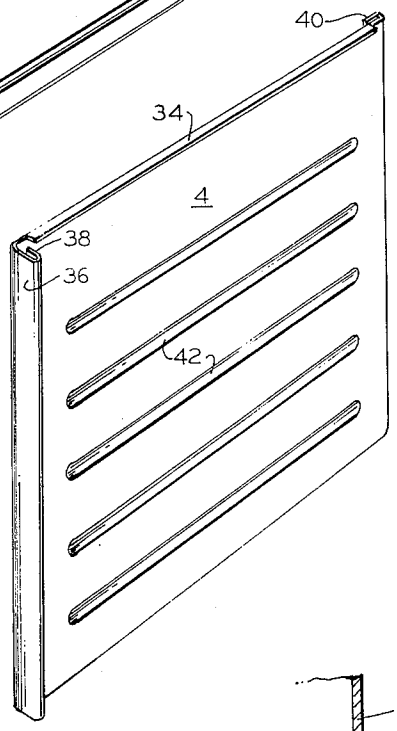
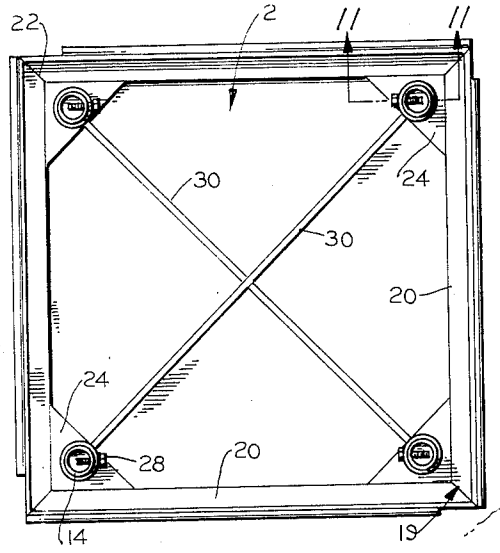


FIG_5



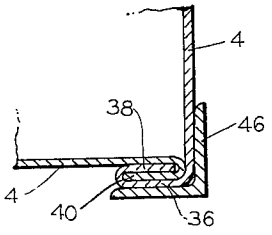


FIG_7

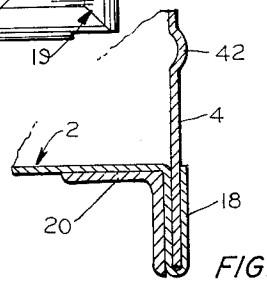
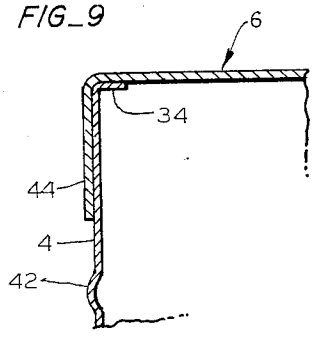


FIG_8

FIG_9



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FIG_10

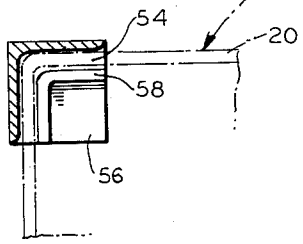
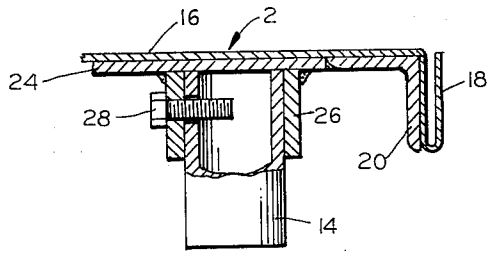


FIG_11



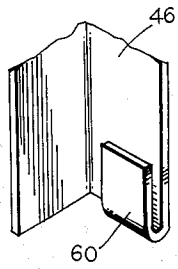


FIG_12

FIG_13

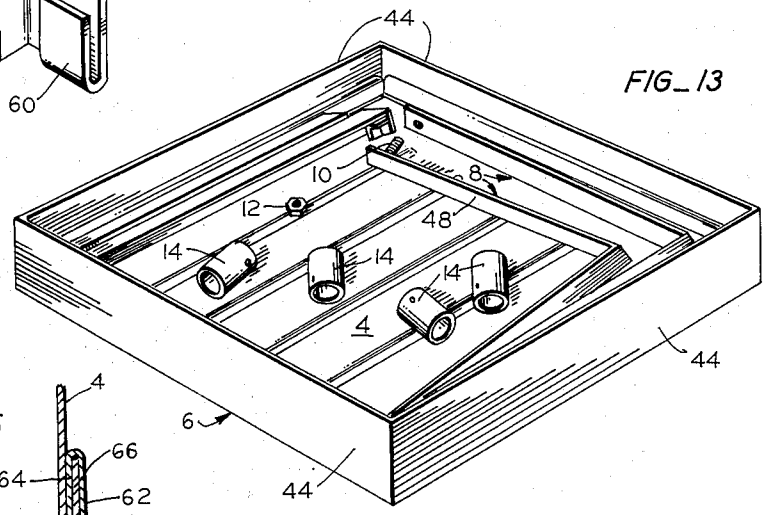


FIG_15

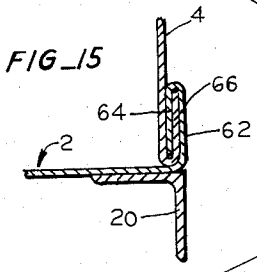
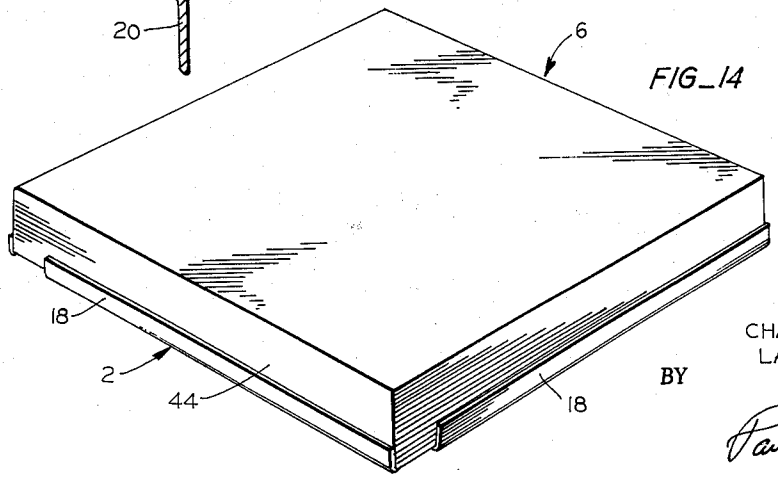


FIG_14



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3,208,619
DEMOUNTABLE SHEET METAL SHIPPING CONTAINERS

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13 Claims. (Cl. 220—4)
(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates to demountable shipping containers and more particularly to demountable sheet metal shipping containers. Prior art demountable containers typically, when made of wood, do not reduce, when disassembled, to the desired small fraction of assembled size. The degree to which a container can be reduced in size when demounted has an important direct bearing on the cost of returning the container to the place of reuse. Prior art collapsible metal containers are typically high in cost because of relatively intricate design requiring hinges and the like. Such intricate design also makes the collapsible container more vulnerable to damage. Furthermore, when one part of a collapsible container is damaged, the entire container is lost for use until repaired.

An object of the present invention is to provide a demountable shipping container of simple and inexpensive construction having a maximum amount of usable cube as compared to gross cube, having a minimum collapsed cube compared to gross cube, providing maximum protection of contents against pilferage and damage, capable of rapid, easy assembly, providing maximum protection of component parts against loss and damage when disassembled and requiring a minimum maintenance cost.

Another object of the invention is to provide a demountable container in which all the demountable parts, other than the lid and the base, are proportioned to fit within a compact, closed receptacle formed by fitting the lid and base together.

Another object of the invention is to provide a demountable shipping container including corner braces for reenforcing and encompassing the corners and having means for joining the corner braces together to secure the container against undesired opening.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. 1 is an axonometric view of an assembled container constituting one preferred embodiment of the invention;

FIG. 2 is an elevation view of the container of FIG. 1;

FIG. 3 is a detail axonometric view of one of the corner braces of the embodiment of FIG. 1;

FIG. 4 is an axonometric view of the base of the container of FIG. 1;

FIG. 5 is a plan view of the base of FIG. 4 taken from underneath;

FIG. 6 is an axonometric elevation detail view of the side panel of the embodiment of FIG. 1;

FIG. 7 is a cross-sectional detail view taken along the line 7—7 in FIG. 2;

FIG. 8 is a detail cross-sectional view taken along the line 8—8 in FIG. 2;

FIG. 9 is a detail cross-sectional view taken along the line 9—9 in FIG. 1;

FIG. 10 is a cross-sectional view taken along the line 10—10 in FIG. 3 showing the retainer of a corner brace in detail with the base of the container in phantom;

FIG. 11 is a view partly in cross section taken along the line 11—11 in FIG. 5 showing the mounting of a removable leg and the reenforced frame construction of the base;

FIG. 12 is a fragmentary detail view of a modified version of the corner brace of FIG. 3 showing a modification of the retainer;

FIG. 13 is an axonometric view showing the container in disassembled state with the demountable parts deposited in the lid;

FIG. 14 is an axonometric view of the compact, closed receptacle formed by fitting together the lid and the base with the demountable parts therein; and

FIG. 15 is a fragmentary cross-sectional view showing as a modification of FIG. 8 an interlocking joint between a side panel and the base.

Reference is now made to the drawings for a detailed description of one preferred embodiment of the invention and certain modifications thereof. In FIG. 1 is shown an assembled container made according to the invention and ready for storage or shipment.

The container comprises a base **2**, four identical side panels **4**, a lid or cover **6**, four corner braces **8**, and means illustrated as a bolt **10** and nut **12** for fastening the corner braces together. Preferably the container includes removable legs **14**.

The base **2**, as seen especially in FIGS. 4, 5, 11, and 14, is conveniently made of a piece of sheet metal **16** having a hemmed flange **18** formed along each side. The base is reenforced by a frame **19** to which the sheet metal piece **16** is welded or otherwise conveniently fixed. The frame is shown as being made of angle iron pieces **20** welded together with mitered corner joints **22**. The frame is strengthened and its rigidity improved by the provision of corner blocks **24** conveniently constituted of metal plate welded to the angle iron frame pieces. The corner blocks **24** also serve as points of attachment for sockets **26** welded to the corner blocks and constituting receptacles for removable legs **14** which can be conveniently held in place by means of screws **28**. The base **2** is reenforced for added rigidity by ribs **30**. The hem extending along each side of the base is correspondingly omitted from each side beginning at the corner and extending from the corner a distance sufficiently greater than the width of a hemmed flange (hereinafter described) on the side panels so that the side panels can readily be assembled with the base. The portion where the hem has been omitted, conveniently by notching the sheet metal before hemming it, is indicated generally at **32** in FIG. 4.

Each side panel is provided for strength and rigidity with a flange **34** (FIG. 4) along what is the top edge of the side panel when the container is assembled. Along one side edge of each side panel is located a hemmed flange **36** extending outward from that surface of the

side panel which is located in the interior of the container when the container is assembled. The hem **38** of the hemmed flange **36** is located adjacent that surface of the flange which is closer to the interior of the assembled container. The other side edge of the side panel **4** is provided with a hem **40** adjacent that surface (i.e. the surface which becomes the exterior surface of the assembled container) of the side panel **4** opposite to the surface from which extends the hemmed flange **36**. The side panel **4** is preferably reenforced with stiffening ribs **42**.

The lid or cover **6** (FIGS. 1, 2, 9, 13, 14) can be formed simply of a piece of sheet metal flanged on each side as shown at **44**. The lid fits on the container in the manner of an ordinary shoe box top.

The corner braces **8** (FIGS. 1, 3, 10) can conveniently be made of a piece of angle iron **46** to which is welded a piece of flat stock **48** drilled at **50** to receive the bolt **10**. The piece **48** extends generally diagonally across the top of the assembled container. It is also preferably provided with restraining means such as a collar **52** welded in place and serving to receive a leg **14** of another container when the containers are stacked for storage or shipment. To engage the base **2** the corner brace **8** is provided with a right-angled channel **54** conveniently constructed by welding a plate **56** to the end of the angle iron **46** and welding a piece of angle iron **58** to the plate **56**. The plate **56** is adapted to engage the base **2** so that the base and lid are held together between plate **56** and piece **48**. The channel **54** receives the corner of the frame **19**. The angle iron **58** forms part of retaining means to retain the corner brace in engagement with the container.

In FIG. 12 there is shown a modification of a corner brace having a different type of retainer **60**. In this case the retainer is formed by simply bending back on itself a portion of the flange of the angle iron **46**. The channel formed between the retainer portion **60** and the main body of the flange of the angle iron **46** serves to engage the flange of the angle iron **20** of the frame **19** in the same manner as does the channel **54** of the embodiment of FIGS. 3 and 10.

To assemble the container of FIG. 1 the base **2** is preferably placed generally in a position as shown in FIG. 4. If desired, the base may have the legs **14** attached to it as shown in FIGS. 2 and 11. A side panel is placed with its bottom edge standing in the channel or groove of the hem **18**. Conveniently an adjacent side panel is slid down with its hem **40** or **38** interlocking appropriately with the hem **38** or **40** of the first mentioned side panel as seen particularly in FIG. 7. This second side panel is slid down until it rests in the groove or channel of its respective hem **18**. In a similar manner the other two side panels are interlocked with their neighbors and placed in position resting in the hemmed flanges of the base **2**. The interlocked joints **38**, **40** occupy the spaces provided by omitting the portions of the hems on the base **2** adjacent the corners.

Next the corner braces are attached. To accomplish this each corner brace is tilted so that the axis forming its corner is inclined outward from the axis of the corner formed by the interlocking side panels, thus to facilitate engaging the retainer **60** or the retainer formed by angle iron **58** with the frame pieces **20** of the frame **19** of the base. While so tilted the corner brace is moved to engage its retainer with frame **19**. After the retainer has engaged the frame **19** the corner brace is tilted into the position shown in FIG. 1 so that its corner coincides with and encompasses the corner of the container. The first corner piece to be placed in position is the one carrying the bolt **10**, which may be welded or permanently fixed as a stud to the strap **48** of that corner piece, although it may, if desired, be removable. The remaining corner pieces are placed with their respective holes **50** over the bolt or stud **10** and then the nut, shown as a castellated

nut **12**, is threaded on the stud **10**. Finally a wire railroad car seal, or a padlock, or the like, is placed through a hole (not visible in the drawing) in the bolt **10** to secure the container against unintentional opening and against tampering and pilferage.

To facilitate stacking the containers, the legs **14** of one container are rested within the collars **52** of the container beneath it to prevent undesired displacement of one container relative to another.

Another preferred embodiment of the invention is generally similar to that shown in FIG. 1 but differs from it as regards the joint between the base and the side panels. In FIG. 15 is shown a cross section analogous to that of FIG. 8 illustrating this modified joint. In this latter embodiment at least one of the hemmed flanges of the base, and typically two opposite hemmed flanges, are located to extend from the plane of the base generally in a direction toward the lid of the assembled container, with the hem of the flange lying adjacent that surface of the flange closer to the interior of the assembled container, and with the groove or channel of the hem facing (i.e. concave) toward the plane of the base. To interlock with this hemmed flange on the base the corresponding side panel is provided with a hem along its bottom edge, with the groove of its hem facing toward the top edge of the side panel and proportioned to interlock with the aforedescribed hem on the base. In FIG. 15 one such joint is illustrated with the flange **62** of the base having a hem **64**, the channel of which is adapted to receive the hem **66** of a side panel **4**. In assembling this preferred embodiment each side panel provided with a hemmed flange along its bottom edge is first slid in a generally horizontal direction into interlocking engagement with the corresponding upstanding hemmed flange on the base. This interlocking engagement allows the side panels to remain upright by virtue of the interlocking engagement and frees the operator to use both hands to slide the neighboring side panels generally downward into engagement with this self-standing side panel by interengaging the respective hems **38** and **40**, one each of which is provided on the self-standing side panel in the same manner as shown in FIG. 6. Usually two such self-standing side panels are provided for a four-sided container as shown in FIG. 1. In this embodiment, then, these two side panels are interchangeable with one another and the remaining two side panels are interchangeable with one another, whereas in the embodiment of FIG. 1 all four side panels are interchangeable with one another.

The inventive concept contemplates a structure wherein essentially all of the demountable parts other than the lid and the base can be packed within the relatively small size closed receptacle formed by fitting the lid and base together. This is achieved in accordance with the teaching of the invention by carefully making each of the demountable parts small enough individually to fit readily within the lid and proportioning all of these demountable parts relative to one another and to the size of the lid so that all these parts will fit within the lid simultaneously. To this end, for example, the corner braces are proportioned so that the piece **48** does not exceed in length the interior diagonal of the lid and indeed this piece is quite satisfactory when made to be only slightly larger than approximately half the diagonal of the lid Since it is convenient to be able to pack the side panels flat in the lid, although they could be packaged within the lid inclined to the plane of the top of the lid, the side panels are proportioned so that the height of the side panels is less than the width of the interior of the lid. Of course, the length of the side panels is necessarily less than the length of the interior of the lid in order to permit assembling the container in the manner hereinbefore described, where the lid is said to fit in the manner of an ordinary shoe box top. Similarly, the legs **14** are proportioned to fit readily within the lid.

To demount the box for storage or shipping for reuse to the point of origin, for example, the procedure outlined hereinbefore is reversed until all the removable parts have been separated from one another. The lid is placed in the position shown in FIG. 13, and the side panels, corner braces, legs, and the corner brace fastening elements are placed in the upturned lid as shown in FIG. 13. The base is then inverted from the position shown in FIG. 4 and fitted together with the lid, each flange **44** of the lid **6** fitting into the groove of a corresponding hem **18** as shown in FIG. 14. The compact, closed receptacle thus formed containing all the demountable elements is preferably strapped with conventional metal strapping and then, if desired, can be inverted into the position shown in FIG. 14 where it rests securely on the reinforcing frame **19** and the sockets **26** of the base **2**. In this collapsed configuration it occupies a very small portion of the volume of the assembled container shown in FIG. 1 and can be stored or shipped for reuse at small cost.

Various modifications of the structure can be made within the teaching of the invention. For example, the legs **14** can be attached by means other than the bolts **28** shown. One convenient method of attachment is simply to use threads on the projections **26** and mating threads on the legs **14**, the projections **26** being threaded either exteriorly or interiorily, but preferably the latter for greater protection from damage. The legs need not necessarily be cylindrical. They can be of any desired shape. Similarly the restraining collars **52** on the corner brace extensions **48** need not be cylindrical but can be of any shape satisfactory to receive and retain the legs or base of the container. Furthermore, the elements **52** need not be permanently attached to the corner braces but can be formed to slide onto the pieces **48** and can thus be adjustable in position on the corner braces to accommodate stacking of different size containers. The means for fastening together the corner braces need not be of the bolt and nut variety but can be of any other desired clamping or fastening type.

Although the hems and flanges are shown as being integral with and formed by bending a portion of the element of which they are a part, they can obviously be made separately and attached to their element by rivetting, welding or the like. Although the container illustrated has four sides, it is apparent that within the teaching of the invention containers of three sides or more than four sides can be constructed.

It will be observed that with the illustrated structure the container can be lifted by a fork lift without the need for a pallet. The fork lift, by virtue of the legs **14**, can readily pass underneath the container and can engage the reenforcing elements of the base, such as angle iron pieces **20** and ribs **30**, which provided sufficient rigidity and strength to prevent damage to the container and contents from this method of lifting. The invention also facilitates lifting the container by means of a commonly used bridle, the legs **14** being spaced away from the angle iron pieces **20** sufficiently to facilitate placing the bridle lift elements securely against the frame **19**.

Obviously many other modifications and various of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A demountable container comprising a lid, a base, side panels interlocking with one another and interfitting with said base; corner braces, each corner brace having means interfitting with said base, a portion encompassing the corner where adjacent side panels interlock, and a portion extending from said first mentioned portion across the top of said lid generally in a direction toward the center of said lid; and means for fastening together said extending portions of said corner braces, said fastening means being provided with means for receiving securing means to secure said fastening means, whereby said container is retained in assembled, reinforced, relatively rigid configuration, proof against accidental opening and against tampering.

2. The container of claim **1** wherein each corner brace comprises retainer means for retaining said brace in engagement with said base.

3. The container of claim **2** wherein each corner brace includes means for engaging a container stacked on top of said first mentioned container to keep said second mentioned container from undesired displacement relative to said first mentioned container.

4. The container of claim **2** wherein said base comprises a frame; said first mentioned portion of said corner brace comprises angle iron; and said retaining means includes a channel portion on said angle iron portion adjacent the free end thereof adapted to engage the frame of said base.

5. The container of claim **4** wherein each corner brace includes restraining means for receiving a leg of a container to be stacked on top of said first mentioned container to keep said second mentioned container from undesired displacement relative to said first mentioned container.

6. The container of claim **1** further including removable legs and means for retaining said legs on said container, whereby said container is generally raised above a surface on which it rests to facilitate handling of said container by fork lift without the need for a pallet.

7. The container of claim **4** wherein said fastening means comprises a bolt and a nut and said bolt is provided with a hole to receive said securing means.

8. The container of claim **1** wherein said lid and said base are shaped and proportioned to be able to engage one another with the base nested at least in part with the lid to form a closed receptacle considerably smaller than said assembled container and wherein the remaining demountable elements of said container are proportioned so as all to fit within said receptacle.

9. The container of claim **8** wherein the height of said side panels is less than the width of the interior of said lid.

10. The container of claim **6** wherein said lid and said base are shaped and proportioned to be able to engage one another to form a closed receptacle considerably smaller than said assembled container and wherein the remaining demountable elements of said container are proportioned so as all to fit within said receptacle.

11. A demountable container comprising a base, a lid, side panels, and corner braces; each side panel being generally rectangular, having along one side edge a hem adjacent to one surface of said generally rectangular side panel, and having along its other side edge a hemmed flange extending outward from the other surface of said rectangular side panel and proportioned for interlocking with the hem of an adjacent side panel; said base having a hemmed flange extending along each side thereof to receive a side panel; and a plurality of generally L-shaped corner braces, each provided with means for engaging said base to retain said brace against undesired removal from said container, each also provided with an angle iron type portion to encompass and reinforce the corner located generally at the interlocking of two side panels, and each also provided with a strap portion located generally at right angles to said angle iron type portion in such a manner as to lie over the top of said lid and extend generally toward the center of said top; the strap portions of said braces being provided with means to facilitate fastening said braces together to secure said braces against accidental removal and against tampering.

12. The container of claim **11** wherein the hemmed flanges of said base each have a portion thereof correspondingly omitted extending from the corner a distance sufficiently greater than the width of the hemmed flange

of a side panel whereby said hemmed flange of said side panel can fit into the space left by omission of said corner portion of said hemmed flange.

13. The container of claim **11** wherein at least one of the hemmed flanges of said base extends from said base in a direction toward the lid with its hem lying on that side of the flange adjacent the interior of the container and the groove of the hem facing toward the plane of the base and wherein at least one side panel provided with a hem along its bottom edge with its groove facing toward the top edge of said side panel and proportioned to interlock with the last mentioned hem on said base whereby when said last mentioned hem on said side panel and last mentioned hem on said base are interlocked, said side panel and said base are fastened together.

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