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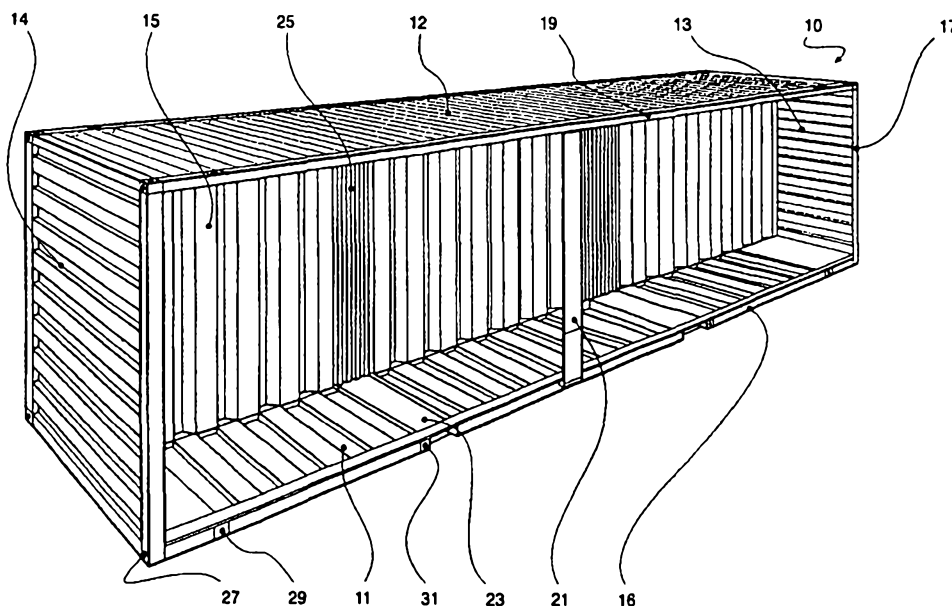
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(54) Title: SIDE-LOADING CARGO CONTAINER



(57) Abstract

An open-sided container (10), allowing side load access, has an intermediate support, such as a corrugated wall section (15), struts or ties (43), between a base deck and overlying roof, configured in a unitary, integrated "I"-beam sectional profile; in a variant with opposed end walls, an intermediate wall braces the end walls; multiple "I"-beams may be stacked one upon another to provide multiple decking; other variants combine multiple "I"-beams or "I"-beams with other beam sections for diversity of deck height and load access, whilst achieving mutual stiffening.

Side-Loading Cargo Container

This invention relates to cargo or freight containers, for storage and transport, eg road, rail and shipping, and to container construction, adaptation and loading configuration.

- 5 Insofar as an at least partially enclosed (container) storage volume is integrated with a chassis and running gear, some aspects of the invention are also applicable to wheeled (road vehicle) lorry bodies or trailers, or even railway rolling stock such as wagons or carriages - albeit with stacking limitations attendant chassis and dependent running gear intrusion.
- 10 Generally, the rationale of containerisation is
- the standardisation of load shape and size, generally to a rectangular configuration, in particular by base 'footprint' and (maximum) overall height: and
 - the provision of lifting or support points and attendant locking mechanisms of
- 15 a standard character and disposition .

Structure

Containers, can be configured as open-plan - ie a mere (base) chassis - through a peripheral lattice frame, with or without selective infill, to a fully enclosed, ie opposed end and side walls, surmounted by a roof upon a base.

- 20 As an alternative to, or supplement of a peripheral frame, a relatively thin-walled monocoque structure may be employed, possibly upon a base chassis.

Stiffness

However configured, the container span is relatively open and unbraced and vulnerable to longitudinal bending and torsional twisting loads.

- 25 The issue of stiffness or rigidity is particularly acute with an open-sided structure, with optional, flexible, curtain-siding closures.

Omission of structural (longitudinal side) walls imposes demands in preserving overall strength and rigidity, especially in bending, as when supported by or lifted from the base or roof.

- 30 Thus, if a container deforms materially in use - for example sags or twists, when suspended from lifting points across the roof - the internal cargo or freight load could be put at risk, aside from potential mis-alignment (and consequential obstruction or jamming) of (lockable) suspension and mounting points, for handling and stacking.

Thus, for example, GB 1,575,508 (Bell) reflects typical curtain-sided container considerations.

Standardisation

5 Generally, containers, and attendant mounting fittings, are configured in conformity with an internationally recognised standard, such as 'ISO' or 'Euro'.

The base area or footprint, height and location/lifting fitment geometry are determined accordingly.

In this way containers of diverse origin can readily nest, stack, inter-fit and be handled by common lift cranes and loaders.

10 Multiple Standard

On occasion a multiple, specifically dual, standard container has advantages, in allowing nesting inter-fit and stacking of different sizes or proportions.

15 Thus, for example, a dual ISO-Euro standard, would allow a longer, larger footprint of one standard (eg Euro - representing some 13.6m or 45' overall length) to be handled from the handling, lifting or support points of another standard (eg ISO - representing some 40' overall length).

This places extra demands upon the stressing and bracing of container structures, since reliance can no longer be placed simply upon corner end fittings, whose positioning affords an inherent support.

20 Rather, load transfer must be accommodated from points intermediate the full container span - and for which no special provision is made in conventional container construction.

Load Capacity

Loading to full theoretical capacity can be impeded by necessary structural provision.

25 Thus even corner end posts can prove an obstruction in that regard.

Flexibility in re-configuring the load space, to adapt to individual cargoes and minimise such voids, is also desirable, without undue structural complexity.

Side Access

30 As to container un/loading, open-sided configurations are known, which allow load transfer from either (longitudinal) side.

The open side is commonly closed by flexible, curtain-siding, that is a fabric sheet, suspended by runners from an overhead rail and tied down at regular intervals to a

lower rail, by an array of successive spaced tensioner straps and buckles.

Side access, for (un-)loading from either longitudinal container side is advantageous, but positioning the load at each side is critical if the load space on the opposite side is not to be intruded upon or obstructed.

5 The general principle of side loading is known from specialised road and railway carriage vehicle body art.

However, these do not address the special demands of multi-mode containers - that is self-contained structures transferable between different transport media, such as road, rail, shipping, and even air freight in the case of smaller containers.

End Access

End-loading is also known, through gates or hinged end walls - albeit generally between corner support posts.

Summary of the Invention

The invention provides a container comprising a base deck, supporting a roof, through an intervening support structure, located intermediate the base span, to create a unitary structural I-beam section, allowing side load access.

The invention may also provide a container comprising a base deck, supporting a roof, through an intervening structure, located intermediate the base span to create a unitary structural beam section, allowing side load access.

25 The invention may yet provide a container comprising a base deck, supporting a roof, through an intervening structural web, located intermediate the base span, to create a unitary structural webbed beam section, between base and roof flanges, allowing side load access.

The invention may further provide a container, comprising a load deck, a plurality of posts and wall portions, upon, or around, the deck, and upstanding therefrom, one or more posts, and associated wall portion, being (re-)movable, for deck or load access.

"I"-beam

35 Generally, an "I"-beam and variant or derivative forms are inherently



stiff, both in bending and torsionally.

In one variant, an intermediate support (such as a continuous wall section) is located generally mid-transverse span - that is parallel to, and generally equi-distant from the longitudinal side wall (openings).

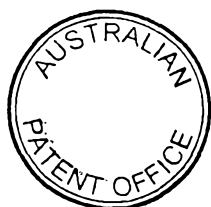
5 However, alternatively, for example, intermediate supports may be laterally offset from mid-depth span locations.

Essentially, the "I"-beam configuration relies upon the roof and base as opposed flanges, with the intermediate (eg. centre) wall, as the intervening web.

10 Thus the web is a key structural element, not merely an internal partition or divider.

In a conventional container, absent the intervening web, the base and roof are largely unbraced - with a comparatively reduced overall cargo capacity, for a given roof and base depth and container tare weight.

15



Curtain Sided - Sideways Loading

As reflected in Figure 27A, under sideways loading, of a curtain-sided variant, the intermediate (eg centre) wall supports a proportion (say one half) of the payload and the curtain the other portion (eg one half).

5 In contrast, a conventional container profile would lozenge, as depicted in Figure 27B

Thus the side curtain and its associated tensioner (straps) need only be half the strength of conventional products, for a given payload.

Opposed Side Rail Tensioning

10 Moreover, the tension in the curtain side-wall tensioners pulls the longitudinal rails together somewhat.

Since this happens on both sides, the centre wall acts as a (compression) strut and allows much greater tension to be supported by the side rails, as depicted in Figure 28A.

15 In a conventional container, this curtain tension loading is largely unbraced, allowing container profile bulge, as depicted in Figure 28B.

This is a great advantage for keeping the cargo (sectional) profile from bulging out from the intended (unloaded) container envelope.

End Support

20 When lifting or stacking a container through the standard coupling fittings, various supplementary end (frame) bracing configurations can be employed, as depicted in Figures 29 through 31.

Thus a pair of opposed 'C'-frames could be deployed, 'embracing' the opposed ends of floor and roof side rails and intervening end wall corner post, as depicted in Figure 29.

25 Alternatively, angled 'C'-frames could be disposed in opposed pairs as a 'V'-section in plan, with individual 'C'-frames orientated from the junction of a side wall (mid-span) and end of an intermediate (eg centre) wall, with upper and lower arms to base and roof side rail lift points, as depicted in Figure 30.

30 A variant end-lift brace is depicted in Figure 31, embodying a self-contained 'I'-frame integrated into the overall 'I'-beam roof, intermediate wall and floor configuration.

Such localised lift bracing obviates the need for tie cords between base and roof, as supplementary bracing (described later in relation to Figure 2).

Off-set Intermediate Support

In deference to a certain 'differential' lateral loading capacity, some asymmetry, or departure from mid-location, of the intermediate wall can be accommodated, without undermining the 'I'-beam structural qualities unduly.

Multiple Offset Intermediate Supports

- 5 In order to counter the effect of a lateral displacement of an intermediate support (wall) portion, it could be followed (longitudinally) and a corresponding offset in the opposite sense.

Thus, overall, successive mutual off-set intermediate support (eg wall) sections could be fitted, following a multiple stepped configuration in plan.

- 10 Moreover, elements or limbs of an 'I' profile could be omitted, at least locally, for example for load access.

Stacked 'I'-beams

The intermediate (eg central spine) dividing wall of an 'I'-beam container configuration, provides stacking support for multiple individual containers.

- 15 Thus relatively shorter or longer individual containers can be stacked, with the base of an upper container upon the roof of a lower container.

Moreover, even in a given container profile, multiple 'I'-beams could be employed, stacked one upon another.

- 20 For example, a two-tiered, twin or double 'I'-beam could employ a common intermediate linking deck - effectively creating a base and overlying intermediate deck.

Such a relative 'I'-beam disposition affords a multi-tiered stacking or racking array of successive spaced deck levels

- 25 The individual 'I'-beams in such an array could be symmetrical or different depth or even span, for bespoke loads.

Mixed 'I'-beam and other Sections

An individual 'I'-beam' section, or multiple 'I'-beam' sections, could be combined with other sections, such as 'U-sections', 'C-sections' or 'S-sections', for variety and flexibility of deck dispositions and load access.

- 30 Thus, for example, successive different sections could be combined in a container (longitudinal) span to provide loading flexibility and mutual bracing.

Corrugated Wall Sections

In a particular construction, an intermediate support comprises a corrugated wall panel

section, spanning one or more selected portions, or the entire (longitudinal) span, of the container.

Such corrugations effectively stiffen, in at least one plane, what would otherwise be a flexible thin-walled panel.

- 5 The end walls, base and roof can be similarly fabricated from corrugated sheet (of metal, typically steel), either selectively locally, or over their entire span.

The orientation of such corrugations reflects local loading and load distribution to other parts of the structure.

Thus, bending along the corrugations is more readily countered.

- 10 A common configuration would be transverse, ie from one longitudinal side to another, corrugations for the base or floor and roof.

Conventionally, the end walls would have upright corrugations, but the intermediate support wall of the present invention stiffens the end walls when secured thereto - allowing transverse (or horizontal) corrugations also.

- 15 Particularly for the intermediate wall, multiple individual tie members or struts, for example configured in an intersecting (say criss-cross diagonal) lattice or grid array, may be substituted for continuous wall panels, either selectively locally, or over an entire (wall) span.

Access Apertures

- 20 Access apertures or openings, such as windows or doorways, may be installed in the intermediate wall, for operator access.

Such openings are optionally (partially or completely) closable, by hinged or removable door or shutter panels.

- 25 Similarly, the intermediate wall may be selectively reduced in height or depth, or indeed omitted altogether over selected portions.

On the other hand supplementary reinforcement or bracing, may be provided locally - in particular where lifting or suspension loads are concentrated, such as when an 'ISO' container is lifted at intermediate 'Euro' suspension points.

- 30 Generally, the intermediate support transfers and spreads loads between the roof and base, and if extending that far, can stiffen end walls.

End Wall Access

The end walls may also incorporate apertures for operative and cargo access.

Such access apertures could be selectively closed by door panels.

Similarly, an end wall portion, from intermediate support to corner post, could be (re-)movable.

Thus, for example, an end wall panel could be hinged about the intermediate support.

5 Corner Door

Moreover, the corner posts itself could be carried with the end wall portion, as could a portion of side wall, forming a corner door assembly.

To allow for this, a corner post could have end couplings selectively engageable with the base and roof.

10 Similarly, selective local portions of the roof could be removable or hinged about the intermediate support 'spine'.

The base need not have a continuous deck surface - that is it could be a part-open lattice of cross-bracing members or struts or continuous corrugated sheeting.

The roof could also be fabricated of continuous corrugated sheeting.

15 Denser Corrugation Locally

The corrugations of the base - and indeed the roof - could be 'multiplied', concentrated, or supplemented locally at load concentration points, to provide additional stiffening and rigidity.

Roof Bracing

20 The roof could be provided with transverse bracing at locations to fit another (shorter) configuration standard.

This would allow containers of the same or different standards to be stacked one upon another, with the transverse bracing matching the span or footprint of the shorter standard.

25 The match would either be with the ends of the overlying shorter container, or intermediate span points reinforced according to the present invention.

As with conventional curtain siding, provision maybe made for an upper curtain runner rail in the roof edge, for example through a proprietary channel section, and with a capture rail for curtain tensioner ties and the base edge.

30 Roof to Floor Bracing

In order to brace the otherwise open roof span over the entire longitudinal side faces, (re-)movable bracing struts, spanning between roof and base outer edges, could be

fitted.

The bracing strut could be (re-)located at, say, mid-span on each side of the container, or multiple struts could be positioned at intermediate span points.

- 5 The bracing struts are conveniently entrained in a guideway alongside, but in-board of the curtain rail in the roof, to allow selective variable positioning of the bracing strut, reached by a goose neck at the strut upper end.

This allows continuous, uninterrupted curtain siding past the bracing strut locations.

Roof Access

- 10 Provision may be made for top (un)loading, by incorporating (re-)movable, say hinged, roof access panels - for example from an outer edge to a pivot axis at an intermediate supporting wall.

With such a roof panel section folded back a suspended load may be passed through the attendant roof opening, from an overhead crane lift.

Multi-Deck

- 15 The integrated 'I'-beam structure of the present invention can be made compatible with multi-level or layer containerised cargo storage.

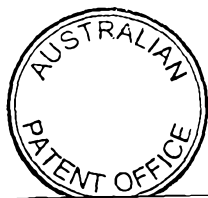
In my earlier UK patent applications nos 9618703.4 and 9707250.8, now pursued as PCT International Application No. PCT/GB97/02319, I have proposed a multi-deck container configuration adaptable for general cargo or bespoke vehicle carriage.

- 20 Some aspects of the present invention variously address integrated side loading and multi-layer or multi-deck 'I'-beam and mixed section configurations.

- 25 According to another aspect of the invention
a multi-deck container comprises
a plurality of mutually overlying
load platforms or decks,
with an intervening support,
allowing (load) access from (either) one side,
at each of a plurality of different deck layers,
30 and creating an integrated, unitary, multiple stacked
'I'-beam configuration.

In some variant configurations, differential depth side access is provided for successive deck layers, by laterally offsetting intervening deck supports.

Thus a form of 'staggered', stacked 'I'-beam section can be employed.



The container section may also be varied along its length, to achieve a series of bespoke sections adapted for particular load configurations.

By way of example, a single 'I'-beam may be followed by stacked multiple 'I'-beams and then by other sections.

- 5 Ancillary multiple deck support can also be furnished by peripheral framing, allowing selective deck and wall in-fill.

Although two such (overlying) layers represent a preferred compromise between additional load space and constructional complexity and ease of access, in principle other multi-platform configurations are feasible.

- 10 An overall roof (cover) element, spanning overlying platforms can be fitted - for example, supported cantilever-fashion from an upper frame section.

The roof itself may be a load-bearing platform or deck, with vehicle guide tracks - for, say, three (overlying) lines or stacked rows.

- 15 With a load-bearing roof, the supplementary (intermediate) deck position may be re-adjusted.

Complementing the vehicle protection afforded by an optional roof, side curtains may be fitted.

- 20 There now follows a description of some particular embodiments of the invention, by way of example only, with reference to the accompanying diagrammatic and schematic drawings, in which:

Figure 1 shows a general perspective view, from one (longitudinal) side, of an open-sided (closed end) container, with an intermediate support (in the form of a continuous wall) between base deck and roof according to the invention;

- 25 Figure 2 shows a facility for lifting the container of Figure 1 from suspension points intermediate the full (longitudinal) span;

Figure 3 shows a facility for lifting stacking, one upon another, the containers of Figures 1 and 2, through transverse support bars intermediate the full span;

- 30 Figure 4 shows the container of Figures 1 through 3 fitted with a sliding curtain and bracing bars between base and roof;

Figure 5 shows a sectional detail, taken along the line X-X in Figure 4, of the mounting of the head of the bracing bar of Figure 4 in a roof side header rail;

- 35 Figure 6 shows a variant of the container of Figures 1 through 5, with an intermediate support wall of locally reduced depth and access apertures with door panel closures, together with an end wall access aperture and door panel closure;

Figures 7A through 7C show plan views of various end door access configurations for the container shown in Figure 6;

5 Figure 8 shows a plan view of a bespoke profile intermediate support wall, to complement particular load profiles and preserve load capacity at the container ends, for the containers of Figures 1 through 7;

Figure 9 shows a variant intermediate support for the container of Figures 1 through 8, combining bracing struts or tie rods with multiple, discrete corrugated wall panel sections;

10 Figure 10 shows a variant of the container of Figures 1 through 9, with a hinged roof access panel;

Figures 11 through 17 show multi-deck open-sided container variants of diverse sectional profiles, for use in (stacked or end-on abutment) conjunction with the 'I'-beam configuration of Figures 1 through 10.

15 Figure 11 shows a transverse section, or end-on view, of a stacked open-sided container box frame sections supporting two overlying load platforms with differential side access;

Figure 12 shows a perspective view of an end-on stack, or succession of longitudinally-aligned box frame sections of Figure 11 to fill a (standard) container footprint;

20 Figure 13 shows a reversed alternating sequential end-on stacking sequence for the open-sided box frame sections of Figure 11, as a stiffer alternative to the symmetrically aligned sequence of Figure 12;

Figure 14 shows a diversity of space-frame and selective in-fill configurations for the multi (twin) deck container modules of Figures 11 through 13;

25 Figure 15A shows a re-inforced or braced (lower) side opening variant of the box frame module shown in Figure 11, with an optional removable support strut or leg;

Figure 15B shows an end-on sequence of aligned symmetrical re-inforced box frames of Figure 16;

30 Figure 16 show an alternating reversed end-on sequence of re-inforced box frames of Figures 11 and 13, as a stiffer alternative to the sequence of Figure 15B;

Figure 17 shows a diversity of box-frame and selective in-fill for the end-on module stack of Figure 16;

Figure 18 shows an open-ended, 'I'-beam section container frame for twin opposed side loading;

Figure 19 shows a symmetrical, aligned, end-on stacking sequence for the I-section frame of Figure 18, with optional curtain side walling;

Figure 20 shows a variant of the I-section frame of Figure 20, with periodic intervening transverse divider wall sections, for stiffening;

5 Figure 21 shows a diversity of box frame and selective in-fill for end-on stacked 'I'-beam modules, with successive intermediate walls re-orientated;

Figure 22 shows a vertical stack of 'I'-sections of Figure 18;

10 Figures 23A through 23C and corresponding sectional views Figures 24A through 24C show various alternative positions of intermediate support wall or web in an 'I'-beam container sectional profile, from respectively central or mid-depth span, to laterally offset somewhat to one side or another;

Figure 25 shows a multi-decked or stacked 'I'-beam section within a unitary container profile, as a development of Figure 22;

15 Figure 26 shows a variant of Figure 25 with multiple decks of different longitudinal span;

Figure 27A shows an 'I'-beam container section under lateral loading;

Figure 27B shows a corresponding conventional container under lateral loading;

Figure 28A shows an 'I'-beam container section with an intermediate wall or web acting as a strut to brace opposed side curtain tensioning loads;

20 Figure 28B shows a conventional container distorting by bulging under opposed side curtain tension loads;

Figure 29 shows supplementary 'C'-section end bracing frames for container lift intermediate the ends aligned and integrated with the longitudinal side rails and corner posts;

25 Figure 30 shows a variant of Figure 29, with supplementary 'C'-section end bracing frames orientated in an opposed 'V' in plan, with the apexes at the junction of the intermediate wall or web and end wall;

Figure 31 shows supplementary 'I'-section end bracing frames, integrated with the 'I'-section overall container profile.

30 Referring to the drawings, a rectangular shipping container 10 is of generally open-side configuration, along its longitudinal sides, and comprises an outer (hollow) shell of base deck 11, overlying roof 12 and end walls 13, 14, with an intermediate support 15.

In this variant, a continuous intermediate support wall is fitted over the entire longitudinal container span, between end walls 13, 14 and to full height or depth between base deck 11 and overlying roof 12.

5 The intermediate wall is located generally mid-depth of the transverse span of the base 11, in a symmetrical 'I'-beam section - although some variation can be admitted.

In this particular construction, the various deck and wall elements are panels of corrugated sheet material, such as steel.

10 The corrugations are orientated transversely, that is across the width of the container, except for the intermediate support wall, whose corrugations are orientated (generally upright) between base 11 and roof 12.

These panels are in-fills to a peripheral frame structure, including base rails 16, side rails 17 and roof rails 19.

Infill panels could be (transverse) structural members, supported by a centre wall.

An upright bracing strut 21 is detachably fitted between base and roof rails 16, 19.

15 Multiple such bracing struts may be provided over the otherwise open longitudinal side faces of the container 10.

20 Lifting, suspension or support fittings 27, 29, 31, with proprietary standardised interface locking mechanisms (not detailed), are incorporated in the frame rails, 16, 17 and 19, for selective inter-fit with, and capture by handling cranes and fork lift vehicles (not shown).

The wall and deck panels 15, 11 are reinforced locally, according to local loading and load distribution, to other parts of the overall structure, to provide supplementary stiffening and bracing - in order to help withstand bending and twisting of the elongate structure.

25 Such local reinforcement can be achieved, at least partially, through selective variation in the density or pitch of corrugations.

In particular, regions 25 of locally increased corrugation density are incorporated in the intermediate wall 15.

30 Similarly, supplementary reinforcement beams 23 are incorporated in the base deck 11.

Such local reinforcement provision provides overall bending and torsional stiffness and allows lifting, suspension or support in-board of the container end corners.

Figure 2 shows the suspension of the container of Figure 1 through lift points intermediate the full span.

A suspension sling 24 can extend as tie cords 28, between roof and base deck, as supplementary bracing to the open longitudinal sides.

5 Figures 29 through 31 show various installations for supplementary 'C'-section or 'I'-section end frame bracing, which may be incorporated in the overall 'I'-beam container sectional profile.

Figure 3 shows a facility for stacking the containers of Figure 1, either to similar configurations 20, 30, or to different standards, such as ISO and Euro.

In either case, the containers are stackable, one upon another.

10 In the case of dual-standard containers, and stacking different container types, the (underlying longer) container 20, constructed to the longer standard is fitted with transverse roof bracing and support beams 32, located at a spacing intermediated the full container span.

These allow either a similar length container 30 to surmount an underlying container 20 or alternatively, a container 40 of shorter span.

15 Figure 4 shows the container of Figure 1 fitted with a panel of curtain siding 36.

Figure 5 shows a detail sectional view, taken along the line X,X in Figure 4, of the fitting of curtain siding 36 and (re-)movable bracing strut 21.

The head of the curtain 36 is secured to runners 42, located in a continuous guide track 41, mounted upon the underside of a roof header frame rail 19.

20 A lateral sealing skirt 44 inhibits the ingress of weather effects.

Similarly, the head of the bracing strut 21 is canted inwardly at 47 and carries runners 46 located in a track 45 at the inner side of the roof frame 19.

In this way, the curtain 36 and brace 21 are movable independently and the curtain can be pulled across to cover over the brace 21.

25 Figure 6 shows a variant of the container of Figure 1, with various adaptations and modifications.

Thus the intermediate support wall 15 incorporates at one end an access aperture 33, closable by a (re-) movable, eg hinged, door 34.

30 Over its mid-section 24, the intermediate wall 15 is of locally reduced height or depth, so that it extends from the base deck 11 only part way towards the roof 12.

The end wall 14 also incorporates an access opening 52, closable by a hinged door 38.

Figures 7A through 7C show in plan view, on a reduced scale, variant configurations

of end door opening.

Thus, Figure 7A shows opposed pairs of end doors hinged at the outer corners.

Figure 7B shows end doors hinged about adjacent or even common spines at mid-end wall span, coincident with the intermediate support wall.

5 Figure 7C shows a variant of the centre spine hinged end door configuration of Figure 7B, in which the doors carry demountable corner frame posts 17, allowing uninhibited access.

10 Figure 8 shows a sectional plan view of a variant of the container of Figure 1, in which the corrugated profile 35 of the intermediate support wall is configured to an extended pitch, in order to complement a larger rounded diameter load element profile.

Thus, large diameter cylindrical paper rolls or drums 39, stacked on their ends are accommodated, one in the span of an extended corrugation, and nesting between opposed sloping side walls 37.

15 At one or both ends of the container, the intermediate wall corrugations cease, in favour of a flat panel 51.

This allows a full (albeit slightly inwardly offset) load depth, in what would otherwise be a restricted area between the corner end posts and intermediate wall.

20 Figure 9 shows a variant of the container of Figure 1, with an intermediate support between base deck 11 and roof 12 constituted by a combination lattice of bracing tension ties and struts 11 and minimal (denser pitch) corrugated wall sections 48.

Figure 10 shows yet another variant of the container of Figure 1, with a (re-)movable roof panel 49, in this case hinged about a spine of the intermediate support wall 15 and carrying at its outer edge a corresponding portion of the roof side edge frame 19.

25 This allows load access from above, with appropriate lifting tackle, such as a crane or hoist (not shown).

The roof panel hinge position need not be at a central spine, but could be on a line between the spine and side rail, opening, say, over one quarter of the roof depth.

30 Figures 11 through 17 show multi-deck container variants of alternative sectional profiles, which may be used in conjunction with the 'I'-beam section of Figures 1 through 10.

Thus, referring to Figure 11, a container module 111 comprises an open sided, and open topped, 'dog-leg', 'b' or 'd'- profile box frame section 120, with spaced load platforms 112 and 114, separated by an upright wall or legs 115.

35 The upper platform 114 has an upright side wall or legs 116, on the opposite side

from the support wall 115.

The platforms 112 and 114 can be accessed from opposite sides, for individual (self-contained) cargo loads 122 and 124, respectively.

Thus the platforms 112 and 114 can be loaded and unloaded independently.

5 Cargo loading and unloading can readily be undertaken by, say, proprietary fork lift trucks commonly available at freight stations, of appropriate lift and reach.

Modules 111 can be stacked end-on, in a longitudinally-aligned linear array 110, to occupy collectively a standard container footprint, as shown in Figure 12.

10 The modules 111 can be detachably secured, by, say, releasable pin couplings (not shown) - or permanently integrated, by, say, by welding together their respective box frames.

In constructional detail, the modules 111 can be fabricated as a hollow space-frame of structural elements joined at their ends - or as stiffened (by, say, corrugations) panels, or some combination of frame and panel elements, as shown in Figure 14.

15 Thus, in a given module 111, a mixture of frame and in-fill panels may be employed.

In that regard, the platforms 112, 114 themselves need not be continuous - but could rather be an open lattice, with localised in-fill.

20 Vertical stacking of modules, one upon another, would require temporary deployment of a (collapsible) supplementary upright support from the upper deck, on the opposite side to the existing side wall or frame.

The upper platform 114, surmounting base wall 115, is effectively cantilevered therefrom - making the corner joint of some criticality, particularly when the container is loaded.

25 The end-on stacking sequence of abutting modules 111 in a container span may be varied, for example as shown in Figure 13, to alternately reverse the module 111 'orientation', so that an open side section is followed by a closed side section - thus stiffening the overall structure as a unitary whole or entity.

30 Figure 15A shows the deployment of bracing legs or struts 118 around a lower side access opening 128 for the base platform 112, to supplement the cantilever support of the upper platform 114 from the base side wall 115.

Figure 15B shows successive end-on module stacking, otherwise corresponding to that of Figure 12, for the braced modules of Figure 15.

Figure 16 shows an alternating reversed end-on stacking sequence, otherwise corresponding to that of Figure 13, for the braced modules of Figure 15A.

Figure 17 shows various alternative space-frame, open-lattice and flat panel or stiffened corrugation in-fill for the end-on stack sequence of Figure 18 - to demonstrate that modules may be tailored to particular loads, of to allow a collective flexibility in loading.

- 5 Figure 18 shows an alternative, open-ended, 'I'-section container module, in which an upper platform or roof 144, is supported by a central divider wall 145 upon a base platform 142.

The 'I'-section may be fabricated as a space frame, with selective in-fill panels, and/or by stiffened (say, corrugated) thin-wall panelling, in a box-girder assembly.

- 10 This sectional configuration, allows side-loading, from opposite sides - with separation of the loads on each side of the base platform 142.

As shown in Figure 19, multiple (open-ended) 'I'-section modules 141 may be stacked end-on, in aligned linear succession 140, to occupy a standard container footprint - and may be detachably or permanently secured for overall structural integrity.

15

Permanent or removable divider end walls 148 may be fitted between modules 141, for stiffening an end-on stacking sequence, as shown in Figure 20, and to separate load bays or cells 150 of each module 141.

20

For load security and protection, side-screen, curtain-walling 143 may be fitted, suspended between roof and floor platforms 144,142, as shown in Figure 19.

Figure 21 shows a diversity of space-frame and selective panel in-fill for load carriage flexibility.

Such an 'I'-section also lends itself to stable vertical stacking, one module upon another, where space allows - as shown in Figure 22.

- 25 Figures 23A through 23C, and companion sections 24A through 24C, show variant 'I'-beam sections, with a symmetrical version with centre wall in Figures 23A/24A and intermediate wall offset to one side or the other in Figures 23B/24B and 23C/24C.

Figure 25 shows a multi-deck 'I'-beam variant, and Figure 26 a multi-deck with differential deck span.

30

Component List

- 10 (open sided) container
 11 base deck
 12 roof
 13 end wall
 35 14 end wall
 15 intermediate support wall

	16	base frame rail
	17	end frame rail
	18	—
	19	roof frame rail
5	20	container with intermediate stacking bars
	21	(re-) movable bracing strut
	22	—
	23	local deck reinforcement
	24	suspension sling
10	25	reinforced corrugations
	26	lowered intermediate wall section
	27	suspension fitting
	28	tie cord
	29	suspension fitting
15	30	container profile
	31	suspension fitting
	32	roof bracing bars
	33	intermediate wall opening
	34	door closure for 33
20	35	bespoke intermediate wall corrugations
	36	slidable side curtain
	37	opposed sloping sides of corrugation
	38	(re-)movable end wall
	39	reel or drum load
25	40	container profile
	41	curtain track
	42	curtain runner
	43	intermediate lattice bracing
	44	side skirt
30	45	sliding track
	46	runner
	47	goose neck
	48	local corrugated intermediate wall section
	49	(re-) movable roof panel
35	51	flat intermediate wall end panel
	52	end wall opening
	110	(end-on) stacked array
	111	module
	112	base platform
40	114	upper platform
	115	(base) side wall
	116	(upper) side wall
	118	bracing (side) element
	122	(base) load
45	124	(upper) load
	128	(side) access
	131	joint (base platform - base side wall)
	132	joint (base side wall - upper platform)
	140	(container footprint) stacked array

5	142	base platform
	143	side-screen/curtain-walling
	144	upper platform
	145	central support wall
	148	divider wall
	150	load bay/cell

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A container comprising a base deck, supporting a roof, through an intervening support structure, located intermediate the base span, to create a unitary structural I-beam section, allowing side load access.
- 5 2. A container, as claimed in claim 1, with an intermediate wall located generally mid-transverse span, allowing load access from either side.
3. A container, as claimed in either of the preceding claims, with opposed end walls, and an intermediate base-to-roof support wall, spanning between, and bracing, the end walls.
- 10 4. A container, as claimed in any of the preceding claims, configured as multiple I-beam sections.
5. A container, as claimed in any of the preceding claims, configured as dual I-beam sections, stacked one upon another, with a common intervening deck level.
- 15 6. A container, as claimed in any of the preceding claims, combining diverse beam sections.
7. A container, as claimed in any of the preceding claims, combining diverse beam sections, in longitudinal succession.
8. A container, as claimed in any of the preceding claims, combining diverse beam sections, in a stacked array.
- 20 9. A container, as claimed in any of the preceding claims, with successive, mutually off-set, intermediate wall sections, providing a stepped intermediate wall configuration in plan, but retained overall I-beam section.
10. A container, as claimed in any of the preceding claims, with an intermediate support, comprising a corrugated wall panel section, spanning one or more selected portions, or the entire (longitudinal) span, of the container.
- 25 11. A container, as claimed in any of the preceding claims, wherein the end walls, base and roof are fabricated from corrugated sheet, either selectively locally, or over their entire span.
- 30 12. A container, as claimed in any of the preceding claims, with a corrugated intermediate support wall section, whose corrugations are orientated to span between base and floor, and secured to corrugated end wall panels, with transverse orientated corrugations.
- 35 13. A container, as claimed in any of the preceding claims, with an intermediate wall section configured as multiple individual members.



14. A container, as claimed in any of the preceding claims, with access apertures, windows or doorways, optionally closable by hinged or removable door or shutter panels, installed in the intermediate wall.
15. A container, as claimed in any of the preceding claims, with an intermediate wall portion reduced in height or depth, or omitted altogether .
16. A container, as claimed in any of the preceding claims, with supplementary local reinforcement or bracing, to accommodate suspension or support loads.
17. A container, as claimed in any of the preceding claims, with an access aperture incorporated in an end wall.
18. A container, as claimed in any of the preceding claims, with movable closure panels for end wall apertures.
19. A container, as claimed in any of the preceding claims, with a movable end wall portion, from intermediate support to corner post.
20. A container, as claimed in any of the preceding claims, with an end wall panel hinged about an intermediate support.
21. A container, as claimed in any of the preceding claims, with a movable end and/or side wall portion, carrying an associated corner post, with releasable end fittings, between base and roof, to form a corner door assembly.
22. A container, as claimed in any of the preceding claims, with selective (re-)movable local roof portions.
23. A container, as claimed in any of the preceding claims, with a (re-)movable roof portion, hinged about an intermediate support 'spine'.
24. A container, as claimed in any of the preceding claims, with base, intermediate, or end wall corrugations, 'multiplied', concentrated, or supplemented locally, at load concentration points, to provide additional stiffening and rigidity.
25. A container, as claimed in any of the preceding claims, with transverse roof bracing, for supporting a container, of the same or different standard, in a stack.
26. A container, as claimed in any of the preceding claims, with integrated or demountable wheeled running gear, for container mobility.
27. A container, as claimed in any of the preceding claims, with integrated or demountable roadway running wheels, for container mobility.



28. A container, as claimed in any of the preceding claims, with integrated or demountable rail or track running wheels or bogies, for container mobility.

29. A multi-deck variant of the container, as claimed in any of the preceding claims, with a plurality of mutually overlying or overlapping load
5 platforms or decks, with intervening support, allowing (load) access from (either) one side, at each of a plurality of different deck layers, and creating a structurally-integrated, unitary, multiple stacked I-beam configuration.

30. A container comprising a base deck, supporting a roof, through an intervening structure, located intermediate the base span to create a unitary
10 structural beam section, allowing side load access.

31. A container comprising a base deck, supporting a roof, through an intervening structural web, located intermediate the base span, to create a unitary structural webbed beam section, between base and roof flanges, allowing side load access.

32. A container, comprising a load deck, a plurality of posts and wall
15 portions, upon, or around, the deck, and upstanding therefrom, one or more posts, and associated wall portion, being (re-)movable, for deck or load access.

33. A container, as claimed in claim 32, with a movable post, coupled to a hinged wall support, with a pivot axis generally orthogonal to the deck.

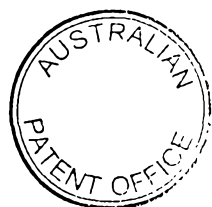
34. A container, as claimed in claim 32, with a movable post, carried by an end and/or side wall or frame portion, with a pivot axis intermediate the end or side span respectively.

35. A container, as claimed in claim 32, with a post, and adjoining end
25 and/or side wall portions, movable as an entity.

36. A container, as claimed in claim 32, with a movable corner unit, including corner post and adjoining residual end and side wall portions, carried together by a hinged mounting, from a pivot axis intermediate the end or side wall span, and supported by the deck.

37. A container, with a (re-)movable end and/or side wall portions, to
30 facilitate load or deck access.

38. A container, as claimed in claim 37 with a coupled end and side wall panel(s), hinged about an intermediate support.



39. A container, as claimed in claim 37 or 38, wherein a corner unit is integrated with movable end and/or side wall portion, carrying an associated corner post, with releasable end fittings, between base and roof.

5 40. A container substantially as described herein with reference to the drawings.

Dated this third day of August 2001

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Patent Attorneys for the Applicant:

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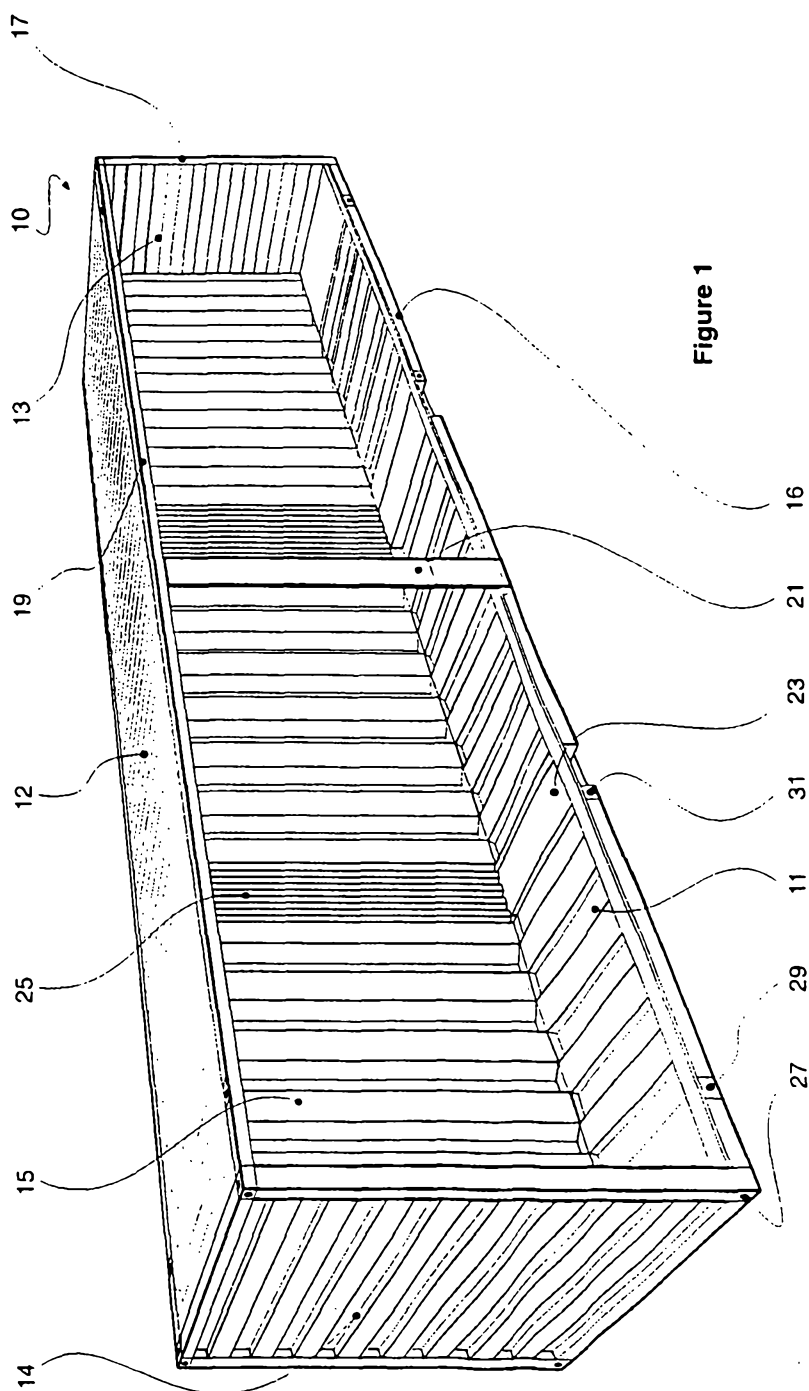


Figure 1

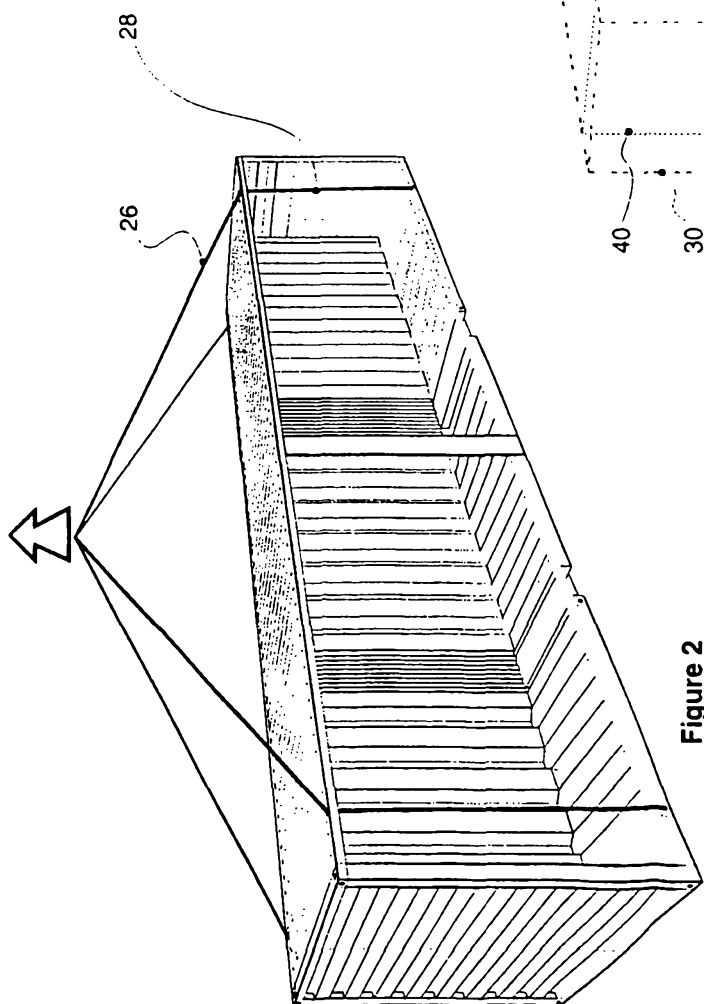


Figure 2

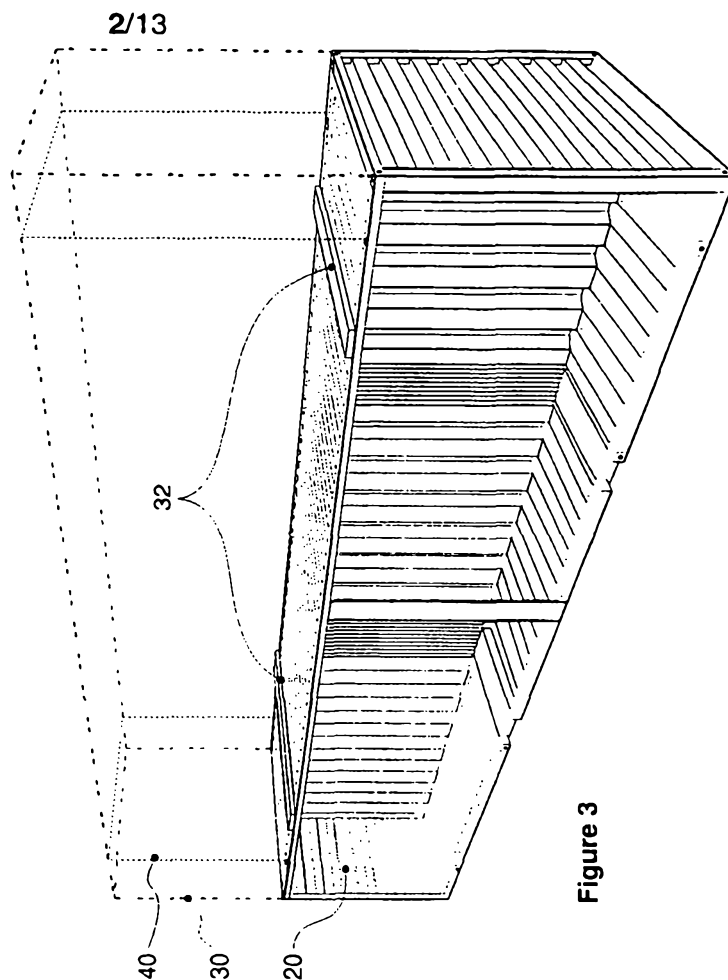


Figure 3

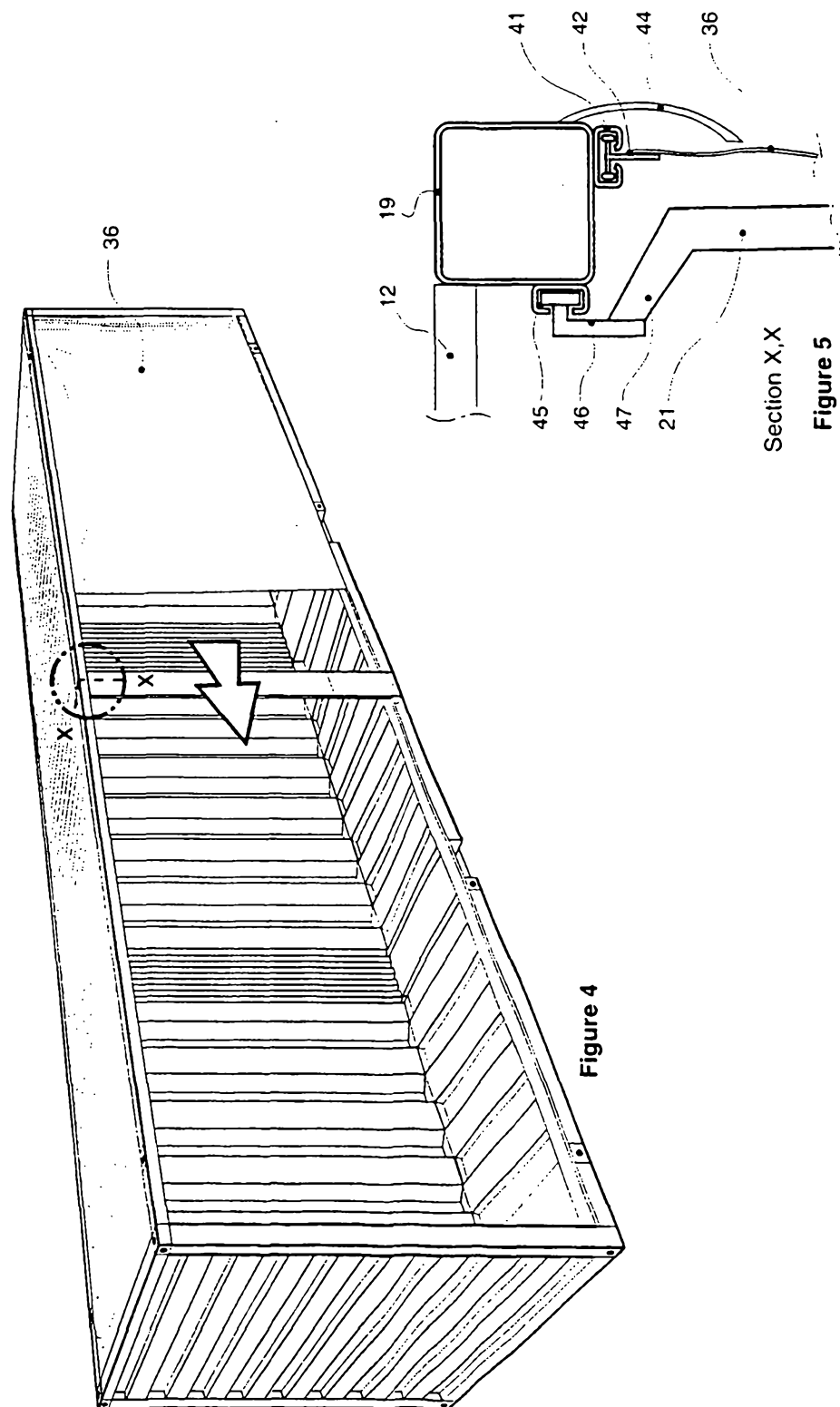


Figure 4

Section X,X
Figure 5

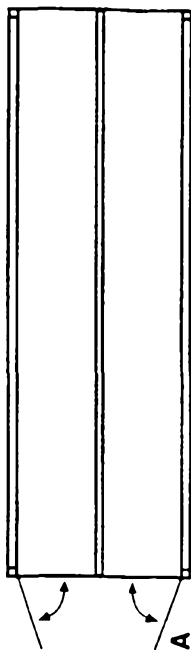
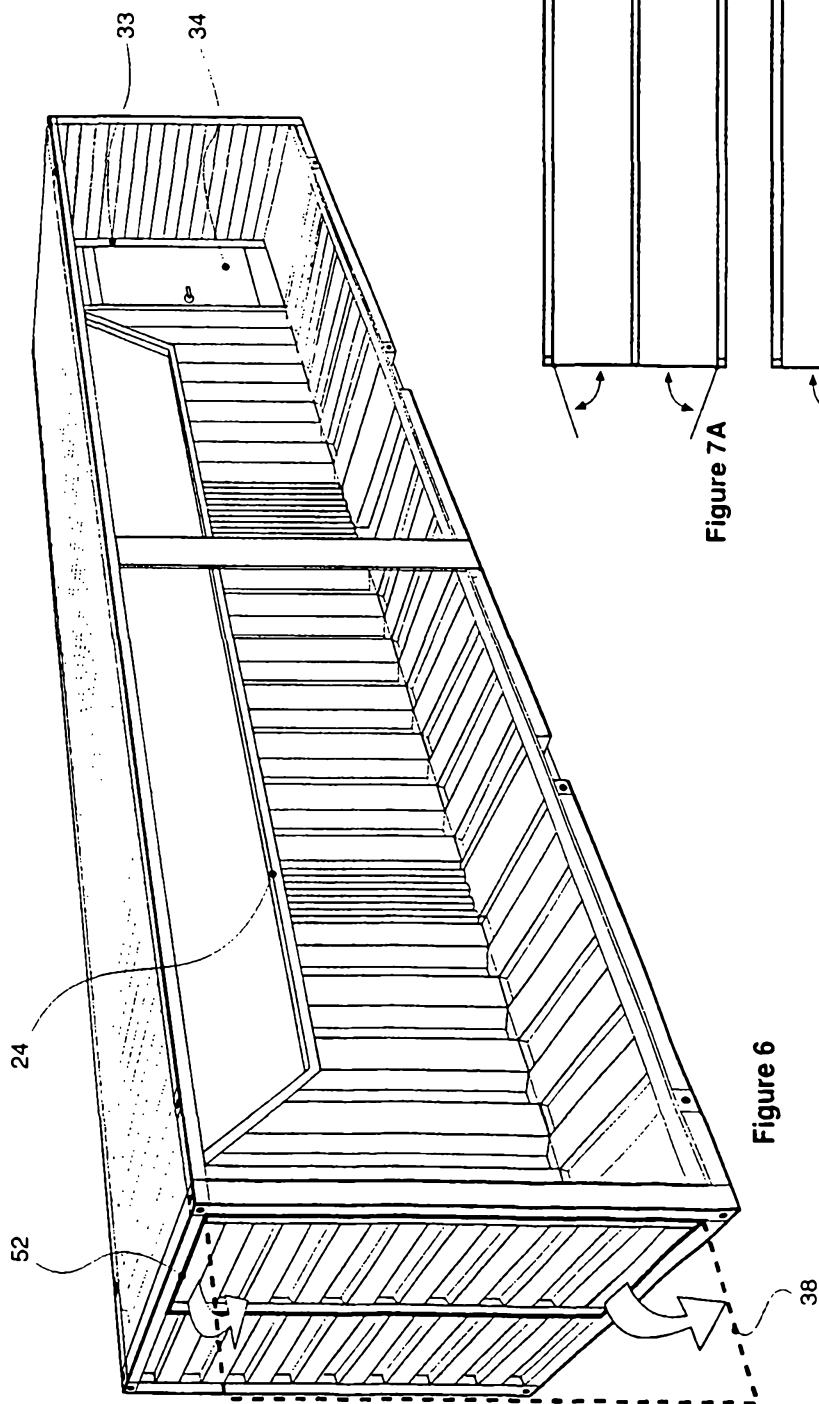


Figure 7A

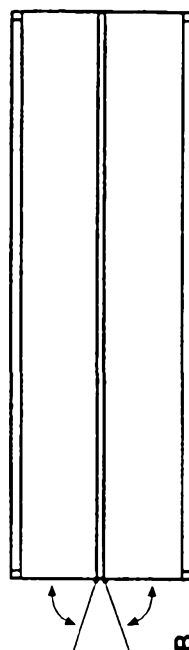


Figure 7B

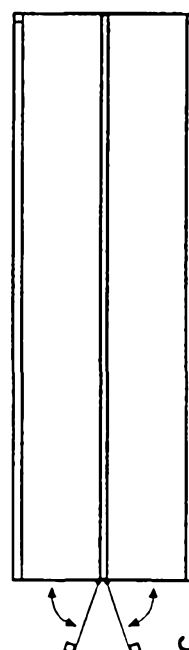


Figure 7C

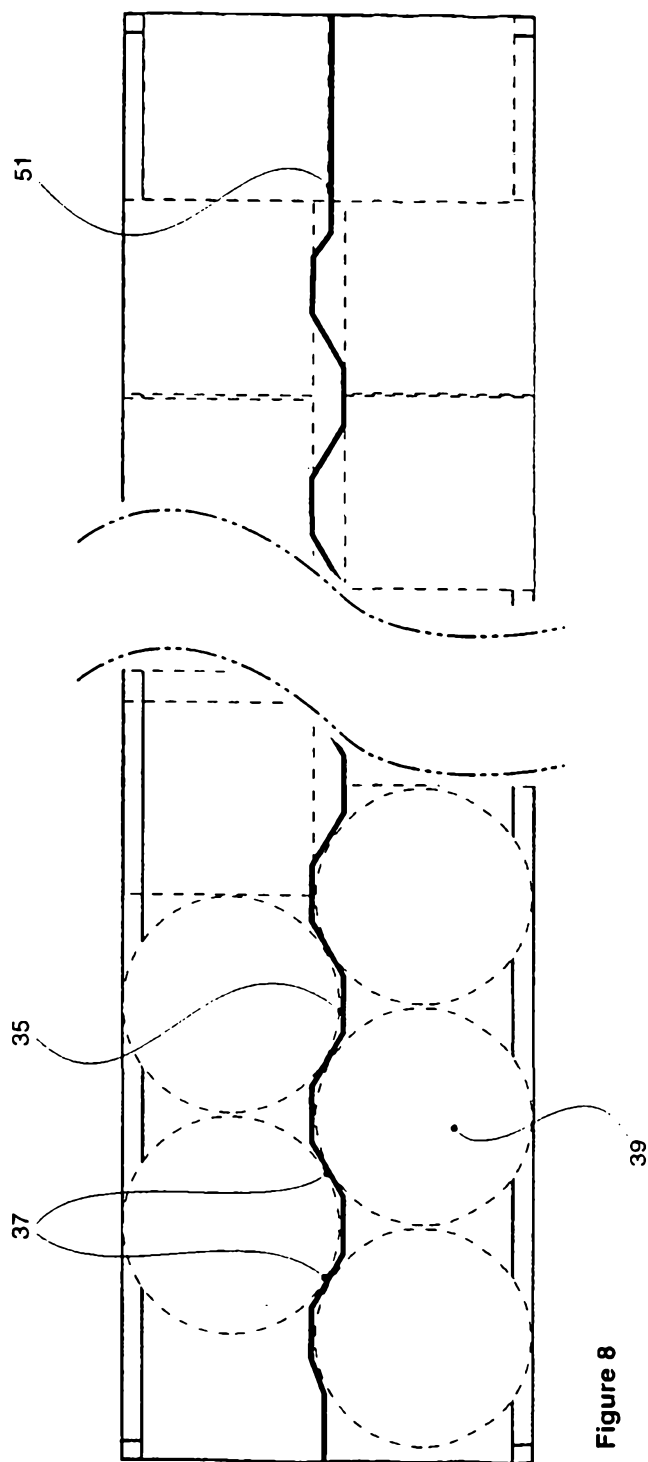


Figure 8

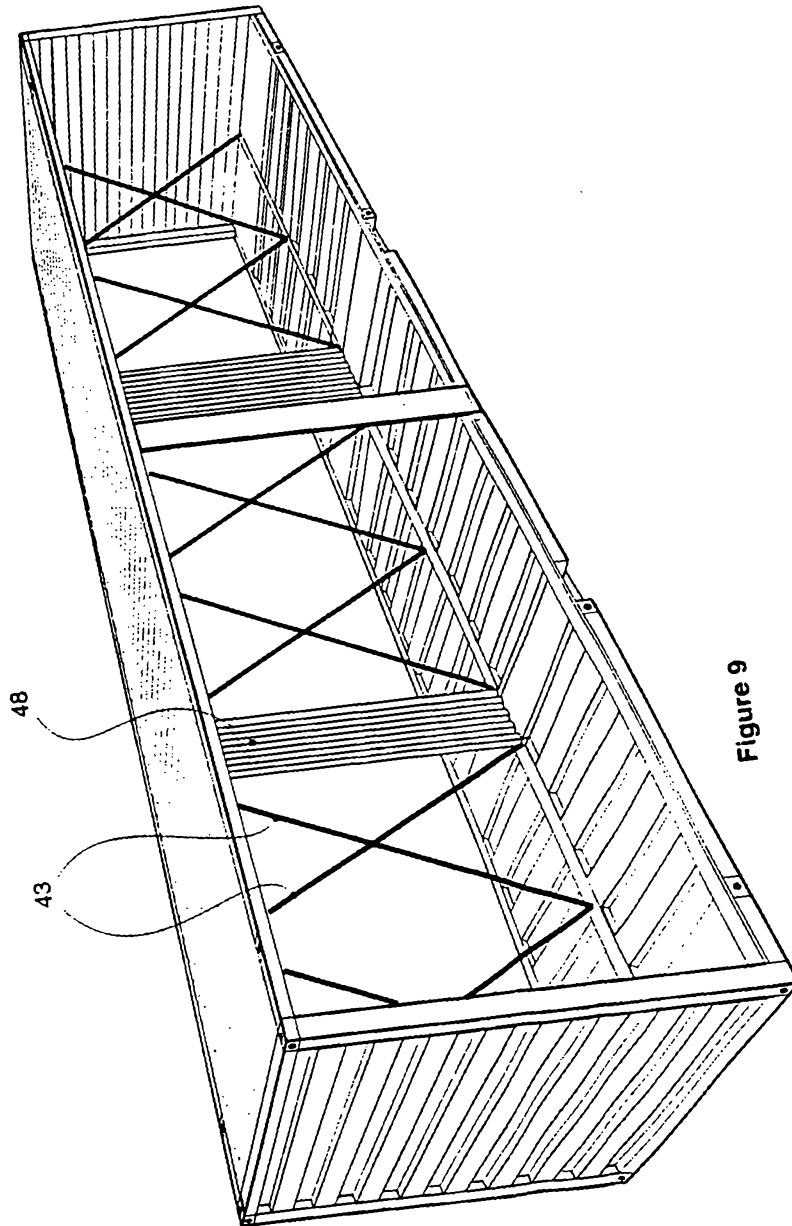
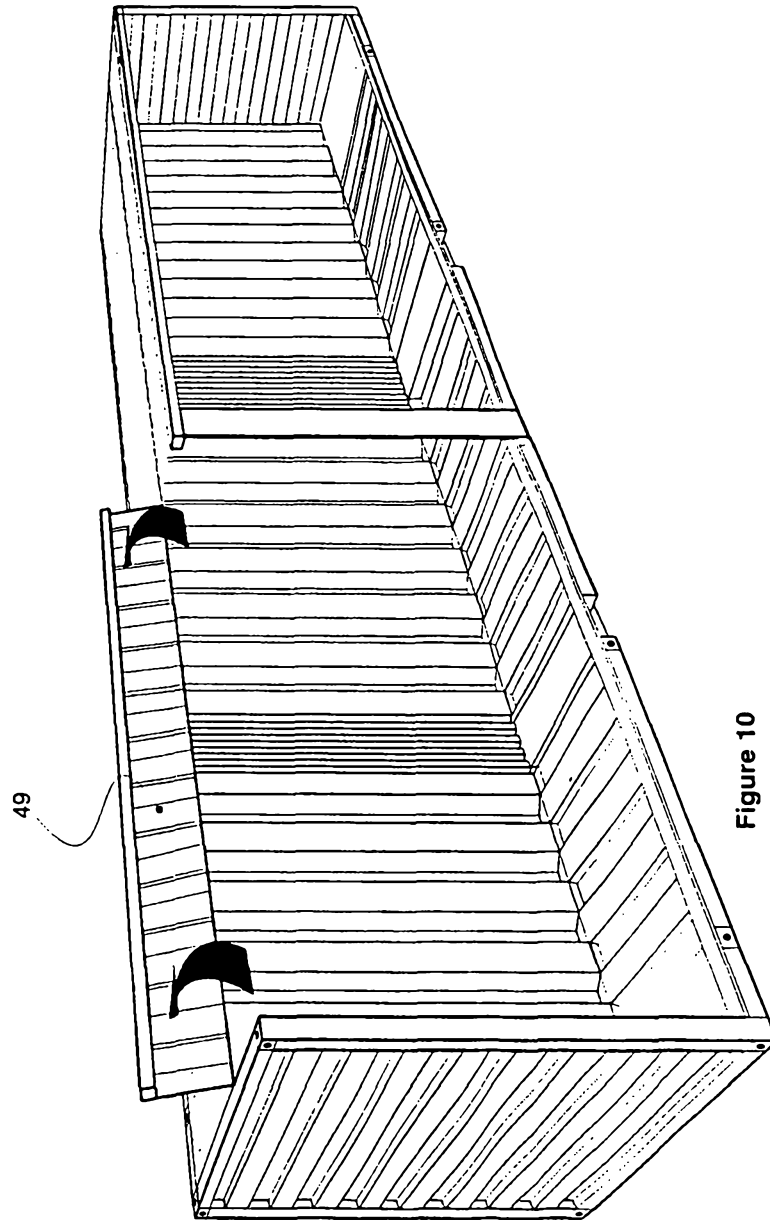


Figure 9



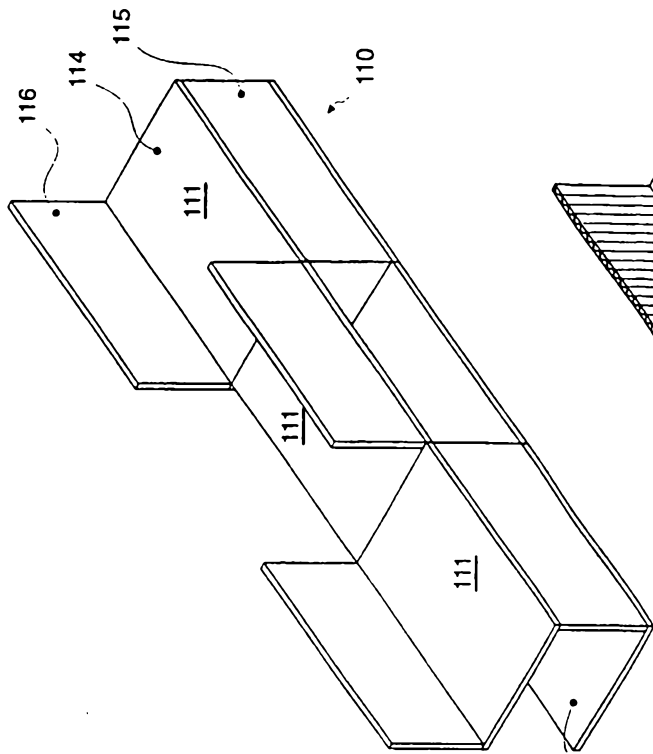


Figure 13

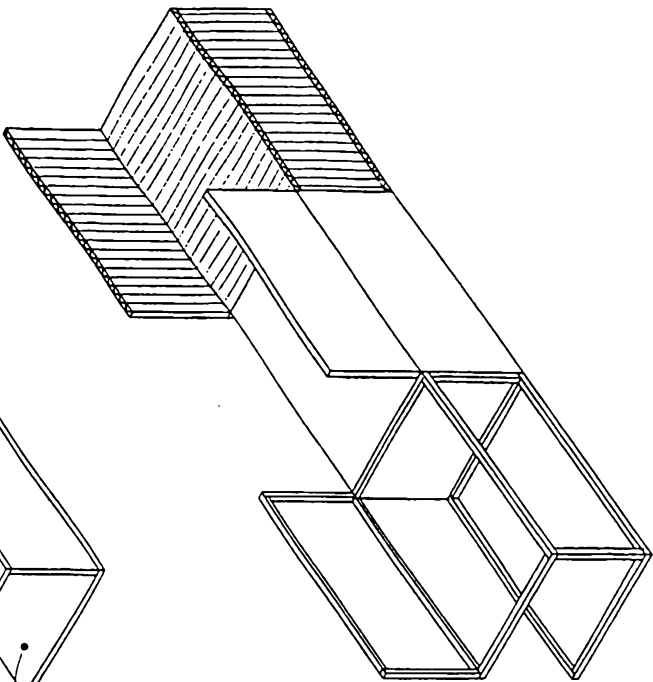


Figure 14

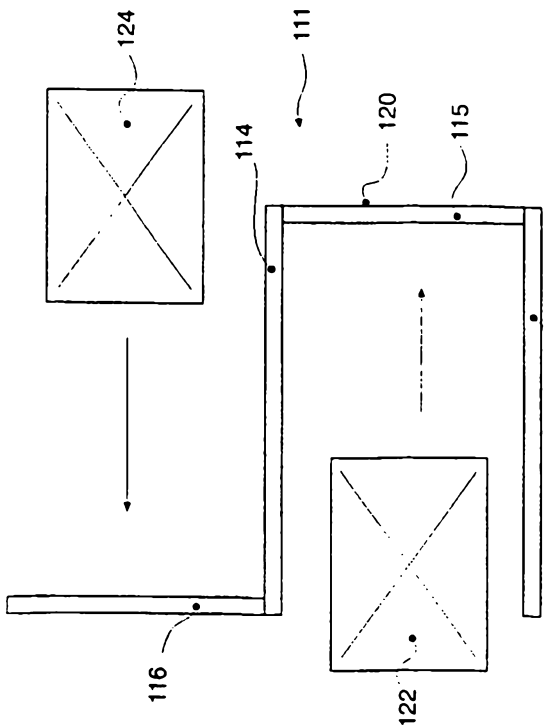


Figure 11

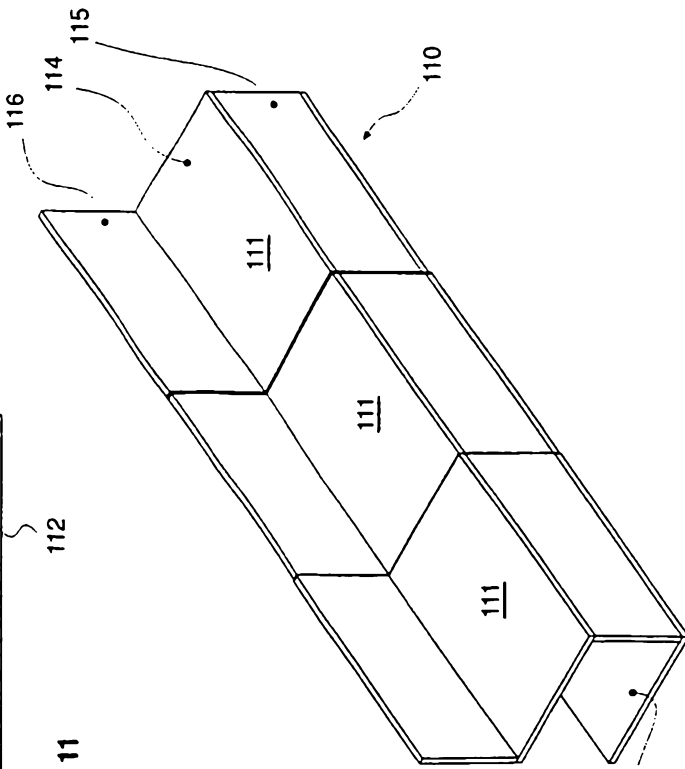


Figure 12

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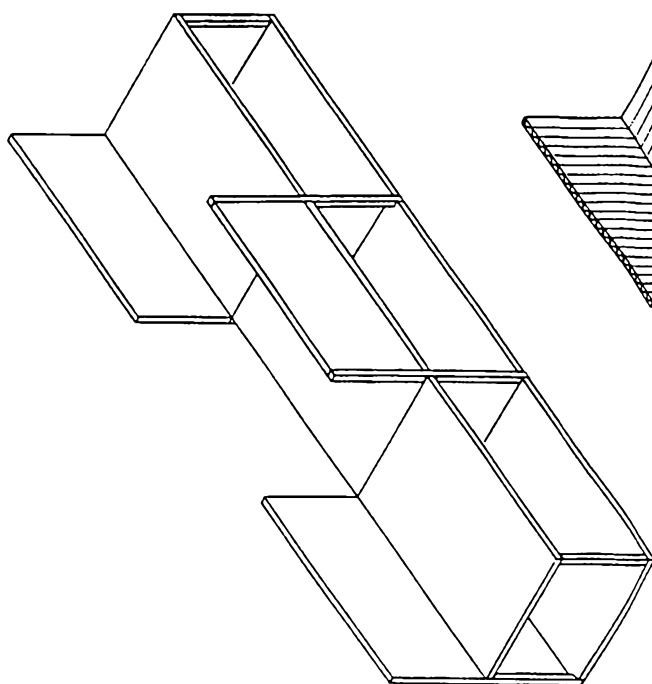


Figure 16

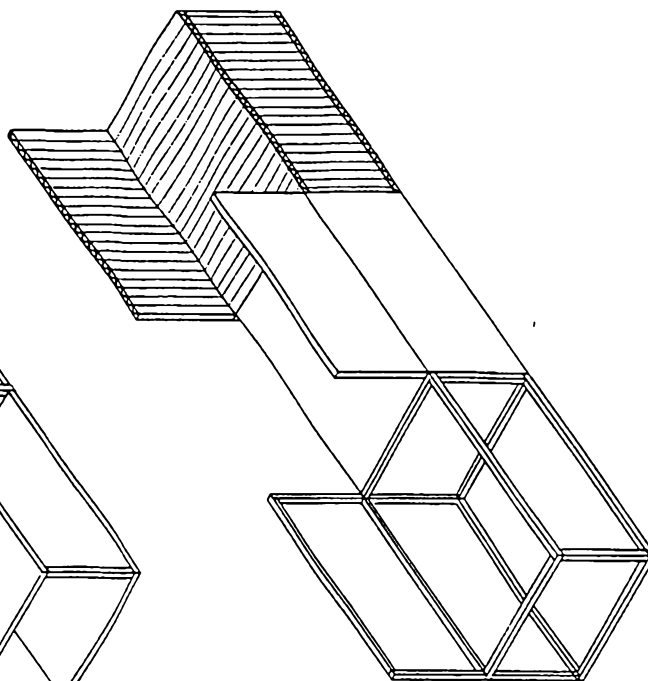


Figure 17

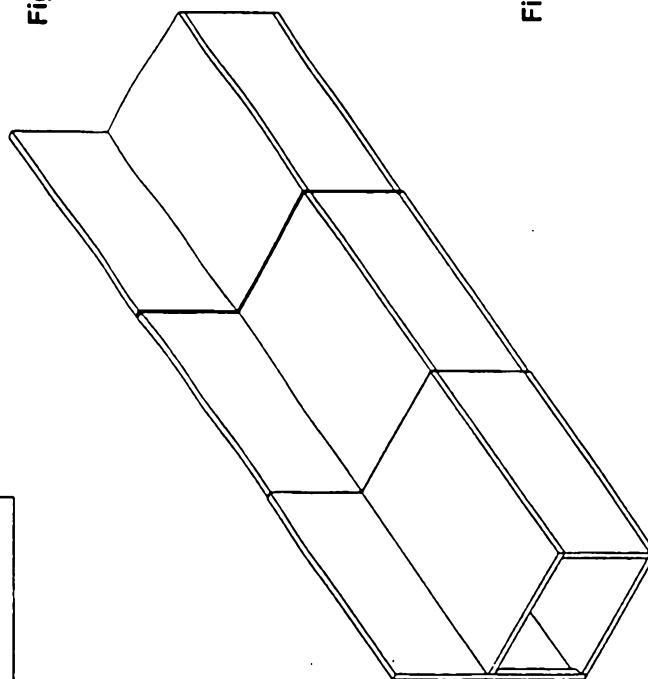


Figure 15B

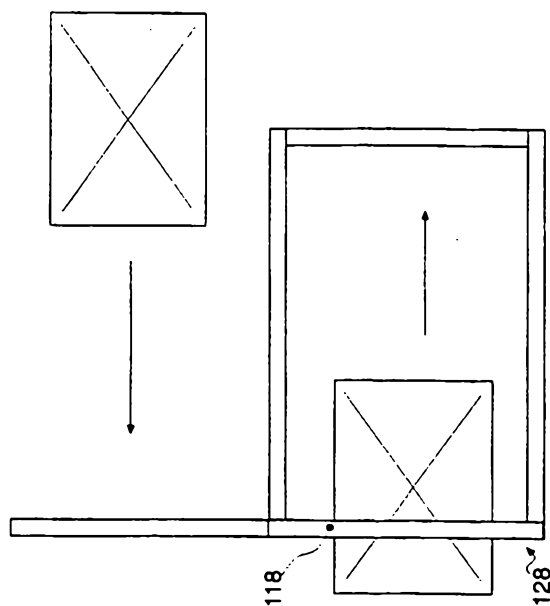


Figure 15A

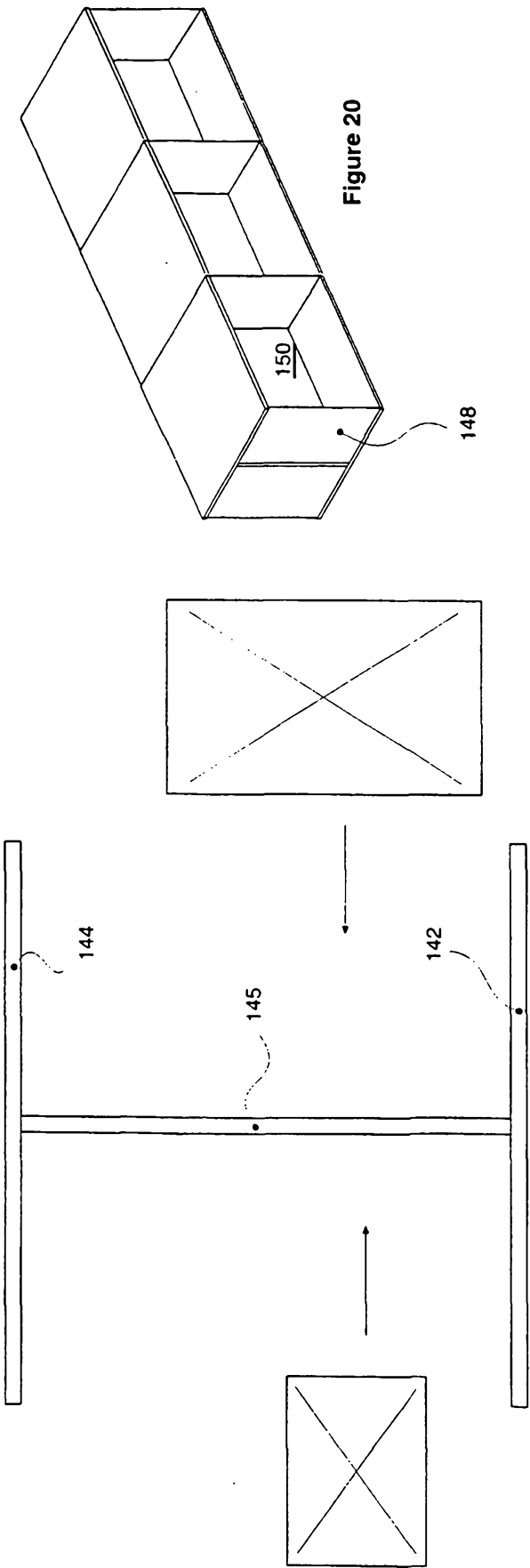


Figure 18

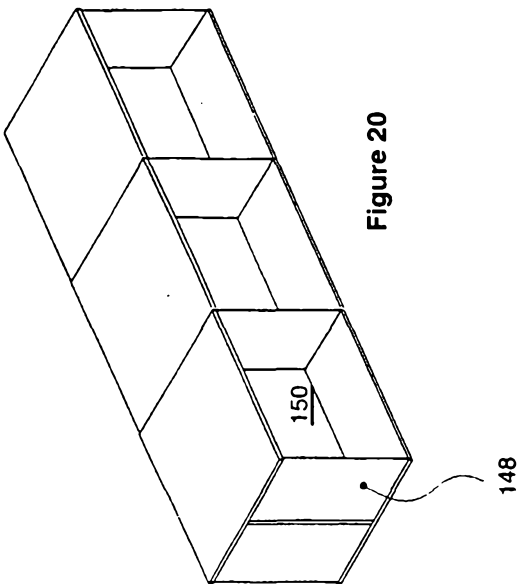


Figure 20

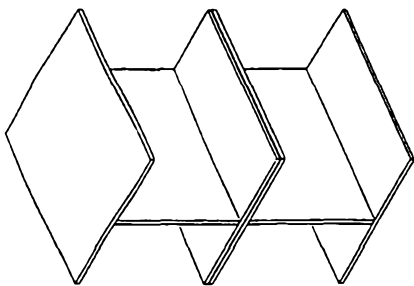


Figure 22

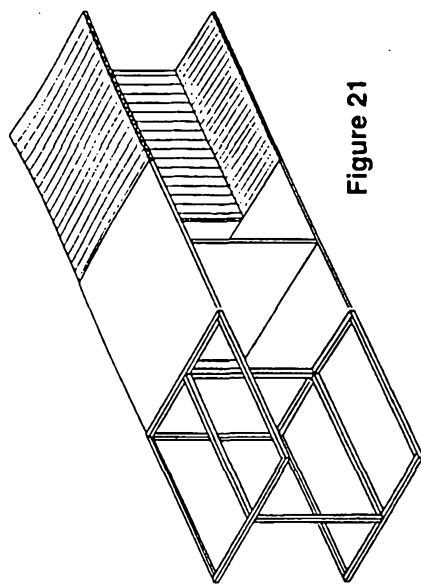


Figure 21

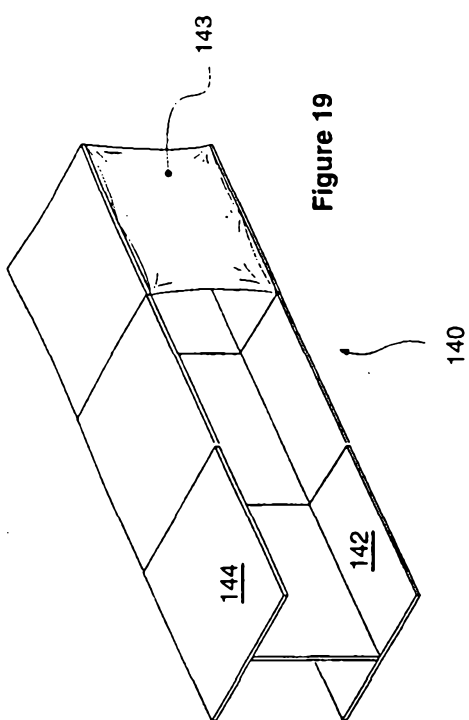


Figure 19

Figure 24A

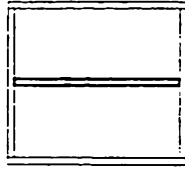


Figure 24B

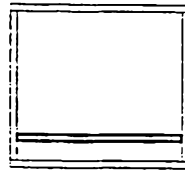


Figure 24C

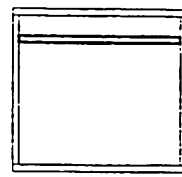


Figure 23C

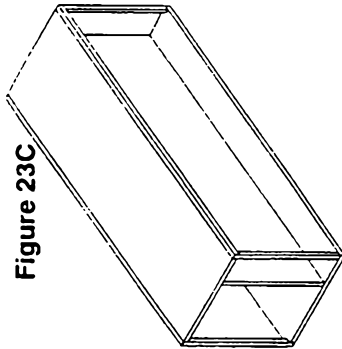


Figure 25

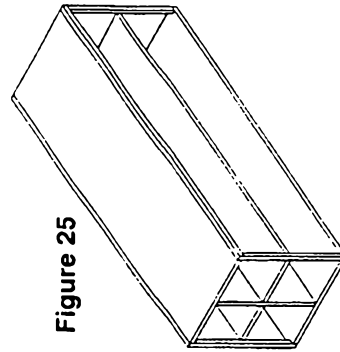


Figure 23A

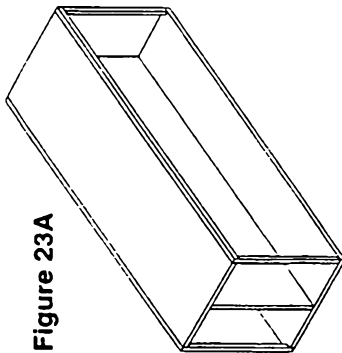


Figure 23B

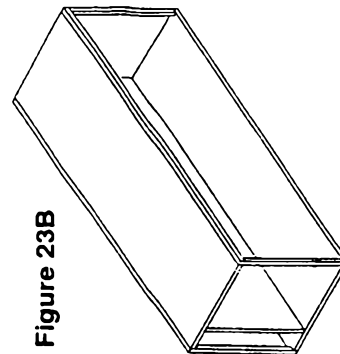
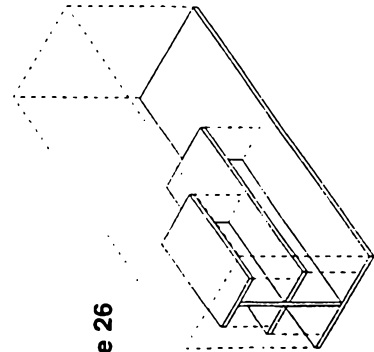


Figure 26



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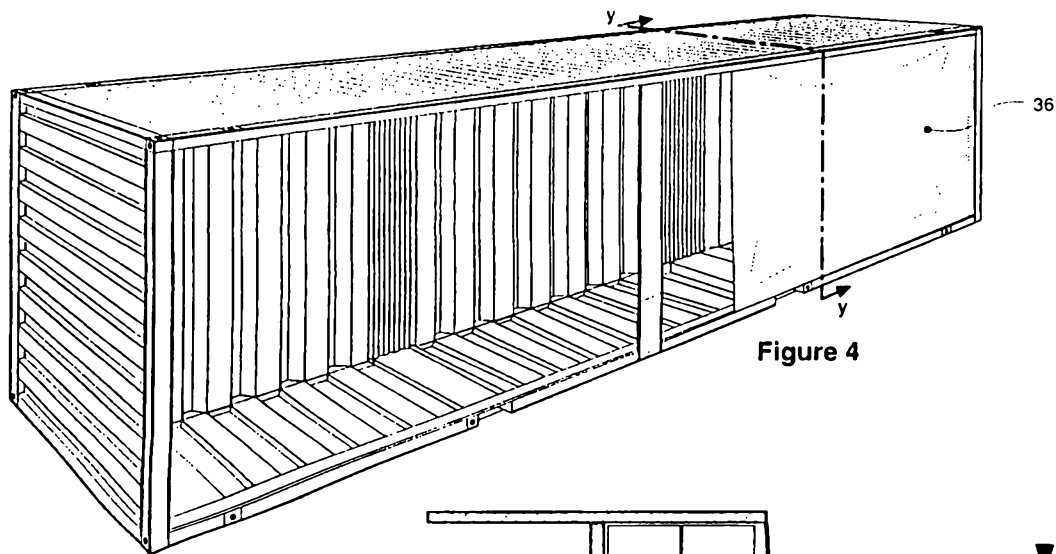


Figure 4

Figure 27 A

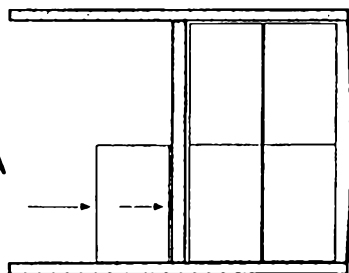


Figure 27 B

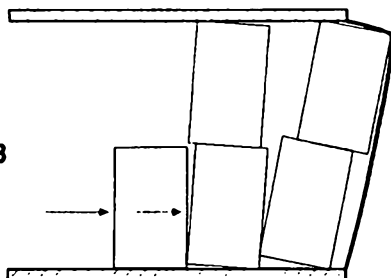


Figure 28 A

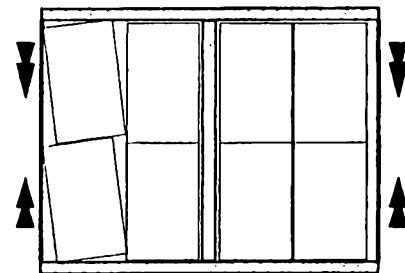


Figure 28 B

