

June 30, 1970

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3,517,849

LIGHTWEIGHT COLLAPSIBLE SHIPPING CONTAINER

Filed Nov. 29, 1968

2 Sheets-Sheet 1

FIG. 1

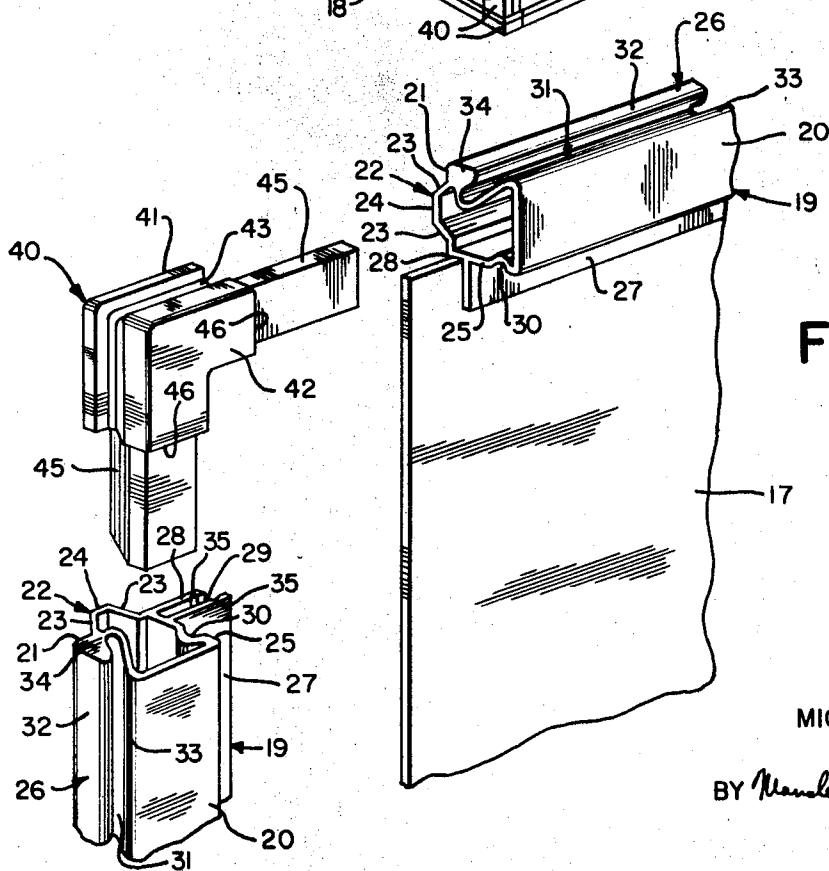
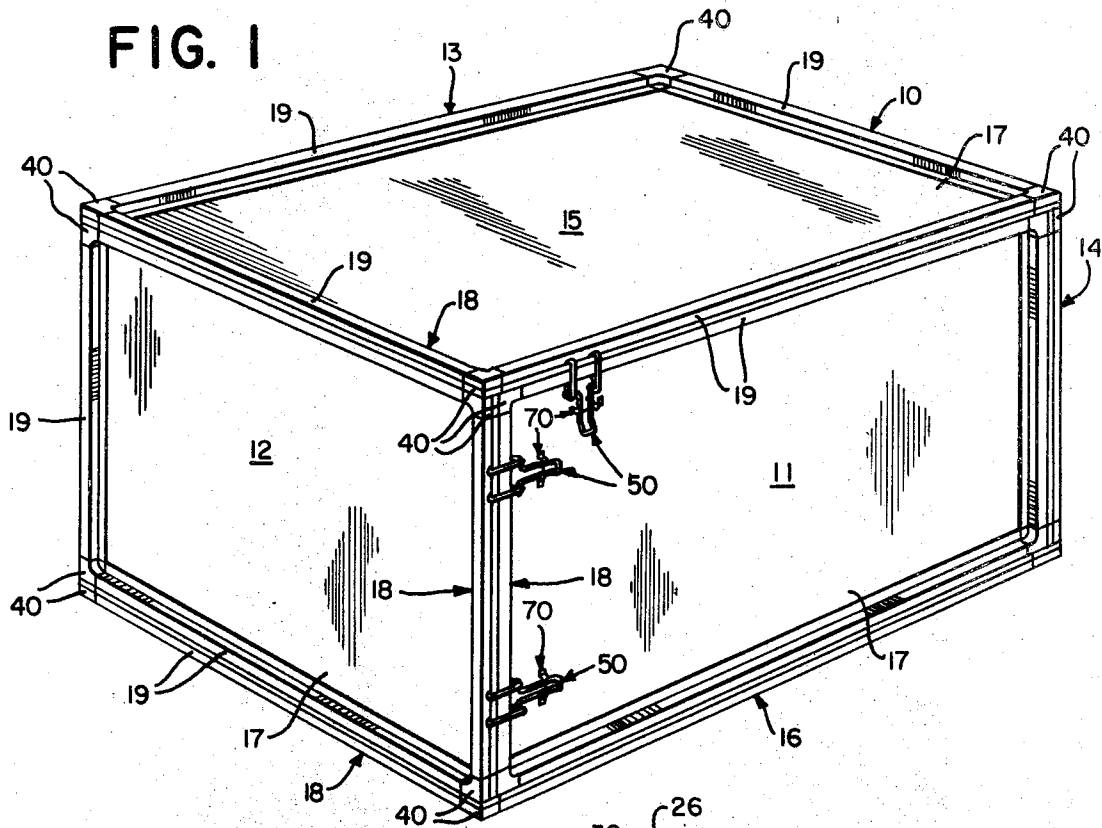


FIG. 2

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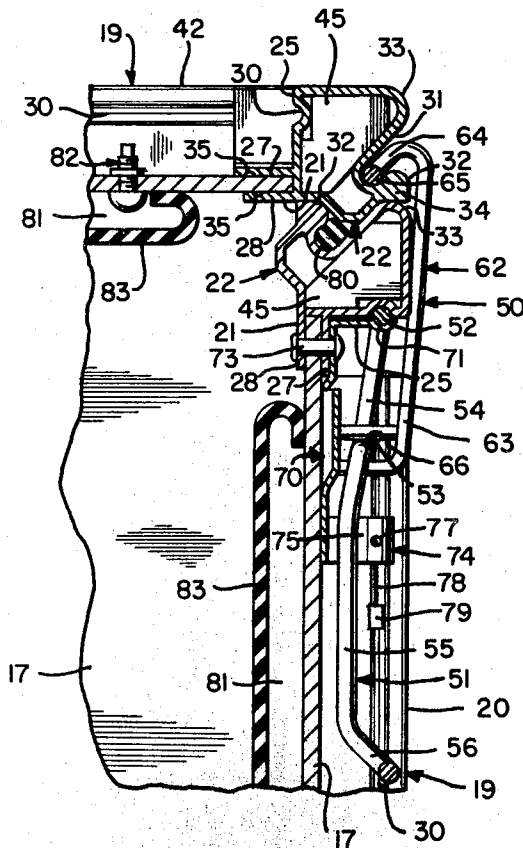


FIG. 4

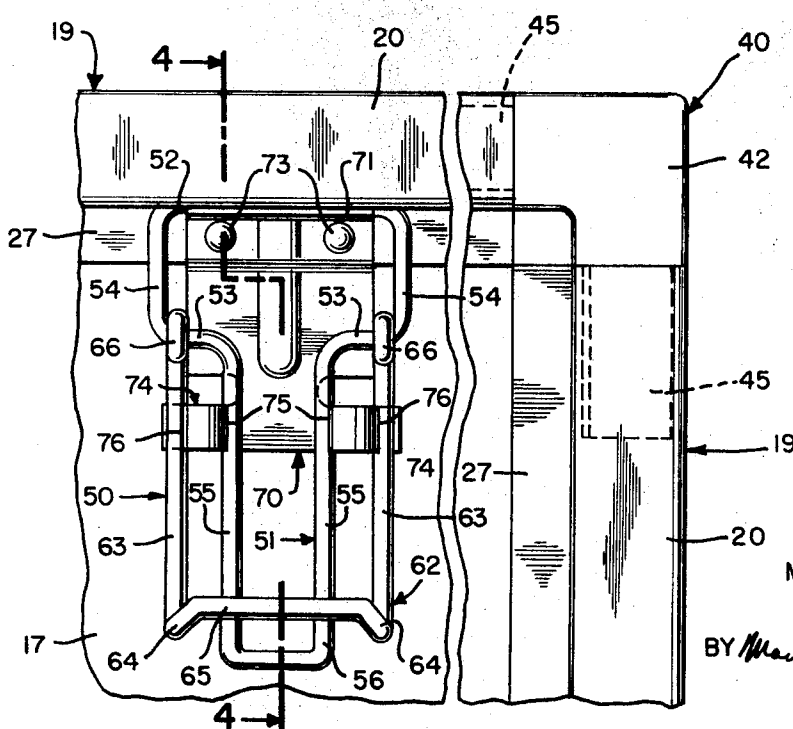


FIG. 3

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**LIGHTWEIGHT COLLAPSIBLE SHIPPING
CONTAINER**

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18 Claims

ABSTRACT OF THE DISCLOSURE

A lightweight, collapsible or knock-down container, having a high strength-weight ratio, erected without tools from a series of standardized wall sections is disclosed herein. Each wall section of the container comprises a plurality of framing rails which define a closed frame, which supports a rigid sheet of lightweight, durable paneling. The cross section of the framing rails is especially configured to mate with itself, i.e., it is hermaphroditic. The appropriate mating of two of the framing members is the first step in forming a unique edge joint of the container without the use of tools. The edge joint is rigidly established by swinging toggle clamp members which firmly lock together the hermaphroditic mating framing members of adjacent wall sections. When desired, the new container may be disassembled or knocked down, also without tools, for storage in minimum space, by releasing the toggle clamp members by a simple pivoting movement. Spring keeper elements hold the toggle clamps in predetermined relation to the wall sections in both the operative and inoperative positions of the toggle clamps.

Background of the invention

With the ever increasing investments by airlines, freight forwarders, and others in automated and semi-automated airline terminals, sophisticated loading equipment and the like, the amount and types of cargo shipped by air has expanded to include almost every commodity and manufacture consumed by industry and the general public. needless to say, the air freight industry has sought lighter and stronger containers to promote more efficient and cheaper air shipments. In addition to seeking high strength-weight ratios (and concomitant reduced tare weight-cargo volume ratios) in containers, the industry has striven to develop a container which may be easily collapsed and easily erected; which may be easily packed and easily unpacked; which provides a meaningful deterrent against pilferage; and which is intermodal (may be readily transferred among railway cars, trucks, ships, etc.).

The field of containerization has striven to keep pace with the rapid growth of air freight and with the containerization effort of the air cargo industry. As part of the effort, the air transport industry has developed a family of standard shapes for containers. The use of these "standard" containers and containers having low tare weight-cubic content ratios is promoted by offering shippers special discounts.

While the freight industry has employed a wide variety of reusable and knock-down containers, very few, if any of them, have been ideally suited for air freight applications. That is to say, commercially available containers generally require substantial weights of material and/or expensive and complicated construction to achieve the ruggedness and strength necessary for adequate packaging protection of goods, for durability, and for collapsibility.

Summary of the present invention

The present invention provides a new and improved collapsible container structure of especially light weight

in comparison to earlier containers of comparable capacity and of strength substantially equal to or greater than previously available containers of comparable capacity. The new containers may be simply assembled by unskilled laborers from standardized and interchangeable wall sections, without the use of tools, and conversely they can be disassembled and completely collapsed for storage, without the use of tools, by virtue of a new and improved framing rail and edge joint construction.

More specifically, each of the wall sections for the containers of the invention is comprised of a rigid aluminum frame made from a hollow aluminum extrusion or rail having a unique hermaphroditic cross section. The configuration of the framing rail cross section is such that it is generally four-sided and includes a planar wall, a wedge-shaped key opposite the planar wall, a bi-functional, canted locking slot on a third wall, and a shallow groove on the fourth wall. An extension of the first wall together with a projecting flange from the fourth wall cooperate to form a panel retaining channel.

In accordance with the invention, predetermined lengths of the new hollow extrusion may be cut at right angles to its length and then connected together at predetermined angles to form closed frames by the use of angular corners which are appropriately shaped to fit within the hollow portions of the extruded frame members and to define the angle of junction. As will be understood, each wall section for the new containers may be fabricated by framing an appropriately shaped panel of rigid lightweight material such as reinforced corrugated board, plywood, aluminum sheets sandwiched about a core, etc.

In accordance with a very important aspect of the present invention, at least the side wall sections will carry pivotable toggle clamp members, which are adapted to clamp wall sections together in a predetermined rigid, container edge joint generally established by the mating of the key portion of one wall section frame rail with the bi-functional slot of an adjacent wall section frame rail.

To provide greater flexibility to a collapsible container built up from the wall sections of the present invention and to provide both cushioning and internal dunnage for less than full volume cargo shipments, one or more of the new wall sections employed in the erection of a container include an expandable internal wall of a suitable elastomeric material. This internal wall, in the form of a rubber sheet or rubber bag, for example, is attached to a wall section of the container to provide a closed air chamber into which air may be introduced through a valve disposed in the paneling of the wall section to inflate the closed chamber and thereby reduce the effective volume of the container. It will be appreciated that this inflatable dunnage will help to hold packaged cargo firmly and safely in place by absorbing impact and will enable shippers to quickly and safely move shipments of less than full container volume.

For a more complete understanding of the invention and a better appreciation of the attendant advantages, reference should be made to the following detailed description taken in conjunction with the accompanying drawings.

Description of drawings

FIG. 1 is a perspective view of an intermodal, collapsible container embodying the principles of the invention;

FIG. 2 is an exploded, perspective view of the elements required to form a corner of a wall section for the new container;

FIG. 3 is a plan elevational view of a corner of a wall section of the new container showing the toggle clamp members in an inoperative position; and

FIG. 4 is a cross-sectional view of the new container edge joint taken along line 4—4 of FIG. 3 and showing

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nested hermaphroditic frame rails locked together by a toggle clamp member in accordance with the invention.

Description of preferred embodiment

Referring initially to FIG. 1, a preferred form of the container 10 of the invention comprises a front wall section 11, an end wall section 12, a rear wall section 13 (not visible in FIG. 1), an end wall section 14, a top wall section 15, and a bottom wall section 16 arranged in the shape of a rectangular prism. It is to be understood, of course, that containers embodying the inventive concepts may assume any of the other standard shapes currently used or which may be developed in the future for air freight.

In accordance with the invention and as shown in FIG. 1, each of the wall sections 11-16 of the container is formed from a panel 17 of durable, lightweight, substantially rigid sheet material, which panel is cemented into a circumscribing frame 18 for support and stiffening. In accordance with the principles of the invention, each of the frames 18 is built up from a standard or universal hollow frame rail 19 (FIG. 2), having a unique tubular cross section especially designed to perform a multiplicity of functions. Advantageously, the frame rails are of extruded aluminum construction.

Specifically, the new framing rail member 19 is adapted to be self-mating with a rail member of identical cross section when rotated 90°, i.e., it is hermaphroditic; it is adapted to hold and to stiffen the wall panel material 17 in a flat plane recessed from the periphery of the finished container; it is adapted to provide a groove in which a pivotable toggle clamp may be disposed in operable association therewith; it is adapted to receive a sealing gasket between itself and a mating frame rail; and it is adapted to be rigidly locked to a mating frame rail by a pivotable toggle clamp.

More specifically and with reference to FIG. 2, the hollow frame rail 19 of the invention includes an outer substantially planar wall 20 and a planar inner wall 21 having a wedge-shaped key 22 projecting centrally therefrom. The key 22 has convergent sides 23 and a flat face 24. The inner and outer frame rail walls 20, 21 are spaced from one another by a panel retaining wall 25 and a locking wall 26. As shown, the retaining wall 25 includes a projecting flange 27 which is parallel with an extension or flange 28 of the inner wall 21. The flanges 27, 28 cooperate to define a channel 29 of sufficient width to receive and to securely hold the container wall sheet material 17. The flanges 27, 28 include grooves 35 at their inside surfaces, which grooves provide additional surface area for establishment of the cement bond between the channel 29 and the paneling 17 and which grooves prevent bonding material (usually epoxy) from flowing beyond the flanges 27, 28. The panel retaining wall 25 also includes a shallow groove 30 which extends longitudinally parallel to the axis of the frame rail.

The locking wall 26 of the frame rail includes a canted, deep slot 31, the divergent mouth of which is defined by spaced lands 32, 33 which are generally shaped to matingly receive the wedge-shaped key 22. As shown, the land 33 is formed generally by a rounded hollow corner 33' connecting the rail walls 20, 26, while the land 32 is formed by a solid locking lip 34 which defines one wall of the slot 31. In accordance with the invention, the rounded edges 33' are the outermost edges of the erected container and contribute to safety in handling of the erected container and to the even distribution of shock forces. As will be understood, the slot 31 is deep enough and sufficiently canted to receive and to hold the hooked locking portion of a toggle clamp, as will be described in greater detail hereinafter.

The individual lengths of frame rails 19 required to form a frame 18 are advantageously cut from pieces of stock by 90° cuts and are connected together to form

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frame corners by an angle piece or frame connector 40 having a central portion with external contours which are generally flush with external contours of the rails with one exception. The inner face 41 of the frame connector 40 is planar and is flush with the wall 21 (and not the key 22) for reasons to be discussed hereinafter. Planar surfaces 42 and slot 43 of the connector 40 are generally flush with the slots 31 and outer wall surfaces 20 of the rails 19 which are to be joined to form a frame 18. A pair of solid legs 45 having cross sections generally similar to the hollow portions of the tubular rails 19 project outwardly from the central portion of the connector and mutually define the angle of juncture of the connector. In the illustrated preferred embodiment in which each of the container wall sections is rectangular, the corner connector 40 will, of course, be L-shaped or perpendicular. As will be understood, shoulders 46 are formed where the central connector portions are joined with the legs 45. Advantageously and as shown in FIG. 2, the connector 40 is of solid construction, although a hollow connector may be employed with efficacy in some applications.

As an important aspect of the invention, the surfaces 41 of the frame corner connector 40 are suitably recessed in relation to the keys 22 to allow framed wall sections (for example, sections 11, 12 in FIG. 1) to be mutually butted in the formation of the completed container without interference from the keys.

The corner of a framed wall section may be simply completed in accordance with the invention by telescoping the hollow frame rails 19 over the legs 45 and into contact with shoulders 46 formed in the corner 40. Permanence and absolute rigidity of the established corner may be ensured by applying a thin coat of epoxy cement to the surfaces to be joined before they are telescoped. Of course, other adhesives or suitable mechanical fasteners may be employed in lieu of epoxy cement, if desired.

From the foregoing, it will be apparent that container wall sections of all sizes and shapes can be easily fabricated from readily available lightweight sheet material, such as plywood or sheet aluminum, laminated to a honeycomb core.

As a most important aspect of the invention, completed wall sections may be quickly, simply, and efficiently connected together, without any tools whatever, to form a rigid container 10 through the employment of novel toggle clamps 50 carried by selected ones of the wall sections. For example, in a rectangularly prismatic container having 42" x 58" front and rear walls and 42" x 42" end walls, three clamps would be carried at the top and bottom edges of the front and rear walls and two clamps would be carried by the side edges of the front and rear walls and by the top and bottom edges of the end walls, a total of twenty-eight clamps. However, for the sake of brevity of description and simplicity of illustration, only a few of these toggle clamps 50 have been shown in FIG. 1. As a specific aspect of the invention, the clamps 50 are held in a recessed relation within the periphery of the container by a keeper member 70.

More specifically and in accordance with the principles of the invention, each toggle clamp assembly 50 includes an operating lever 51 and pivoting locking member 62, both of which are formed from heavy wire which has been appropriately bent into the illustrated shapes. As shown in FIGS. 3 and 4, the lever 51 is of closed shape and has a fulcrum rod portion 52 spaced from a pair of pivot axis portions 53 by parallel leg portions 54. An elongated handle 55 having a slightly upturned distal end 56 is connected to the pivot portions.

The locking member 62 includes a pair of elongated parallel locking portions 63, the hooks 64 of which are interconnected by a transverse locking bar 65. The free ends of each of the locking portions 63 are bent back upon themselves and around the pivot axis portions 53 of

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the operating lever 51 to form loops 66 and to effectively articulate the locking member 62 to the lever 51 to form a locking clamp assembly 50. As shown, each of the loops 66 is in the nature of a stabilizing foot for the clamp assembly 50.

The toggle clamp assembly 50 is associated with each wall section by placing the fulcrum rod 52 in the shallow groove 30. Thereafter, the hooks 64 are swung up, over, and loosely into the canter locking slot 31 of an appropriately abutted frame rail by pivoting the lever 51 outwardly from the plane of the paneling 17. The subsequent pivoting of the operating lever downward and towards the plane of the wall panel will pull the locking bar 65 tightly into the locking slot 31 and will firmly and rigidly clamp the abutted frame rails, one to the other, between the locking bar and the fulcrum bar. As a very important aspect of the invention, each pair of abutted, clamped, hollow tubular rails constitutes a very strong (but lightweight) load-bearing member, i.e., the four pairs of horizontal rails act as four load-bearing beams, while the four pairs of vertical rails act as four load-bearing columns. Thus the containers 10 may be readily, safely stacked upon one another or otherwise externally loaded or stressed.

In accordance with the invention, the keeper member 70 is fabricated of tempered spring steel and is provided to maintain the toggle clamp assembly in permanent association with the wall sections and to maintain the elements of the assembly 50 in either of two positions shown in FIGS. 3 and 4. More specifically, the keeper includes a groove-like portion 71 which cooperates with the groove 30 on the frame rail 19 to define a substantially closed passage in which the fulcrum rod 52 is disposed. As shown in FIG. 4, the keeper member 70 is attached by rivets 73 or is otherwise suitably secured to the wall section to maintain the assembly 50 in a fixed longitudinal position with respect to each frame rail but in a manner which accommodates free swinging of the lever 51 and locking member 62 toward and away from the plane of the wall panel. Additionally, the keeper member includes an integral pair of U-shaped spring clip members 74, the inner surfaces 75 of which are adapted to engage and hold the operating lever 51 substantially flat against the wall panel, and the outer surfaces 76 of which are adapted to hold the locking member 62 parallel to the plane of the wall panel, as shown in FIG. 3. Accordingly, when the toggle clamp assembly 50 is not in use, it will be held restrained from movement and maintained in a recessed relation beneath the outer periphery of the wall section (the plane defined by the outer surfaces of the frame rails). On the other hand, when the locking member 62 is disposed in a locking relation (FIG. 4), the inner surfaces of the clips 74 will maintain the handle portion 55 of the lever against the wall panel, thereby securely maintaining the container edge joint of the container 10 through the clamping of abutted wall sections and preventing the accidental unlatching of the locking member 62.

As a more specific aspect of the invention, each of the spring clips 74 includes an aperture 77 through which a sealing wire 78 may be threaded after the erection, filling, and closing of the container 10. The wire 78, when sealed across the gap between the clips 74 and over the handle 55 by an integral seal 79, will prevent unauthorized opening or tampering with the container and will provide further assurance against accidental unlatching of the locking member by pivoting of the lever 51.

As shown best in FIG. 4, the key 22 of the frame rail of one wall section nestingly or matingly fits into the mouth of the slot 31 of the frame rail of an adjacent wall section. The planar surfaces adjacent the key 22 abut the lands 32, 33 adjacent the slot 31 in flat face-to-face contact, in a manner whereby the outer surfaces 42 of the frame rail members are disposed outwardly of the wall panels 17. These surfaces 42 are definitive of the outer periphery of the container, as will be understood.

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In some applications, where it is desirable or necessary, an elastomeric sealing member or gasket 80 may be disposed in the bottom of the slot 31 to seal the formed container edge joint, which is, of course, rigidified and completed by clamping the nested frame rails together by the locking toggle action of the clamp assembly 50, described hereinabove. Thus it should be appreciated that, in accordance with the principles of the invention, an entire container can be built up or knocked down in a matter of minutes without any tools merely by latching and unlatching a series of toggle clamps.

The sequence of erection of a complete container is as follows: The bottom wall section 16 is disposed with the keys 22 of its frame 18 facing upwardly. The rear wall section 13 is then locked to the side wall section 12 in perpendicular relation thereto (with the key 22 and slot 31 nested in the manner shown in FIG. 4) by hooking the locking members carried by the rear wall section into the locking slot in the frame of the side wall section and then clamping the abutted frame rails together through the pivoting movement of the operating levers, thereby forming a corner "post" or load bearing column of the container. Thereafter, the joined sections 12, 13 may simply and accurately be located over the keys of the bottom wall section 16 and connected thereto by the locking members in a similar manner to that described immediately above. Subsequently, the side wall 14 is clamped to the rear wall and bottom wall. As should be understood, the wall sections 12, 14 will be free to abut the wall section 13, in spite of the upwardly facing keys 22 of the bottom wall section, due to the surface 41 of the corner connector which is recessed with respect to the keys 22. At this stage and in accordance with a specific aspect of the invention, the container may be filled with cargo through the open front and/or open top. After loading, the container 10 may be completed by clamping the front wall section to the bottom wall section 16 and to the end wall sections 12, 14, and then clamping the top wall section 15 to the interconnected upstanding wall sections 11-14 in the manner described.

As a further specific aspect of the present invention, one or more of the wall sections used to erect the container 10 may be provided with an expandable inner wall 83 formed from a sheet or closed bag of elastomeric material. As shown in FIG. 4, the wall 83 is in the form of a rubber sheet attached to the paneling 17 (by epoxy cement or suitable mechanical fasteners) in a manner whereby the inner surfaces of the paneling and the walls 83 form closed chambers 81. An air valve 82 is disposed in the paneling to provide for the rapid expansion of the wall 83 by the admission of pressurized air into the chamber 81. The valve 82 also permits the deflation of an expanded chamber 81 when that is desired. Thus it will be appreciated that the expandable wall 83 provides the new containers with built-in internal, expandable dunnage, and pneumatic cushioning. This arrangement permits less than full container volume shipments to be safely and quickly shipped by merely inflating the chambers 81 sufficiently to eliminate dead cargo space.

It will be understood that the specific form of the container invention illustrated and described herein, including the frame rail and clamp assembly configurations, is intended to be representative only, and that certain changes may be made therein without departing from the clear teachings of the disclosure. Accordingly, reference should be made to the following appended claims in determining the full scope of the invention.

I claim:

1. A wall section for a collapsible cargo container or the like built up from plural wall sections having tubular frame rails of a predetermined universal hermaphroditic cross section, said wall section comprising:

- (a) a sheet of lightweight durable paneling material,
- (b) frame means supporting and stiffening said paneling material,

- (c) said frame means including a plurality of universal, hermaphroditic, tubular frame rails,
- (d) a plurality of corner connectors joining said tubular rails and forming the corners of said frame means,
- (e) the cross section of said hermaphroditic tubular rails including plural walls, one of which includes a key means and a second of which includes a slot means of mating configuration with said key means,
- (f) whereby said tubular frame rails are adapted to mate with rails of similar cross section to define, when clamped therewith, tubular load-bearing members.
2. The container wall section of claim 1, in which:
- (a) said key means is in the form of a protuberance having a predetermined height,
- (b) said slot means is canted and has a depth at least equal to said predetermined height,
- (c) whereby the key means of one frame rail is adapted to nest in the slot means of another frame rail of the same cross section when two of said frame rails are abutted,
- (d) said slot means is adapted to receive a hooked locking means.
3. The container wall section of claim 1, in which:
- (a) said connector includes a central portion, the outer surfaces of which are substantially flush with all the outer surfaces of said rails with the exception of said key means,
- (b) said connector includes legs extending from said central portion and engaging the internal surfaces of said hollow rails,
- (c) said connector including shoulder portions between said central portion and said legs.
4. A container formed from a plurality of wall sections in accordance with claim 1, in which:
- (a) each edge joint of said container is formed by mating a key means of one frame rail with a slot means of the frame rail of an adjacent wall section,
- (b) locking means firmly and rigidly establish said edge joint by clamping said mated rails together,
- (c) whereby each pair of clamped, mated hermaphroditic rails constitutes a hollow load-bearing member.
5. The container of claim 4, in which:
- (a) said locking means comprises a toggle locking clamp assembly,
- (b) said assembly includes a pivotable lever and a locking means articulated thereto.
6. The container of claim 3, in which:
- (a) at least one of said wall sections includes an expandable wall of elastomeric material attached to the inside surface of its paneling,
- (b) said expandable wall is one wall of a closed chamber,
- (c) an air valve means is disposed in said paneling for outside access,
- (d) said air valve means accommodates the pneumatic inflation and deflation of said chamber.
7. A wall section in accordance with claim 1, in which:
- (a) said frame means is rectangular,
- (b) said corner connectors are L-shaped.
8. A wall section in accordance with claim 1, in which:
- (a) the cross section of said hollow rails includes four consecutive generally perpendicular walls, the first of which includes said key means, the second of which includes said slot means, the third of which is generally flat, and the fourth of which has a paneling support means integral therewith.
9. A container wall section in accordance with claim 8, in which:
- (a) said key means is wedge-shaped and has a predetermined height,
- (b) said slot means is canted and has a depth greater than said predetermined height,
- (c) whereby the key means of one frame rail is adapted to nest in the slot means of another frame rail of the same cross section.
10. The container wall section of claim 1, in which:
- (a) said corner connector is solid.
11. The container wall section of claim 1, in which:
- (a) said frame rails are of extruded construction.
12. The container of claim 4, in which:
- (a) said locking means comprises a toggle locking clamp assembly,
- (b) said assembly includes a pivotable lever and a hook means articulated thereto.
13. The container of claim 12, in which:
- (a) said lever is formed from wire and includes a fulcrum rod portion, pivot axis portions spaced from and parallel to said fulcrum rod portion, and a handle portion connected to said pivot axis portions,
- (b) said hook means is formed from wire and comprises elongated hooked portions, the ends of which are interconnected by a locking bar portion,
- (c) said hook means is articulated to said pivot axis portions of said lever through closed loop portions.
14. The container of claim 13, in which:
- (a) a keeper means maintains each of said toggle locking clamp assemblies in operative association with said frame rails,
- (b) said keeper means includes spring clip means adapted to engage and to hold said lever and said locking means beneath the periphery of said wall section.
15. The container of claim 14, in which:
- (a) said spring clip means comprises a pair of spaced springs of U-shaped cross section,
- (b) said springs include apertures accommodating the insertion of sealing wire therethrough.
16. A collapsible cargo container including:
- (a) a plurality of wall sections arranged to define an enclosed cargo carrying space,
- (b) the edges of each of said wall sections being universal in cross section and comprising hermaphroditic framing rails,
- (c) the edges of said cargo container comprising abutted and mated pairs of said hermaphroditic framing rails,
- (d) manually operable locking means clamping each of said mated pairs of framing rails together.
17. The container of claim 16, in which:
- (a) said locking means comprises a plurality of toggle clamps.
18. The container of claim 16, in which:
- (a) said hermaphroditic rails are tubular,
- (b) the cross section of said rails has plural walls, a perpendicular pair of which includes a key means and a mating slot means.

References Cited

UNITED STATES PATENTS

2,743,029	4/1956	Mautner	217—65	X
2,764,314	9/1956	Mautner	217—65	X
2,774,503	12/1956	Moore		
2,919,826	1/1960	Richter	220—4	X
3,044,656	7/1962	Combs	220—4	

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U.S. Cl. X.R.

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