

[54] **MODULAR CARGO CONTAINER FOR TRANSPORT VEHICLES**

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[51] Int. Cl. **B65j 1/02**

[58] Field of Search 220/1.5, 4, 6, 23.6, 23.4, 220/23.2, 23.83, 97 R, 97 C, 97 D; 214/10.5; 108/55

[56] **References Cited**
UNITED STATES PATENTS

3,162,331 12/1964 Hutchins et al. 220/1.5 X
3,040,925 6/1962 Mills 220/1.5

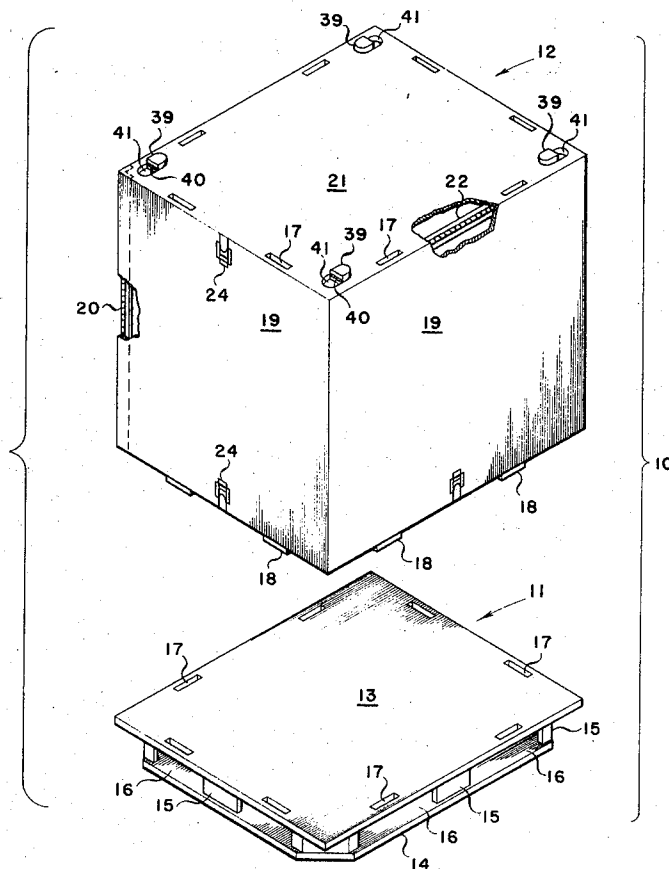
3,088,619 5/1963 Boucher 220/4 X
3,231,084 1/1966 Kean, Sr. 220/84 X
3,122,258 2/1964 Shile 220/97 R

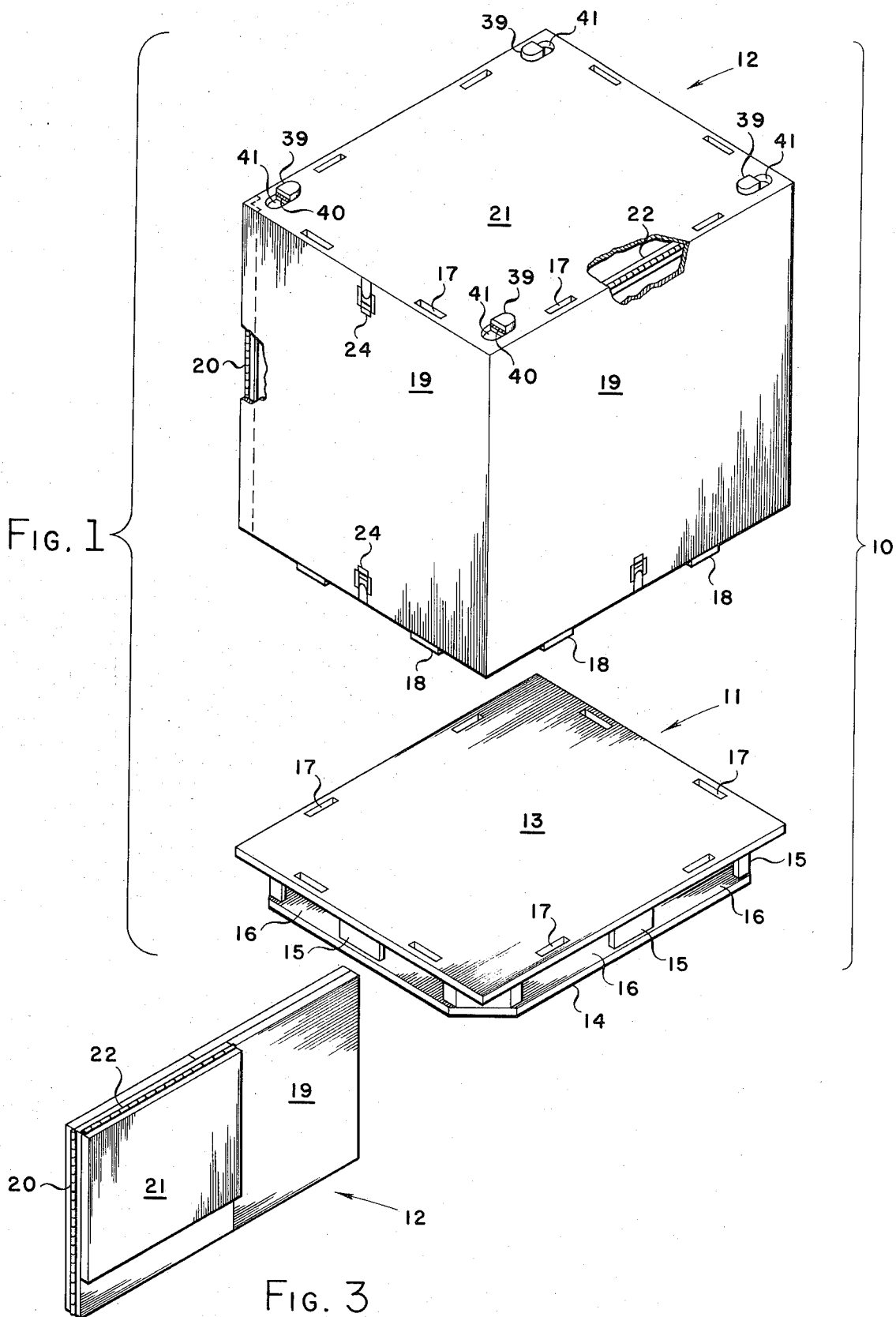
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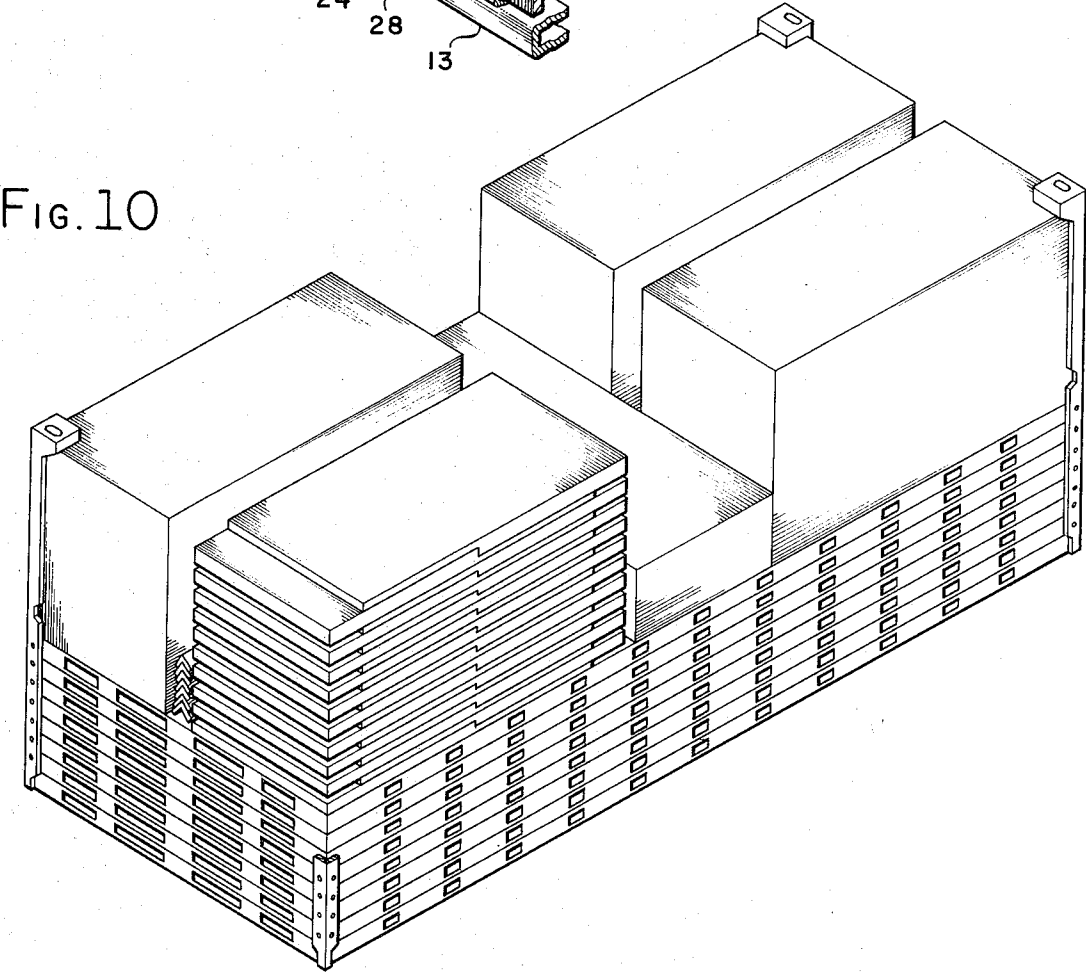
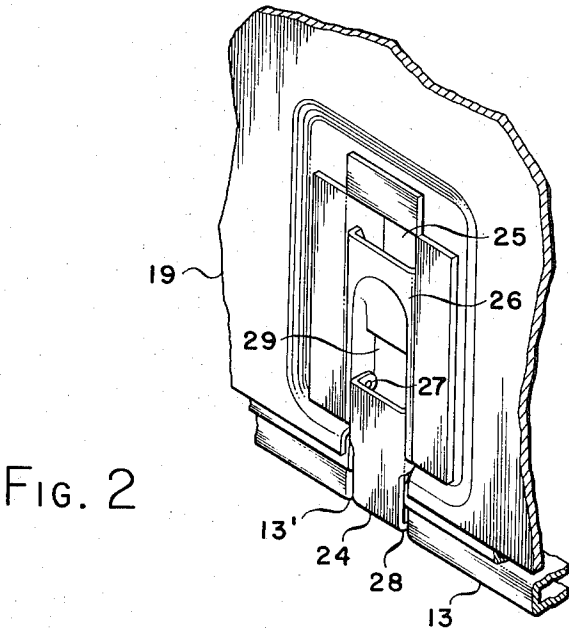
[57] **ABSTRACT**

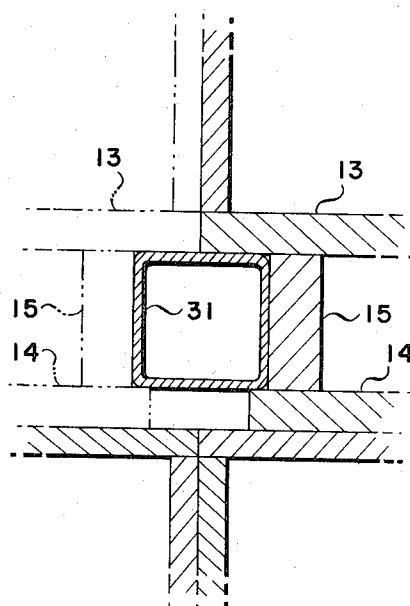
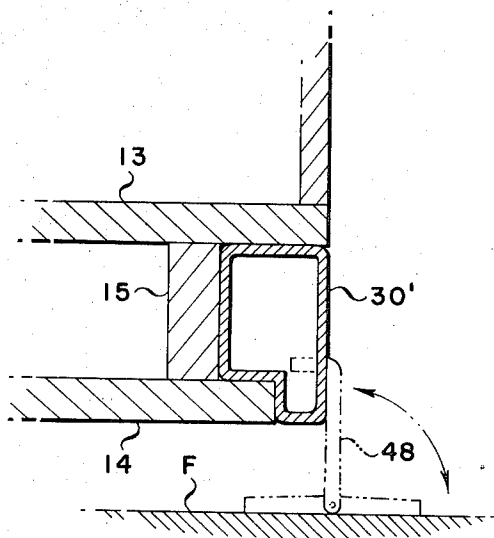
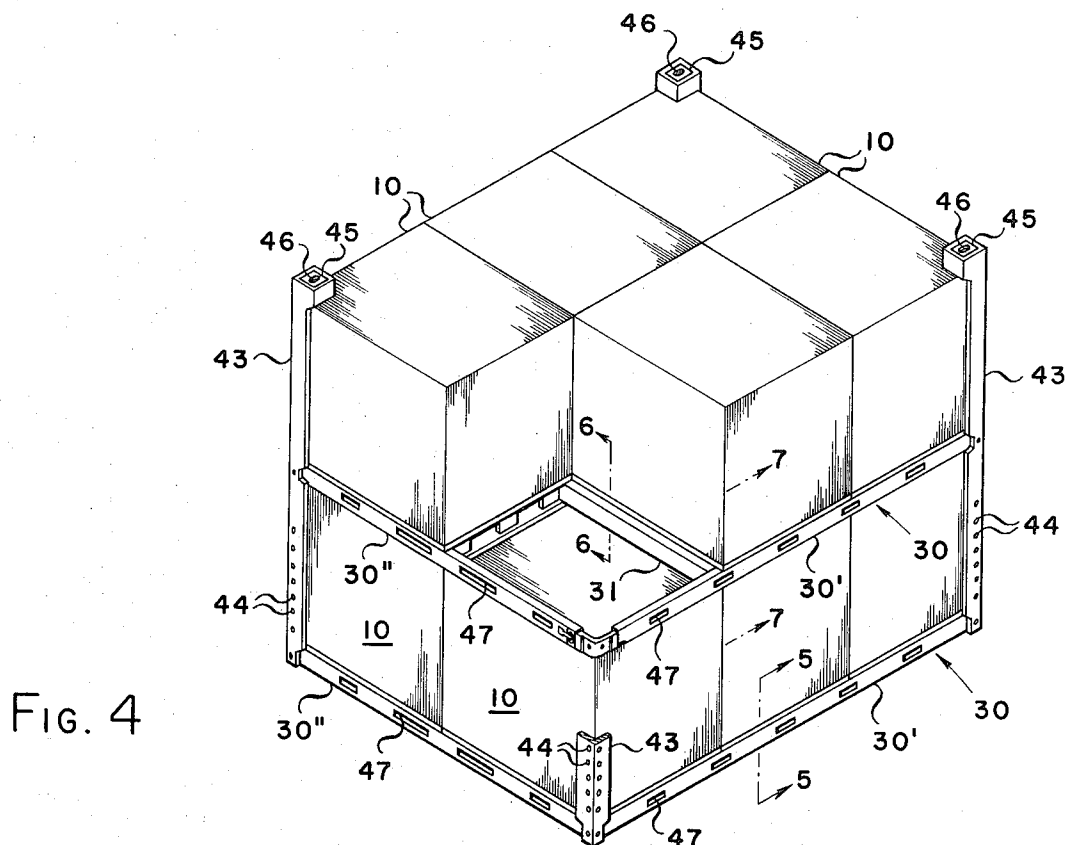
A container consists of a plurality of modules interconnected one to another to form a preselected, standard size assembly to permit the movement thereof through existing transportation systems as a unit. Break apart features between the several modules facilitate the handling and loading thereof at times other than during shipment. Also each module is so constructed as to permit folding for stacking and packing to minimize its space requirements when empty.

10 Claims, 10 Drawing Figures









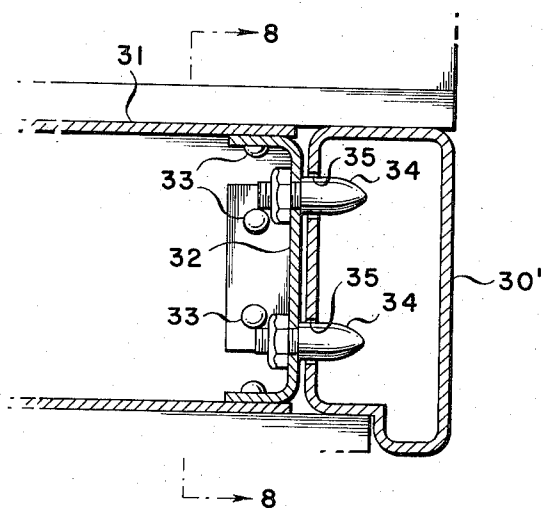


FIG. 7

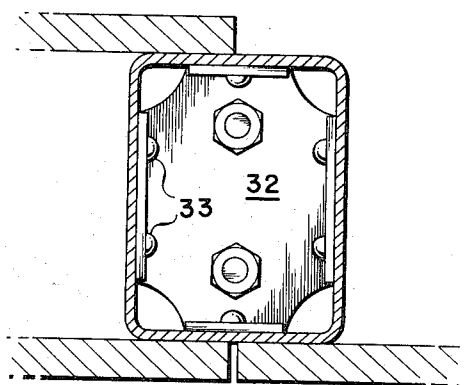


FIG. 8

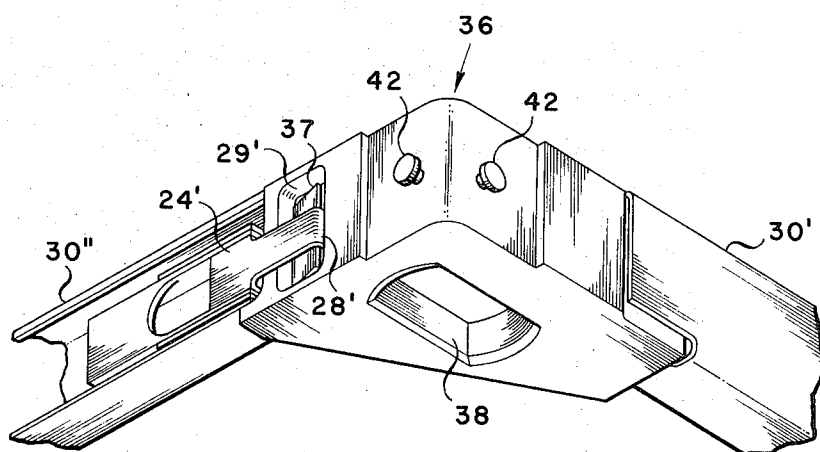


FIG. 9

MODULAR CARGO CONTAINER FOR TRANSPORT VEHICLES

This invention relates generally to cargo shipment including the techniques employed to expedite such shipment and more particularly to the handling and transporting of containerized cargo to the end that maximum efficiency can be attained in the overall operation and notably to minimize cost without compromising safety, damage, or breakage.

In cargo shipment, "down time," i.e., the time during which a vehicle is not actually in transit with payload aboard, has been generally recognized as the costliest phase of the business. Therefore, every effort has been made to reduce such time. Streamline loading and unloading methods and equipment have been developed and perfected. Schedules, routes and loads have been preplanned in order to avoid and, to the extent possible, to eliminate what is commonly referred to in the vernacular as "deadheads," which means trips or partial trips without a payload or with substantially no payload aboard.

One improvement that has been made to substantially reduce the time required for on-and-off loading of the vehicle (usually referred to as "vehicle turnaround time") as well as to assure maximum vehicle loading is the containerized cargo concept. The principle underlying this scheme is that by container loading cargo in advance it can be readily and quickly placed on and taken off of the vehicle. Moreover, by configuration design and size of the container, mechanized loading systems can be provided and maximum payloads realized. Through this advanced planning, standards are also possible which take into consideration the entire gamut of shipper's or transporter's operation to provide for all exigencies and requisites.

The present invention envisions further improvements in these areas which in simplest terms comprise the reduction of a standard cargo container to modular form whereby a build up of modules to a range of standard assembly sizes and configurations is possible. When assembled these modules constitute in effect a unitized structure capable of withstanding all the handling and abuse to be expected in loading and unloading operations, as well as during shipment. At the same time, this modular assembly includes break-apart features which permits manual handling of each module where appropriate, avoiding a requirement for machine handling or other more elaborate equipment.

Moreover, relatively small shippers may realize the economy of container shipment by utilizing a single module for their goods, when insufficient goods are available to fill a large container. Also, so-called "break bulk" from container size to module size for terminal delivery is accomplished within a minimum of time while retaining completely sealed unit protection. This lends itself to integration with conventional retail distribution systems.

To facilitate the foregoing, each module is configured to a predetermined size and constructed of rigid sides or walls which allow for folding when empty to permit the collapse thereof into a substantially flat, relatively thin, rectangular package. Thus, a minimum stacking, packing and storage area is required for each module when not in use. Also, when unfolded or opened and during use, these modules can abut one another, both end-to-end and top-to-bottom, in the mod-

ule build up. Additional means is provided for the interconnection of multiple modular building ups into a train to further facilitate the on-and off-loading as well as the general movement and handling thereof.

With the above and other objects in view as will be apparent, this invention consists in the construction, combination and arrangement of parts all as hereinafter more fully described, claimed and illustrated in the accompanying drawings, wherein:

FIG. 1 is a perspective view of a single basic module comprising a bottom, load supporting pallet and a removable, overlying and enclosing cover shown in an elevated position primarily to reveal the engagement means therebetween to permit the assembly and interconnection thereof, portions of corners of the cover being broken away to show hinges which facilitate folding of the associated sides;

FIG. 2 is a detail in perspective of the latch mechanism shown as the connection means in FIG. 1 between the cover and pallet as well as between the cover and its lid;

FIG. 3 is a perspective view of the cover only in the folded condition to illustrate its compactness for packing and storage;

FIG. 4 is a perspective view of a built up of several of the modules shown in FIG. 1 into a course or tier retained by a frame and superimposed upon another tier whereby both tiers are retained by corner posts to form the ultimate assembly, one of the modules in the upper tier having been removed to reveal one of the cross frame elements employed between each of the several adjacent modules to secure and maintain them in a structural, unitized assembly;

FIG. 5 is a section taken along the line 5—5 of FIG. 4 to show the construction and arrangement of a bottom corner of each lower or first tier module and the associated side frame element which also serves to cooperate with hold-down means carried by the vehicle structure, such hold-down means being illustrated in phantom lines;

FIG. 6 is a section taken along the line 6—6 of FIG. 4 to show the construction and arrangement of the associated corners of adjacent modules in adjacent tiers and the associated cross frame element the module removed from FIG. 4 being illustrated in phantom lines;

FIG. 7 is a section taken along the line 7—7 of FIG. 4 primarily to show the construction of each cross frame element and each side frame element and the interengagement means to maintain them in structural assembly;

FIG. 8 is a section taken along the line 8—8 of FIG. 7 to show the end plate secured to each cross frame element to give it structural integrity and to carry the interengagement means for coaction with the associated side frame element;

FIG. 9 is a fragmentary view in perspective from below of a corner of the frame employed to retain each tier of modules in a rectangular configuration to show primarily the fitting employed between each end frame element and side frame element and the releasable engagement means carried thereby; and

FIG. 10 is a perspective view showing several frame and pallet assemblies stacked one upon another with multiple covers each in the collapsed condition of FIG. 3 superimposed thereon, the entire arrangement being

retained in stack by corner posts to minimize the required space therefor.

Referring more particularly to the drawings, 10 designates a module or basic unit as contemplated herein. This basic unit consists primarily of two parts — a pallet 11 and a cover 12. The pallet 11 comprises a pair of interconnected, rectangular sheets 13 and 14 of pre-selected dimensions which are disposed in spaced relation one to the other, being separated by a plurality of spacers 15 and forming, in effect, an integral unit. The spacers 15 are so located with respect to each other in both dimensions of the pallet 11 that they define intervening passageways 16 adapted to receive the tines of a conventional fork-lift mechanism customarily employed to handle and move such pallets 11 from place to place. The marginal edge portion of the upper sheet 13 is cut out as at 17 to provide accommodations for complementary lugs 18 projecting from the several sides 19 of the cover 12 as will be further explained hereinafter.

The cover 12 (FIG. 1) consists of four sides 19 which are adapted to be vertically disposed in relation to the pallet 11 with the adjacent edges of each of the sides 19 incorporating corner, piano type hinges 20 to permit the folding of the several sides 19 one adjacent the other in collapsed condition as illustrated in FIG. 3. At its top, the cover 12 is further provided with a closure sheet or lid 21 which is similarly hinged as at 22 at and along one edge so as to permit the lid 21 to swing laterally with respect to the adjacent side 19. At and along its marginal edge portions, the lid 21 is cut out as at 17 similarly to the top sheet 13 of the pallet 11 to accommodate lugs 18 projecting from each cover side 19.

When the cover 12 overlies the pallet 11 with its adjacent sides 19 at right angles to each other and the lid 21 closed, all of the several lugs 18 projecting from opposite ends of each side 19 are accommodated within their respective cut outs 17 in the pallet 11 and lid 21 so as to prevent all relative lateral movement of the entire cover assembly 12. At the same time, the cover 12 may be readily lifted from the pallet 11 and the lid 21 may likewise be raised with virtually no resistance.

When the cover 12 is removed from the pallet 11 and the lid 21 raised or opened, diagonally opposite corners of the cover 12 may be moved toward one another so as to collapse into side abutting position. The lid 21 merely folds down against and in flush abutment with the adjacent cover side 19.

In order to secure the cover 12 in position on the pallet 11 when assembled therewith, special latch means is provided. For this purpose, each side 19 is provided with one or more connector elements at its upper and lower ends. Each such connector element may comprise a tension or toggle latch 24 mounted within a channel 25 formed or otherwise provided in the side 19. Each latch 24 includes a handle 26 connected to one end thereof by means of and through an offset pivot 27. Thus, when the handle 26 is rotated outwardly of the side 19, the latch 24 is extended beyond the adjacent edge of the side 19 a distance greater than the thickness of the top sheet 13 of the pallet 11 in one case and the lid 21 in the other. When the handle is thereafter rotated inwardly of the side 19 its end flange or lip 28 clampingly engages the top sheet 13 or lid 21 and thereby retains the cover 12 on the pallet 11 against substantially all vertical movement. The outer surface of the handle 26 is recessed as at 29 so as to re-

ceive and stow the latch 24 when the cover 12 is folded as previously described. Also, the edge of the pallet top sheet 13 is notched as at 13' to receive the latch 24 therein whereby the outer surface of the latch 24 lies flush with the pallet surface.

Referring more particularly to FIG. 4, several modules 10 are shown in side-to-side position so as to form a layer or tier of such modules. Any number of such tiers may, in turn, be stacked, but for purposes of illustration herein, only two such tiers are shown. In forming each tier, a rectangular frame 30 is provided which has side members 30' and end members 30'' substantially equal in length to the total length and width dimensions respectively of the several modules 10 in side-to-side position.

As illustrated by way of example in FIG. 4, the modules 10 are employed six to the tier in 2 by 3 dimensions. In transverse section (FIGS. 5 and 6), each frame member 30' and 30'' is sized so as to be disposed in flush abutment against the under surface of each top pallet sheet 13, the outer surface of each spacer 15, and the upper surface of each bottom pallet sheet 14.

Also the lower pallet sheet 14 is of a slightly smaller dimension than the upper sheet 13 thereby providing a recess to accommodate the entire frame 30, more particularly frame members 30' and 30''. Thus the frame members 30' and 30'' not only abut adjacent surfaces of the top pallet sheet 13, spacers 15 and bottom pallet sheet 14 but also the outer edge of the bottom pallet sheet 14 so that the outer, defining faces of the members 30' and 30'' are disposed substantially in the plane of the lower surface of the bottom pallet sheet 14 and the outer edge of the upper pallet sheet 13 (FIG. 5). As will be seen as this description progresses, this form of the frame 30 will provide additional structural integrity to the ultimate, unitized assembly.

In order to further enhance the structural integrity of the ultimate assembly, cross frames 31 are also provided between the adjacent modules 10 of each tier. Each cross frame 31 comprises a generally rectangular, tubular member having a length substantially equal to the aggregate width of adjacent modules 10, i.e., two modules 10 in the illustrative case of FIG. 4. The transverse dimension of each cross frame 31 is sized to be substantially equal to the distance between the adjacent surfaces of the associated spacer elements 15 when the adjacent upper pallet sheets 13 abut (FIG. 6). Thus, the cross frame 31 acts to substantially fill the space between the adjacent modules 10 defined by the adjacent surfaces of the upper pallet sheets 13, the lower pallet sheets 14 and the spacers 15. Lateral loads as well as vertical loads imposed on the modules 10 are thereby transferred therethrough and distributed over the entire modular assembly.

As best shown in FIGS. 7 and 8, each cross piece 31 is closed at each of its ends by a plate 32 immovably secured, as for example by rivets 33, to all sides of the cross piece 31. One or more projections 34 are provided in each plate 32 which are adapted to insert into complementary holes 35 which pierce the inner wall of the side frame member 30' whereby the cross pieces 31 are locked in position to the frame 30.

The side frame members 30' and the end frame members 30'' which comprise the frame 30 are substantially identical in section and a corner fitting 36 is employed to connect the adjacent members 30' and 30''. Referring particularly to FIG. 9, each fitting 36 is generally

triangular with outer surfaces disposed substantially in the planes of the adjacent surfaces of the side frame member 30' to which it is secured at one end in any appropriate manner to constitute, in effect, an integral part extending therefrom. At its other end each fitting 36 is provided with a recess 29' in which is located a latch plate 37 designed and adapted to receive the lip 28' of a latch 24' carried by the associated end frame member 30'' at the end thereof. This structure is comparable in all respects to the side 19 and latch 24 as previously described.

Medially each fitting 36 is pierced by a slot 38 defined by at least three sides which correspond to sides of a lug 39 carried by each corner of each lid 21. These lugs 39 are each hinged as at 40 to the lid 21 which contains a complementary notch 41 to receive and seat the lug 39 when inoperative. In its operative position each lug 39 is rotated out of its notch 41 and rests on the upper surface of the lid 21 where it aligns with and is seated within the slot 38 of the associated fitting 36. Each upper tier of modules 10 is thereby secured to the next lower tier of modules 10 against relative horizontal movement.

The outer sides of each fitting 36 are further provided with removable retention studs 42 by which and through corner posts 43 secure the multiple tiers of modules 10 against relative vertical movement. To this end each corner post 43 is pierced with a series of holes 44 along the length thereof two of which align with the stud openings in each fitting 36. Stud 42 when inserted in the holes 44 thus aligned serve to retain the corner posts 43 in position. At its upper end each post 43 terminates in a fitting 45 adapted to lie flush against the associated module lid 21. This fitting is slotted as at 46 constituting the equivalent of the fitting slot 38 to receive and retain the module lug 39 when disposed in the position shown in FIG. 1.

Each side of each frame 30 includes provisions adapted to cooperate with complementary engaging elements of structure or equipment to be associated therewith. Illustrative of such provisions are the various holes and/or slots 47 to accommodate accessories to be employed in handling the modular container and/or for restraining it when installed on the transportation vehicle. For example, tie-down and hold-down attachments 48 or the equivalent which may be secured to the vehicle floor F are receivable in a selected one of these holes or slots 47 to prevent relative movement of the installed modular container assembly in the vehicle. These slots 47 also serve as convenient means to facilitate connection of modular containers one to the next in trains or the like, when desired.

With the several modules 10 interconnected in a frame 30 with multiple framed modules 10 stacked in tiers as hereinabove described to form a modular container and, where desired, with multiple modular containers interconnected into a train, a cargo package is provided which comprises a substantially homogeneous type of structure capable of withstanding all required loads to be imposed thereon during movement on and off, as well as shipment aboard, vehicles. Moreover, in handling and movement between destinations and the vehicle, the several assembled modules 10 are readily broken down into individual modules 10 which permits easy handling thereof.

When not actually being employed, these several, basic modules 10 can each be further broken down by

folding into a compact, rectangular unit (FIG. 3). The several assembled frames 30 with pallets 11 and cross pieces 31 secured may be stacked one upon the next and retained in assembly by corner posts 43 (FIG. 10) when stowed or shipped requiring a minimum area. Among other things, this permits the vehicle to transport the empty modular containers in a reduced size cube or volume configuration thereby providing more available cube for revenue producing cargo.

What is claimed is:

1. A modular cargo container for transport vehicles comprising:

multiple modules of predetermined size adapted to be disposed in abutment one with another, each of said modules being formed by a base pallet, an upstanding, overlying cover cooperating with said pallet to define a cargo containing area and at least one releaseable interlocking engagement between said cover and said pallet; and

a releaseable frame in abutment and surrounding all of said modules when disposed in abutment as aforesaid to retain them in a single, compact group against relative movement, said frame being disposed adjacent said module base pallets within recesses provided therein with the external surfaces of said frame lying in the plane of the adjacent pallet edges and including engagement elements adapted to cooperate with complementary elements, whereby said group may be alternatively connected to a transport vehicle, to handling equipment and to another modular cargo container.

2. The container of claim 1 including complementary fittings carried by said frame and at least some of said modules adapted to interengage when one said group is superimposed upon another with the perimetric surfaces thereof aligned to prevent relative movement of said groups.

3. The container of claim 2 wherein each said module fitting includes a lug mounted on said cover for extension and retraction therefrom and a notch in said cover to accommodate said lug when retracted so as to occupy a position within the plane of the external cover surface.

4. The container of claim 2 including a plurality of vertical posts each having a length substantially equal to the aggregate height of said superimposed groups, each of said posts defining a surface corresponding to the adjacent perimetric surfaces aforesaid for continuous abutment therewith; and releasable engagements between each of said posts, said frames and the associated modules.

5. The container of claim 1 wherein each said pallet is rectangular and each said cover includes four sides interconnected one to the next by a hinge and a lid hinged to the upper surface of one of said sides whereby said cover may be collapsed by folding two of said sides into abutment with each other and the lid against one of said sides when each of said interlocking engagements is released and the cover separated from said pallet.

6. The container of claim 1 wherein each said pallet includes a pair of sheets interconnected by spacers located at selected intervals to establish passageways therebetween and said recesses are formed by the adjacent surfaces of said sheets and said spacers.

7. The container of claim 6 wherein the lower of said sheets has a perimetric dimension less than that of the

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upper of said sheets and the adjacent surface of said frame abuts the edge of said lower sheet.

8. The container of claim 1 wherein each said pallet and said frame is rectangular and including a cross frame member releaseably engaging opposite sides of said frame and in continuous abutment with adjacent sides of said pallets.

9. The container of claim 8 wherein each said pallet includes a pair of spaced interconnected sheets, the lower of which has a perimetric dimension that is less than that of the upper of said sheets and said cross frame member is disposed within the confines of the

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adjacent upper and lower sheets.

10. The container of claim 2 wherein each said pallet is rectangular and each said cover includes four interconnected sides disposed vertically relative to said pallet and a lid hinged to the upper edge of one of said sides adapted to abut the edges of the remaining three sides, and wherein said complementary fittings include a generally triangular plate carried by said frame at each corner thereof having a slot and a lug carried by each said lid corresponding in shape to said lug for insertion therein.

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