Nov. 10, 1942. N. M. LONEY ET AL 2,301,895

SHIPPING CONTAINER

Filed Nov. 10, 1941 2 Sheets-Sheet 1

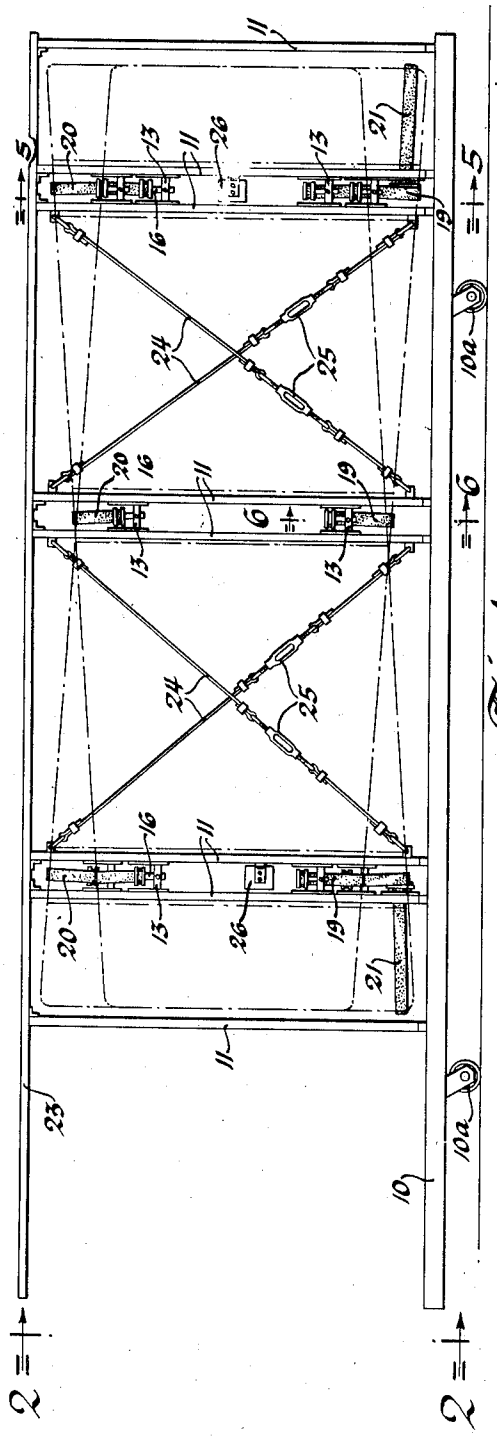


Fig. 1

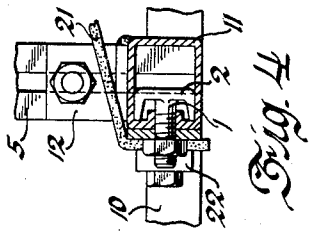


Fig. 4

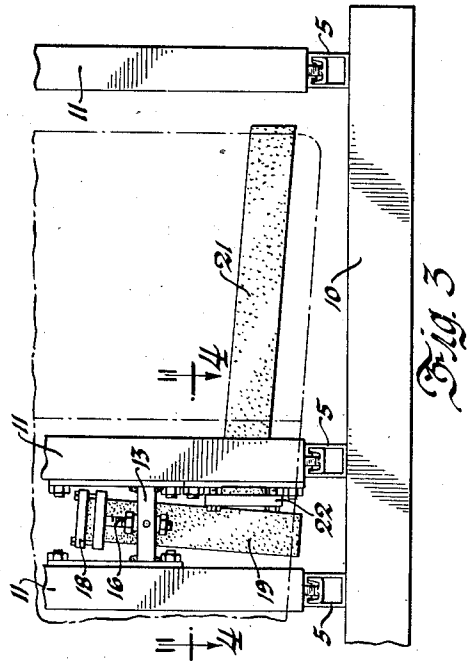


Fig. 3

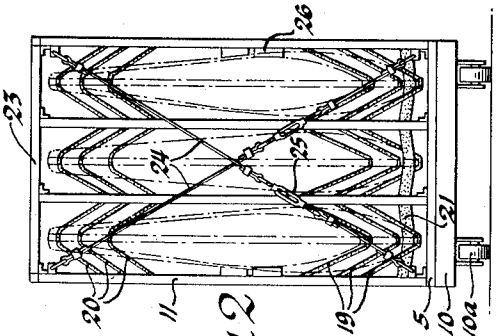


Fig. 2

Inventors
Neil M. Loney &
Otto C. Ferguson

By Blackmar, Spencer & Olliff
Attorneys

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Filed Nov. 10, 1941 2 Sheets-Sheet 2

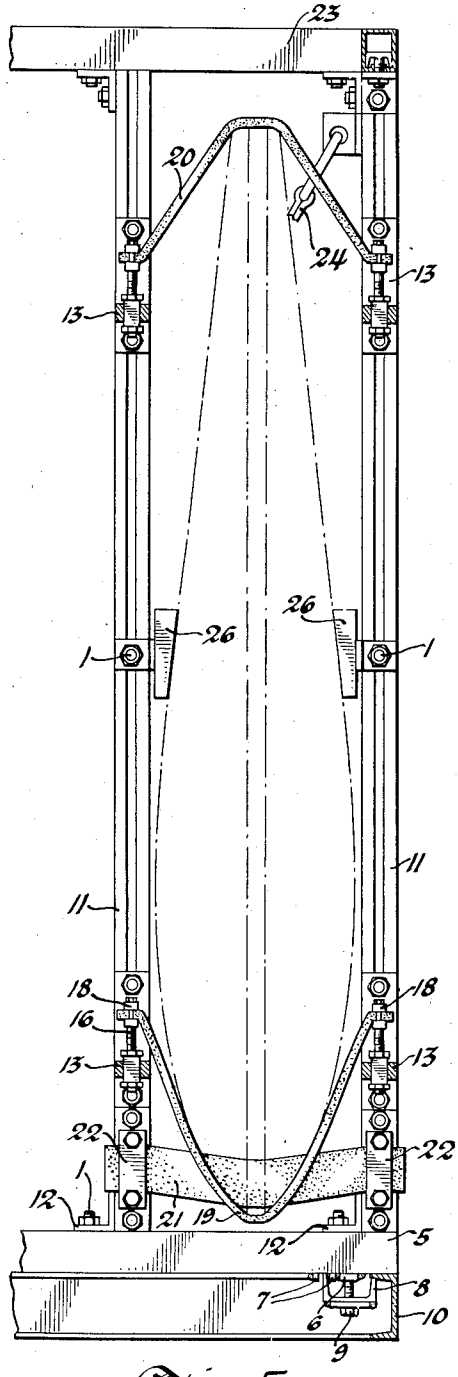


Fig. 5

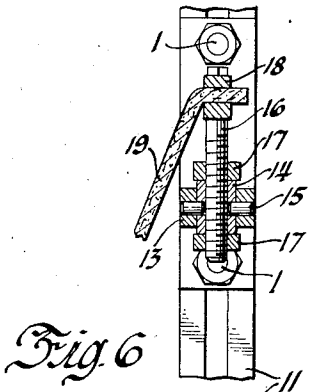
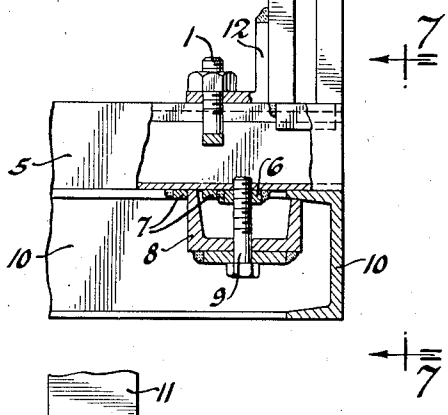


Fig. 6



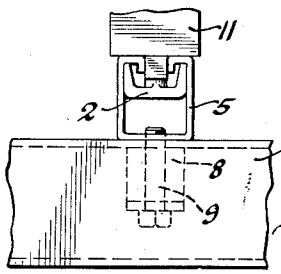


Fig. 7

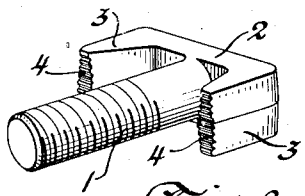


Fig. 8

Inventors
Neil M. Loney &
Otto C. Ferguson

By Blackmore, Spencer & Allen
Attorneys

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UNITED STATES PATENT OFFICE

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SHIPPING CONTAINER

Neil M. Loney, Royal Oak, and Otto C. Ferguson, Detroit, Mich., assignors to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application November 10, 1941, Serial No. 418,436

12 Claims. (Cl. 211—13)

This invention relates primarily to material handling or the protective care of fabricated articles, such as airplane wing assemblies, and more particularly to a transportable storage container.

Under a plan now in effect for greatly increasing airplane production with minimum delay, various parts and subassemblies are fabricated in different plants available throughout the country and then shipped to a central point for final assembly. To avoid handling and rehandling of these parts and the likelihood of damage with respect particularly to large subassemblies, it is here proposed to pack wings, rudders, elevators or other substantially flat panel-like articles individually in strong protective containers which receive the load at the point of manufacture and serve as storage and shipping racks to be unloaded at the point of final plane assembly. To this end it is among the objects of the invention to provide a reusable container adjustable in size to fit the load and embodying flexible suspension loops in which the parts may be individually cradled with minimum strain by being set on edge and in a vertical plane.

It is a further object of the invention to provide a rigid base mounted on wheels or casters and on which knock-down framing elements may be set up and rigidly bolted together in choice combinations or variable size groupings in accordance with the size of the load and on which the suspension hangers may be fastened at selective heights and swung on pivots which allow the hangers automatically to assume positions best suited to the direction or inclination of the mounting edges of a wing or other article whose edges are convergently related.

Another object is to employ framing elements of light weight metal strips formed to cross section of inherent strength to afford longitudinally slotted hollow rails having reentrant pockets along opposite sides at the slot for the reception and location non-rotatively of the head of a specially formed anchor bolt capable of sliding adjustment in the slot to the desired fastened position and having serrated bearing seats to bite into the rail seating surfaces when the bolt is drawn up under tension whereby to resist displacement of the anchoring bolt.

Additional objects and advantages will appear upon inspection of the accompanying drawings wherein Figure 1 is a side elevation of a loading container constructed according to a preferred embodiment of the invention; Figure 2 is an end elevation of the container; Figure 3 is an enlarged view of the structure seen in the lower right-hand corner of Figure 1; Figure 4 is a detail section taken on line 4—4 of Figure 3; Figures 5 and 6 are sectional views taken on lines 5—5 and 6—6, respectively, of Figure 1; Figure 7 is a fragmentary view looking in the direction of the arrows on line 7—7 of Figure 6 and Figure 8 is a perspective view showing a special anchorage bolt.

The bolt shown in Figure 8 includes a threaded tensionable stud or shank 1 and a U-shaped head 2 terminating in axially extending legs 3—3 spaced from the shank and whose tips or seating faces are transversely serrated as at 4. The specially constructed framing rails with which the anchor bolt is employed comprise hollow C-shaped channels, the sides of which are spaced apart substantially the width of the bolt head 2 so as snugly to receive the same as illustrated in Figures 4 and 7. The serrated tips 4 of the bolt head are arranged to seat on the inturned extensions of the respective C-sectioned rails, and the extensions terminate in inwardly directed stiffening flanges defining the margins of the longitudinal slot in the rail through which the bolt stud 1 projects and in which the bolt may be slid longitudinally of the rail to selective anchorage position. These inturned marginal flanges are of lesser depth than the bolt extensions 3 and cooperate with the side walls of the channel in forming pockets for receiving the bolt head extensions or legs 3.

The several C-sectioned framing rails, cut to proper length, include a series of longitudinally spaced transversely extending footings indicated at 5. Each of these footing rails 5 has its longitudinal slot on its upper side and is provided near opposite ends on its underside with a nut 6 welded thereon (see Figures 5 and 6) and a pair of spaced locating ribs 7 also welded thereon. In the space between the ribs 7 is seated one leg of a U-shaped clip 8 secured by a threaded stud 9 engaged with the nut 6 and whose other leg seats against the underside of the top flange of a side framing member constituting a part of a rigid rectangular base or chassis 10. This base is formed by welding together side and end channel members and mounting the whole on swiveled casters 10a which enable the container to be easily transferred from place to place. The mounting on the chassis frame 10 of the rails 5 through the detachable clamping clips 8 allows the framing elements to be readily taken down or set up in any desired longitudinally spaced relation, as dictated by the type of load to be carried.

Extending upwardly from each of the lower rails 5 are a series of C-section uprights or vertical posts 11 arranged in longitudinal and transverse rows as indicated in Figures 1 and 2. In the arrangement shown in Figure 2 the transverse rows contain a total of four posts spaced apart to provide loading space for three airplane wings. The posts in each transverse set or row are all mounted on the upper face of a common bottom rail 5 and for this purpose each vertical post 11 has secured at its lower end an angle bracket 12 (see Figure 5) whose horizontal leg is apertured to receive the shank 1 of an anchor bolt and to be secured by a nut threaded on the bolt shank. The placement of the several posts by shifting the fastening studs in the longitudinal slot of the base bar 5 before the nuts are drawn down, will be determined by the size of the space necessary to receive the airplane wing.

In the longitudinal alignment of the posts in each row the arrangement may be as shown in Figure 1 wherein single uprights are employed at opposite ends of the space to be occupied by the load and intermediate uprights for carrying the load are arranged in sets of cooperating pairs longitudinally spaced apart. Among other things the endmost single posts serve as protective guards for the load. The two load carrying uprights of each pair have their open slots facing each other. Near the bottom of the space between each pair of cooperating side posts is located an H-shaped bracket 13, the side legs of which bear against the slotted faces of the two posts and receive anchorage bolts 1, slidable in the posts and by which the brackets are secured at selected vertical heights. The center of the cross bar of the H-shaped bracket 13 has a vertical aperture in which is located a sleeve 14 as seen in Figure 6 pivotally mounted in the bracket by a pair of fulcrum pins 15 to provide a horizontally hinged axis for the sleeve 14. A T-shaped stud 16 extends through the sleeve 14 and is held in place by fastening nuts 17—17 clamped against opposite ends of the sleeve. The head of the stud in cooperation with the clamping bar 18 bolted thereto provides an attachment for one end of a flexible hanger strap 19 of fabric, leather or the like and which hangs downwardly across the load receiving space and loops back for attachment at its other end to a similar mounting bracket carried by corresponding uprights in the next adjacent and transversely spaced row. The pivotal connection of the flexible hanger 19 with its mounting bracket 13 enables the loop, which receives the bottom edge of the airplane wing, to swing so as automatically to assume the position of the loading edge. This adjustment together with the adjustment for height of the several cradle straps enables proper positioning of the same to fit the inclination of the edge of an airplane wing whose opposite edges are convergent in relation to one another. This convergent relation of the wing edges is best illustrated by the dotted lines in Figure 1. In this connection it should be noted that neighboring wings have wide and narrow ends reversed in their load receiving spaces for better load distribution.

To hold the loaded wings in an upright or vertical plane their upper edges may be engaged by holddown straps 20 similar to the load supporting hangers 19 and whose adjustable connection with the posts may be made by the use of the same type of H-shaped brackets 13. As a guard against endwise shifting of the loaded wings the endmost vertical edges of the wings may be saddled by flexible straps 21 whose fixed ends are secured to adjacent uprights by a pair of clamp plates 22 bolted together and in turn bolted to the uprights by a pair of anchor studs 1—1 as shown in Figures 3 and 4. To assist in locating the load there is contemplated optionally the use of bearing pads 26 detachably and slidably mounted by studs 1 on selected uprights 11 to seat against opposite faces of the wing assembly. The upper ends of the several posts are preferably tied together by side and end stringers 23 also of C-shape in section and containing anchorage studs 1 slidable therein and engageable with angle straps secured to the tops of the vertical posts 11. For additional rigidity and to relieve the framing connections from strain, diagonal truss rods or guy wires 24, each containing a turnbuckle 25, are provided in the ends and sides of the frames extending between the top of one post and the bottom of an adjacent post.

While the foregoing description has dealt specifically with the vertical plane loading illustrated in the drawings it will be feasible also to load panels in horizontal planes and superposed one above the other within the container framework. In such case the suspension and holddown cradle straps 19 and 20 instead of being engaged by the top and bottom edges of the wing assembly would engage the lower and upper surfaces of the assembly and the several articles to be loaded in a single container would be in tiered relation rather than side by side. Loading horizontally or vertically will be dependent partially on the overall size and breadth of the parts and the practical limitations on handling equipment capacity. It may be mentioned that upright loading is best adapted for relatively wide parts and prone loading for narrow parts, such as the small breadth subassemblies of an airplane fuselage. For vertical tier loading of horizontally disposed parts with the standard width chassis illustrated in the drawings, particularly Figure 2, the two centermost longitudinal rows of posts 11 would be omitted with the cradle straps extended entirely across the loading space and fastened at opposite ends to the posts in the two outermost rows.

Optionally the longitudinal spacing of the vertical posts 11 may be varied according to the character of the load and in place of the short strap connecting brackets 13—13 there may be employed longer horizontal rails connecting longitudinally spaced uprights and being of the special C-section shape of the rails 5, 11 and 23. To such longitudinal rails the ends of the cradle straps 19 and 20 can be attached by clamps of the same type shown at 22 in Figures 3 and 4 holding the ends of the saddle straps 21.

In use the framing members may be set up to fit the size of the wings or other articles to be loaded. The container is loaded at the point of final operation on the subassembly and moved into storage position or directed into a freight car and transported to a distant point for unloading where the airplane is to be put together. If desired the framing may be knocked down for return shipment or may be returned in erected position in the same freight car. The size of the freight car needs to be taken into consideration in constructing the wheeled chassis, the chassis in the instant disclosure being of a size to occupy substantially half the length and width of a standard box car so that four of the containers

may be placed in each car. If desired special tracks may be mounted on the floor of the car to receive the wheels of the chassis and suitable connections may be provided in the car to engage the chassis and block it in loaded position.

The rack thus explained is completely universal for parts to be shipped and its adaptability is limited only by the maximum dimensions of the structure itself.

We claim:

1. In combination, a longitudinally slotted hollow mounting rail having sides and lateral overhanging wings extending centrally from said sides and terminating in inturned stiffening flanges at the side margins of the slot and in spaced parallelism with said sides and an anchorage bolt having a tensionable shank projected through the slot and longitudinally slidable therein to anchorage position and a head enclosed by the rail, said head being formed with axially extending legs on opposite sides of the shank for projection into the pockets afforded between the rail sides and said flanges whereby the bolt is held against rotation, said legs being longer than the flanges are deep so as to bear on said wings and being formed on their bearing extremities with transverse serrations adapted to bite into the wing surfaces when the shank is under tension and thereby resist longitudinal displacement of the bolt.

2. In an adjustable shiftable anchorage connection, a channeled rail having a longitudinal slot and being of substantially C-shape in section with inwardly directed flanges bounding the longitudinal slot therein, a fastening bolt having its shank projecting through and shiftable in the slot between said flanges and having a substantially U-shaped head located within the channeled rail with its legs telescoping with and being longer than said flanges for bearing engagement with the top of the channeled rail and roughened tips on said legs to bite into the bearing surface of the rail.

3. In an anchorage connection shiftable to desired anchored position, an anchoring bolt having a shank and a head terminating in angular bearing legs projecting from the head in the same direction as and in spaced parallelism with the shank, a slotted mounting member receiving the bolt shank in its slot and having lateral flanges at the margins of the slot telescopically fitted within the spaces between the bolt shank and said legs and seating the legs beyond said flanges.

4. In a load container of the character described, a base, transverse rails extending across the base, means mounting the rails on the base in adjustable selective longitudinally spaced relation and in groups of two side by side rails, vertical posts extending upwardly from each rail and having transversely adjustable anchorage connections with said rails, each post on a given rail being longitudinally aligned with a corresponding post on the companion rail for cooperation therewith, vertically adjustable holders each mounted respectively on a pair of said cooperating posts and each provided with a support swiveled thereon on a transverse horizontal axis, and a load engaging flexible strap extending across the load receiving space and secured at opposite ends to complementary supports for positioning the load in cooperation with other similar straps.

5. For packing wing assemblies or the like in load position, a base, a series of uprights mounted on the base for longitudinal and transverse adjustment relative thereto to accommodate the size of the load and arranged on opposite sides of the wing loading space and in cooperating pairs, a flexible strap vertically adjustably secured to each cooperating pair of uprights with its intermediate portion extending across the wing loading space and affording a depending strap in which the wing assembly is cradled.

6. For loading on edge and in a vertical plane a panel article such as an airplane wing or the like and which article has convergently related upper and lower edges, a loading frame including supporting members on opposite sides of the article receiving space, a series of longitudinally spaced upper and lower oppositely extending article engaging and locating slings adapted to seat the convergently related upper and lower edges of the article, and means mounting each sling on said members and at least certain of the mountings providing a transverse pivotal connection to accommodate the sling to the plane of edge engaged thereby.

7. For loading on edge and in a vertical plane a panel article such as an airplane wing or the like and which article has convergently related upper and lower edges, a loading frame including supporting members on opposite sides of the article receiving space, longitudinally spaced suspension loops adapted to receive the lower edge of a loaded article and fulcrum connections between the upper ends of said loops and said supporting members enabling each loop to swing about a transverse axis to adjust itself automatically to the inclined plane occupied by said lower edge of the article.

8. For loading on edge and in a vertical plane a panel article such as an airplane wing or the like and which article has convergently related upper and lower edges, a loading frame including supporting members on opposite sides of the article receiving space, a series of longitudinally spaced upper and lower oppositely extending article engaging and locating slings adapted to seat the convergently related upper and lower edges of the article, and means mounting each sling on a transverse horizontal axis about which the sling may be shifted automatically in conformity to the convergence of the article edge seated therein.

9. For loading wings or the like, a base, a series of uprights arranged on the base in two longitudinal rows defining the wing loading space therebetween and with an individual upright of one row in transverse alignment with a corresponding upright in the other row, flexible slings suspended between the transversely aligned uprights to cradle the wing within the loading space, diagonal tie rods connected with the upper ends of the uprights to brace the same in upright position and anchorage connections securing the tie rods in fixed relation with the lower ends of the uprights.

10. For loading on edge and in a vertical plane, wing assemblies having convergent edges, a base, two rows of stanchions affording wing loading space therebetween with said stanchions arranged in longitudinally spaced pairs in both rows and each pair in one row transversely aligned with a corresponding pair in the other row, a sling extending across the loading space at each set of corresponding pairs of stanchions for receiving the lower edge of a loaded wing, hangers for the ends of the slings associated with the respective pairs of stanchions and adjustable connections between each hanger and its pair of stanchions for permitting individual vertical adjustment of

the hangers to proper heights in compensation for wing edge convergence.

11. A load container including a base, a series of longitudinally and transversely spaced upright load supporting columns, means anchoring the load supporting columns adjustably to selected fixed positions on the base to fit variations in load size, and load receiving cradles mounted on the upright load supporting columns.

12. A load container including load supporting members defining the sides of the article loading space, load cradling loops located within said space and carried by said members and hinge joints enabling each loop to swing longitudinally of the article receiving space for automatically adjusting itself to the contour of the article seated therein.

NEIL M. LONEY.
OTTO C. FERGUSON.