

Oct. 24, 1939.

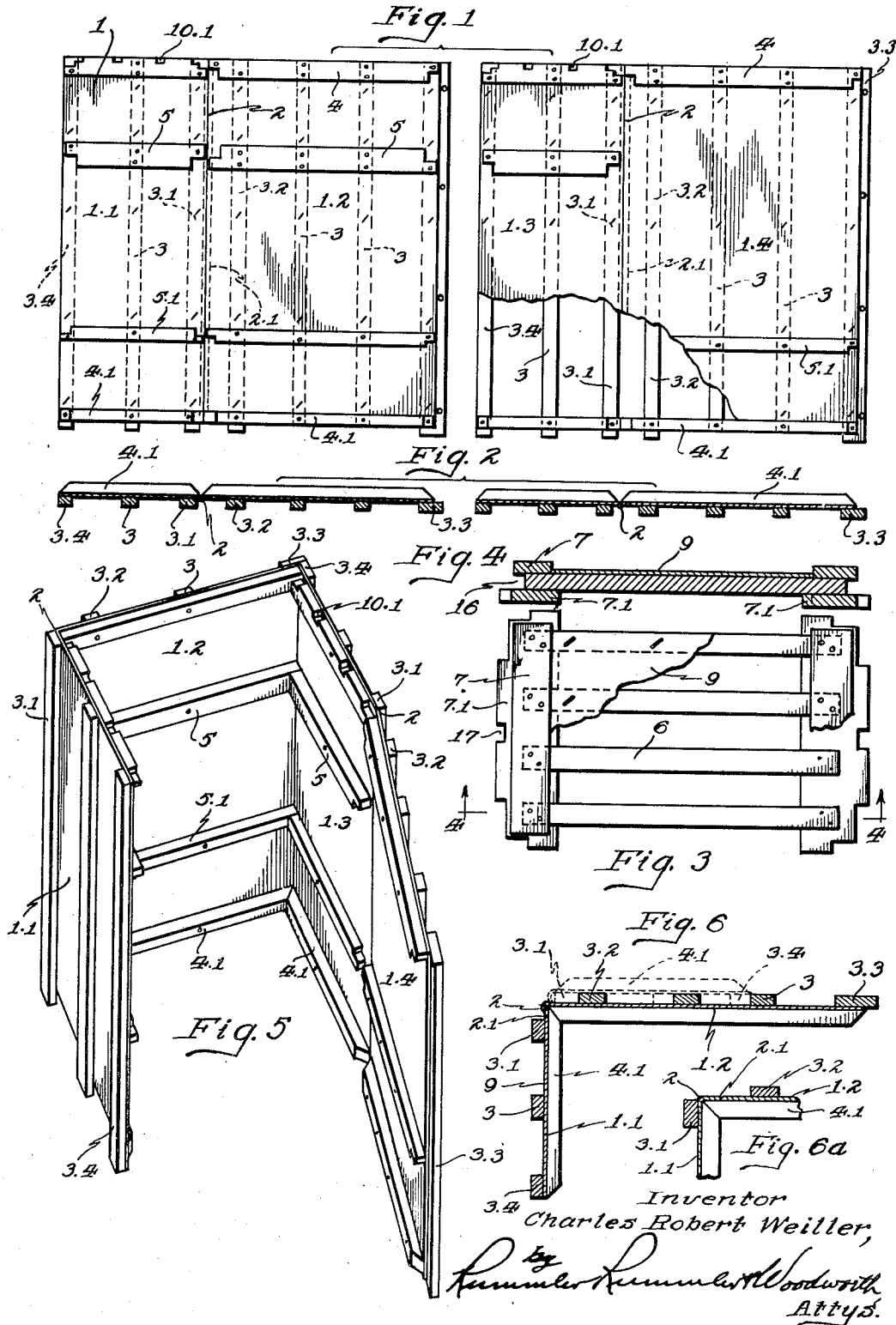
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2,177,507

FOLDING BOX CONSTRUCTION

Filed Sept. 14, 1936

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

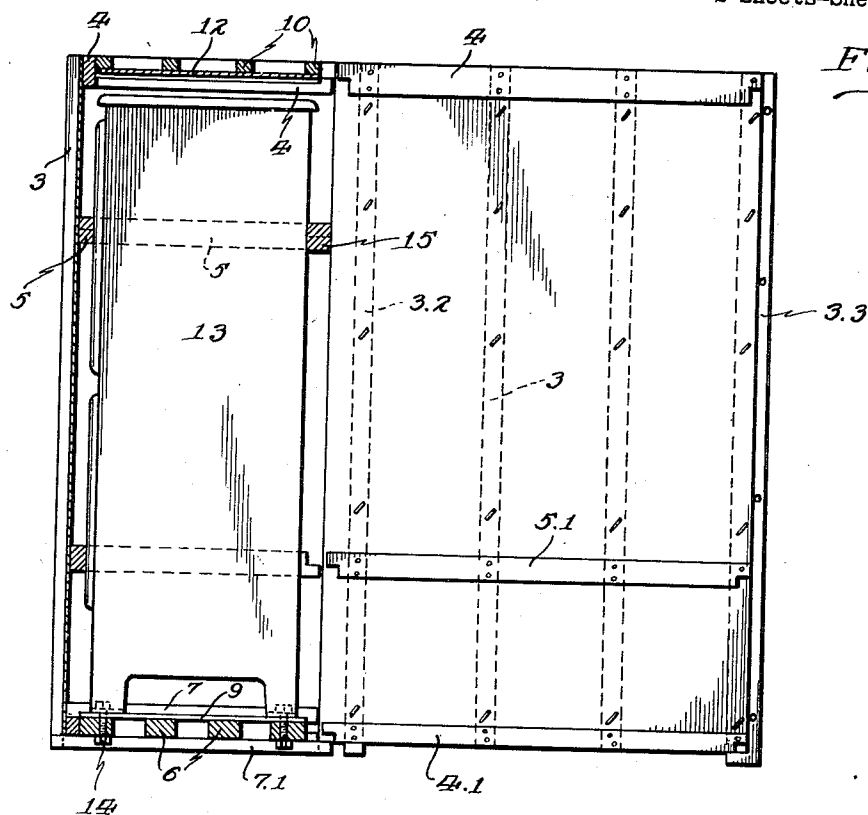


Fig. 7

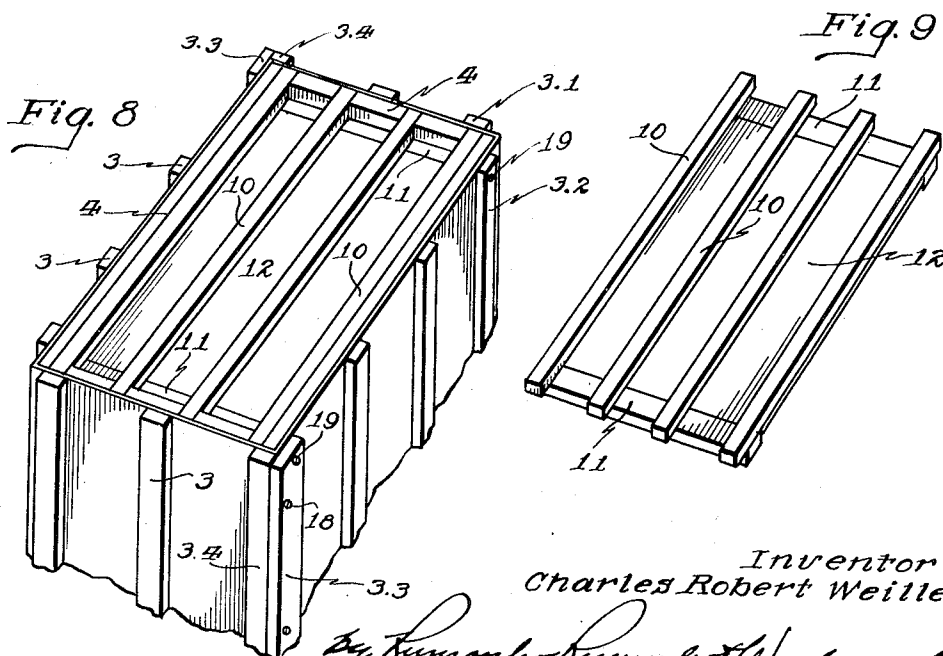


Fig. 9

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UNITED STATES PATENT OFFICE

2,177,507

FOLDING BOX CONSTRUCTION

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Application September 14, 1936, Serial No. 100,665

6 Claims. (Cl. 217-16)

This invention relates to folding box constructions and particularly to such devices of the wrap-around type having panels comprising sheet material of relatively large areas.

5 The problems of box manufacturers in devising constructions employing relatively thin, lightweight sheet materials, as a substitute for wood, in box wall panels, have resulted in many satisfactory solutions for boxes or containers of small or medium sizes. However, these constructions have proved unsuitable for containers of large sizes, or for applications where the weight of the boxed articles or products, per unit of volume, is large.

15 The failure of these constructions in such a case is due primarily to lack of strength in the large areas of the container walls, and to insufficiency of the container frame structure; and when the frame structure was suitably strengthened, it was found that the container weight and cost of manufacture were so increased that the devices were no longer competitive with the heavy all-wood constructions which they were intended to supplant.

25 The main object of this invention are to provide an improved box construction of relatively light weight and great strength; to provide an improved wrap-around box construction; to provide such a construction having an improved frame or supporting structure; to provide an improved lightweight, totally enclosed container adaptable for constructions of large sizes; to provide an improved box or container frame that will maintain its strength and shape independently of the material forming the box walls; and to provide an improved box construction arranged to interfit and interlock with a separate end panel after the box has been partially assembled and the article to be enclosed has been mounted upon said end panel.

A specific embodiment of this invention is shown in the accompanying drawings, in which:

Fig. 1 is an innerside view of the side wall mats.

45 Fig. 2 is an edge view of the same as seen from the bottom of Fig. 1.

Fig. 3 is a top plan of the bottom or lower end panel.

Fig. 4 is a section of the same on line 4-4 of Fig. 3.

50 Fig. 5 is a perspective view of the side wall mats partly assembled.

Fig. 6 is a sectional detail showing in dotted outline how the side wall mats may be folded for knock-down shipment or storage.

Fig. 6A is a similar view showing another foldable corner arrangement.

Fig. 7 is a partly sectional elevation showing the manner in which the box is positioned around the article to be housed.

Fig. 8 is a fragmentary perspective view of the upper end of a container showing the top panel arrangement.

Fig. 9 is a perspective view of the top panel.

In the form shown in the drawings, my improved box construction comprises panel sections each including a mat of sheet material, and a frame structure made up of transversely and longitudinally extending cleats which are suitably secured together, so as to provide a composite structure of great strength with lightness of weight.

The sheet material comprising the wall panels of the box mat may be sheet metal, fiber board, corrugated board, or any other suitable material, and may be in several sections joined together in any of the several suitable ways well known in the art, but adapted or arranged to be readily assembled into a rectangular box form by the user.

As shown in the drawings, the side walls are preferably made up of two mats each comprising two adjacent sides or panels of the completed box. Each mat consists of a single piece of the sheet material 1 scored transversely on one side as indicated at 2 and on the opposite side as at 2-1 to divide the said sheet into two portions or panels comprising the side walls, 1-1 and 1-2, or 1-3 and 1-4 of the box. Transversely extending cleats 3, 3-1, 3-2, 3-3, and 3-4 are disposed on what is to be the outer side surface of the mat, and these cleats are of relatively heavy stock and are so distributed that they will reinforce the corners of the box and the panel walls between corner edges. The cleats 3-1, 3-2, 3-3, and 3-4, as shown, extend from end to end of each wall panel, and thus, as shown in Fig. 5, provide vertical columns which extend from end to end of the folded box at each side of each corner thereof. Also the scored lines 2 and 2-1 are spaced apart a distance substantially equivalent to the thickness of the corner cleats 3-1, for the purpose of folding the wall panels back upon each other as will be described.

As shown, the panels may be provided with intermediate cleats 3 in addition to the corner cleats 3-1, 3-2, 3-3 and 3-4 for the purpose of providing additional vertical strength where necessary, and according to the nature of the article to be enclosed in the box. Certain of the

cleats are preferably extended beyond the lower or bottom edge of the mat that forms the side walls to interfit with the bottom frame, as will be described.

On its inner side each wall mat has a plurality of cleats 4 and 4-1 which extend from side to side of the several wall panels at right-angles to the vertical cleats and are of the same length as the respective wall panels are wide. The cleats 4 are disposed adjacent the top edge of the mats which are flush with the upper ends of the vertical cleats, and the bottom cleats 4-1 lie along the mat edge but are spaced upward from the ends of certain vertical cleats as will be hereafter described.

The ends of the respective cleats 4, as shown, are notched or mitered or otherwise shaped so that the cleat ends will abut or interfit with each other and form a square joint when the mat is folded. Any suitable arrangement for joining the ends of these cleats may be employed. However, as shown, the ends of cleats 4 and 5 are arranged for ship-lap engagement with each other because under handling of the box these cleats must sustain a large portion of the weight of the article to be housed within the box. The bottom end cleats 4-1 may be merely mitered or abutted at their ends to make a square joint since they are seated in grooves in the framing members of the bottom panel.

In the form shown, an intermediate series of horizontal cleats 5 is also provided on the inner surface of the side wall mats. These cleats 5 are disposed on the wall panels 1-1, 1-2 and 1-3 only. The corresponding cleat on the rear or last side wall panel 1-4 in the series is omitted for a reason that will be hereafter explained. Additional cleats 5-1 may be employed when required.

As indicated in the drawings, the outer vertical cleats and the inner horizontal cleats are rigidly secured together by nails, staples, wire stitching, or other suitable means, which extend from one set of cleats through the sheet material comprising the wall panels, and into the cleats on the opposite side of the panel, the staples or securing means being used at every point at which a cleat on the inner surface of the mat opposes a cleat on the outer surface. Thus a substantially rigid frame is provided that is practically independent of the sheet material forming the wall panels for its sustaining strength, but the sheet material is also stapled to the cleats so as to form a strong composite structure as a whole.

As shown in Figs. 3 and 4, the lower or bottom end panel for the box construction comprises a plurality of relatively heavy slat-like members 6, spaced apart, and arranged parallel to each other in the nature of a rectangular grid, the shape and area of which is designed to close the free area of the end of the structure formed by the erected side wall mats. Upper and lower frame members 7 and 7-1 are disposed across the ends of the grid members 6, and are arranged to overhang the same a distance substantially equivalent to the thickness of the bottom cleats on the mats 1. The wide bottom bars 7-1 extend beyond the edges of bars 7 and are notched to receive the extended lower ends of the vertical cleats. The ends of the cleats 7, likewise are arranged to overlap or extend beyond the side edges of the outermost grid members 6 so as to overlap the cleats 4-1 on the side walls. The cleats 7-1 are also notched at their ends to receive the vertical cleats 3-1, 3-2, 3-3, and

3-4. The members 7 and 7-1 being spaced apart by the slats 6 provide aligned peripheral grooves or channels 8 to receive the cleats 4-1 at the bottom edges of the side wall mats.

As shown in Fig. 4, a layer of sheet material 9 is fastened to the grid bars 6 and closes the inner surface of the bottom end panel to prevent moisture, dust and dirt from entering the box through the said end panel.

As shown in Figs. 8 and 9, the top panel or cover of the box comprises a rectangular frame of grid form, of such proportions that it will fit into the top end of the erected box and its grid cleats 10 are extended beyond its end cleats 11 and rest in notches 10-1 cut in the upper edges of the top cleats 4, as shown in Fig. 8, the thickness of the cover cleats 10 and 11 being each approximately one-half that of the uppermost cleats 4. Sheet material 12 is provided on the inner side of the cover frame between bars 11, so as to completely close the upper end of the box.

Thus, when the top end panel is set into the end of the completed box, its frame will be flush with the uppermost cleats 4 of the side wall panels.

The hereindescribed construction is designed primarily as a container for articles of large size and heavier weight than those for which fiber board and corrugated paper containers are ordinarily employed; as for example, a refrigerator such as is shown at 13 for illustrative purposes in Fig. 7. It is to be understood also that the box panels are shipped in knock-down form but are otherwise completely fabricated so that the user can readily erect the box around the article which he desires to pack.

The hereindescribed construction lends itself, with slight modification, to the expedient of forming all of the side walls in a single mat but I prefer to make the side walls in the form of two mats, each comprising two panels corresponding in size to the corresponding sides of the finished box and foldable on a scored line 2 and a spaced, oppositely scored line 2-1 in the sheet material. To this end, the cleats 3-1 which reinforce the narrower side wall panels and are located adjacent the main fold line 2 lie next adjacent to the said fold line, while the corresponding corner cleats 3-2 of the wider side wall panels are spaced away from said fold line 2 a sufficient distance to allow these two panels to be folded back upon each other on the line 2 and 2-1 as illustrated in Figs. 6 and 6A, without having any of the vertical cleats interfere with each other. The spacing of the cleats of bars 3-1 and 3-2, relative to each other and to permit such folding of the mats, is substantially equal to the sum of the thickness and width of one of the bars; and when these mats are thus folded, the parts can all be assembled in a package having a horizontal area of about the same size as the size of the largest side wall panel.

When the user desires to erect the box about an article, such as a refrigerator illustrated, he mounts the refrigerator in its final position upon the bottom panel of the box and secures its legs to this bottom panel by appropriately located bolts 14 and then sets the side wall panels in place around this bottom panel.

As shown in Fig. 7, the article being packed in the container has fastened across its back a cross bar 15. This cross-bar is positioned at the same level as the intermediate longitudinally extending cleats 5 of the box mat and takes the

place of the cleat 5 that is omitted in the right-hand panel of Fig. 1. The ends of this cross bar are notched to interfit with the adjacent ends of the cleats 5 of the narrower wall panels 1—1 and 1—3 and thus the refrigerator or other article contributes to the support of the container.

When the side wall mats are unfolded from the folded position in which they are shown in Fig. 6 to the position in which the narrower panel 1—3 has been swung through an arc of 270° with respect to the wider panel, then these two panels will stand at right-angles to each other as shown in perspective in Fig. 5 with the ship-lapped ends of their horizontal cleats 4 and 5 overlapping and interfitting with each other and with the beveled ends of the bottom cleats 4—1 abutting in mitered relation. The lower cleats 4—1 are then pushed into the grooves 16 provided for them in the edges of the base panel frame; then the extended ends of the vertical cleats 3 will find seats in the notches 17 provided for them in the outer margins of the frame member 7—1 of the bottom panel.

The second side wall mat is handled in a similar manner and the two side wall mats are fastened together by screws 18 in holes previously bored in the projecting marginal portions of the edge cleats 3—3 which overlap the adjacent cleats 3—4 of the adjoining panels in the manner shown in Fig. 8.

The cover panel is now dropped into place with the overhanging ends of its bars 10 seated in the notches 10—1 provided for them in the cleats 4 of the side walls and with their cleats 11 lying inside of and adjacent the lower portion of these notched cleats 4 and with their outermost side bars 10 lying along and parallel with the upper cleats 4 of the wide sides of the box. The cover is now fastened by means of four screws 19 adjacent to its four corners and the bottom is similarly fastened by screws connecting its frame work with the frame work of the side panels at appropriate places.

It will be readily seen that the box construction herein shown and described provides a container of great strength and durability; that is particularly adaptable for articles of large sizes, the structure being such that the sheet material of which the wall panels are made serves mainly as a covering to keep out dirt and dust. The frame of the box provides the strongest protection against damage to the article enclosed within it and because of the arrangement wherein vertical and interlocking horizontal members are rigidly secured together at every point where they cross or are opposed to each other the danger of breaking or collapsing during handling or shipping is substantially obviated regardless of the size or weight of the article.

The sheet material may be paper, corrugated board, sheet metal, wood, composition or fibre board, or any other convenient material and cost can be the deciding factor without detracting from the strength or durability of the container.

Another feature of the improved construction is the removable bottom end panel upon which the article to be packed may be mounted before the covering or enclosure is applied; and the ease and simplicity with which the said end panel is rigidly incorporated into the box structure without handling of the article during the boxing operation. This feature is also of great convenience in the unpacking operation wherein the enclosure is readily stripped from the article while

the same is resting upon its base and without the necessity of handling of the article.

Further advantages are found in the fact that the box may be shipped in a knocked down state and in flat elements that can be readily stacked and stored, thus preserving all of the features of the usual flat-folding, ship-lapping container construction in a container that is of a size hitherto incompatible with such devices.

Although but one specific embodiment of this invention is herein shown and described, it will be understood that details of the construction shown may be altered or omitted without departing from the spirit of the invention as defined by the following claims.

I claim:

1. A box mat comprising a sheet of material divided into two adjacent panels by a corner fold line, individual frame structures for reinforcing said panels and each frame structure comprising a bar extending parallel with and near said fold line, said bars being spaced apart a distance substantially equal to the sum of the width and thickness of one of said bars, and one of said panels having an oppositely creased fold parallel with said corner fold and spaced therefrom a distance equal to the thickness of said one bar.

2. A box construction comprising a plurality of side walls foldably connected together in pairs and having cleats extending transversely of the wall series, said cleats being disposed on the outside of said side walls and there being a cleat adjacent each margin of each side wall parallel with the line of fold, end cleats on the inside of each of said side walls arranged in series adjacent and parallel with the longitudinal margins of said wall series, the ends of said end cleats being arranged to interfit with each other upon folding of said wall series to form a box, fastening means rigidly securing the outside cleats to the inside cleats at points where the said cleats are opposed to each other, an end wall arranged to fit one end of said box and having a peripherally disposed and extending groove arranged to interlockingly receive the respective end cleats of the folded side walls, and another end wall arranged to fit the other end of said box and engage said end cleats thereof.

3. In a shipping container, an end wall construction comprising a plurality of parallel members arranged with their ends in transverse alignment, upper and lower frame members disposed across the ends of said parallel members at each end thereof, said upper and lower frame members each overhanging the ends of said parallel members and the ends of said frame members overhanging the side edges of the outer ones of said parallel members whereby a peripheral channel is formed in said end wall.

4. In a shipping container, an end wall construction comprising a plurality of spaced parallel members arranged in the form of a rectangular grid, upper and lower frame members disposed across the ends of said parallel members at each end thereof, said upper and lower frame members each overhanging the ends of said parallel members a predetermined distance and the ends of said frame members overhanging the side edges of the outer ones of said parallel members a predetermined distance whereby a peripheral channel is formed in said end wall.

5. A box construction comprising a plurality of side walls foldably connected together and having outside cleats extending parallel with the line of fold, a cleat on each wall being adjacent the

line of fold, end cleats on the inner side of each of said walls arranged adjacent and parallel with the bottom margin thereof, the end cleat of one wall being aligned with the end cleat of the adjacent wall, an end wall arranged to fit one end of said box and comprising a plurality of parallel members arranged in the form of a rectangular grid, and upper and lower frame members disposed across the ends of said parallel members at each end thereof and arranged to overhang the ends of said parallel members and the side edges of the outer ones thereof whereby a peripheral channel is formed in said end wall arranged to interlockingly receive and fit the end cleats of the folded side walls.

6. A box construction comprising a plurality of side walls foldably connected together and having outside cleats extending parallel with the line of fold, a cleat on each wall being adjacent the line of fold and the ends of certain of said cleats extending beyond the bottom margin of

said walls, end cleats on the inner side of each of said walls arranged adjacent and parallel with the bottom margin thereof, the end cleat of one wall being aligned with the end cleat of the adjacent wall, an end wall arranged to fit one end of said box and comprising a plurality of parallel members arranged in the form of a rectangular grid, and upper and lower frame members disposed across the ends of said parallel members at each end thereof and arranged to overhang the ends of said parallel members and the side edges of the outer ones thereof whereby a peripheral channel is formed in said end wall arranged to interlockingly receive and fit the end cleats of the folded side walls, the lower ones of said frame members extending beyond the margins of the upper ones thereof and having marginal slots disposed and arranged to receive and fit the extending ends of said outside cleats.

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