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READY BOUND CRATE

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Fig. 1

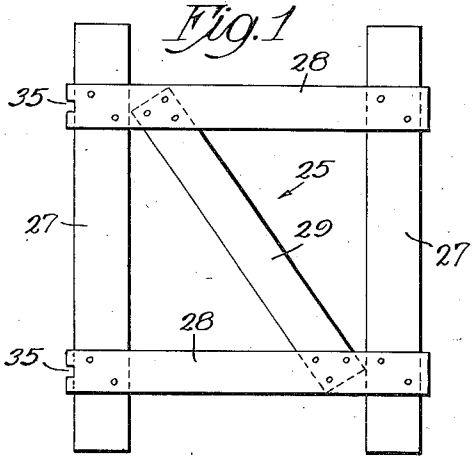


Fig. 2

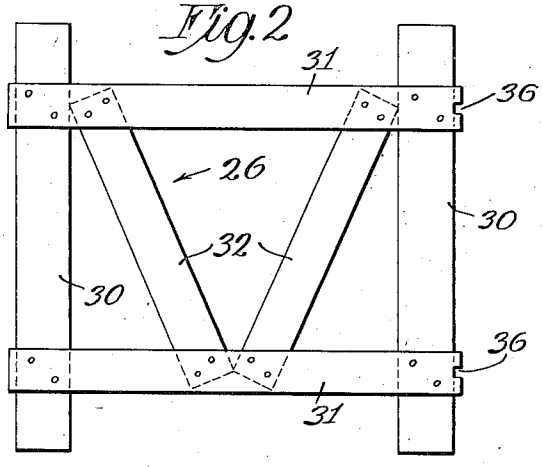


Fig. 3

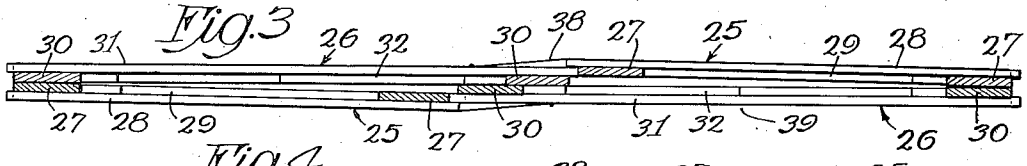


Fig. 4

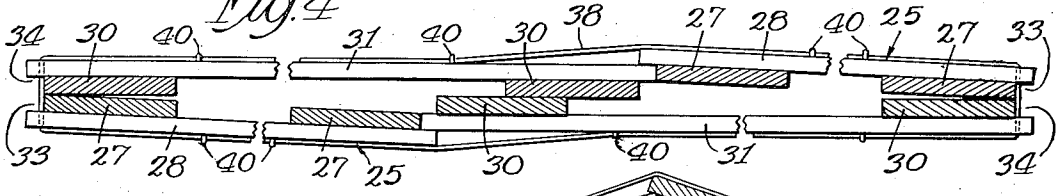
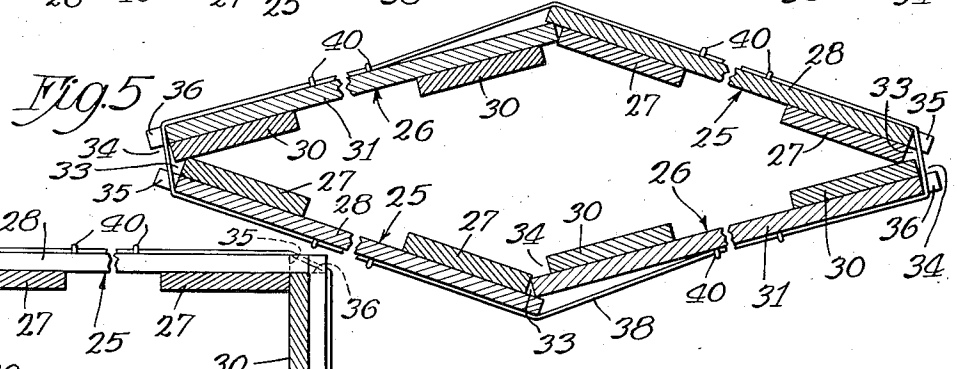


Fig. 5



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Fig. 7

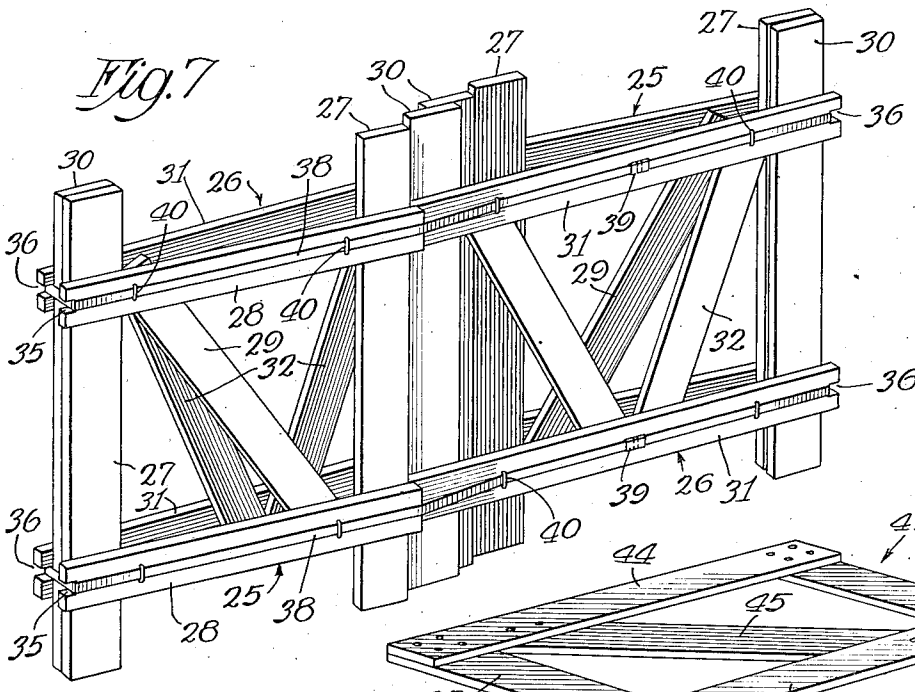


Fig. 8

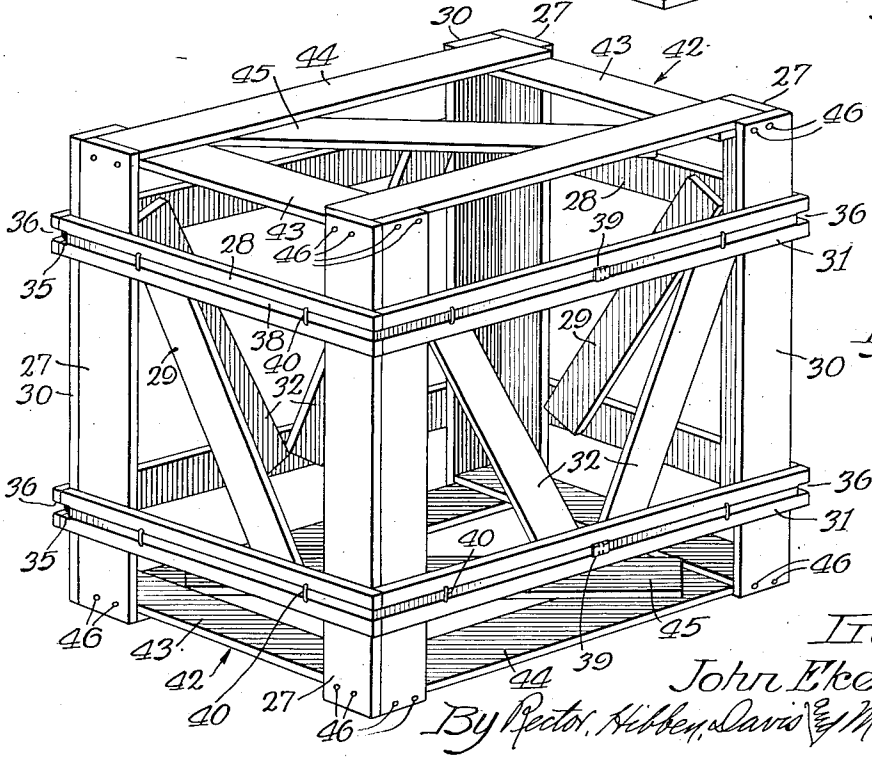


Fig. 9

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READY BOUND CRATE

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Fig. 10

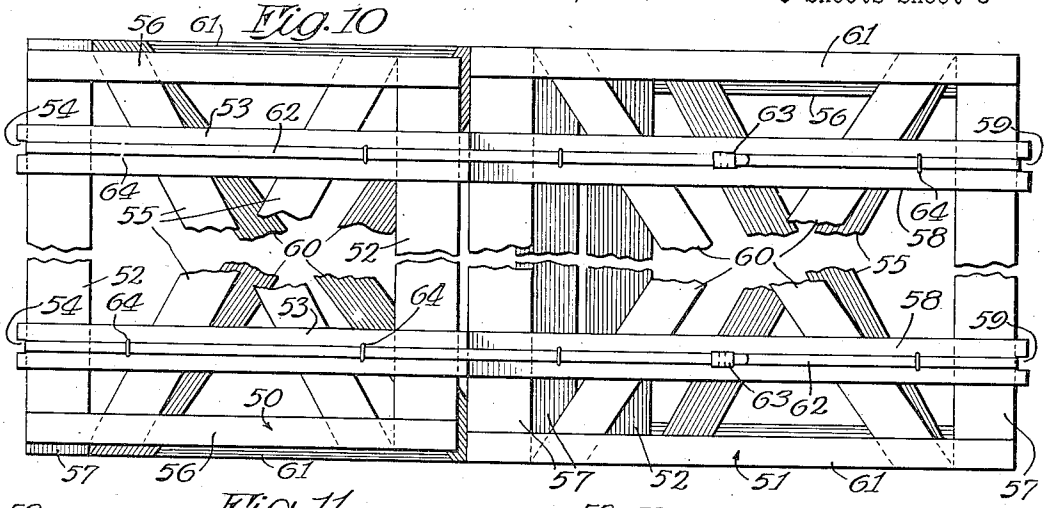


Fig. 11

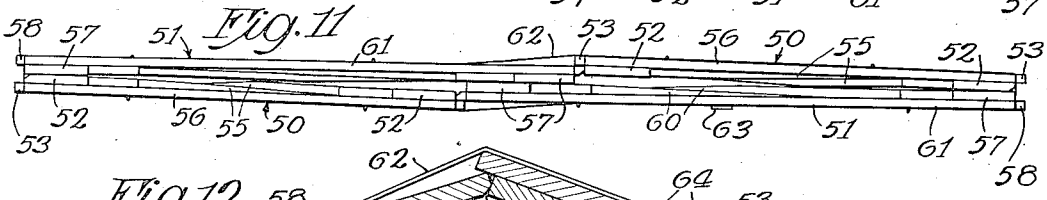


Fig. 12

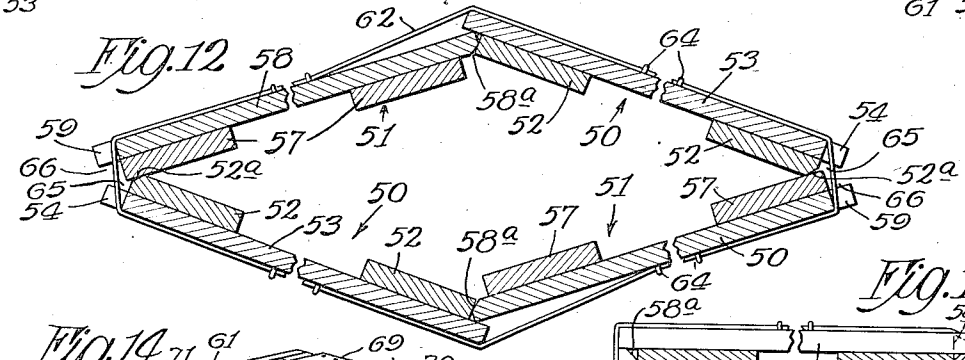


Fig. 13

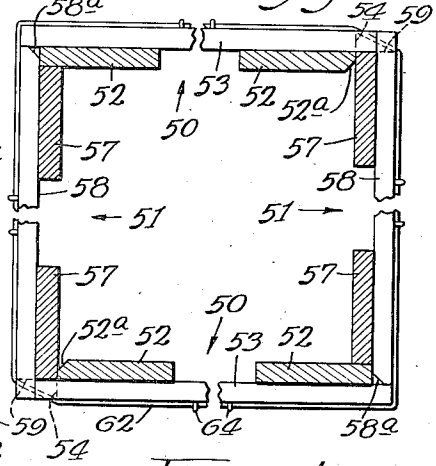
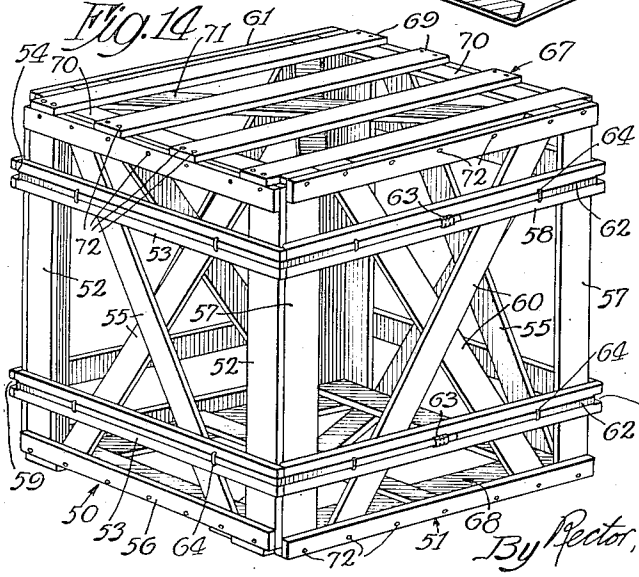


Fig. 14



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Fig. 15

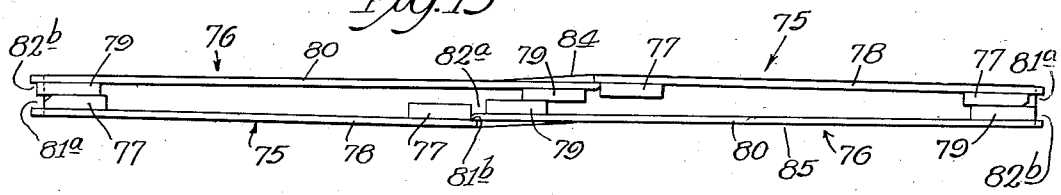


Fig. 16

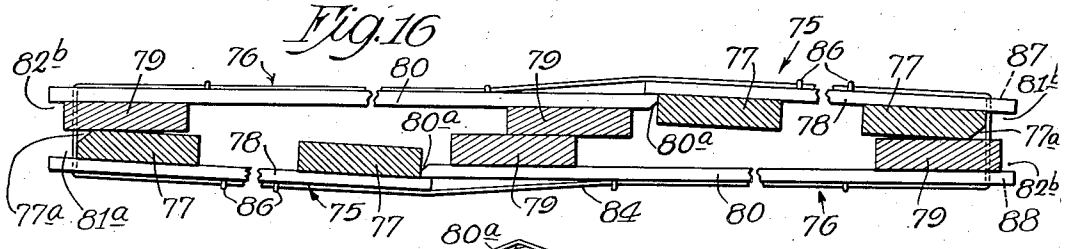


Fig. 17

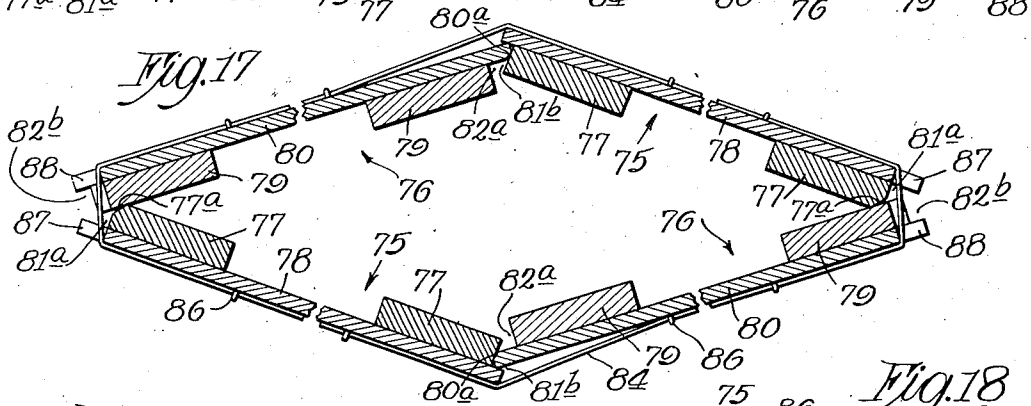


Fig. 18

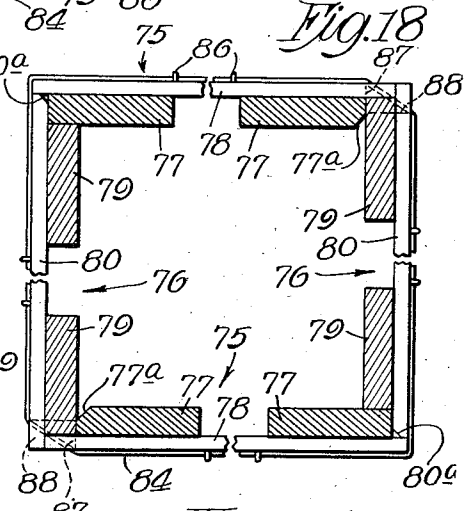
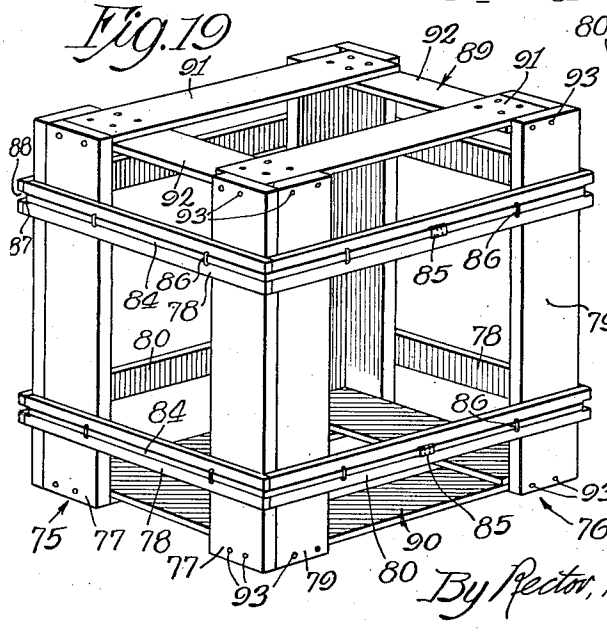


Fig. 19



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Fig. 20

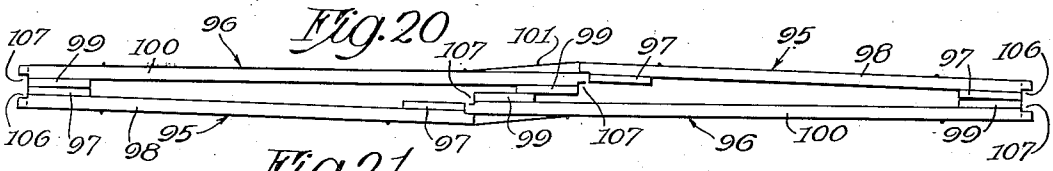


Fig. 21

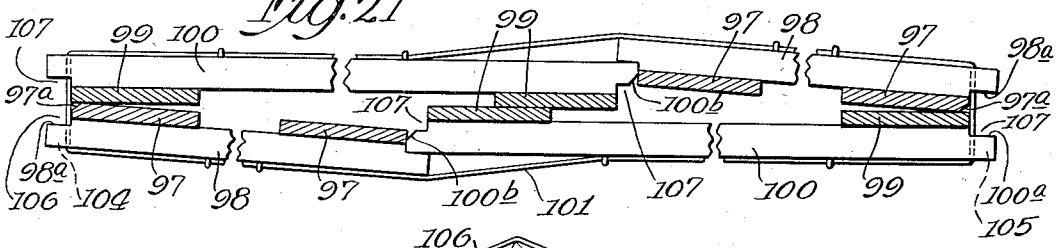


Fig. 22

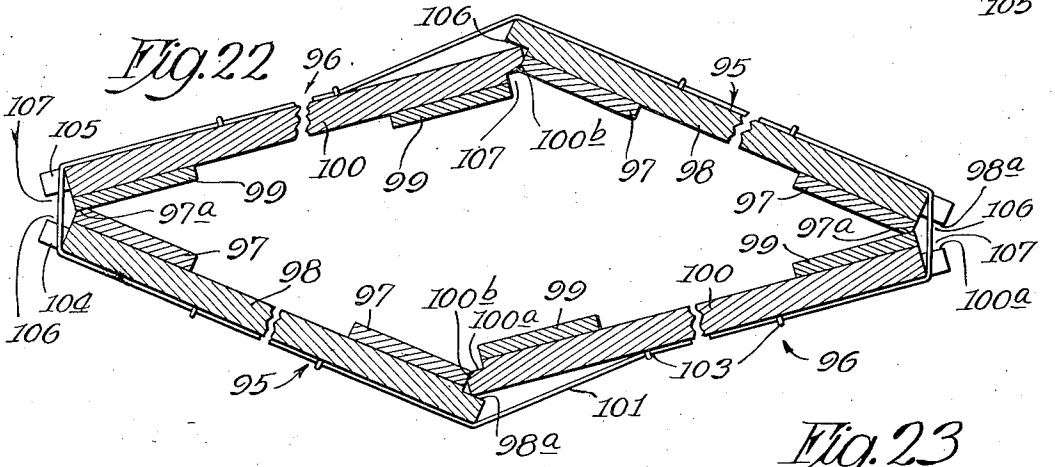


Fig. 23

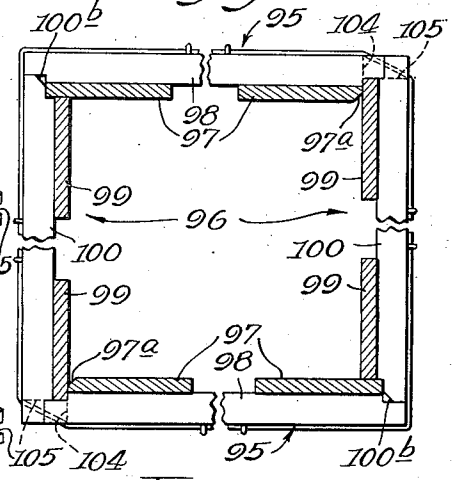
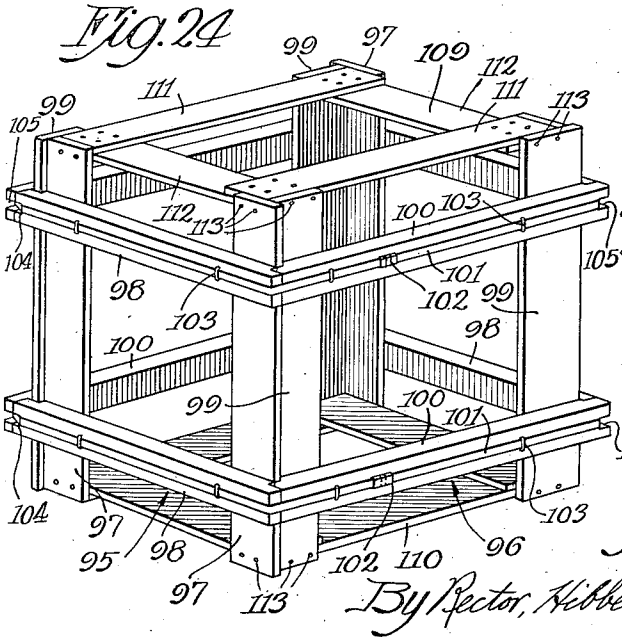


Fig. 24



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Patented May 26, 1936 2,042,323

UNITED STATES PATENT OFFICE

2,042,323

READY BOUND CRATE

John Ekern Ott, Chicago, Ill., assignor to Acme Steel Company, Chicago, Ill., a corporation of Illinois

Application November 4, 1931, Serial No. 572,905

16 Claims. (Cl. 217—16)

This invention relates to improvements in crates or boxes and its purpose is to provide an improved crate comprising a plurality of complementary walls or wall sections to which are applied one or more endless binders in such a manner that when the walls are moved from the folded positions which they normally occupy for shipment to an assembled crate or box-forming relationship, the binder or binders are put or maintained under tension so that the complementary walls are held in the proper assembled relationship and reinforced without the application of additional securing or binding means. The principal object of the invention is to provide a crate or box comprising a plurality of complementary walls encircled by one or more endless metallic binders and arranged to be unfolded with respect to each other about edges extending transversely to the direction of such binders so that when the unfolding operation is completed and the complementary walls occupy positions to form an enclosure, the binders are drawn taut and put under tension so that the walls are held in those relative positions and reinforced by the binders during the subsequent use of the box or crate. A further object of the invention is to provide a box or crate comprising a plurality of walls which are adapted to be unfolded from a flat condition to a condition in which they form the enclosing walls of a box or crate to which bottom and top walls may be applied, in combination with one or more encircling endless metallic binders which are applied to the enclosing walls while they are in their collapsed condition and which serve, when these walls have been fully unfolded, to maintain them in proper assembled relationship with each other along their meeting edges. Still another object of the invention is to provide a box or crate comprising a plurality of complementary walls surrounded by one or more encircling metallic binders which are put or maintained under tension to hold the walls in assembled relationship when they are unfolded into box-forming relation and which permits the folding and unfolding of the walls without material stretching thereof at any stage of the folding or unfolding operation. A further object of the invention is to provide a ready bound crate in which complementary box or crate walls are held in the proper relationship with each other in both unfolded and folded positions by one or more encircling binders which are put or maintained under tension when the walls are unfolded into box or crate-forming relationship. Another object is to provide an improved box or crate formed of light reinforced material and capable of being conveniently manipulated, thus lessening labor and reducing weight and freight charges. A further object is to provide a ready bound crate or box which may be sold to the trade as a unit, ready for use, thereby eliminating separate sales of box material and strapping as well as the labor on the part of the user in applying the strap. Other objects of the invention relate to various features of construction and arrangement which will appear more fully hereinafter.

The nature of the invention will be understood from the following specification taken with the accompanying drawings in which several embodiments are illustrated.

In the drawings,

Figure 1 shows an elevation of one of two identical complementary vertical walls of a crate of rectangular, horizontal cross section;

Fig. 2 shows an elevation of one of two other identical vertical walls adapted to cooperate with two walls like that illustrated in Fig. 1 to form a complete rectangular enclosure when the four walls are brought together in edge to edge relationship;

Fig. 3 shows a top plan view of the folded enclosing walls of one form of crate embodying the present invention comprising two walls like that illustrated in Fig. 1 and two walls like that illustrated in Fig. 2 with these walls surrounded by a pair of endless metallic binders;

Fig. 4 is an enlarged top plan view, similar to that of Fig. 3, with parts broken away, to show on a larger scale the relationship of the flexible binders to the walls which are surrounded by them;

Fig. 5 shows a horizontal section through the complementary walls shown in Figs. 3 and 4 showing the relative positions of the parts when the walls have been partially unfolded from the collapsed or folded positions shown in Fig. 3;

Fig. 6 shows a top plan view of the enclosing crate walls shown in Fig. 3 when these walls have been fully unfolded to form a rectangular enclosure adapted to constitute the outer vertical walls of a box or crate;

Fig. 7 shows a perspective view of the four walls shown in Fig. 3 with these walls in their folded or collapsed relationship surrounded by two endless metallic binders;

Fig. 8 shows a perspective view of a bottom or top wall adapted to be secured to the ends of the enclosing walls shown in Figs. 3 and 7;

Fig. 9 is a perspective view of the completed crate after the enclosing walls shown in Fig. 7

have been unfolded into position to form a rectangular enclosure and after the application thereto of top and bottom walls like that illustrated in Fig. 8;

Fig. 10 shows a side elevation of the folded enclosing walls of a crate embodying a modified form of the invention with the walls surrounded by two endless metallic binders;

Fig. 11 shows a top plan view of the binder encircled walls shown in Fig. 10;

Fig. 12 shows a horizontal section through the crate walls shown in Fig. 10 after they have been partially unfolded from the collapsed relationship shown in Fig. 11;

Fig. 13 shows a top plan view of the crate walls shown in Figs. 10, 11 and 12 after they have been fully unfolded to form a rectangular enclosure;

Fig. 14 shows a perspective view of a completed crate made up of four enclosing walls having the relationship shown in Fig. 13 and having secured thereto top and bottom walls of rectangular form;

Fig. 15 shows a top plan view of four complementary crate walls surrounded by flexible endless binders and embodying still another modification of the invention;

Fig. 16 shows an enlarged top plan view of the crate walls shown in Fig. 15 with parts thereof broken away, and illustrating the construction and arrangement of the cooperating edge portions of the several walls;

Fig. 17 shows a horizontal section through the vertical walls shown in Figs. 15 and 16 after these walls have been partially unfolded from the collapsed relationship shown in Fig. 15;

Fig. 18 shows a top plan view of the walls shown in Fig. 17, with parts broken away, after these walls have been fully unfolded to form a rectangular enclosure bound by the encircling endless binders;

Fig. 19 is a perspective view of a completed crate embodying the features illustrated in Figs. 15, 16, 17 and 18, and with the upper and lower ends of the enclosing walls secured to top and bottom walls, respectively;

Fig. 20 shows a top plan view of the vertical walls of still another modified form of crate embodying the present invention with the walls in collapsed relationship surrounded by a plurality of endless flexible binders;

Fig. 21 shows an enlarged top plan view of the wall sections shown in Fig. 20 with parts thereof broken away;

Fig. 22 shows a horizontal section through the complementary walls illustrated in Figs. 20 and 21, after these walls have been partially unfolded from their collapsed relationship;

Fig. 23 shows a top plan view of the complementary walls shown in Figs. 20, 21 and 22, with parts broken away, after these walls have been fully unfolded to form a rectangular enclosure with the complementary walls held in proper relation with each other by the encircling binders which are then under tension; and

Fig. 24 is a perspective view of a completed crate embodying the wall construction shown in Figs. 20, 21, 22 and 23 and with these walls secured to top and bottom walls.

In Figs. 1 to 9, inclusive, of the drawings, there is illustrated a simple form of crate embodying the features of the present invention. This crate comprises four complementary vertical walls which have an edge to edge relationship with each other to form the rectangular enclosure and the ends of the walls forming this enclosure are secured to top and bottom walls to form the completed crate. For convenience in shipment from the crate or box manufacturer, and to facilitate the use of the crate or box by the user, whose products are to be packed and shipped therein, the four enclosing walls of the box or crate are assembled in folded relationship by the manufacturer thereof and are surrounded by one or more endless metallic binders which closely engage these walls when they are in this collapsed relationship and which are put under tension when these walls are subsequently unfolded into the form of a rectangular enclosure by the user of the crate or box so that the only box-forming operation which is required of the user is the act of securing the top and bottom walls to the enclosing side walls, by nailing or the like. For convenience in assembly, it is ordinarily preferable to form the vertical enclosing walls of the box or crate of identical wall units, since this saves the necessity of selecting walls in pairs of different sizes and forms, but in Figs. 1 to 9, inclusive, the invention is shown as being embodied in a crate having two opposite walls of one size and two other opposite walls of another size so that when these vertical walls are assembled and unfolded, they form a rectangular enclosure of oblong shape. The walls have been illustrated in the drawings as being formed of wooden members secured together in skeleton form in the manner generally followed in crate construction, but they may have any desired form and be constructed of a wide range of materials such as sawed wooden "shook", veneer, ply-wood, wall-board, paperboard or sheet metal.

In Fig. 1 of the drawings there is illustrated a wall **25** which is adapted to form a vertical end wall of the crate and of which two identical walls are selected for each crate. These two walls are adapted to cooperate with two other walls **26** of similar construction, shown in Fig. 2, which are substantially like the walls **25** except that they are longer. Each wall **25** comprises a pair of upright or vertical members **27** secured together by two horizontal members **28** and these horizontal members may be further connected with each other by one or more diagonal braces **29**. The walls **26** are similarly formed of two upright or vertical walls **30** to which are secured two horizontal members **31** and these members **31** may be secured to each other by two diagonal braces **32**. The vertical members **27** and **30** are of the same thickness as the horizontal members **28** and **31** and the ends of the horizontal members project slightly beyond the edges of the vertical members to which they are attached. The extent of this projection is equal to the thickness of the members of which the walls are formed so that a right angular recess **33** is formed between the inner side of the projecting end of each horizontal member **28** and the adjacent face of the member **27** to which it is secured, while a similar right angular recess **34** is formed between the inner side of the projecting end of each horizontal member **31** and the adjacent vertical face of the upright member **30** to which it is attached. One end of each horizontal member **28** is provided with a notch **35** equal in depth to the thickness of the upright and horizontal members of which the walls are formed and one end of each horizontal member **31** of the walls **26** is similarly provided with a notch **36** of that depth. These notches are adapted to receive the encircling binders when the walls are assembled.

In Figs. 3 and 4 of the drawings, there is il-

lustrated the relationship of the encircling of the enclosing vertical walls of the box or crate when they have been assembled in collapsed relationship ready for shipment from the manufacturer. When thus assembled, one of the smaller walls **25** is located opposite one of the larger walls **26** with the notched ends of the frame members **28** positioned opposite to the notched ends of the frame members **31**.

The vertical frame members **27** and **30** adjacent to these notches **35** and **36** lie directly opposite each other. The other unnotched ends of the frame members **28** and **31** are located adjacent to each other and in overlapping relationship, that is, with the projecting end of one frame member **28** or **31** engaging the right angular recess **34** or **33** formed at the vertical edge of the next adjacent wall. As shown in Fig. 4, the projecting ends of the frame members **28** of the uppermost wall **25** overlie the projecting ends of the frame members **31** of the uppermost wall **26** with the projecting ends of the members **31** entering the right angular recesses **34**. Similarly, the unnotched projecting ends of the frame members **28** of the smaller wall section **25** on the lower side of the assembled structure, as illustrated in Fig. 4, underlie the projecting ends of the horizontal frame members **31** of the lower wall **26**. With the walls **25** and **26** occupying these relative positions, they are surrounded by flexible binders **38** which may be in the form of flat steel straps commonly employed for box strapping purposes. These straps are drawn taut and the overlapping ends of each strap are then secured together in any desired manner, as, for example, by means of seals **39**. Two endless binders are thus formed each of which occupies a surrounding position opposite to one set of horizontal frame members **28** and **31** in such position that the binder engages the notches **35** and **36** at the ends of the folded structure as viewed in Figs. 3 and 4. For security in holding the parts in this assembled relationship, the encircling binders are secured at one or more points on each wall by means of staples **40** which are preferably of such size that the binders are permitted to slide freely therethrough.

The crate is received by the user with the vertical walls folded as shown in Fig. 3, and with separate top and bottom walls which are attached to the vertical walls after the latter have been unfolded into the rectangular relationship shown in Fig. 6. The unfolding of these vertical walls of the crate is a manual operation which is preferably accompanied by slightly shifting the uppermost walls toward the left as viewed in Fig. 4 so that they slide slightly over the lower members to a position shown in Fig. 5 where the walls are shown partly unfolded. As the unfolding operation continues, one vertical member **30** of the uppermost wall **26** rocks about the corner of one vertical member **27** of the lowermost wall **25**, as viewed in Fig. 5 and at the same time the lowermost wall section **26** moves about the vertical edge of one of the vertical members **27** of the other wall **25** as shown at the right hand side of Fig. 5. The other coacting edges of the walls **24** and **25** engage each other in the right angular recesses **33** and **34**. The tension in the binders **38** increases as the unfolding operation continues until the maximum point is reached, at which the strap may form indentations in the wood at the corners about which it passes or cause the walls to bow slightly between their edges, and when the unfolding operation has been fully completed, as shown in Fig. 6, it is found that the binders **38** have retained or resumed substantially the maximum tension created therein so that they hold the contacting edges of the adjacent walls in firm relation with each other.

It will be observed that in Fig. 6 of the drawings the several vertical walls of the crate have a progressive, overlapping relationship, that is, one end of one wall abuts against the side of one of the next adjacent walls while the other end thereof overlaps the ends of the other next adjacent wall and this arrangement is continued progressively around the crate with the result that the four sides of the crate are similar in their relative arrangement with the other sides. This progressive overlapping relationship arises from the shifting movement of two of the walls with respect to the other two walls as represented in Fig. 5 upon unfolding these walls from the relationship shown in Fig. 4. If the uppermost walls, as viewed in Fig. 5, were shifted toward the right, instead of toward the left, at the commencement of the unfolding operation, two of the walls of the crate would be interposed between the other two walls with an abutting relationship at both ends thereof, which may be termed a symmetrical relationship, but that method of unfolding the walls is considered less desirable than the method illustrated in Figs. 5 and 6.

The complete walls shown in top plan view in Fig. 3, are shown in perspective view in Fig. 7 with the encircling binders in position thereon and these vertical walls which are folded as shown in Fig. 7 are adapted to be secured, when unfolded, to top and bottom walls **42** having the form shown in Figs. 8 and 9. Each bottom wall, or top wall, is made up of two transverse frame members **43** which are secured by nails or the like to two longitudinal frame members **44** and these longitudinal frame members may be connected by one or more diagonal braces **45**. When the outer or vertical walls have been unfolded into the relative positions shown in Fig. 6, they are adapted to receive the top and bottom walls **42** which are of such size that they fit within the ends of the vertical frame members **27** and **30** and, when so fitted, the ends of the frame members **27** and **30** are secured to the top and bottom walls by driving the nails **46**. This operation of applying the top and bottom walls is performed by the user of the crates who ships his wares therein and the driving of the nails **46** is the only operation required of this user to secure all of the parts of the crate in their proper assembled relationship.

In Figs. 10 to 14, inclusive, of the drawings, there is illustrated a modified form of the invention in which the coacting edges of the vertical side walls of the crate, which unfold upon each other, are chamfered or beveled for the purpose of decreasing the tendency to stretch the encircling binders during the operation of unfolding the vertical walls which are enclosed thereby. This crate is shown as comprising two similar vertical walls **50** which are adapted to cooperate with two other different vertical walls **51**, which are of similar construction, to form a complete rectangular enclosure when they are unfolded from the collapsed relationship shown in Fig. 11. Of course, all of the vertical walls of the crate may be of the same size and construction but in the drawings this crate has been shown as comprising two walls which are of less

width than the other two walls so that the crate when unfolded has an oblong cross section; and, in addition, the walls **50** are of less height than the walls **51**. The walls **50** each comprise two vertical frame members **52** which are connected by two horizontal frame members **53**. The members **53** project beyond the members **52** at both ends and adjacent one of the vertical members **52**, the projecting portions of the members **53** are notched as shown at **54**. The horizontal members **53** preferably have diagonal cross braces **55** secured thereto and the ends of these braces and of the upright members **52** may be secured to horizontal nailing strips **56**. The walls **51** are each formed with two vertical frame members **57** connected by two horizontal frame members **58** which project beyond the members **57** at both ends with the projecting ends adjacent one member **57** provided with notches **59**. The horizontal members **58** are preferably secured to diagonal braces **60** and the upper and lower ends of these braces and of the vertical members **57** may be secured to horizontal nailing strips **61**. The notches **59** are adapted to be engaged by the surrounding binders **62** which, in this embodiment, are in the form of flat, flexible steel straps. After these straps have been drawn taut around the superimposed walls in the position shown in Fig. 11, the overlapping ends of each strap are secured together by means of a seal **63**. Each strap **62** is also secured to each of the wall sections **50** and **51** by one or more staples **64** which are driven into the horizontal frame members and which are of such size as to permit the straps to move freely therethrough.

In the embodiment shown in Figs. 10 to 14, inclusive, the vertical members **52** and **57** are preferably of the same thickness as the horizontal members **53** and **58**. The projection of the horizontal members **53** beyond the members **52** forms right angular recesses **65** on the walls **50** while the similar projection of the members **58** beyond the members **57** forms similar right angular recesses **66** on the walls **51**. The outer edge or corner of one vertical frame member **52** of each wall **50** is chamfered or beveled as shown at **52a** and the inner vertical corner or edge of each horizontal frame member **58**, embodied in the walls **51**, is similarly chamfered or beveled as shown at **58a**. When the walls are in the folded or collapsed relationship shown in Figs. 10 and 11, the outermost vertical frame members **52** are positioned directly opposite the outermost vertical frame members **57** while the other intermediate vertical frame members **52** and **57** have the overlapping relationship shown in Fig. 11. It will be observed that the innermost ends of the horizontal frame members **58** of the walls **51**, as viewed in Fig. 11, are overlapped on their outer sides by the innermost ends of the frame members **53** of the walls **50** and that these ends of the frame members **58** thus engage the angular recesses **65** which are formed on the walls **50**. At the commencement of the unfolding operation, which is shown at an intermediate point in Fig. 12, the walls **50** and **51** which are there shown as being uppermost, are shifted slightly to the left as viewed in that figure and then the intermediate overlapping end portions of the walls are moved outwardly away from each other. During this relative movement, the vertical frame members **57** at the outer edges of the walls **51** coact with the chamfered or beveled surfaces **52a** on the outermost vertical frame member **52** while the chamfered surfaces **58a** at the inner ends of the frame members **58** coact with the vertical end faces of the innermost frame members **52**. The converging walls thus maintain a relatively close relationship with each other at the point of convergence during the unfolding operation and this permits the walls to be moved from the folded relationship shown in Fig. 11 to the fully unfolded relationship shown in Fig. 13 without causing the outer edge portions of the walls **50** and **51** to stretch the flexible binders **62** during the unfolding process. When the walls have been fully unfolded into the rectangular relationship shown in Fig. 13, they are in readiness to receive the top and bottom walls **67** and **68**, respectively, which are wooden frame construction. For example, the top wall **67** comprises spaced longitudinal members **69** having their ends projecting slightly beyond the transverse members **70** to which they are secured, together with diagonal braces **71**. The bottom wall **68** may be substantially similar to the top wall **67**. When the vertical walls are fully unfolded the top and bottom walls are fitted to the ends of the vertical walls and secured thereto by nails **72**. The longitudinal members of the top and bottom walls then overlap the edges of the walls **50**, which are of less height than the walls **51**, and the top and bottom walls fit between the edges of the walls **51**, so that nails may be driven horizontally through the nailing strips **61** into the top and bottom walls and may be driven vertically through the top and bottom walls into the nailing strips **56**. This embodiment has the advantage that the unfolding operation may be completed without the necessity of bowing or bending the vertical walls and without the necessity of permitting the binders to dig into the wood of the frame members at the corners about which they pass, so that the walls may be made of rigid construction and of relatively hard wood while at the same time permitting the unfolding operation without stretching the strap and preventing the maintenance of a high degree of tension in the strap or binder when the final unfolded relationship of the walls is attained.

In Figs. 15 to 19, inclusive, of the drawings, there is illustrated still another modification of the invention in which the vertical frame members and the horizontal frame members of the vertical walls of the crate are of different thickness. In this form, the crate is made up of two similar walls **75** and two other similar walls **76** which are of greater length than the walls **75** so that when the crate is unfolded it is oblong in horizontal cross section. Each wall **75** is made up of a pair of vertical frame members **77** which are connected by a pair of horizontal frame members **78** and each wall **76** is made up of a pair of vertical frame members **79** connected by a pair of horizontal frame members **80**. In this embodiment the vertical frame members **77** and **79** are of the same thickness but of greater thickness than the horizontal frame members **78** and **80**. Owing to this difference in thickness, some variation in construction is necessary, as compared with the forms of the invention previously described, in order to cause the several walls of the crate to fit together smoothly at the corners. When the walls are in the collapsed relationship shown in Fig. 15, the outer ends of the horizontal frame members **78** are directly opposite the outer ends of the horizontal frame members **80**, while the inner ends of the hori-

zontal frame members 78 overlap the inner ends of the horizontal frame members 80.

In order that the walls may fit together at the corners when unfolded from the collapsed relationship just described, the vertical frame members 77 of the walls 75 are spaced inwardly from the ends of the horizontal frame members 78 to form right-angular recesses 81a at the outer end of each wall 75 and other right-angular recesses 81b at the inner ends of these walls 75. Similarly, the vertical frame members 79 of the walls 76 are spaced inwardly from the ends of the members 80 to form right-angular recesses 82a at the inner ends of the walls 76 and right-angular recesses 82b at the outer ends of the walls 76. When the walls are unfolded in the overlapping relationship heretofore described, that is, a progressive relationship in which one end of one wall abuts against one adjacent wall while the other end of that wall overlaps the next following wall, the walls fit together to form smooth right-angular joints at the corners of the crate, and the recesses 81a and 82a are therefore made equal in depth to the thickness of the vertical frame members 79 and 77, respectively, measured horizontally, while the other recesses 81b and 82b are made equal in depth, measured horizontally, to the thicknesses of the horizontal frame members 78 and 80.

The walls 75 and 76 which are folded upon each other as shown in Fig. 15 are surrounded by a plurality of flexible binders 84, preferably in the form of flat, flexible steel straps, each of which is located opposite one series of horizontal frame members. Each flexible binder 84 has the ends thereof secured together while it is under tension by means of a seal 85 or the like. Each binder is further held against vertical movement by means of staples 86, one or more of which is driven into each horizontal frame member, and these staples are sufficiently large to permit endwise movement of the binders therethrough. When the walls 75 and 76 are in the folded relationship shown in Fig. 15, the binders 84 are under tension and they engage notches which are formed in the outer ends of the horizontal frame members as they appear in the folded relationship. The outer end of each wall 75 is provided centrally on each horizontal frame member 78 with a rectangular notch 87 which extends inwardly to the point where the bottom of the notch lies flush with the adjacent vertical edge of a frame member 77. The outer ends of the larger wall sections 76 are similarly provided with notches 88 which extend inwardly from the central points of the horizontal frame members 80 but which extend partially into the adjacent vertical frame members 79 also, so that they are of the same depth measured inwardly from the frame members, as the notches 87 which are formed in the other walls 75. This arrangement permits the binders 84 to extend transversely across the ends of the folded structure at right angles to the longitudinal portions of the binders, as illustrated in Fig. 16, and it facilitates the unfolding of the walls without undue stretching of the binders. For the purpose of further facilitating the unfolding of the walls, certain contacting edges or corners of the walls are beveled or chamfered as explained in connection with the form of the invention shown in Figs. 10 to 14, inclusive. The inner ends of the horizontal frame members 80 of the walls 76 are chamfered or beveled on their inner vertical corners as shown at 80a and the outermost vertical corners of the outer vertical frame members 77 are similarly chamfered or beveled as shown at 77a. The chamfered surfaces 77a are adapted to engage the adjacent flat faces of the outer vertical frame members 79 during the operation of unfolding the walls, as shown in Fig. 17, and the chamfered surfaces 80a are adapted to engage and rock upon the adjacent end faces of the inner vertical frame members 77 during this unfolding operation. The provision of the chamfered or beveled surfaces tends to prevent any increase in the circumferential dimension of the outer surfaces of the walls during the unfolding operation so that there is no tendency to stretch the binders 84 to such a point that the tension therein would be substantially decreased as the walls reach the final unfolded position shown in Fig. 18. By using these special notches in the ends of the horizontal frame members and by employing the chamfered surfaces on certain vertical edges of the walls as shown, it is possible to construct wall sections which are comparatively rigid and which are made up of frame members of different thickness, without interfering with the convenient unfolding or collapsing of the walls and without appreciably diminishing the tension which is present in the surrounding binders after the walls have been fully unfolded. After the vertical walls have been unfolded into rectangular relationship, the top and bottom walls may be secured thereto. The top and bottom walls 89 and 90, respectively, are each made up of longitudinal members 91 secured to transverse members 92. These walls fit within the ends of the vertical frame members 77 and 79, as shown in Fig. 19 and are secured to these vertical frame members by nails 93. This nailing operation is performed by the user of the crate after he has placed within the enclosing vertical walls of the crate the objects to be shipped therein and when the loaded crate reaches its destination, the nails 93 may be readily withdrawn to permit the unpacking of the crate without breaking the flexible binders 84 so that the crate may again be stored and subsequently used for another shipment, if desired. This advantage is, of course, present in the other forms of crate which are herein described.

In Figs. 20 to 24, inclusive, of the drawings, there is illustrated still another form of the invention which is distinguished from the forms heretofore described in that the horizontal frame members of the crate are thicker than the vertical frame members and in the fact that a different form of recessing or notching is employed along the contacting edges of the walls to facilitate the unfolding of the crate without stretching the binders and to permit smooth joints to be obtained at the corners. This crate comprises two similar wall sections 95 and two other similar wall sections 96 which are of larger dimensions so that when the walls are folded from the collapsed relationship shown in Fig. 20, they form an enclosure of oblong rectangular cross section. Each wall 95 is made up of a pair of vertical frame members 97 which are secured together by means of a pair of horizontal frame members 98, and each wall 96 is similarly made up of two vertical frame members 99 which are secured together by two horizontal frame members 100. These walls are surrounded and held in proper relationship while in the collapsed condition shown in Figs. 20 and 21, by means of a plurality of surrounding flexible binders 101, preferably in the form of flat flexible steel straps, which are under tension while the crate is in its collapsed condition and

which are so located that each strap extends around the outer sides of one series of horizontal frame members, it being understood that the horizontal frame members **98** are located in alignment with the horizontal frame members **100**. The binders **101** are put under tension when passed around the walls in the collapsed state and the ends of each binder are then secured together by a seal **102**. The straps are held in place by staples **103**, one or more of which are driven into each horizontal frame member and these staples are adapted to permit the free sliding movement of the straps therethrough. The members **98** are of the same thickness as the members **100** but both of these members are of substantially greater thickness, than the members **97** and **99** which are preferably of equal thickness. The horizontal frame members project at their ends beyond the vertical frame members to which they are attached and at the outer ends of the horizontal frame members, when the walls are in the collapsed relationship shown in Fig. 20, the horizontal members **98** and **100** are provided with notches **104** and **105**, respectively, which extend inwardly from the outer ends of the horizontal frame members to distances equal to the thickness of these members, terminating at their inner ends flush with the outer vertical edge surfaces of the adjacent vertical frame members. These notches serve, of course, to retain the flexible binders **101** against vertical displacement but it is ordinarily desirable to use also the staples **103** previously referred to. Each wall **95** is provided at its outer end or edge, as shown in Figs. 20 and 21, with an angular vertically extending recess **106** and each wall section **96** is similarly provided at each end with an angular vertically extending recess **107**. These recesses are formed not only by the projection of the horizontal frame members beyond the edges of the adjacent vertical frame members but are enlarged by cutting out portions of the horizontal frame members **98** as shown at **98a** and by similarly cutting out portions of the frame members **100** as shown at **100a** so that each notch **106** or **107** has a depth, measured transversely of the wall, equal to one-half of the combined thickness of the adjacent horizontal frame member and vertical frame member secured thereto. Thus all of the recesses **106** and **107** are identical in size. For further facilitating the unfolding of the collapsed walls of the crate, the outermost vertical corners of the outer vertical frame members **97**, as shown in Fig. 21, are chamfered or beveled as shown at **97a** and the innermost corners or edges of the horizontal frame members **100** are similarly chamfered or beveled as shown at **100b**. These chamfered or beveled edges function as did the correspondingly formed parts in the embodiments of the invention heretofore described, to facilitate the unfolding of the walls without unduly stretching the surrounding binders.

When the walls **95** and **96** are unfolded the uppermost wall sections, as viewed in Fig. 21, are shifted slightly toward the left as these two walls are separated from the lower ones so that as the walls are gradually unfolded through the stage illustrated in Fig. 22, they tend to assume the progressive overlapping relationship heretofore referred to. When the unfolding operation has been completed, the walls occupy the rectangular relationship shown in Fig. 23 and the parts are then in readiness for receiving the commodities to be shipped and for the attachment thereto of the top wall **109** and the bottom wall **110**. Each of these walls is made up of longitudinal frame members **111** secured to transverse members **112** and each of the top and bottom walls is adapted to fit within the vertical frame members **97** and **99** so that they may be secured to the upper and lower extremities of these frame members by means of nails **113**.

The invention has been illustrated as being embodied in crates made up of wall sections composed of frame members spaced apart but it is, of course, apparent that the invention may be employed with the same advantage in boxes or the like having continuous walls and it is to be understood that the features which have been herein described and which are referred to in the appended claims may be considered as being employed either in a crate or a box, although crates have been more specifically referred to. Where the invention is embodied in a crate, the recesses which are formed at the vertical edges of the wall sections, where the horizontal frame members project beyond the vertical frame members, will exist only at the points where the horizontal frame members are located but, in the case of a box, these recesses will, of course, be continuous from one edge of the wall to the other. The accompanying claims are intended to be of such scope as to include boxes having three or more side walls as well as crates.

Although several forms of the invention have been shown and described by way of illustration, it will be understood that the invention may be embodied in various forms of construction coming within the allowable scope of the appended claims.

I claim:

1. The combination in a crate or the like, of a plurality of complementary walls folded upon each other and capable of being unfolded to form an enclosure, each of said walls being formed of horizontal members secured to vertical members which are spaced inwardly from the ends of said horizontal members to form angular recesses at the ends of each wall, and a flexible binder surrounding said walls and adapted to hold the ends of said walls in interfitting relationship with the recesses of adjacent walls when said walls are unfolded.

2. The combination in a crate or the like, of a plurality of complementary walls folded upon each other and capable of being unfolded to form an enclosure, and a flexible metallic binder permanently surrounding said walls and holding them in proper relative positions in both the folded and unfolded conditions, said walls being adapted to contact with each other along their edges during the unfolding operation, some of said walls being beveled along said edges.

3. The combination in a crate or the like, of a plurality of complementary walls folded upon each other and adapted to be unfolded to form an enclosure, each of said walls comprising horizontal members secured to vertical members and extending beyond the edges of such vertical members to form angular recesses along the edges of the walls, each of said recesses being adapted to be engaged by a part of the next adjacent wall when said walls are unfolded, and a flexible binder surrounding said walls and secured in position thereon for holding said walls in assembled relation, said binders being put under tension by the operation of unfolding said walls.

4. The combination in a crate or the like, of a plurality of complementary walls folded upon

each other and adapted to be unfolded to form an enclosure, each of said walls comprising horizontal members secured to vertical members and extending beyond the edges of such vertical members to form angular recesses along the edges of the walls, each of said recesses being adapted to be engaged by a part of the next adjacent wall when said walls are unfolded, and a flexible binder surrounding said walls and secured in position thereon for holding said walls in assembled relation, said binders being put under tension by the operation of unfolding said walls, said walls having some of their edges beveled where they contact with the next adjacent walls during the unfolding operation.

5. The combination in a crate or the like, of a plurality of complementary walls folded upon each other and capable of being unfolded to form an enclosure, each of said walls being made up of a plurality of horizontal members secured to vertical members with the horizontal members extending beyond the vertical members to form angular recesses at the edges of said walls, said horizontal members having parts of the ends thereof cut away to increase the depth of said recesses, each of said recesses being adapted to be engaged by an edge portion of an adjacent wall when said walls are unfolded, and a flexible binder surrounding said walls and adapted to be put under tension when said walls are unfolded to hold them in assembled relation.

6. The combination in a crate or the like, of a plurality of complementary walls folded upon each other and adapted to be unfolded to form an enclosure, each of said walls comprising horizontal members secured to vertical members spaced inwardly from the ends of said horizontal members, the projecting portions of said horizontal members being provided with notches, and a flexible endless binder extending around said walls in engagement with said notches, said binder being put under tension by the operation of unfolding said walls whereby said walls are held by said binder in assembled relation.

7. The combination in a crate or the like, of a plurality of complementary walls folded upon each other and adapted to be unfolded to form an enclosure, each of said walls comprising horizontal members secured to vertical members and extending beyond the edges of said vertical members to form angular recesses along the edges of said walls, each of said recesses being adapted to be engaged by a part of the next adjacent wall when said walls are unfolded, and a flexible binder surrounding said walls and secured in position thereon for holding said walls in assembled relation, the horizontal members of said walls having notches engaged by said flexible binder.

8. The combination in a crate or the like, of a plurality of complementary walls folded upon each other and adapted to be unfolded to form an enclosure, each of said walls comprising horizontal members secured to vertical members and extending beyond the edges of said vertical members to form angular recesses along the edges of said walls, each of said recesses being adapted to be engaged by a part of the next adjacent wall when said walls are unfolded, and a flexible binder surrounding said walls and secured in position thereon for holding said walls in assembled relation, the horizontal members of said walls having notches engaged by said flexible binder, said walls having some of their edge surfaces beveled to coact with parts of adjacent wall sections during said unfolding operation.

9. The combination in a crate or the like, of a plurality of complementary walls folded upon each other and adapted to be unfolded to form an enclosure, each of said walls comprising horizontal members spaced apart and secured to spaced vertical members, said horizontal members extending beyond said vertical members to form angular recesses at the edges of said walls, each of said recesses being adapted to be engaged by a part of the next adjacent wall when said walls are unfolded, said horizontal members and said vertical members having some of their coacting edge surfaces beveled, said horizontal members having their outer ends provided with notches, and a plurality of endless, flexible binders extending around said walls and engaging said notches, said flexible binders being put under tension when said walls are unfolded.

10. The combination in a crate or the like, of a plurality of complementary walls folded upon each other and capable of being unfolded to form an enclosure, each of said walls being formed of horizontal members secured to vertical members which are spaced inwardly from the ends of said horizontal members to form annular recesses at the ends of each wall, and a flexible binder surrounding said walls and adapted to hold the ends of said walls in inter-fitting relationship with the recesses of adjacent walls when said walls are unfolded, said flexible binder being put under tension by the act of unfolding said walls.

11. The combination in a crate or the like of a plurality of complementary walls folded upon each other and adapted to be unfolded to form an enclosure, each of said walls comprising horizontal members secured to vertical members spaced inwardly from the ends of said horizontal members, an endless flexible binder surrounding said walls to hold the ends of said walls in inter-fitting relationship with each other when said walls are unfolded, and top and bottom walls fitted within the ends of said vertical members and secured thereto by nailing.

12. The combination in a crate or the like of a plurality of complementary walls folded upon each other and adapted to be unfolded to form an enclosure, each of said walls comprising horizontal members secured to vertical members spaced inwardly from the ends of said horizontal members, an endless flexible binder surrounding said walls to hold the ends of said walls in inter-fitting relationship with each other when said walls are unfolded, top and bottom walls fitted within the ends of said vertical members, and nailing strips located on the outer sides of the end portions of said vertical members to receive nails passing therethrough into said top and bottom walls.

13. The combination in a crate or the like, of a plurality of complementary walls folded upon each other and capable of being unfolded to form an enclosure, each of said walls being made up of a plurality of horizontal members secured to vertical members with the horizontal members extending beyond the vertical members to form angular recesses at the edges of said walls, said horizontal members being of greater thickness than said vertical members and having portions thereof cut away at their ends to increase the depth of said notches, each of said recesses being adapted to be engaged by an edge portion of an adjacent wall when said walls are unfolded, and a flexible binder surrounding said walls and adapted to be put under tension when said walls are unfolded to hold them in assembled relation.

14. The combination in a crate or the like, of

a plurality of complementary walls folded upon each other and capable of being unfolded to form an enclosure, each of said walls being made up of a plurality of horizontal members secured to the outer sides of vertical members with the horizontal members extending beyond the vertical members to form angular recesses at the vertical edges of said walls, said horizontal members having notches in the ends thereof, certain of said vertical members having notches therein to register with the notches in said horizontal members, and an endless flexible binder surrounding said walls and engaging said notches when said walls are folded upon each other, each of said recesses being adapted to be engaged by an edge portion of an adjacent wall when said walls are unfolded, said flexible binder being put under tension by the operation of unfolding said walls.

15. The combination in a crate or the like, of a plurality of complementary walls folded upon each other and capable of being unfolded to form an enclosure, each of said walls being made up of a plurality of horizontal members secured to the outer sides of vertical members which are of greater thickness than said horizontal members, said horizontal members extending beyond said vertical members to form angular recesses at the edges of said walls, each of said recesses being adapted to be engaged by an edge portion of an adjacent wall when said walls are unfolded, the ends of said horizontal members and the edges of certain of said vertical members which are located at the outer edges of the folded crate being provided with aligning notches, and an endless flexible binder surrounding said walls and engaging said notches and adapted to be put under tension when said walls are unfolded.

16. The combination in a crate or the like, of a plurality of complementary walls folded upon each other and capable of being unfolded to form an enclosure, each of said walls having two lateral edges which contact with the corresponding edges of two next adjacent walls during the operation of unfolding, some of said walls being beveled along their contacting edges, and flexible binders secured to each of said walls and extending over each pair of contacting edges of adjacent walls, said binders being put under tension by the operation of unfolding said walls.

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