May 26, 1936. C. S. HENDERSON 2,042,339

READY BOUND CRATE

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Fig. 1

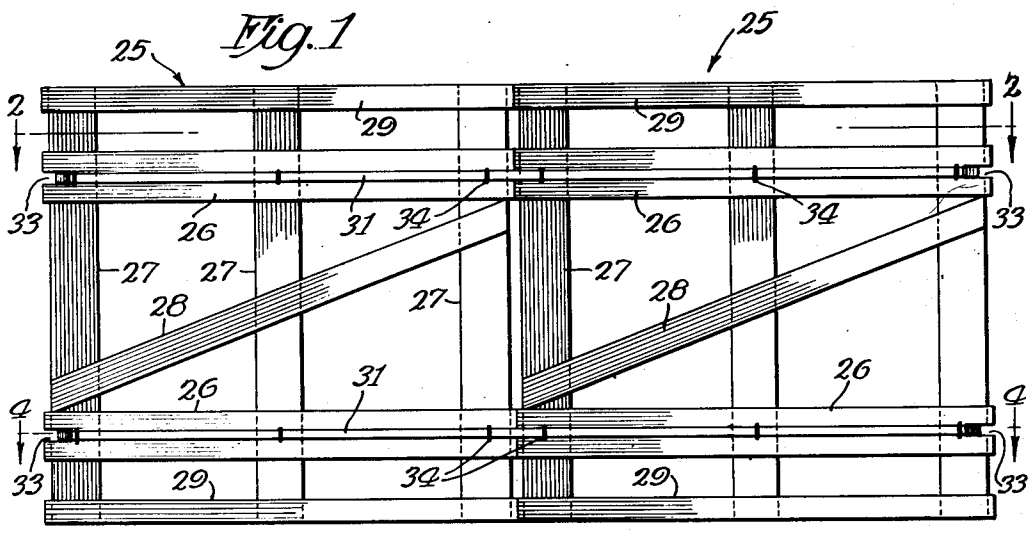


Fig. 2

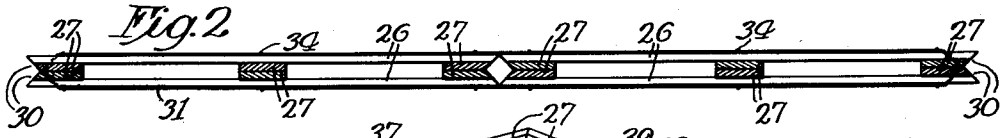
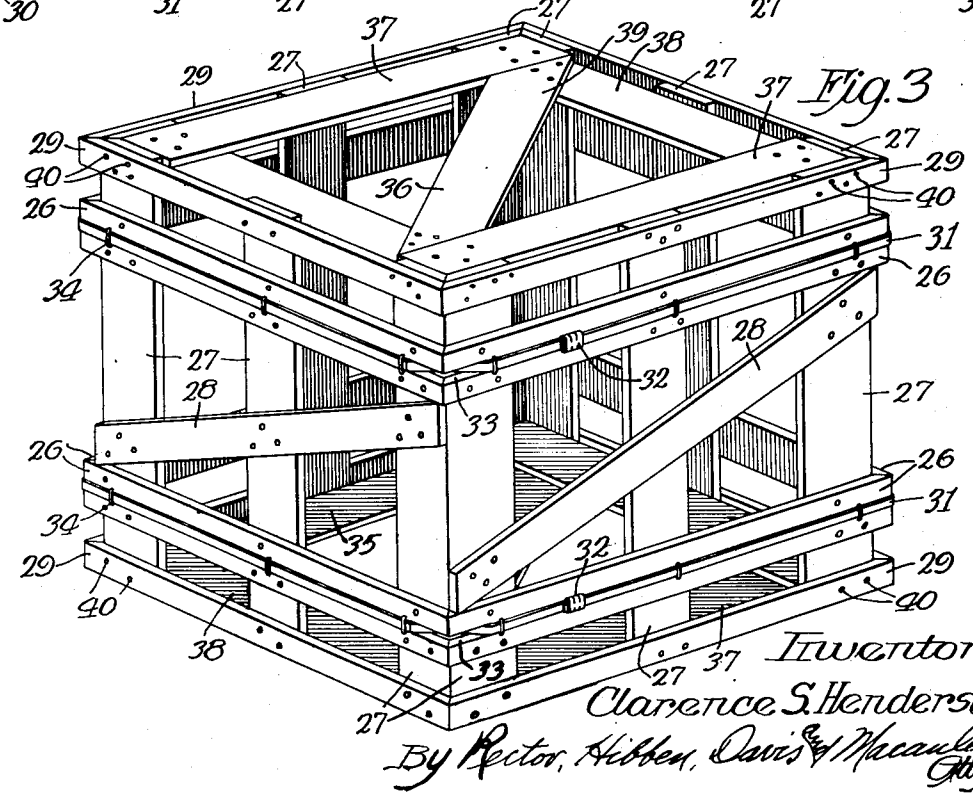


Fig. 3



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Fig. 4

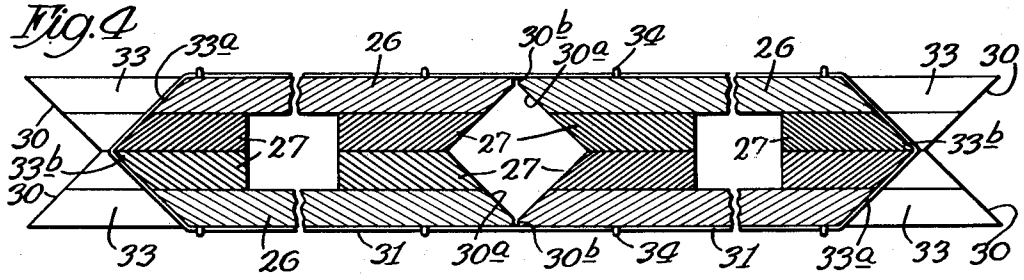


Fig. 5

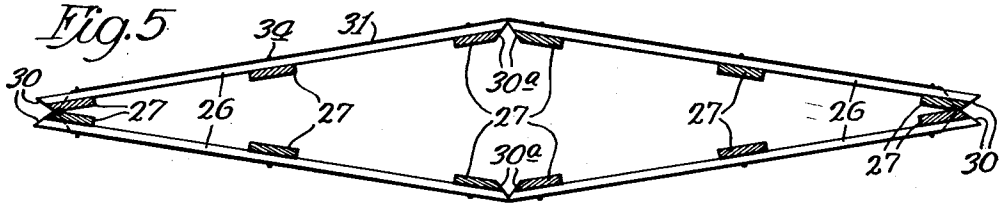
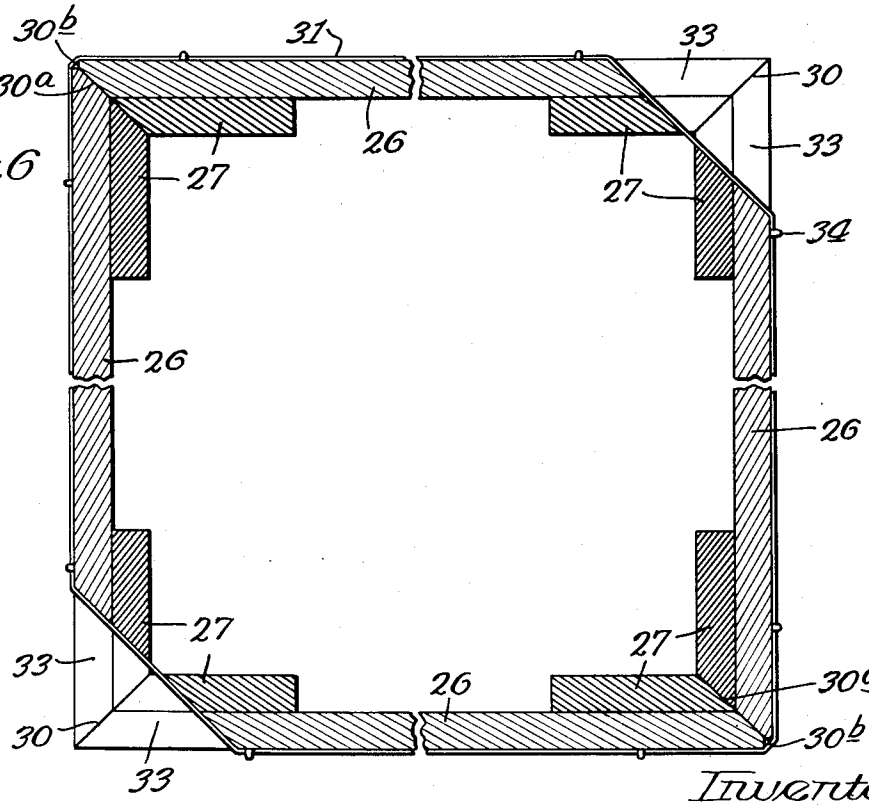


Fig. 6



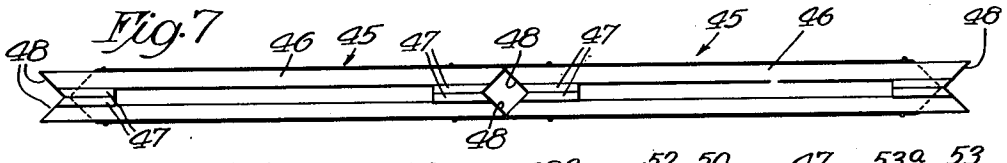
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READY BOUND CRATE

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Fig. 7



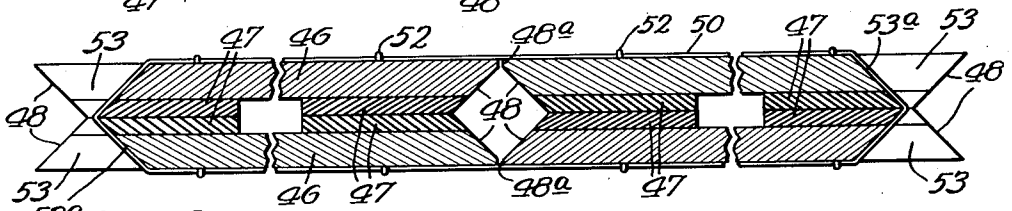


Fig. 8

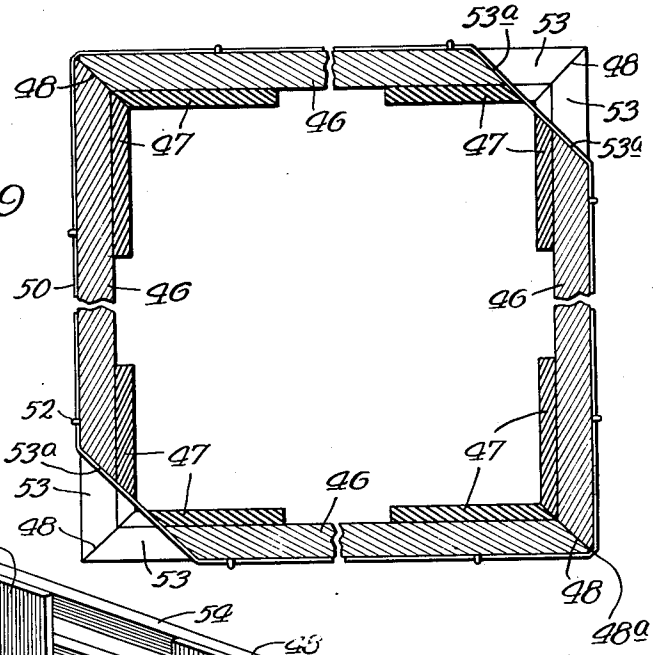


Fig. 9

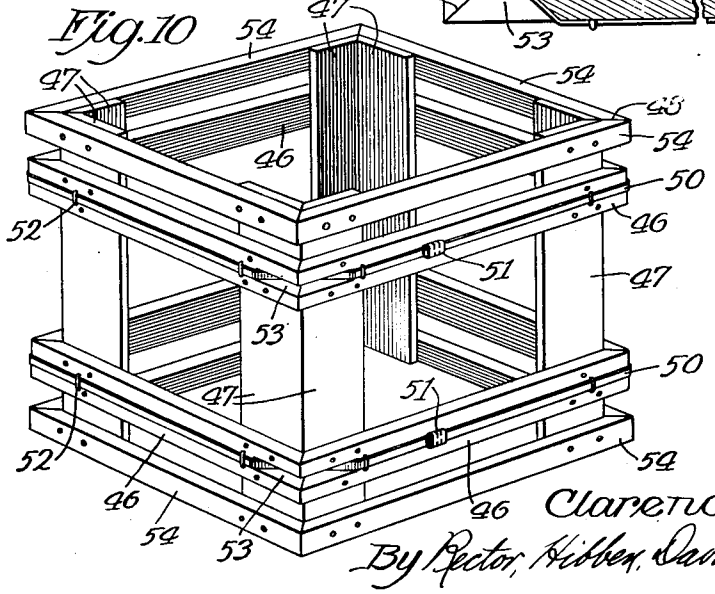


Fig. 10

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READY BOUND CRATE

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Fig. 11

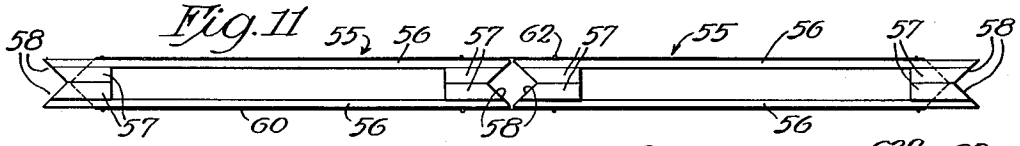


Fig. 12

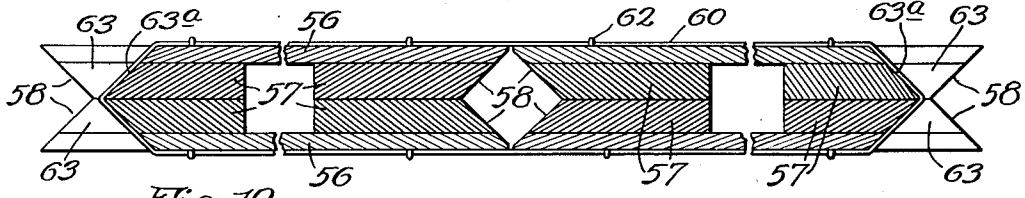


Fig. 13

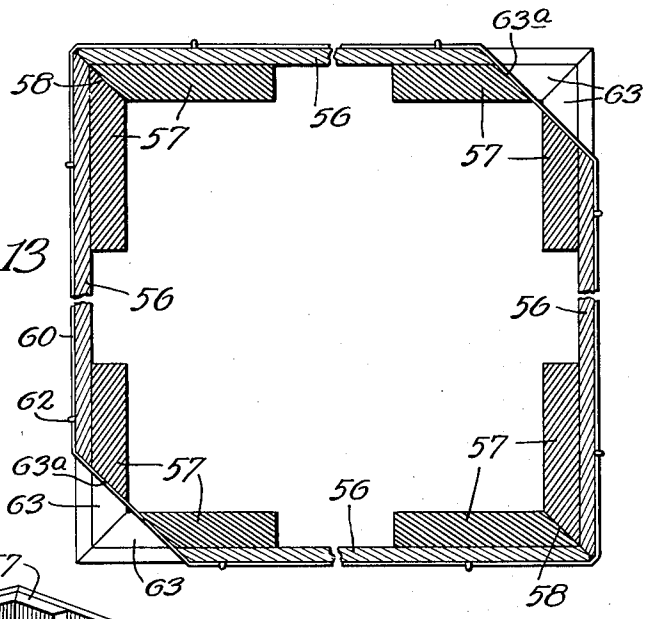
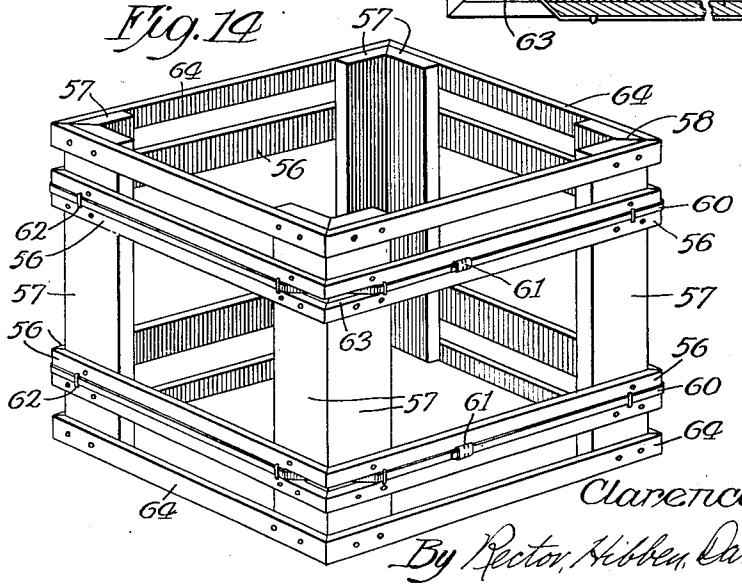


Fig. 14



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Patented May 26, 1936 2,042,339

UNITED STATES PATENT OFFICE

2,042,339

READY BOUND CRATE

Clarence S. Henderson, Downers Grove, Ill., assignor to Acme Steel Company, Chicago, Ill., a corporation of Illinois

Application December 27, 1932, Serial No. 648,887

11 Claims. (Cl. 217—16)

This invention relates to ready-bound crates and is an improvement upon the invention described and claimed in the co-pending application of John Ekern Ott Serial No. 572,905, filed November 4, 1931, in which there are disclosed a number of forms of ready-bound crates made up of separate walls or wall sections which are surrounded by endless metallic binders adapted to permit the walls to be collapsed or folded upon each other and to be put under tension when the walls are unfolded into box or crate-forming relationship so that they then hold the walls in proper assembled relation. In said application, the separate wall sections are shown as having an overlapping relationship when they are unfolded to form a box or crate, that is, one end of each wall section abuts against the lateral side of the end portion of one next adjacent section, while the other end of the first mentioned section overlaps the end of the other next adjacent wall section. The present improvement is based upon the discovery that the advantages of the invention of said application may be obtained in a box or crate in which the adjacent wall sections abut against each other along diagonal lines to form what is known as a mitered joint. The principal object of the present invention is to provide a ready-bound box or crate comprising a plurality of separate wall sections which are surrounded and held in assembled relationship by one or more endless metallic binders which are adapted to be put under tension when the walls are unfolded and to be retained under tension in the normal box or crate forming relationship of the walls. Another object of the invention is to provide an improved ready-bound crate made up of a plurality of separate wall sections surrounded by one or more endless metallic binders which engage notches formed in the wall sections at diagonally opposite corners of the box or crate so that when the walls are unfolded, the endless binders are put under tension to an extent proportional to the depth of these notches. Other objects 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 three embodiments are illustrated. In the drawings,

Fig. 1 shows a side elevation of the outer walls of a crate embodying the features of the present invention with the walls thereof folded into collapsed relationship and surrounded by the endless metallic binders;

Fig. 2 shows a horizontal section taken on the line 2—2 of Fig. 1;

Fig. 3 is a perspective view of the completed crate embodying the wall sections and endless binders illustrated in Figs. 1 and 2;

Fig. 4 shows an enlarged horizontal section on the line 4—4 of Fig. 1, with portions thereof broken away;

Fig. 5 is a horizontal sectional view similar to that of Fig. 2, showing the relative positions of the outer wall sections when they are partially unfolded;

Fig. 6 is an enlarged horizontal section similar to that of Fig. 4, showing the outer walls of the crate after they have been completely unfolded into rectangular crate-forming relationship;

Fig. 7 is a horizontal section, similar to that of Fig. 2, taken through a modified form of the invention in which the horizontal members of the wall sections are thicker than the vertical members, as distinguished from the construction illustrated in Fig. 2, where the horizontal and vertical members are of substantially equal thickness;

Fig. 8 is a horizontal section similar to that of Fig. 4, through the modified form of construction illustrated in Fig. 7, with parts thereof broken away;

Fig. 9 shows a horizontal section similar to that of Fig. 8, with the wall sections unfolded into box or crate-forming relationship;

Fig. 10 is a perspective view of the outer walls of a crate made up of the wall sections illustrated in Figs. 7, 8 and 9;

Fig. 11 shows a horizontal section similar to that of Fig. 2 through a third form of the invention where the horizontal members of the wall sections are of less thickness than the vertical members;

Fig. 12 shows an enlarged horizontal section similar to that of Fig. 4, illustrating the construction shown in Fig. 11 with parts thereof broken away;

Fig. 13 is a horizontal section similar to that of Fig. 12, showing the wall sections unfolded into box or crate-forming relationship; and

Fig. 14 is a perspective view of the outer walls of a crate made up of the wall sections illustrated in Figs. 11, 12 and 13.

In Figs. 1 to 6, inclusive, of the drawings there is illustrated a form of the present invention in which a crate is made up of four complementary vertical walls having mitered joints at their corners and having their upper and lower edges secured to the top and bottom walls to form the

completed crate. The four vertical walls of the crate are surrounded by a pair of endless metallic binders and, for convenience in shipment from the crate or box manufacturer, these walls are collapsed or folded upon each other so that they occupy little space and may be shipped in large bundles. When the user of the crate is about to fill it for shipment, these collapsed walls are unfolded, thereby putting the surrounding metallic binders under tension and then, after attaching the bottom wall to the vertical walls, the crate is filled in readiness for the application of the top wall or cover which may be secured thereto by nails or the like. It is ordinarily desirable to form the vertical walls as members of identical construction since they may then be interchanged with each other and any group of these walls may be selected for a particular crate, but the principles of this invention may, of course, be applied to crates or boxes of oblong horizontal cross-section. The walls illustrated in the drawings are of skeleton form adapted for use in forming a crate but they may have any desired form and may be constructed of a wide range of materials such as sawed wooden "shook", veneer, plywood, wallboard, paperboard or sheet metal.

As illustrated in Figs. 1 to 6, inclusive, the improved crate comprises four identical wall sections 25 each of which is made up of a plurality of horizontal members 26 united by vertical members 27 which are secured thereto by nails or other means. The vertical members 27 may also be united by a diagonal cross brace 28 and the extreme upper and lower ends of the vertical members 27 preferably have nailing strips 29 secured thereto. In this instance, the horizontal members 26 are located on the outer sides of the vertical members 27, two of which are located adjacent the ends of the members 26. The edges of the outermost vertical members 27 and the adjacent projecting ends of the horizontal members 26 are beveled along diagonal lines as shown at 30. Each of these beveled surfaces 30 preferably makes an angle of 45 degrees with the adjacent vertical faces of the wall section on which it is formed so that all four wall sections are of identical construction. When the four wall sections which make up the outer walls of one crate are folded upon each other as shown in Figs. 2 and 4, the beveled surfaces 30 diverge from each other on opposite wall sections. These wall sections are surrounded when in the collapsed condition with endless binders 31 which, in this construction, are illustrated as flat steel straps having their overlapping ends united by means of a metallic seal 32 which may be of the form described and claimed in the United States patent to Ralph H. Norton No. 1,260,016, dated March 19, 1918.

These flexible binders 31 are arranged to engage notches 33 which are formed in the outermost vertical members 27 and in the ends of the horizontal members 26 of each wall section, midway between the upper and lower edges of the horizontal members 26. These notches 33 extend horizontally inward from the outer ends of the horizontal members 26 and terminate at their inner ends in inclined surfaces 33^a formed partly on the members 26 and partly on the vertical members 27. The surfaces 33^a diverge from the surfaces 30 and are preferably formed at angles of 45 degrees with the adjacent vertical faces of the members 26 and 27. When the binders 31 have been placed into engagement with the notches 33 and the ends thereof have been united by seals 32 or the like, they are secured to the horizontal members 26 by staples 34 which are preferably arranged to permit the binders to slide freely through them. The length of each binder 31, when it is applied to the collapsed wall sections as shown in Figs. 2 and 4, is such that when these walls are subsequently unfolded to the rectangular relationship shown in Fig. 6, the binder is put under tension and then serves to maintain the wall sections 25 in that rectangular relationship with the beveled surfaces 30 of adjacent wall sections contacting with each other. It will be seen that when the wall sections 25 are unfolded from the relationship shown in Figs. 2 and 4 through the intermediate position shown in Fig. 5 to the final rectangular relationship shown in Fig. 6, the metallic binders 31 merely have a bending or hinged action around the edges 33^b of the surfaces 33^a at the outer ends of the folded sections illustrated in Fig. 4. At the other corners of the crate, that is, at the inner ends of the sections 25, as shown in Fig. 4, the wall sections fold upon each other about the outer edges 30^a of the beveled surfaces 30 which may preferably be cut off as shown at 30^b to avoid sharp edges at these points and to bring the aligning wall sections somewhat closer to each other when they are in their collapsed relationship. When the wall sections are unfolded with the inner ends of aligning sections pivoting upon each other about the surfaces 30^b, the binders 31 are bent at these points and are somewhat elongated or stretched in passing to the final position shown in Fig. 6 so that they are thereby drawn taut. Inasmuch as the diverging surfaces 30^b at the outer ends of the collapsed sections, as shown in Fig. 4, move toward each other in passing toward the unfolded relationship shown in Fig. 6, the binders 31 would be loosened by the unfolding operation if they were passed completely around the outer ends of the horizontal members 26 and it is for this reason that the notches 33 are provided. These notches preferably extend inwardly so that the inner edges of the surfaces 33^a are located at approximately the inner edges of the surfaces 30 or slightly inward therefrom so that when the walls 25 are unfolded, the diagonal portions of the binders will not intersect the interior space of the crate but by increasing the depth of these notches 33, a greater degree of tautness of the binders 31 may be obtained.

When the wall sections 25 have been unfolded to the relationship shown in Fig. 6, the binders 31 are rendered taut and maintained in that taut condition so that the surfaces 30 at the corners of the crate are maintained in contact with each other and the vertical walls are held in position to form a rectangular enclosure. These walls are then in position to be secured to the bottom wall 35 and the top wall 36 which may be constructed as shown in Fig. 3. Each of these walls comprises a pair of longitudinal members 37 secured by nails or the like to transverse members 38 which may also be connected by diagonal members 39. All of these members are initially nailed together and are then applied to the vertical wall sections 25 to which they are secured by nails 40 passing through the nailing strips 29 and also through the ends of the vertical members 27. The bottom wall 35 is first applied to the vertical wall sections 25 and then, after the crate has been filled with the article or commodity to be shipped therein, the top wall 36 is nailed in place. The top and bottom walls, being of identical construction, are interchange-

able with each other and may be shipped in bundles so that they occupy little space. In this way, large numbers of crates made up of the outer walls **25** and the bottom and top walls **35** and **36** may be shipped from the manufacturer to the user in such condition that they are ready for use merely by unfolding the outer walls and securing the top and bottom walls in place by nailing.

In Figs. 7, 8, 9 and 10 of the drawings, there is illustrated the application of the invention to a modified form of crate in which the vertical and horizontal members are of unequal thickness. Owing to the mitered construction at the corners, this unequal thickness of the members of which the walls are formed does not affect the action of the unfolding operation in rendering the flexible binders taut. In this form, the vertical walls **45** are made up of horizontal members **46** of greater thickness than the right angularly disposed members **47** to which they are secured. The vertical members **47** are located adjacent the ends of the horizontal members and the outer edges of both members are mitered to form vertically extending beveled surfaces **48**. These surfaces **48** are inclined to the adjacent vertical surfaces of the members on which they are formed at angles which are preferably 45 degrees so that the edges of all of the sections are similar in form. When the walls are in the collapsed relationship shown in Figs. 7 and 8, metallic binders **50** are placed around them with the overlapping ends of each binder secured together by a seal **51** or the like. These binders are secured in sliding engagement with the middle portions of the members **46** about which they pass by means of staples **52** and they are arranged to engage notches **53** which extend inwardly from the outer ends of the wall sections **45** when these walls are collapsed as shown in Figs. 7 and 8. Each notch is bounded at its inner end by a beveled surface **53a** which preferably makes an angle of 45 degrees with the adjacent vertical surfaces of the members **46** and **47** and which makes an angle of 90 degrees with the beveled surface **48** formed on the end of the wall section. The inner margin of each surface **53a** is preferably located in proximity to the inner margin of the adjacent surface **48** and when the binders **50** are initially placed around these collapsed wall sections, the binders are substantially taut although there may be a small space between the inner ends of the adjacent wall sections **45** which may be cut off as shown at **48a** to prevent sharp edges at the outer ends of the inner inclined surface **48**. With this construction, the binders **50** are drawn taut when the wall sections **45** are unfolded from the relationship shown in Fig. 7 to that shown in Figs. 9 and 10. Nailing strips **54** are preferably secured to the upper and lower ends of the vertical members **47** for convenience in securing the outer wall sections to top and bottom walls which may be of the form illustrated in Fig. 3.

Another form of the invention is illustrated in Figs. 11 to 14, inclusive, where each wall section **55** is shown as comprising horizontal members **56** which are relatively thin as compared with the vertical members **57** which are secured to the end portions thereof. The outer edges of the vertical members **57** and the ends of the members **56** are beveled to form inclined surfaces **58** adapted to fit upon each other when the walls are unfolded as shown in Figs. 13 and 14. These wall sections are surrounded in their collapsed relationship by flexible binders **60** which have their overlapping ends connected by a seal **61** and which are also secured in sliding engagement with the wall sections by staples **62**. The outer ends of the wall sections are provided with notches **63** which are formed partially in the vertical members **57** and partially in the ends of the horizontal members **56**. These notches are bounded at their inner ends by surfaces **63a** which preferably make angles of 45 degrees with the adjacent vertical surfaces of the members **56** and **57** and which preferably terminate at their inner edges adjacent the inner edges of the surfaces **58**. These parts are adapted to operate as in the forms of the invention previously described so that when the walls are unfolded, as shown in Figs. 13 and 14, the binders **60** are rendered taut and are adapted to maintain the walls in their proper assembled relationship. The upper and lower ends of the vertical members **57** are preferably secured to nailing strips **64** which are adapted to facilitate the application of top and bottom walls secured in place substantially as shown in Fig. 3.

Although three forms of the invention have been shown and described by way of illustration, it will be understood that it may be constructed in various other embodiments within the 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 adapted to be unfolded in edge to edge contact with each other to form an enclosure, said walls having beveled edge surfaces coacting with each other in pairs when said walls are unfolded, and an endless flexible binder surrounding said walls both when folded and unfolded and holding them in proper relative positions, said flexible binder being put under tension by the operation of unfolding said walls.

2. The combination in a crate or the like, of a plurality of complementary walls folded upon each other and adapted to be unfolded in edge to edge contact with each other to form an enclosure, said walls having beveled edge surfaces coacting with each other in pairs when said walls are unfolded and being further provided with notches at their edges intersecting said beveled surfaces, and a flexible binder surrounding said walls when folded and unfolded and engaging said notches, said binder being put under tension by the operation of unfolding said walls.

3. The combination in a crate or the like, of a plurality of complementary walls folded upon each other and adapted to be unfolded in edge to edge contact with each other to form an enclosure, said walls having beveled edge surfaces coacting with each other in pairs at the corners of said enclosure when said walls are unfolded, said walls being further provided with notches terminating at their inner ends in beveled surfaces, and a flexible binder surrounding the outer sides only of said walls when folded and unfolded and engaging said notches.

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, said walls having beveled edge surfaces coacting with each other in pairs at the corners of said enclosure when said walls are unfolded, said walls being further provided with notches at their edges which terminate at their inner ends in beveled surfaces inclined oppositely to the adjacent first named beveled surfaces

formed on the edges of said walls, and an endless flexible binder surrounding said walls and engaging said notches.

5. 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, said walls having beveled edge surfaces coacting with each other in pairs at the corners of said enclosure when said walls are unfolded, said walls being provided at diagonally opposite corners of said enclosure with notches terminating at their inner ends in beveled surfaces inclined oppositely to the adjacent first named coacting beveled surfaces, and an endless flexible binder surrounding said walls in engagement with said notches and put under tension by the operation of unfolding said walls.

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 a rectangular enclosure, said walls being provided at diagonally opposite corners of said enclosure with notches terminating at their inner ends in surfaces which are inclined to the faces of the walls on which they are formed and which are oppositely inclined on adjacent walls at each of said corners, and a flexible binder surrounding said walls and engaging said notches to coact with said inclined surfaces, said binder being put under tension by the operation of unfolding said walls.

7. The combination in a crate or the like, of a plurality of complementary walls folded upon each other and capable of being unfolded in edge to edge contact with each other to form an enclosure, each of said walls being formed of horizontal members secured to vertical members located adjacent the ends of said horizontal members both when said walls are folded and unfolded, said vertical members and said horizontal members being provided along parallel edges of said walls with beveled surfaces, said beveled surfaces being adapted to coact with each other in pairs at each corner of said enclosure when said walls are unfolded, said walls being further provided at diagonally opposite corners of said enclosure with notches formed in said horizontal members and said vertical members, and an endless flexible binder surrounding said walls around said horizontal members and engaging said notches, said binder being put under tension by the operation of unfolding said walls.

8. 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 located adjacent the ends of said horizontal members, said vertical members and said horizontal members being provided along parallel edges of said walls with beveled surfaces, said beveled surfaces being adapted to coact with each other in pairs at each corner of said enclosure when said walls are unfolded, said walls being further provided at diagonally opposite corners of said enclosure with notches formed in said horizontal members and said vertical members, and a flexible binder surrounding said walls around said horizontal members and engaging said notches, said notches terminating at their inner ends in surfaces which are inclined to the faces of said walls substantially at right angles to the coacting beveled surfaces at said corners of said enclosure.

9. 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 located adjacent the ends of said horizontal members, said vertical members and said horizontal members being provided along parallel edges of said walls with beveled surfaces, said beveled surfaces being adapted to coact with each other in pairs at each corner of said enclosure when said walls are unfolded, said walls being further provided at diagonally opposite corners of said enclosure with notches formed in said horizontal members and said vertical members, and a flexible binder surrounding said walls around said horizontal members and engaging said notches, said notches extending inwardly beyond the inner edges of the adjacent coacting beveled surfaces.

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 located adjacent the ends of said horizontal members, said vertical members and said horizontal members being provided along parallel edges of said walls with beveled surfaces, said beveled surfaces being adapted to coact with each other in pairs at each corner of said enclosure when said walls are unfolded, said walls being further provided at diagonally opposite corners of said enclosure with notches formed in said horizontal members and said vertical members, and a flexible binder surrounding the outer sides only of said walls around said horizontal members and engaging said notches, said notches terminating at their inner ends in surfaces which are inclined to the faces of said walls substantially at right angles to the coacting beveled surfaces at said corners of said enclosure, said notches extending inwardly beyond the inner edges of the adjacent coacting surfaces.

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, said walls having beveled edge surfaces coacting with each other in pairs when said walls are unfolded and being further provided with notches at their edges intersecting said beveled surfaces, and an endless flexible binder surrounding the outer sides only of said walls, said binder being of such length that it is put under tension by the operation of unfolding said walls.

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