

Feb. 11, 1958

A. ELMENDORF  
SHIPPING CRATES

2,822,971

Filed Nov. 12, 1954

4 Sheets-Sheet 1

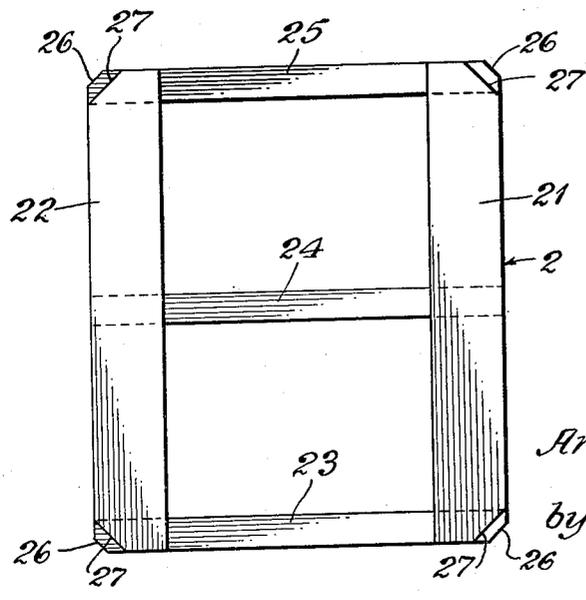
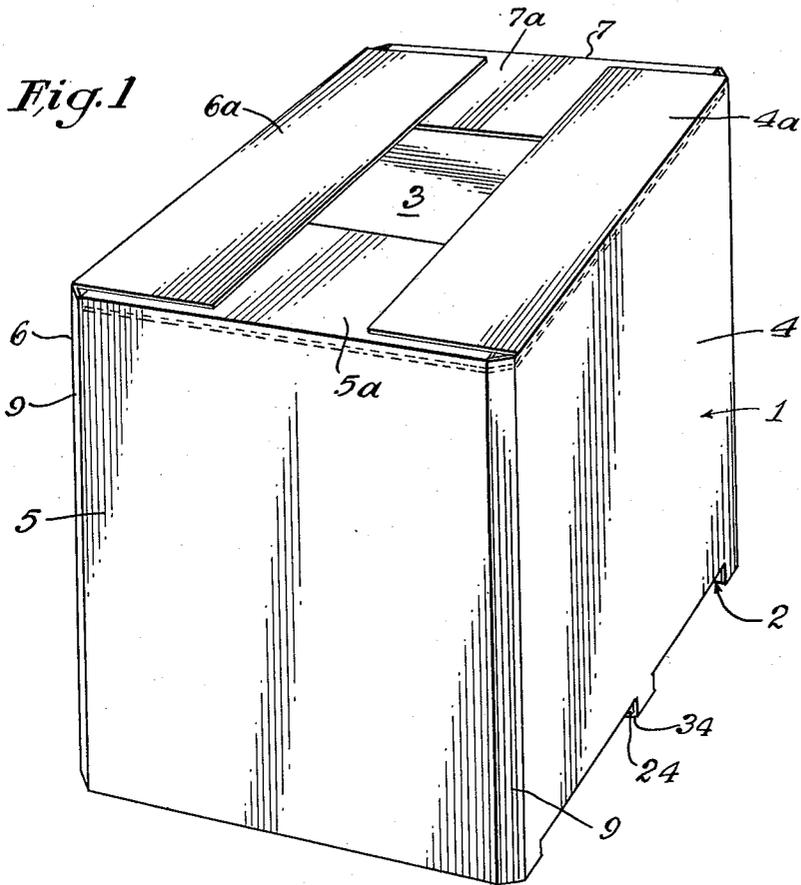


Fig. 5

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4 Sheets-Sheet 2

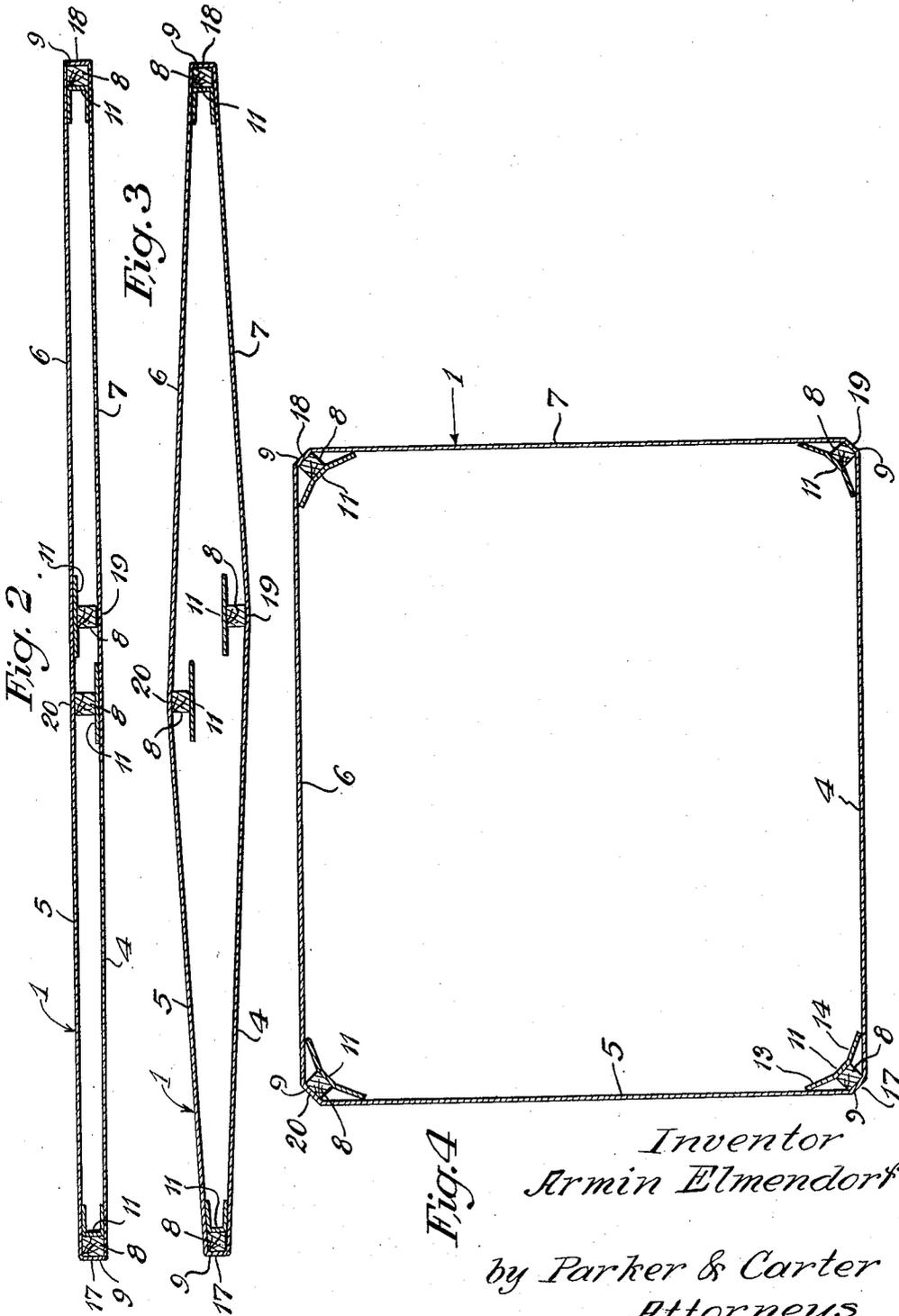


Fig. 4

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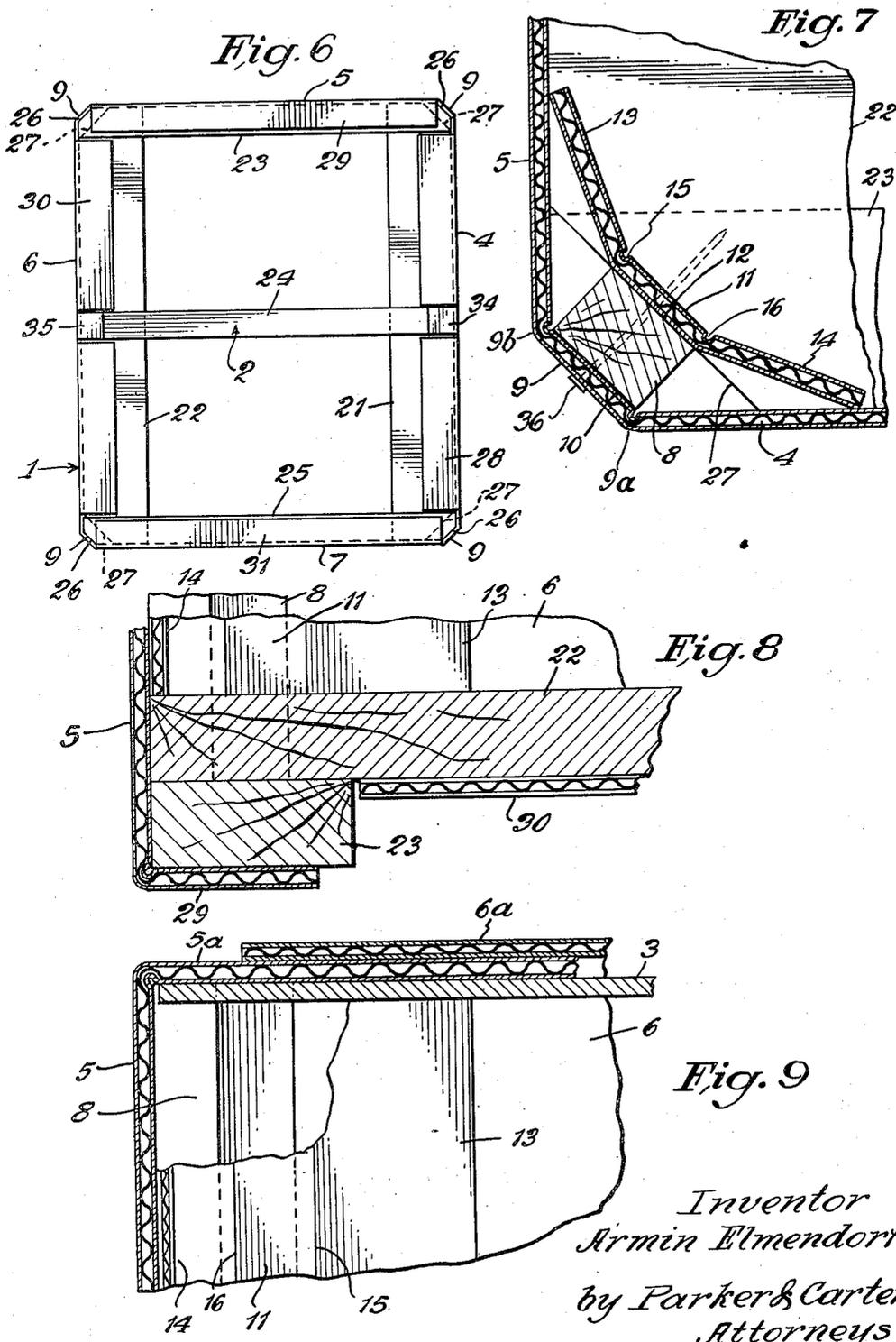
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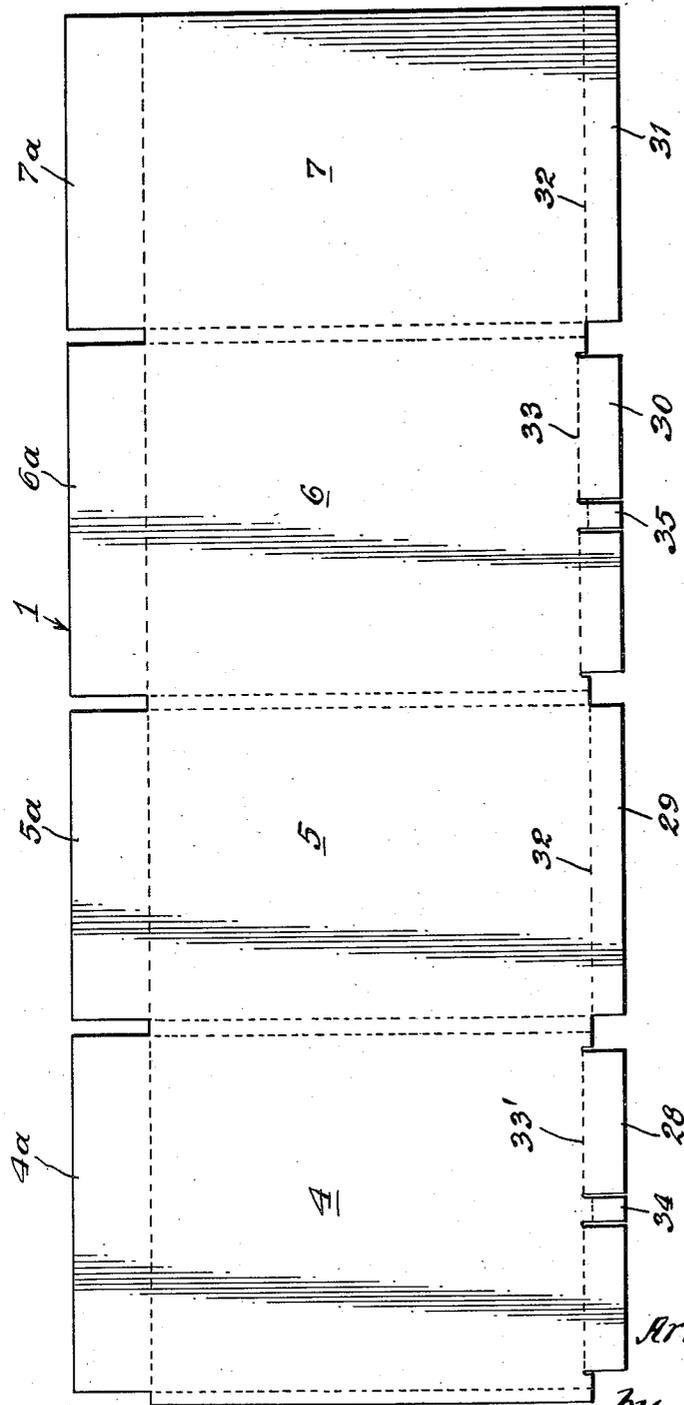


Fig. 10

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2,822,971

## SHIPPING CRATES

Armin Elmendorf, Winnetka, Ill.

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4 Claims. (Cl. 229—23)

The present invention is directed to a new and improved form of shipping crate which has a relatively high strength and a relatively low weight and cost.

The function of a shipping crate is to house bulky objects such as machines during shipment so that they may reach their destination safely and without injury. This function must be achieved at minimum cost. Adequate strength must be combined with adequate protection and these results must be achieved with minimum weight and or minimum cost.

Adequate strength in a crate means that it must possess sufficient structural strength to resist the forces to which it is subject in transit while it functions as a housing for the object shipped so that the machines or other objects shipped will not be scratched, dented or otherwise injured. Designers of crates for the shipment of many products such as domestic appliances are in general agreement that the crates must be so constructed that they may be stacked to considerable height in warehouses without danger of collapse or crushing the contents. The framework of the crate must be such that it will carry the superimposed load without transferring a substantial part of that load to the contents of the crate. Crates in the lower tiers of a warehouse are sometimes called upon to carry several thousand pounds of other crates stacked upon them. Such loads must be carried with an adequate factor of safety.

Crates must be so constructed that they can also resist the vibration of a freight car without serious loss of strength, and if roughly handled they must not be distorted out of shape to the point where the contents are marred. Furthermore the object shipped must generally be enveloped or enclosed against dust. This is especially true of household appliances. Such machines are shipped in crates in great numbers to long distances. The present invention is particularly suited to the shipment of machines of that type. It was developed to meet each of the requirements specified above and has been found by test to fulfill these requirements. It is a low cost, lightweight crate and probably combines more desirable properties than any crate in commercial use today for shipping the same commodities.

One purpose of the present invention is the provision of a fibreboard shell shipping crate which has an exceptionally strong corner construction.

Another purpose of the present invention is the provision of an improved shipping crate shell which is made of fibreboard and which does not employ horizontal reinforcing wood members and still at the same time is able to handle heavy loads.

Another purpose of the present invention is the provision of a novel system for securing a fibreboard shell to a wooden base of a shipping crate.

Other objects will appear from time to time in the course of the ensuing specification and claims.

Referring generally now to the drawings:

Figure 1 is a perspective view of a shipping crate embodying the principles of the present invention;

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Figure 2 is a sectional view of the shell of the shipping crate shown in Figure 1 when the shell is folded flat;

Figure 3 is a sectional view of the shell when the shell is partly opened;

5 Figure 4 is a sectional view of the shell when the shell is completely open;

Figure 5 is a plan view of a wooden base used in my invention;

Figure 6 is a plan view of the base and portions of the shell in assembled relation;

10 Figure 7 is a sectional view which illustrates a typical corner construction employed in the invention;

Figure 8 is a sectional view of the base and a portion of the shell in assembled relation;

15 Figure 9 is a sectional view of an upper portion of the crate; and

Figure 10 is a diagrammatic view of the shell when laid flat.

Like elements are designated by like characters throughout the specification and drawings.

Referring specifically now to the drawings and in the first instance to Figure 1, I illustrate a typical shipping crate which utilizes the principles of the present invention. In Figure 1, the crate is shown as comprised of 20 three parts, namely, a shell or tube 1, a base which is formed of wood 2, and a top insert 3. The shell 1 is formed from fibreboard and includes side panels 4, 5, 6, and 7. It may be, for example, formed from a 200 to 300 pounds per square inch test (the Mullin Bursting test) corrugated board. The top insert 3 may be formed from the same material as the shell or it may be any other suitable material such as plywood, heavy cardboard or fibreboard. The top insert 3 has an area conforming to the area and configuration of a horizontal cross-section taken 25 through the shell 1. It is inserted in the position shown in Figure 1 after the object to be shipped has been placed inside of the crate. It may loosely rest on top of the object to be shipped. After it is thus positioned, flaps 4a, 5a, 6a, and 7a are folded inwardly over the insert 3. The flaps, 4a, 5a, 6a, and 7a are formed unitarily with the side panels 4, 5, 6 and 7 of the shell. After they are folded over the top insert 3, as shown in Figure 1, they may be secured in position and to the top insert, by any suitable means such as an adhesive.

30 The top insert 3, shell 1, and wooden base 2 are formed as separate units and they are brought together in the assembled relation shown in Figure 1, when the object to be carried by the crate is ready for shipping.

The shell is formed from a continuous section of fibreboard. It is adapted to be folded along its corners so that it may rest in a flat position as shown in Figure 2. When it is ready for use, the shell is folded along its corners into the general rectangular shape indicated in Figure 4. At each corner of the shell, I position a wood column 8, which is adapted to extend from the base 2 to the upper portion of the crate. The side panels of the shell are scored along opposite vertical edges of the wood column 8. The inner surface of the shell between these scored portions, indicated generally at 9 may be adhesively secured to the outwardly facing side of the wood column 8 as by means of any suitable adhesive 10 or by means of mechanical fasteners such as staples. Another section of fibreboard 11 is secured to the inwardly facing side of the column 8 as by a suitable adhesive 12. The section 11 has a length corresponding generally to the length of the column and has side portions 13 and 14 terminating adjacent the side panels 4 and 5. The section 11 is scored along the edges 15 and 16 of the column.

70 It is important that the column 8 be symmetrically disposed with respect to each of the side panels 4 and 5, and this is made possible by securing the column 8 in

such a fashion that the portion of the shell 9 defines a mitred corner. The mitred corner has the additional advantage of minimizing the tendency of the crate, when used, to be snagged or pinched at its corner by any piece of passing machinery. The section 11 and the portion 9 and side panels 4 and 5 add column strength to the wooden column 8 to assist the crate in superimposed loads. In the ordinary use of a crate of this type the load carried by the crate is secured to the wooden base 2. When these crates, however, are stacked on top of one another, the load of an upper crate is transmitted from the base of that crate to the shell of the crate immediately below and to the wooden base of that crate. When such a vertical load is imposed upon the shell of the crate, the shell tends to fail by buckling at the corners. With the construction shown in Figure 7, buckling of the corner is resisted not only by the wooden column 8 but also by the panels 4 and 5, portion 9, and section 11 and flanges 13 and 14. These members define what are, in effect, flanges extending beyond the sides of the wood column and add greatly to the column strength of the corner of the shell.

Another matter of importance in this particular type of corner structure is that it enables the panels defining each corner to be folded through 180°. The shell may be folded into a flat position as shown in Figure 2 by bending the panels 4 and 5 and portions 14 and 13 along the scored portions 9a, 9b, 15 and 16 respectively. In Figure 2 it will be seen that two corners 17 and 18 have their associated side panels 4 and 5 and 6 and 7 respectively, bent parallel to and along-side one another. The other corners 19 and 20, however, have their associated panels 5 and 6 and 4 and 7, respectively, defining a 180° angle between them.

Whereas I have mentioned the wood column 8 as being adhesively secured to the portion 9 and section 11, they may, under certain circumstances, be stapled to the wood member.

In Figure 5, I illustrate the wooden base of the shipping crate. The base is made up of spaced, generally parallel wood members 21 and 22, and spaced generally parallel wood members 23, 24, and 25 extending transversely to the members 21 and 22. The outer surfaces of the members 21, 22, 23, and 25 define the outer dimensions of the box. The members 21 and 22 are disposed on the upper side of the base whereas the members 23, 24, and 25 are disposed on the lower side of the base. These wood members may have a thickness on the order of ¾ of an inch, although this may vary considerably. They may be secured together in the relation shown in Figure 5 by any suitable means such as adhesive, nails or the like. It should be noted that the outer ends of the members 23 and 25 are mitred as at 26 so as to conform to the configuration of the shell. The members 21 and 22 are notched at their opposite ends as at 27. These notches or recesses may be provided in the space by cutting a mitre on the outer corners of the members 21 and 22, along a line generally parallel to the mitred portion 26. The notches or recesses provide a space for the reception of the vertical columns 8 so that the vertical wood columns will rest directly upon the members 25 and 23 and thus transmit any load carried by the members 8 directly to the members 23 and 25. The members 23 and 25 thus form what are in effect bearing members for transmitting the superimposed load carried by the crate.

The lower end of each side panel may be provided with a flange as at 28, 29, 30 and 31 for securing the shell to the base. The flanges 29 and 31 are defined by a scored portion 32 which is spaced from the lower edge of the flanges by a distance on the order of the width of the load-transmitting members 23 and 25. The flanges 28 and 30 for the panels 4 and 6 are separated from their panels by scored portions 33' and 33 which are spaced inwardly from the scored portions 32. The flanges 29 and 31 are adapted to be folded beneath the mem-

bers 23 and 25 and adhesively thereto. The flanges 28 and 30 are adapted to be folded beneath the members 21 and 22 and may be adhesively secured to the under surface thereof. The flanges 28 and 30 are provided with intermediate portions 34 and 35 which extend over the ends of the member 24 and are folded beneath the member 24. The intermediate portions 34 and 35 are separated from the remainder of the flanges 28 and 30 by spaces.

When it is desired to use the crate, the load to be carried by the crate is secured to the members 21 and 22 and the shell is unfolded from a flat position, made square or rectangular and slipped over the load. It is moved over the load so that the vertical wood columns 8 rest upon the bearing members 23 and 25. A single securing nail 36 may be driven through the wood members and into the members 21 and 22 so as to hold the shell in position. A hydraulic cylinder or pneumatic cylinder or other similar elevating means for the purpose of raising the base 2 away from a suitable jig having an upper surface with a configuration conforming to the configuration of the lower surface of the base, may be applied to the members 23, 24, and 25. In any event the crate is elevated a distance sufficiently to enable folding of the flanges 28, 29, 30 and 31 beneath the wood base. The flanges or the wood base, or both, may be coated with any suitable adhesive so that when the crate with the load therein, is lowered on to the jig, the jig presses the flanges against the lower surfaces of the wood members 21, 22, 23, 24 and 25. The weight of the crate with the load is sufficient to form a secure bond between the shell and the wooden base. The top insert 3 may then be positioned in the crate as shown in Figure 1 and the flaps 4a, 5a, 6a and 7a folded inwardly and secured. The top insert 3 serves to prevent the upper portion of the crate from caving in. When crates are made in this fashion, they may be superimposed one on top of the other, and may carry heavy loads. The wood columns transfer the majority of the load from above to the bearing members 23 and 25, and these bearing members 23 and 25 transmit the total load to the wood columns immediately below. I have found by actual experiment that a two-hundred-pound corrugated shell box, 29" x 26" x 36.5", with wood columns on the order as shown in the specification and drawings will safely carry a 7000-pound vertical load, yet the shell of the crate which transmits this load weighs only 7.08 pounds. A box of similar dimensions but made of a 275-pound corrugated board will carry a greater load while at the same time weighing only 9.56 pounds.

Whereas I have shown and described a preferred form of my invention, I wish it to be understood that this showing is to be taken in an illustrative or diagrammatic sense only. There are many modifications to the invention which will be apparent to those skilled in the art and which will fall within the scope and spirit of the invention. The scope of the invention, therefore, should be limited only by the scope of the hereinafter appended claims.

I claim:

1. A shipping crate consisting of a wood base, a collapsible fibreboard tube and a flat fibreboard top fastened to flanges of the tube with its corners resting on flat sided wood corner columns, the lower ends of the columns resting in recesses in the wood base, each wood column being fastened to the inside of the tube on one flat side, the tube being scored along spaced lines aligned with the edges of the wood columns, and a similarly scored fibreboard strip fastened to the opposite side of each of the wood columns.

2. A shipping crate shell including side panels of a continuous fibreboard, said panels having scored portions at spaced intervals to define corners for the crate, each corner having a flat sided wood column on the inside thereof, each column having inner and outer edges, said shell being fastened to a flat side of each column, the scored portions being aligned with the edges of one flat

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side of each column to provide a beveled, exposed corner for the shell, and a fibreboard strip fastened to the inwardly facing side of each column and scored along spaced lines aligned with the inner edges of each of said columns.

3. A shipping crate shell including side panels of a continuous fibreboard, said fibreboard having corners, each corner having a wood column on the inside thereof, said shell being fastened to the columns and being scored along lines aligned with opposite edges of the columns to provide a beveled, exposed corner for the shell, and a fibreboard strip fastened to the inside of each column and scored along lines generally aligned with the inside edges of said column to define flanges extending beyond the edges of said column, the side panels defining each corner being foldable generally through 180° by bending of the side panels along the scored portions.

4. A shipping crate including a multi-cornered shell formed from fibreboard and having vertically extending wood columns adhesively secured to the interior of said shell at the corners thereof, each column having inner and outer edges, said shell being scored along lines generally aligned with the outer edges of each of said wood columns to enable folding of said shell and to define beveled corners for said shell, spaced wood members received within the lower portion of said shell and adapted to carry a load positioned within said shell, said wood members being secured to said wood columns, spaced wood mem-

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bers positioned beneath said other wood members and secured thereto, said wood columns resting upon and being in direct, vertical bearing contact with said lower wood members so as to transmit a vertical load from the upper portion of said crate to the lowermost wood members, each of said wood columns having a fibreboard section secured to the inwardly facing surface thereof, each said section being scored along lines aligned with the inner edges of said wood columns to enable folding of said section along the inner edges of said wood columns, and a fibrous top having an area substantially coextensive with the cross-sectional area of said shell, said shell having flaps folded inwardly over said top, said wood columns terminating at their upper ends adjacent said flaps so as to receive and transmit a superimposed load on said crate directly to said lower wood members.

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