

April 29, 1941.

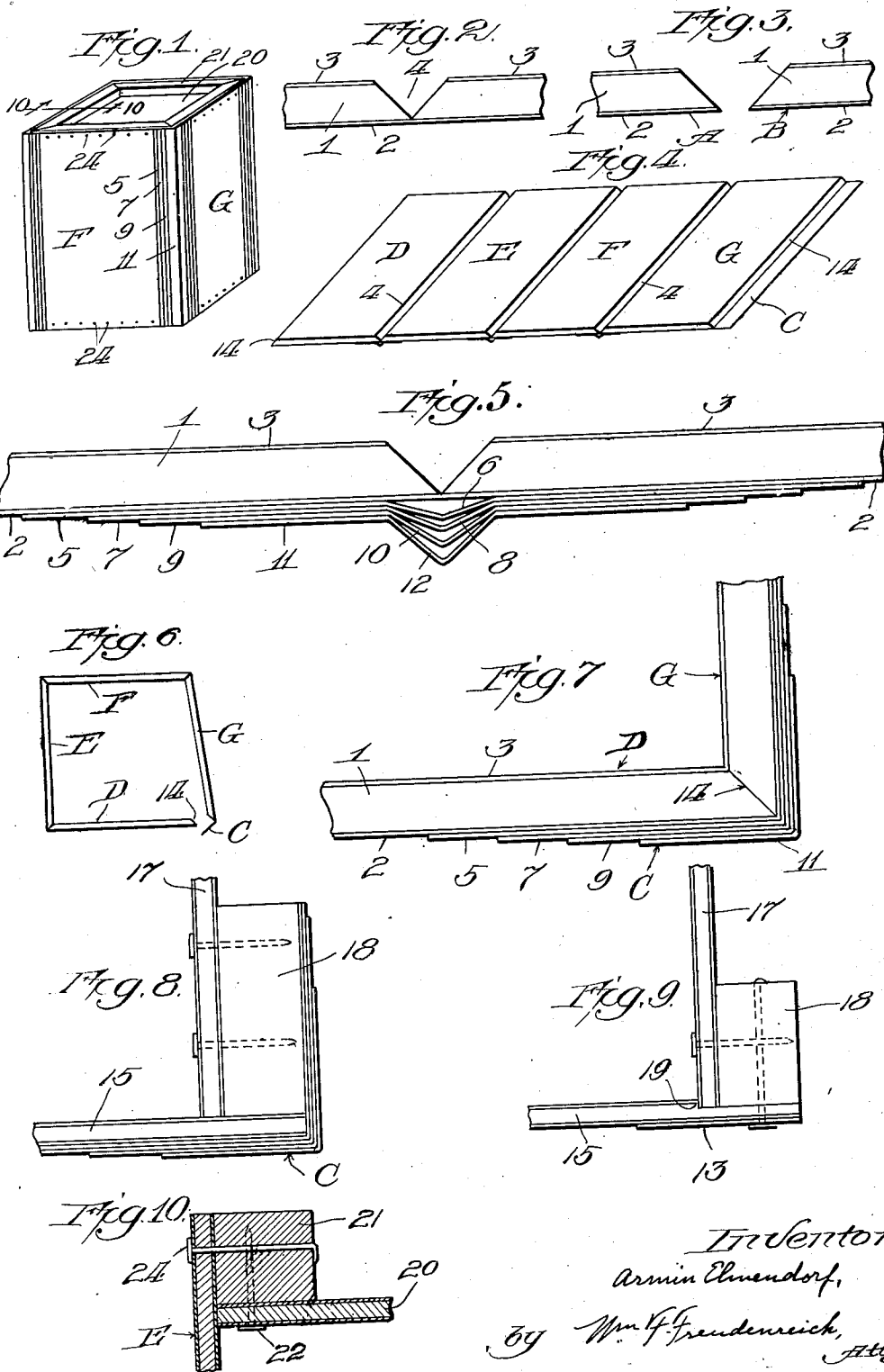
A. ELMENDORF

2,240,256

BOX AND CORNER CONSTRUCTION THEREFOR

Filed Dec. 5, 1938

2 Sheets-Sheet 1



Inventor:
Armin Elmendorf,
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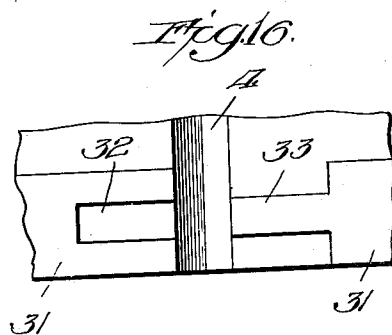
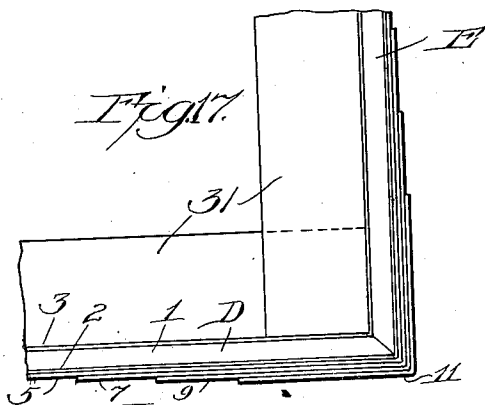
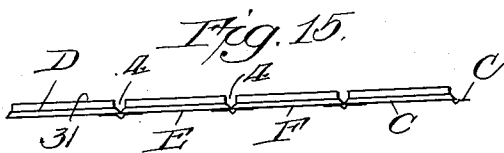
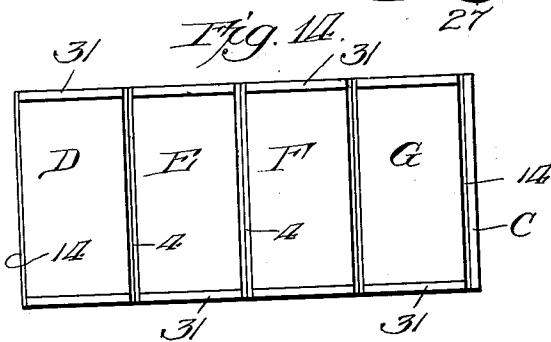
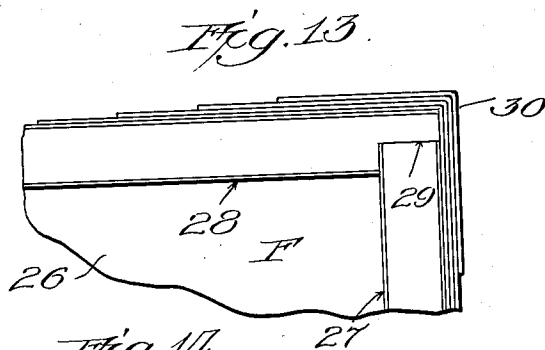
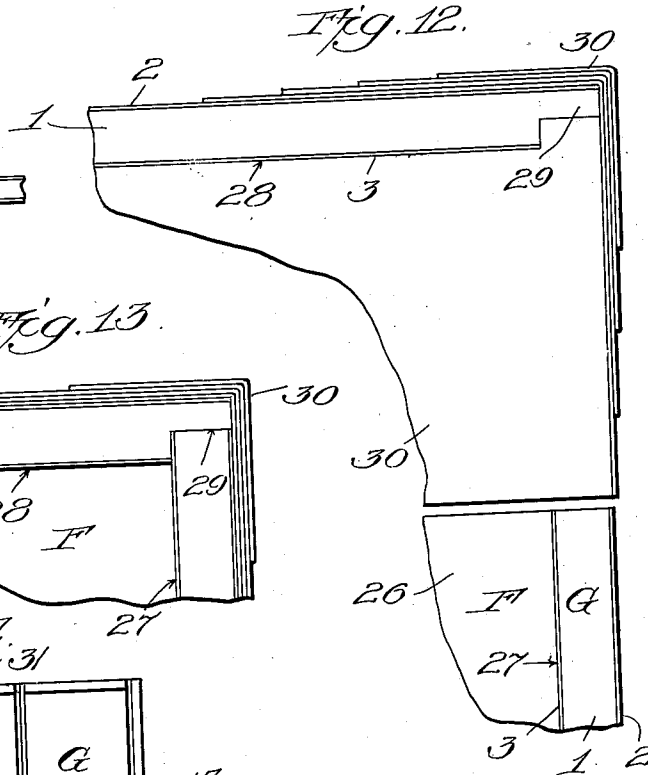
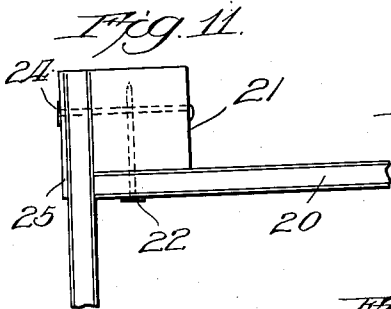
A. ELMENDORF

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BOX AND CORNER CONSTRUCTION THEREFOR

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,240,256

BOX AND CORNER CONSTRUCTION
THEREFOR

Armin Elmendorf, Winnetka, Ill.

Application December 5, 1938, Serial No. 243,966

2 Claims. (Cl. 229—49)

The object of the present invention is to produce a light, strong and durable box particularly adapted for use as a shipping container for heavy articles or goods which cause their containers to be subjected to such severe stresses during rough handling that the usual containers quickly break down.

While many containers have ends and sides that are sufficiently strong, it is a different matter so far as the corners of boxes are concerned, and failures usually start there. This has heretofore been remedied to some extent by making boxes wire-bound or by reenforcing the corners with sturdy cleats, requiring eight cleats for the four corners between the sides of a square of rectangular box.

One of the objects of the present invention is to produce a corner construction that will be simple and inexpensive and which shall possess such strength that no binding wire or cleats for the corners between side walls are needed.

A further object of the present invention is to produce a simple and novel box construction which permits an entire box to be shipped in the form of a few flat pieces of which two constitute the ends, while a third may form the sides or what may be termed the body of the box.

In order that a box shall possess very strong corners between the side walls thereof and yet be capable of having the side wall structure lie flat for storage and shipping purposes, it is necessary that the corners be hinged together with powerful hinges. Therefore, viewed in one of its aspects, the present invention may be said to have for its object to produce a simple, novel and inexpensive hinge device for permitting adjacent panels connected thereby to be laid flat or to be brought into relative positions where they stand at right angles or to any other desired, predetermined angle to each other; which shall be strong and sturdy; and which shall serve as an effective corner post at the juncture of any two panels or the like joined together by the same.

The various features of novelty whereby my invention is characterized will hereinafter be pointed out with particularity in the claims; but, for a full understanding of my invention and of its objects and advantages, reference may be had to the following detailed description taken in connection with the accompanying drawings, wherein:

Figure 1 is a perspective view of a box constructed in accordance with my invention; Fig. 2 is a section taken at right angles to one of the corners through two meeting side walls, showing them flattened so as to lie in the same plane; Fig. 3 is a view similar to Fig. 2, illustrating a construction in which the side walls are separate pieces; Fig. 4 is a perspective view of the

body of the box, composed of the sides, in a flattened condition; Fig. 5 is a section on an enlarged scale similar to Fig. 2 but showing the corner-forming hinge; Fig. 6 is a cross section through the body portion of the box in a plane at right angles to the corners between the sides, illustrating the folding of the body-forming panel being only partially completed; Fig. 7 is a view similar to and on the same plane and scale as Fig. 5, showing the manner in which the open corner in Fig. 6 may be completed; Figs. 8 and 9 are views similar to Fig. 7, illustrating two different modifications of the corner shown in Fig. 7; Fig. 10 is a section on line 10—10 of Fig. 1, but on a larger scale; Fig. 11 is a view similar to Fig. 10, showing a slight modification; Fig. 12 is a vertical section through a fragment of one end of the body member of the box and a cover or end wall separated therefrom; Fig. 13 is a view similar to Fig. 12, showing the cover or end wall secured to the body of the box; Fig. 14 is an elevational view of a box body in a flattened condition, the cleats for engagement with the end walls being fastened to the composite body panel at the time of manufacturing the latter; Fig. 15 is an edge view of the structure shown in Fig. 14; Fig. 16 is a view on an enlarged scale, similar to Fig. 12, showing only a small fragment; and Fig. 17 is a section taken at right angles to the plane of Fig. 16, showing the parts shifted into relative corner-forming positions.

In the construction of my improved boxes, I use thin boards 1, preferably wood boards, faced on one or both sides with tough paper, as indicated at 2 and 3. For the body of a box, meaning thereby the sides which, together with the ends, complete a box, I employ this paper faced material in pieces each of a proper size and shape to form one side, and having the edges that are to form the side corners bevelled. Thus, in the ordinary square box, the sides are composed of four panels whose edges are bevelled at an angle of about forty-five degrees so that the bevelled faces between meeting panels contact with each other when the panels are set up in box form. These panels may be formed as individual pieces, such as A and B in Fig. 3, or enough panels to form all of the sides may be in one piece, as shown in Fig. 4. When the side panels are all to be in one piece, this end may readily be achieved by preparing one long or wide panel and then cutting V grooves 4 across one dimension thereof in parallel relation to each other; the bottoms of the grooves terminating at the facing layer 2 which thus remains continuous from end to end. For a four-sided box, the angle of these V grooves is ninety degrees, so that when adjacent panels or sections are swung until the surfaces bounding the grooves between them are brought in contact with each other, these panels

or sections stand at right angles to each other.

The continuous paper sheathing or facing forms a hinge between the side sections of the box, but is entirely too weak to give to the box the necessary corner strength. In accordance with my invention, I make use of a novel form of hinge of which the paper facing on the box material forms a part when it is continuous. While this hinge may be made from other flexible sheet materials, thick paper may be used to advantage, not only on account of the low cost thereof, but also because of its strength and durability. Reduced to its simplest form, the hinge consists simply of a plurality of long paper ribbons lying one upon the other and bonded together in such a manner that when it is folded on a longitudinal center line until the two halves stand at right angles to each other, the ribbons lie in close contact with each other throughout their entire widths; whereas, when the assembly is flattened, the sheet that formed the inner side of the angle in the folded device lies flat while each overlying sheet produces within itself a ridge extending along said central line; each ridge being higher than the one immediately below the same, because each sheet outwardly from the innermost one must supply a progressively increasing width of material to compensate for the longer radius which it has in turning the corner when the two panels are standing at right angles to each other. The ribbons for the hinge therefore cannot be bonded together while in contact with each other throughout their widths in a flat condition, but they must either be bonded after the assembly has been given a trough-like form or after shaping each ribbon to have the required central ridge at the time of doing the bonding while the ribbons are lying flat. By laying the ribbons over a form having faces sloping away from each other at the desired angle, the bonding may be effected without any further manipulation of the ribbons than to fold them along their longitudinal central lines. Then, if the adhesive or bonding material is omitted from narrow central areas or strips extending throughout the lengths of the ribbons, corresponding to the width of the ridge portions to be subsequently created, the central portions of the ribbons will remain unbonded, and will adjust themselves automatically into V-shaped ridges of progressively increasing height, when the assembly is flattened after the bonding is completed. When using sufficiently thick paper, it is not necessary to omit the adhesive material along the central areas or strips of the ribbons because, if the bonding be continuous, the assembly becomes delaminated through shearing of the paper parallel to the faces of the individual layers along the hinge joint, upon flattening the assembly. The thickness of the paper may vary within comparatively wide limits, but I have found that paper having a thickness of from .016" to .030" makes good hinges.

In the particular arrangement illustrated, the hinges comprise five layers, although the number of layers may be varied. The inner layer is the facing sheet 2 which is left intact in cutting the V grooves. When two adjacent side members or panels are laid flat, as in Fig. 5, the facing sheet 2 also lies flat so that, at this time, the first or inner layer of the hinge, which is a part of this sheet, is flat and unridged. The next layer 5 may be a strip or ribbon from three to six inches wide which, in the flattened condition of the panel, has a very shallow V-shaped

ridge 6 at the hinge axis. The third layer 7 is a strip or ribbon somewhat narrower than the strip 5 and has a higher ridge 8 overlying the ridge 6 in the flattened condition of the body member of the box. Similarly, the fourth and fifth layers are ribbons or strips 9 and 11 narrower than the preceding one, and each having a higher ridge than that in the preceding ribbon or strip, as indicated at 10 and 12. There is sufficient material in the ridges so that, notwithstanding that when two panels are shifted into positions at right angles to each other, the several layers are in intimate contact with each other in the vicinity of the hinge joint, the walls of each ridge are out of engagement with the walls of the adjacent ridge or ridges when the body member is flattened.

All of the corners between the side walls of the box are completed in the manufacturing of the body member, so that the latter need only be properly folded and the free ends joined together in making the final assembly of the box. As shown in Figs. 1 to 7, where the box has four side corners, three of the corners are completed in the manufacture of the body member, whereas one-half or leaf of a fourth hinge C is bonded to the marginal portion along one free bevelled edge 14 so that the other half or leaf projects beyond the same. Then, when the body member is folded into the form of a square shell, one or the other of the endmost panels or sections is the one that is last swung into place, and the projecting hinge leaf is simply swung down to overlap the marginal portion of the body member at the opposite end from that at which one-half of the hinge C projects. Thus, in Fig. 6, three of the sides of the boxes are shown in their final positions, as sides of a box, while the fourth has been swung almost into its final position. In Fig. 7, on the other hand, the corner which is still open in Fig. 6 is shown closed and the hinge at that corner is shown as being bonded to both of the meeting panels or sections.

If desired, the corner which remains to be completed after the final folding of the body member of the box may be formed differently than by having a mitre joint between the meeting wall sections. Thus, in Fig. 8, the corner to be closed is between the walls 15 and 17; the wall 15 being made wide enough so that it projects beyond the plane of the wall 17. This permits a cleat 18 to be applied to the outer side of the wall 17 at the corner. The hinge C is initially attached to the wall member 15 as in the first form described, and is afterwards folded over and bonded to the cleat.

In Fig. 9 the arrangement is the same as that in Fig. 8, except that a marginal portion along the inner side of the wall 15, at the free edge, is cut away to form a step or shoulder 19 against which a marginal portion of the wall 17 may bear when the corner is completed. Also, the cleat is nailed to the wall 15 to complete the joint; the marginal portion of the wall 15 being reinforced by a strip 13 of tough paper.

The ends 20 of the box may be panels formed from the same material as the body member of the box, each end being a single rigid panel faced on one or both sides. In some instances, it may be sufficient to fasten the ends to the body member by hinge-like corner pieces such as employed at the side corners. In the arrangement shown in Figs. 1 to 7, there are cleats 21 forming frames each of which overlies the marginal portions of one of the end walls and is set into the body of

the box. These cleats may be secured in place in any suitable or desired way. In the arrangement shown, as best seen in Figs. 10 and 11, each cleat is secured to the corresponding end wall or panel with nails 22, for example. After the body of the box has been set up, the ends are inserted into the open ends of the shell thus produced, and may be secured in place by means of suitable fastenings, such as nails 24, driven through the sides of the box into the cleats.

If desired, an extra reinforcement in the shape of an additional ribbon-like layer or layers of paper 25 may be bonded to the outer faces of the panels forming the body member along the edges that are at the ends of the box; the nails 24 being driven through this additional reinforcing material.

In Figs. 12 and 13 there is illustrated a manner of securing an end wall to the box, without employing cleats, but achieving the fastening of the end in place and the reinforcement of the corners between the same and the sides of the box by means of hinge-like corner pieces similar to those heretofore described. In these figures, 26 and 27 represent two meeting side walls or panels, and 28 is an end wall or panel. The end wall or panel is preferably cut away on the under side along all four edges for a width equal to the thickness of the body material, whereby there is formed a lip 29 which rests against the edge faces of the sides of the box while the central portion of the end wall extends into the body of the box; thereby interlocking the end wall and the body of the box so that the sides of the box hold the end against displacement in the plane of the latter. Four hinge-like corner pieces 30 overlie the marginal portions of the box end, one adjacent to each edge; the hinge axis of each of the members 30 lying at the upper or outer corner of the edge at which the corner member is located. Thus, considering each member as a hinge, one leaf thereof overlies and is fastened to the box end and the other projects beyond the same. For storage and transportation, these corner members may be flattened. When the members of a box are to be assembled, the end member is simply set down partially on and partially in the box body, as in Fig. 13, and the projecting halves of the corner pieces are bent down and bonded to the box sides.

If desired, the cleats, where such are employed, may be fastened to the panels or sections of the body member, that constitute the box sides, instead of to the ends. In Fig. 1, the cleats are illustrated as making mitre joints with each other, as do the box sides, and in Figs. 6, 10 and 11, the cleats are not initially attached to the box sides, but are intended to be carried by the box ends.

In Figs. 14 to 17, there is illustrated a box body construction in which the cleats for the ends of the box are fastened to the body member at the time of manufacturing the latter. These cleats, instead of making mitre joints with each other, are illustrated as being cut off square and meeting tongues and grooves. Obviously, either type of joint may be employed, regardless of whether the cleats are initially carried by the body member or by the box ends.

Referring to Figs. 14 to 17 of the drawings, D, E, F and G represent four connected panels

adapted to form the sides of a box and may, in fact, be the same as the box body member illustrated in Fig. 4. On the grooved side of the composite panel are arranged two sets of cleats 31, one extending along one long edge of the body member and the other in the vicinity of the opposite long edge. As shown in Fig. 16, each of the cleats has one or more grooves 32 cut into one end edge face, and has its opposite end fashioned into tongues 33 which are adapted to fit into the grooves in the end of another cleat. The cleats in each row are so disposed that the grooved end of one lies on one side of a V groove 4 on the opposite side of which is located the tongue end of the next cleat. Consequently, when the body member is folded into a box form, each cleat interlocks at both ends with two other cleats.

Boxes measuring from twenty to thirty inches in height, width and length may, for example, be formed from double-faced panels in which the inner or core members are of wood not much more than one-eighth of an inch thick faced with thick kraft paper, and be sufficiently strong and durable to outlast much heavier and more expensive boxes heretofore employed in commerce and designed for the transportation of heavy goods, as for example, nails, small metal castings in bulk, or textiles in bolts. Ordinary glues may be employed in securing the facings to the cores and between the layers of the hinges; although it may sometimes be advisable to employ an adhesive having a rubber or rubber latex base for bonding the glue joints that must be formed in the final processes of setting up and sealing the boxes.

The facings not only reinforce the core member of the box material, so as greatly to strengthen the same, but they also permit the use of wood which would not otherwise be suitable because of the presence of knots or other objectionable characteristics; thereby keeping the cost of the boxes reasonably low. However, considering the invention in some of its aspects, the box walls may be composed of unfaced panels of other materials, as for example, plywood, or stiff fiber board.

I claim:

1. A corner-forming member comprising three or more sheets of thick paper overlying each other, each sheet being wider than the sheet on one side thereof and narrower than the sheet on the other side and the sheets being symmetrically disposed with respect to a central longitudinal line, the sheets engaging each other throughout their lengths and widths when said member is bent along said longitudinal line to bring the two halves thereof at a predetermined angle to each other, and said sheets being bonded together except for a longitudinal strip extending across the same at the center.

2. A corner-forming member comprising a plurality of sheets of flexible material lying one upon the other, the sheets being so arranged that, when the assembly lies flat, registering strips extending across said sheets from one edge to another bulge upwardly in the form of inverted V-troughs all symmetrically disposed with respect to a plane at right angles to the plane of said member, the angles of the troughs decreasing progressively from the bottom of the assembly to the top, and the engaging faces of the flat-lying portions of the sheets being bonded together.

ARMIN ELMENDORF.