

Nov. 11, 1947.

S. BERGSTEIN

2,430,755

METHOD OF MAKING COLLAPSED BOXES

Filed May 24, 1944

6 Sheets-Sheet 1

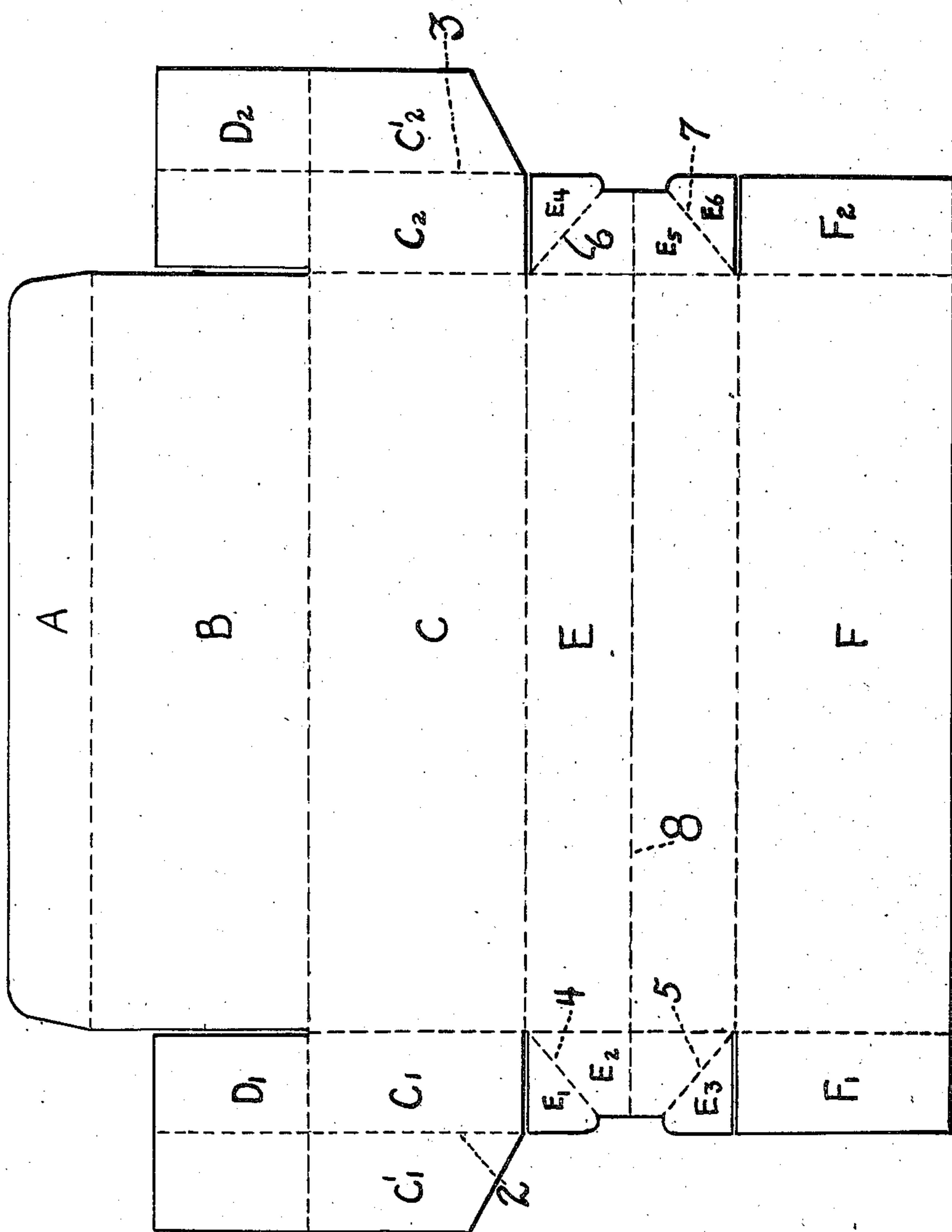


Fig. 1.

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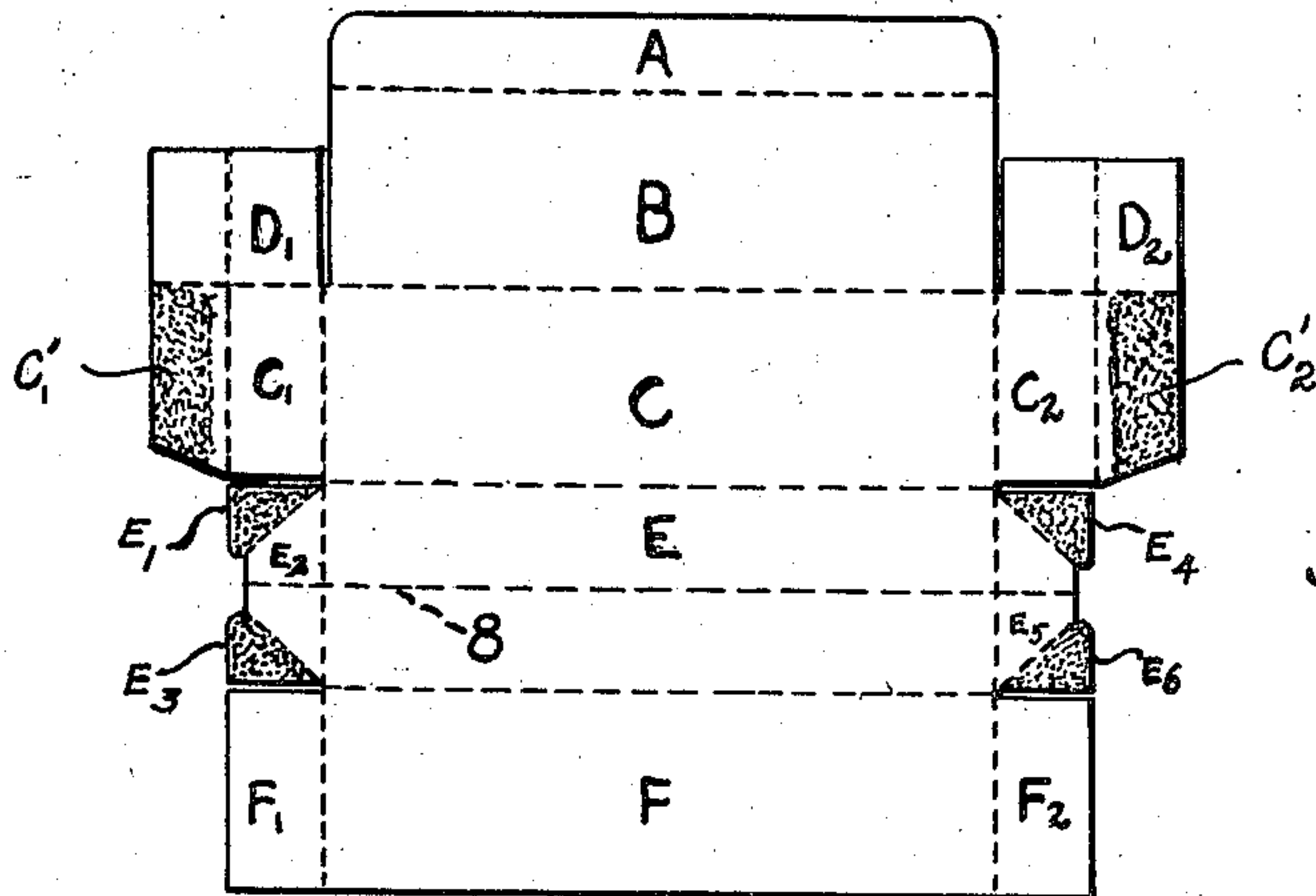


Fig. 2a

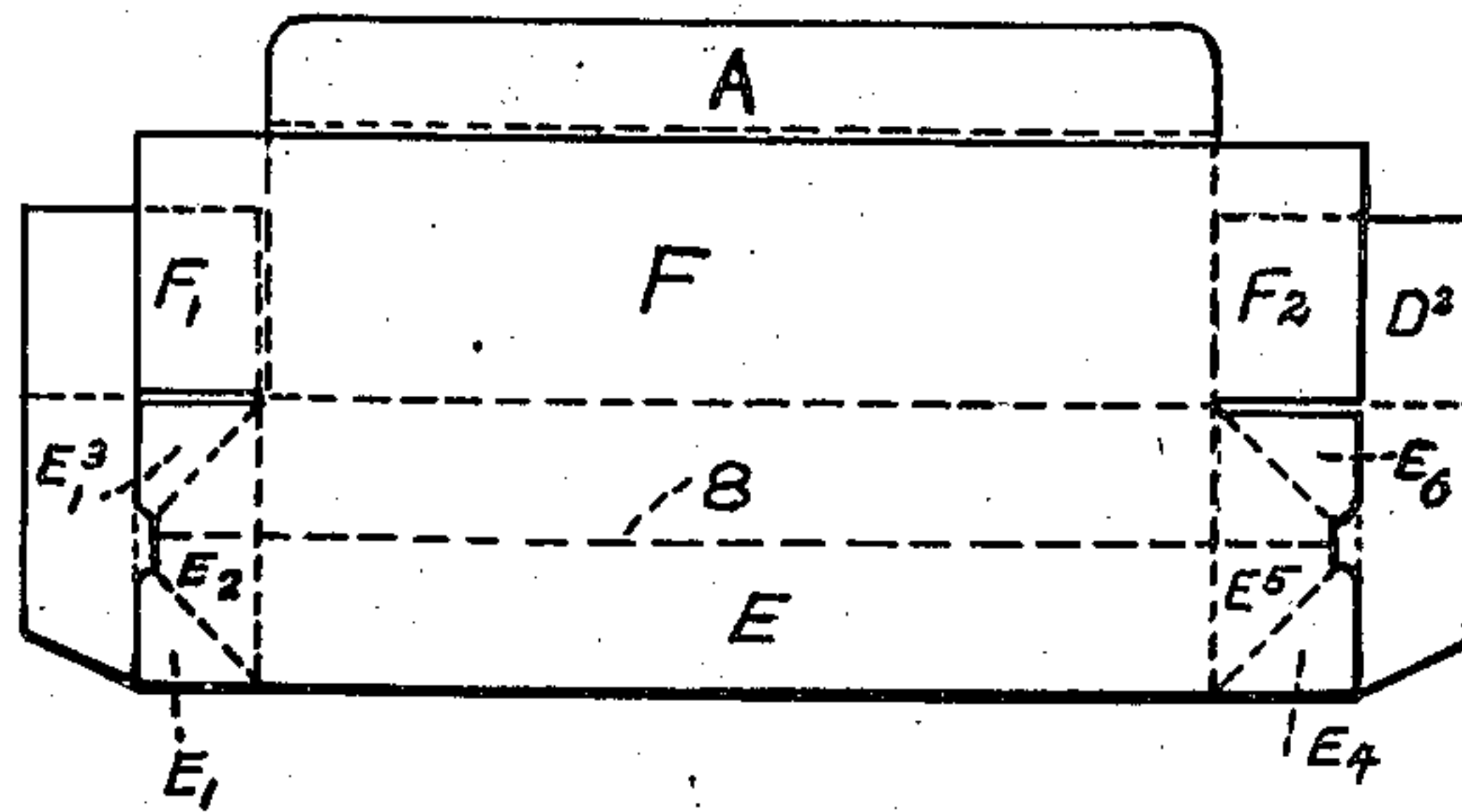


Fig. 2b

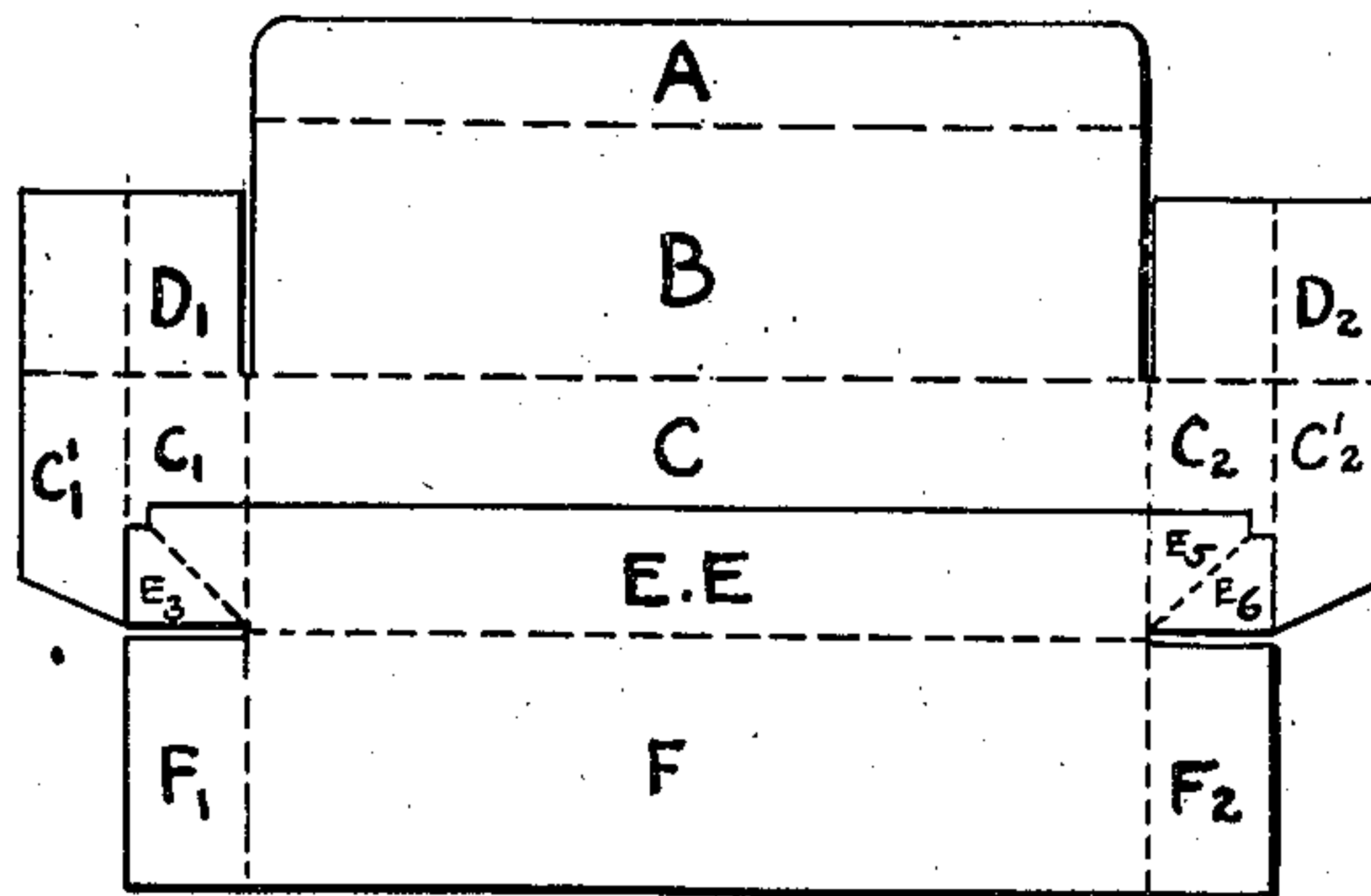


Fig. 2c

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6 Sheets-Sheet 3

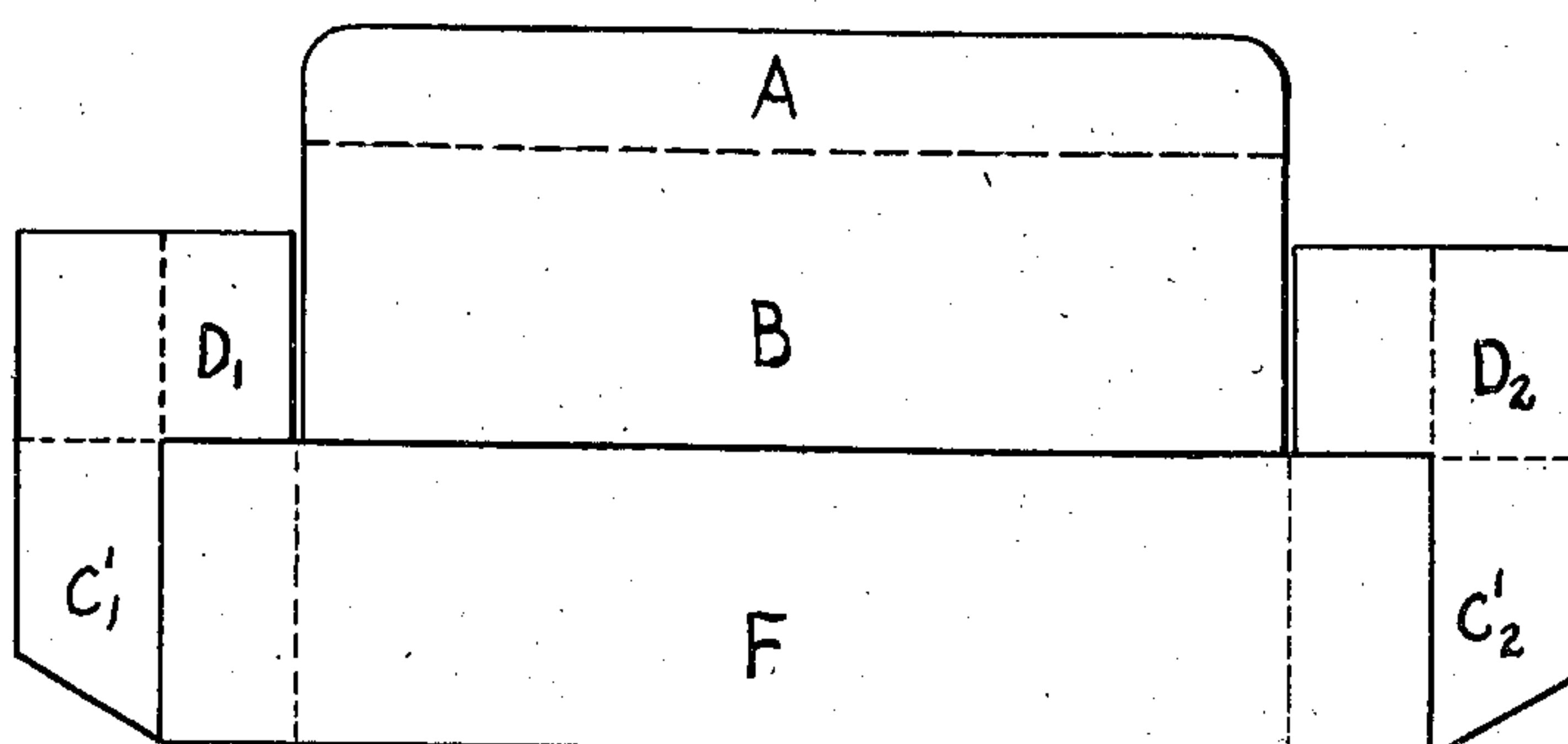


Fig. 2d.

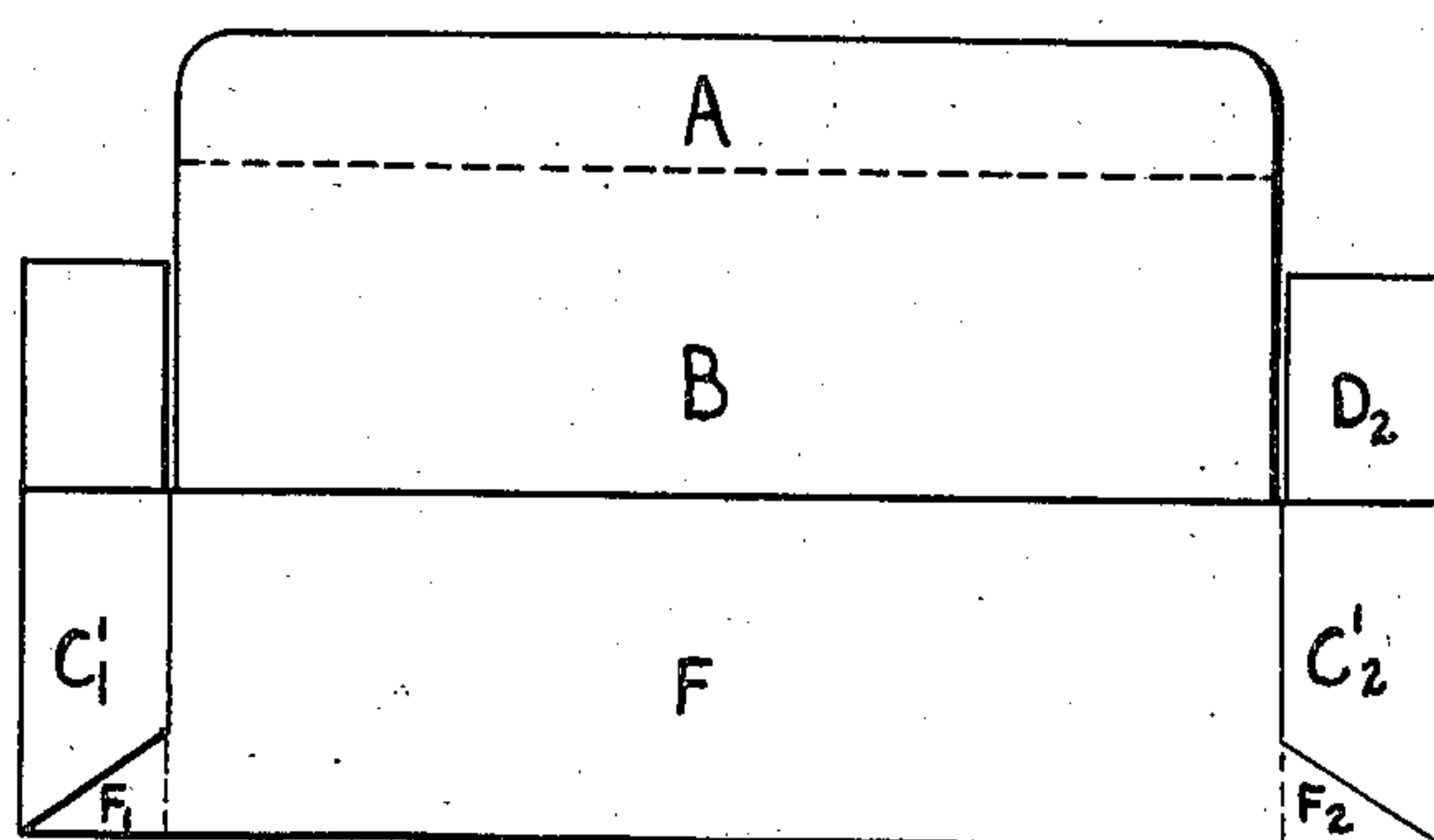


Fig. 3.

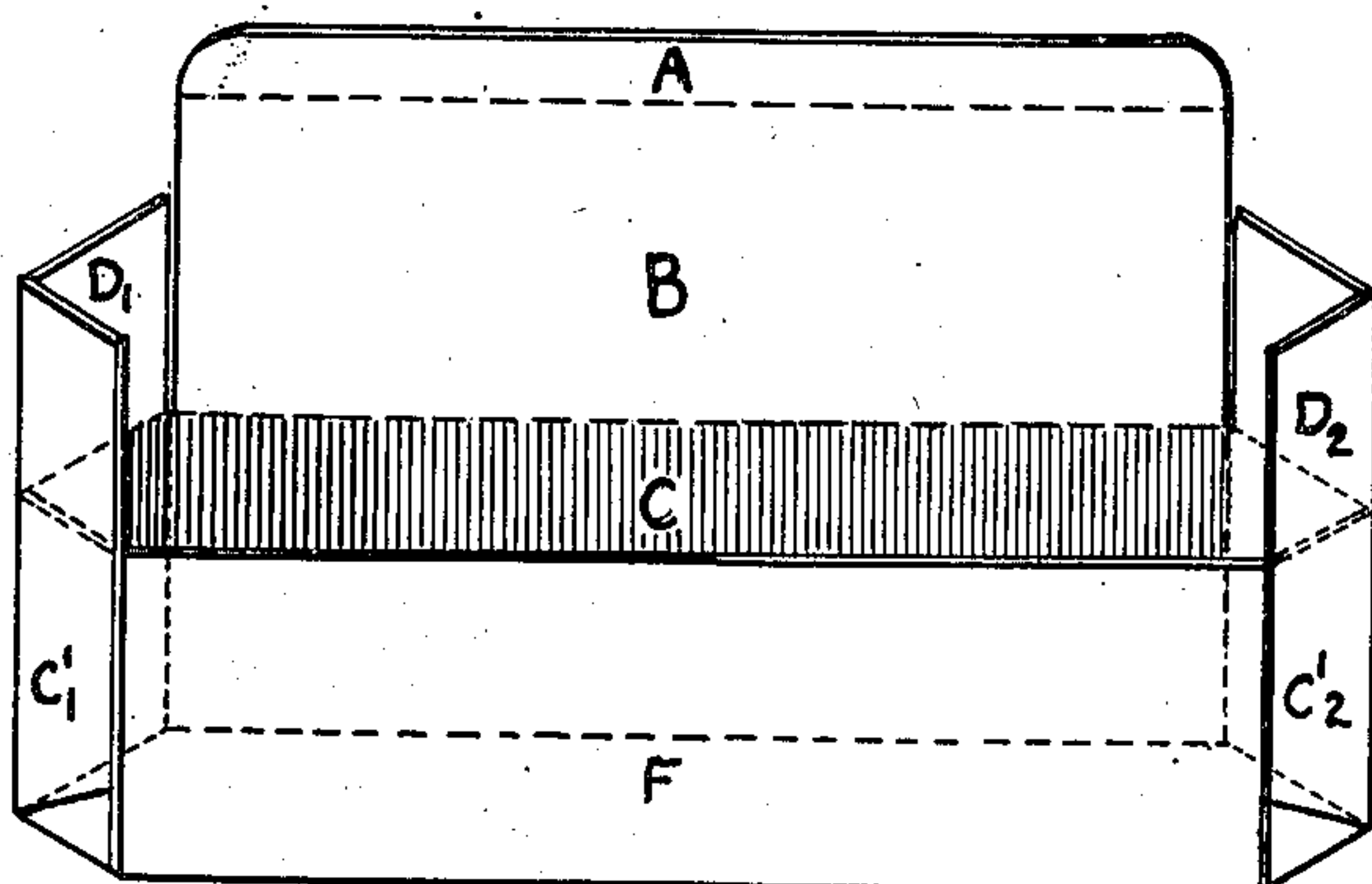


Fig. 4.

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6 Sheets-Sheet 4

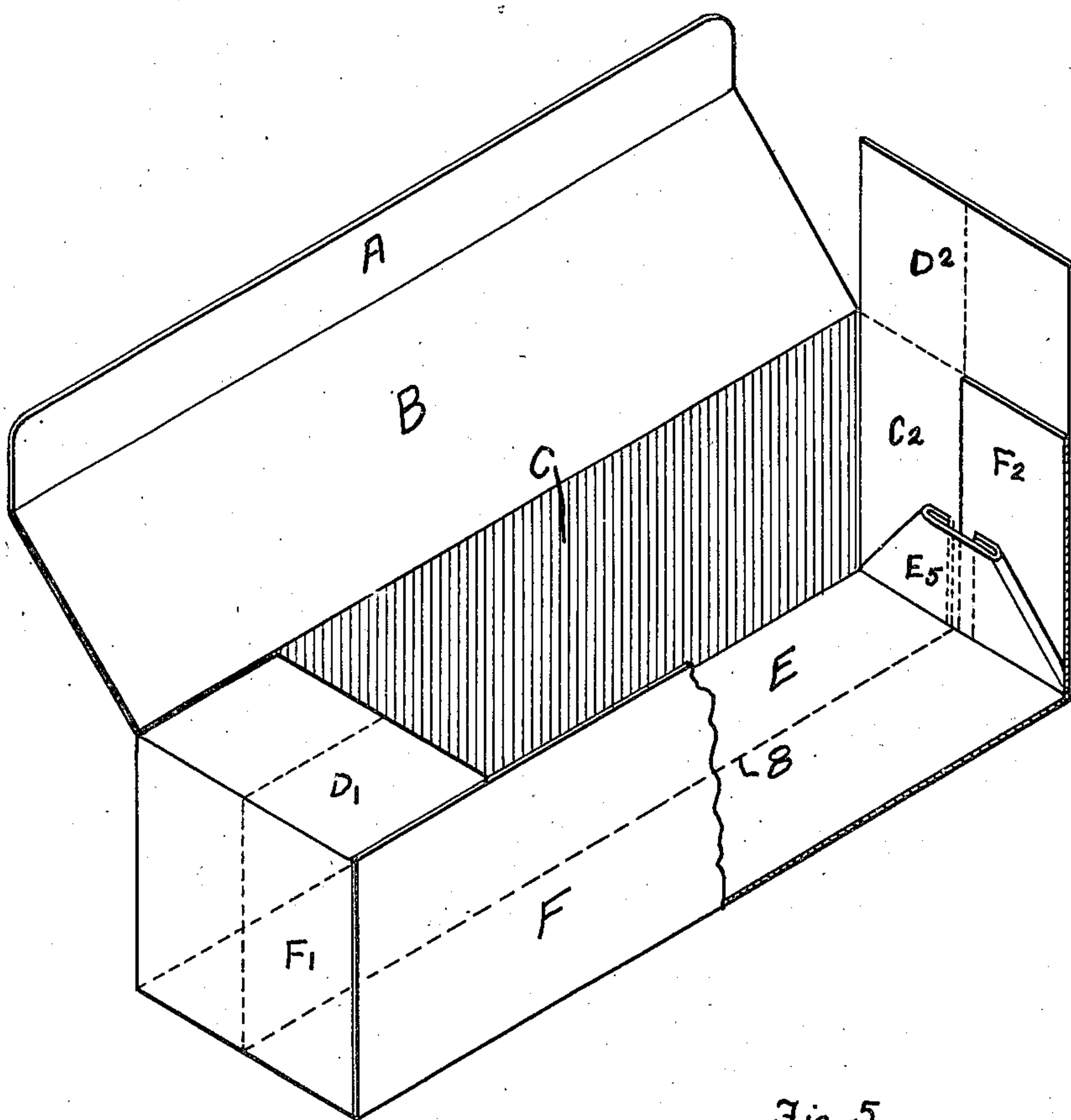


Fig. 5

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6 Sheets-Sheet 5

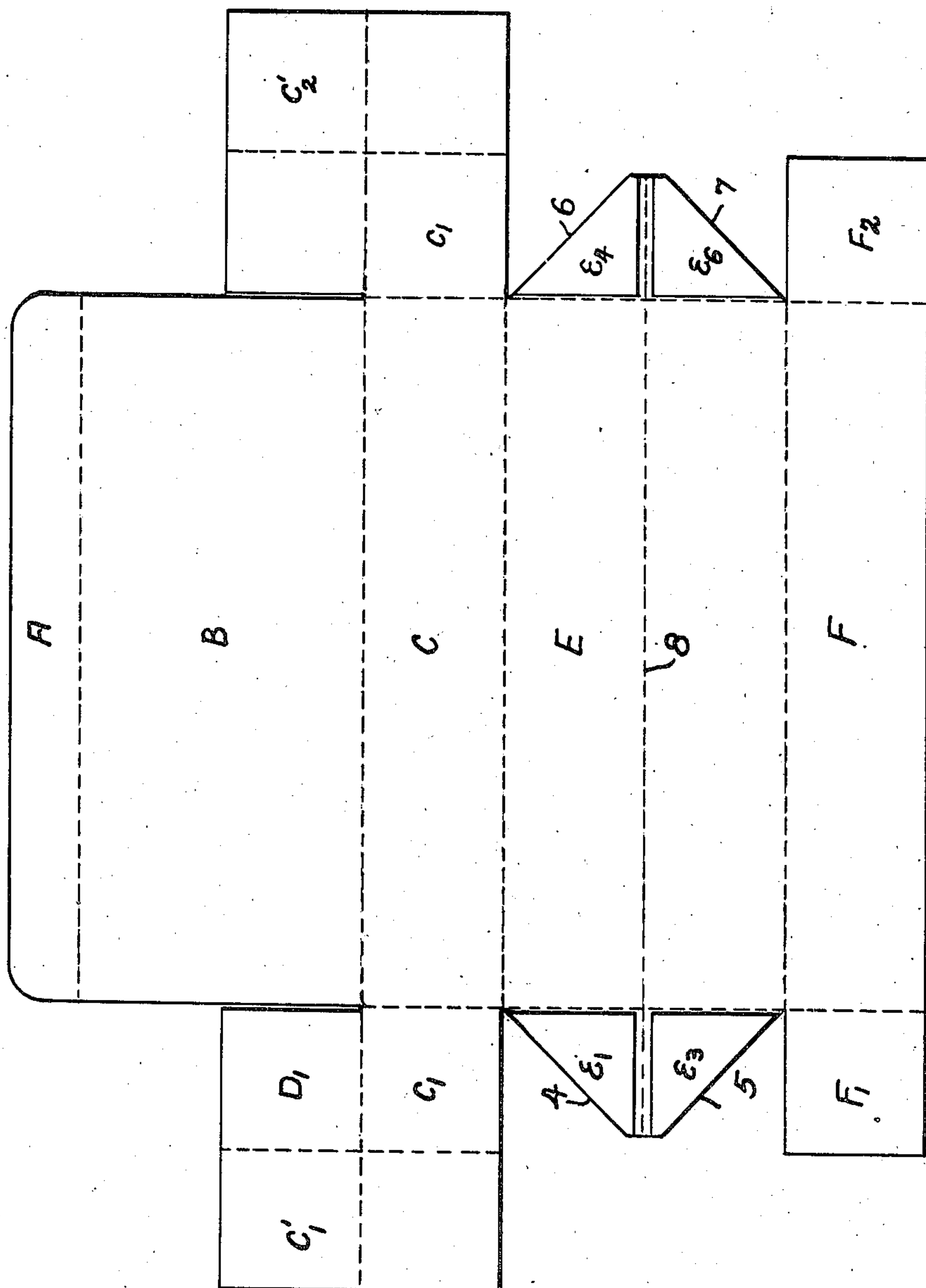


Fig. 6.

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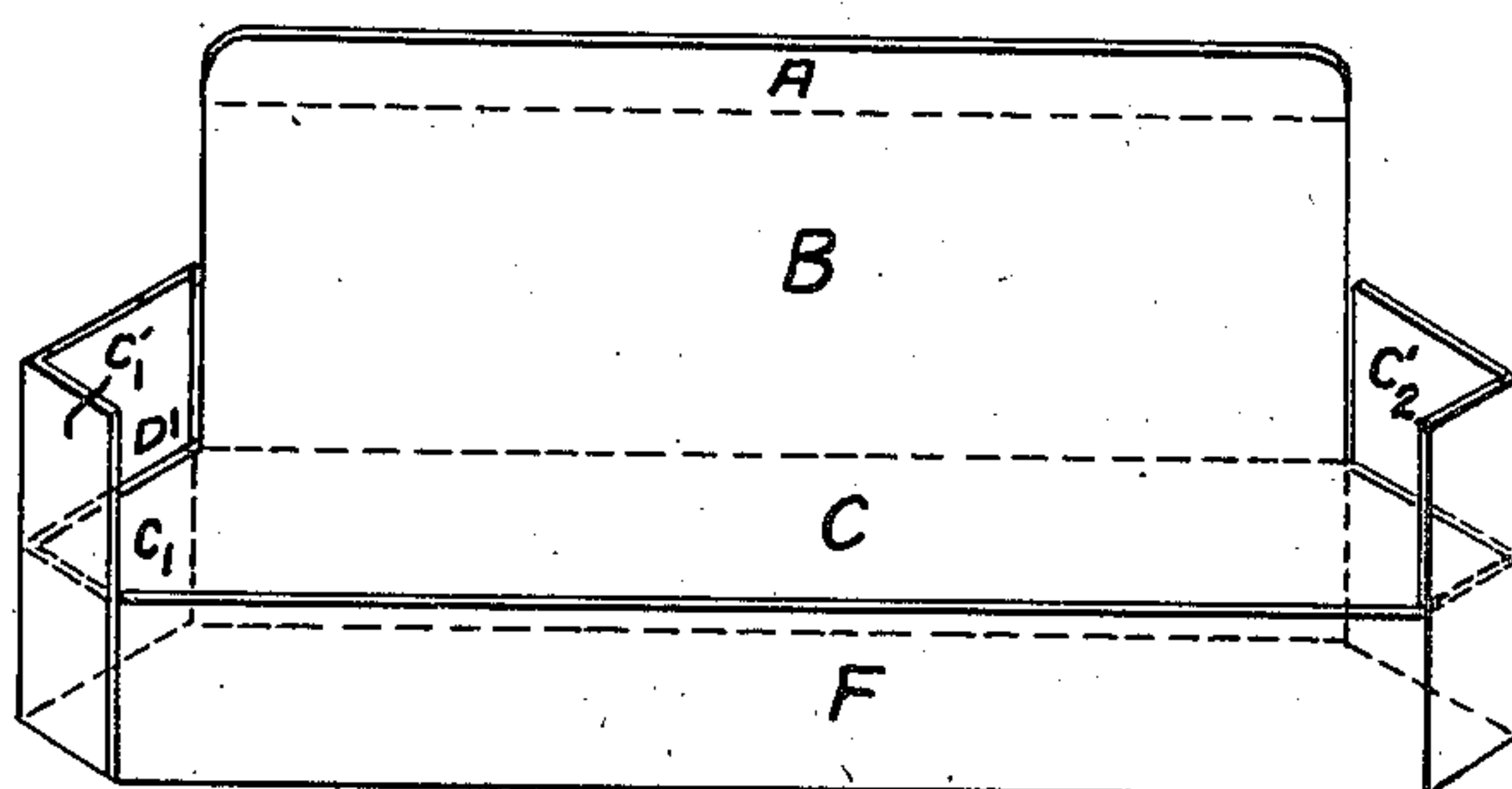


Fig. 7.

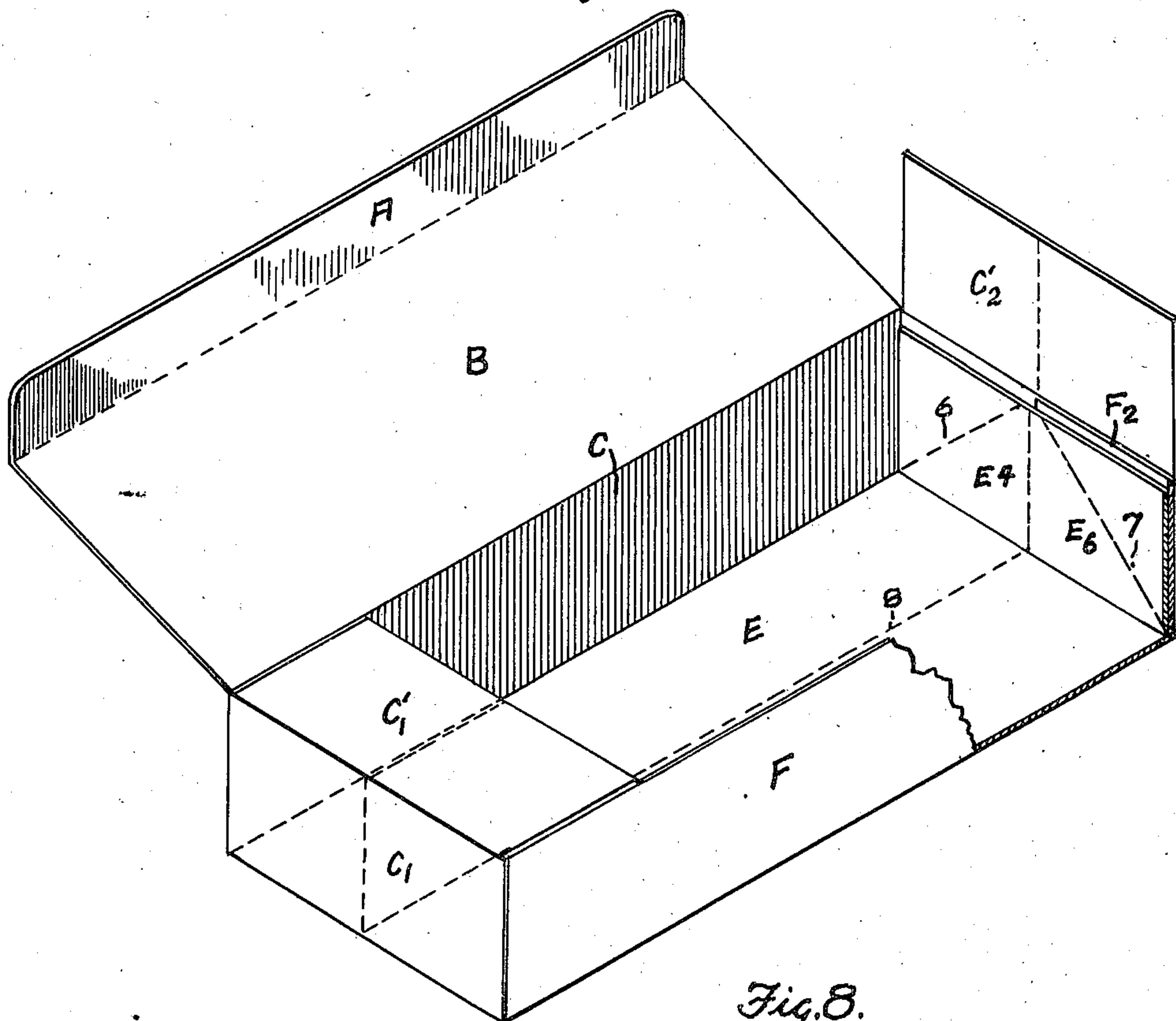


Fig. 8.

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## UNITED STATES PATENT OFFICE

2,430,755

## METHOD OF MAKING COLLAPSED BOXES

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Bergstein, trustees

Application May 24, 1944, Serial No. 537,090

4 Claims. (Cl. 93—49)

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One object of my invention is to provide an infolded automatic knocked down box that can be made from a blank requiring the minimum of material, and which will provide a finished box having the maximum of rigidity and stability when erected. Another object of my invention is to provide a process whereby the box can be glued and folded on high speed automatic machinery, and which is adapted to be carried out on existing equipment with the minimum of change. Other objects of the invention will become apparent as the description proceeds, reference being had to the claims appended as to the nature and scope of my invention.

Referring now to the drawings:

Figure 1 is a plan view of my preferred improved blank.

Figures 2a to 2d inclusive, are a series of diagrammatic plan views showing the successive gluing and folding operations performed on the blank of Figure 1.

Figure 3 is a plan view of a glued and folded knocked down box as made by the method shown in Figures 2a to 2d and illustrates the knocked down form in which the box is shipped.

Figure 4 shows a step in the opening of the box preparatory to filling.

Figure 5 shows the box in opened form, a portion of the front wall being cut away to show the interior and wall construction.

Figure 6 is a plan view showing the first step of an alternate folding and gluing operation on a blank similar to that shown in Figure 1.

Figure 7 shows a step in the opening of the box made according to the alternate method.

Figure 8 shows the box of Figure 7 in its open form, a portion of the front wall being cut away to show the end wall construction.

Referring now to Figure 1, the blank 1 may be made from cardboard or similar semi-rigid material. As shown, there is a top panel B, having a tuck flap A, articulated to it. To the top panel B, there is also articulated a rear panel C, a bottom panel E, and a front panel F, in the order named.

Articulated to the ends of the rear panel C are end flaps C<sub>1</sub> and C<sub>2</sub> divided by a score line from glue flaps, C'<sub>1</sub> and C'<sub>2</sub>. Articulated as shown to said end flaps and glue flaps are flaps D<sub>1</sub> and D<sub>2</sub> designed to fold inwardly over the contents of the box at the box ends. The lines of articulation 2 and 3 between C'<sub>1</sub> and C<sub>1</sub> and between C'<sub>2</sub> and C<sub>2</sub> continue through the flaps D and D<sub>2</sub>. The flaps C<sub>1</sub> and C<sub>2</sub> are each substantially half as wide as the bottom wall of the box.

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Articulated to the ends of the bottom panel E, are inner end flaps, which are divided by angular lines of fold 4, 5, 6 and 7 into three sections each, marked E<sub>1</sub>, E<sub>2</sub>, E<sub>3</sub> and E<sub>4</sub>, E<sub>5</sub>, E<sub>6</sub> as shown.

5 The bottom panel of the box is divided by a medial score line 8, which continues through the bottom end flap portions E<sub>2</sub> and E<sub>5</sub>.

Articulated to the ends of the front panel F are the glue flaps F<sub>1</sub> and F<sub>2</sub>, each substantially half as wide as the bottom panel of the box.

Where the combined width of the extension on the rear panel C is equal to the width of the bottom, the desirable flaps D<sub>1</sub> and D<sub>2</sub> need be formed only on the extensions of the rear panel, as shown. It will be readily apparent to those skilled in the art that this blank requires the minimum of material because it can readily be nested. That is, when laid out on a sheet in the customary way for die cutting each succeeding flat blank will partially nest into the adjoining blank in the row, thereby minimizing the amount of cardboard or similar material required for the production of the blanks themselves.

25 The blanks may be folded and glued on existing machines by means of stationary folding devices, as hereinafter described, and with a minimum of machine changes. The preferred method of folding and gluing as described herein may readily be carried out on right angle gluing machines such as are shown in my Patent No. 1,926,364 by the introduction of properly spaced and shaped stationary folding bars or rods in the first section or first direction of motion, to accomplish the successive parallel folds as the blank passes through it, as will be clear to the skilled worker in the art in the light of the description which follows.

Referring now to Figure 2a, the blank is conveyed in a direction of motion parallel to the medial line of fold 8 in the bottom panel E. As it is moved along, adhesive is applied to E<sub>1</sub>, E<sub>3</sub>, E<sub>4</sub>, and E<sub>6</sub> as shown by the shaded areas in the figure. The adhesive might, if desired, be applied to the corresponding meeting surfaces of C<sub>1</sub>, C<sub>2</sub>, F<sub>1</sub> and F<sub>2</sub> as will be clear. Then, as shown in Figure 2b, the bottom panel E is folded inwardly over the rear panel C, along the line of articulation between these two panels. This brings sections E<sub>1</sub> and E<sub>4</sub> respectively against flaps C<sub>1</sub> and C<sub>2</sub>. Care should be taken to prevent the contact of areas E<sub>3</sub> and E<sub>6</sub> with these same flaps; but this is accomplished by the shaping and positioning of the stationary sweeps or rods.

55 This is followed by a reverse folding along the



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medial score line 8 of the bottom panel E, the blank now being in the condition shown in Figure 2c. If desired, the application of adhesive to the sections E<sub>3</sub> and E<sub>6</sub> may be postponed to this stage; but as explained above, this is not necessary, and requires additional spot-gluing equipment. As the partially folded box continues to travel, the front panel F is folded in to overlies the reversely folded bottom panel, as shown in Figure 2d.

Thereupon the blank preferably passes to the right angle or second section of the machine where the orientation of the blank in relation to its direction of travel is changed by 90°, so that the blank is now travelling parallel to the medial fold lines in the end walls, that is, the medial fold lines connecting C'<sub>1</sub> and C<sub>1</sub> and C'<sub>2</sub> and C<sub>2</sub>. Adhesive is thereupon applied either to the surface shown by the shaded area of panel C'<sub>1</sub> and C'<sub>2</sub> or the corresponding meeting surfaces of the flaps F<sub>1</sub> and F<sub>2</sub> on the front panel; and as shown in Figure 3 the extending flaps C'<sub>1</sub> and C'<sub>2</sub> are folded in, (which also may be done by stationary members). The blank thus folded is brought under the customary pressure conveyor to cause the adhesive to set.

The process as above described delivers a glued and folded knocked down box as shown in Figure 3 of the drawings, and in this form the box is shipped to the point of use, that is, to the bakery or other industry where such automatic boxes are required.

Figure 4, shows a step in the opening of the box, which is accomplished merely by pressing in on the two folded ends with the hands. As the pressure from the two opposite sides is applied, it can be seen from the drawing in Figure 4, that this causes the reversely folded parts of the bottom panel to start to flatten out along the score line 8, and also starts to erect the end walls of the box. The outer end walls, such as are formed on one end by C<sub>1</sub>, C'<sub>1</sub>, and F<sub>1</sub> flatten out and come into a single plane. The sections E<sub>2</sub> and E<sub>5</sub> flatten out and bend upwardly at right angles to the bottom panel, the triangular tabs, such as E<sub>1</sub> and E<sub>3</sub>, bending over outwardly to permit this action. The set up box is illustrated in Figure 5. Bending over the flaps D<sub>1</sub> and D<sub>2</sub> (which is done after the filling of the box), further rigidifies the end wall construction.

In reference to this method it should be noted that infolding of the front wall may be started before the reverse folding along the medial score line 8 of the bottom is completed, so that the order in which the three parallel folds are made while the blank is traveling parallel to the medial line of fold in the bottom, two of these folds being inward and one being reverse, may thus be varied. This series of folds is preferably preceded by the application of adhesive. In this method of folding, the portions E<sub>1</sub>, E<sub>3</sub>, E<sub>5</sub> and E<sub>6</sub> are adhered to end wall flaps in face-to-face relation, and are not bent upon their diagonal scores 4, 5, 6 and 7 until the box is erected.

It will also be apparent that the process as described may be carried out by other types of gluing and folding machinery than that of the right angle machine in my Patent No. 1,926,364. For example, a straight line mechanism may be used in which the orientation of the blank remains that of the first described direction of travel and in which the folding over of the glue flaps, C'<sub>1</sub> and C'<sub>2</sub> is subsequently done by moving folders, operating in a direction of motion transverse the direction of travel.

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It should also be noted that the flaps C'<sub>1</sub> and C'<sub>2</sub> might be extended if desired by a glue flap properly articulated to the outer edges thereof, which glue flap would then be adhered to the outer surface of the front panel F, and that such modifications in structure are within the scope of my invention. In this same manner it is likewise apparent that if desired the lid E could be eliminated, providing thereby a tray or half of a telescope box rather than a one piece structure with the lid attached.

In Figure 6 I have shown the preliminary step of an alternate method of folding and gluing the blank. The blank is fed out and moved in the same direction as previously described, but the initial folding step consists of folding upwardly and inwardly the four corner portions, E<sub>1</sub> and E<sub>3</sub>, E<sub>4</sub> and E<sub>6</sub> along their diagonal lines of articulation, 4, 5, 6 and 7. This folding can be carried out by any suitable apparatus, such as that shown in the Butterfield Patent No. 1,461,966. Thereafter the remaining steps of the process are identical to that of the preferred method. Thus, as the blank continues to travel adhesive is applied either to the in-turned corner portions E<sub>1</sub>, E<sub>3</sub>, E<sub>4</sub> and E<sub>6</sub>, or the corresponding portions of the adjoining wall C<sub>1</sub> and C<sub>2</sub>, F<sub>1</sub> and F<sub>2</sub>, and while retaining the folds along the diagonal lines in folded position, the same series of folds along the parallel crease lines at the bottom is made. Thereafter, the direction of motion is preferably changed and flaps C'<sub>1</sub> and C'<sub>2</sub> are folded over after adhesive has been applied, to complete the folding and gluing operation.

In Figure 7 is illustrated a blank made according to Figure 6, in partially set up form, and the erected box is shown in Figure 8. It will be noted that it resembles very closely the box illustrated in Figure 5, except that the location of the pasted flaps E<sub>1</sub>, E<sub>3</sub>, E<sub>4</sub> and E<sub>6</sub> is different. These flaps lie flush against the end walls, instead of being reversely folded back along the diagonal lines, thereby making a somewhat closer fit at the ends of the carton, which may have some advantage from the standpoint of neatness and tightness. The ease of opening of the box, the handling, the amount of material required for the blank, and the like, are identical in both processes.

Modifications may be made in my invention without departing from the spirit of it.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. The method of making one piece knocked down boxes from blanks having four main body walls comprising a top wall, a rear wall, a bottom wall and a front wall, said rear wall having end walls articulated thereto, each of which end walls has a medial fold line therein, said bottom wall having inner flaps with diagonal lines of fold therein articulated to the ends thereof, a medial line of fold in said bottom wall and said inner flaps, said front wall having glue flaps articulated to the ends thereof, applying adhesive to triangular portions of the inner flaps defined by said diagonal lines of fold or to the corresponding meeting surfaces of the end walls and the glue flaps, and by folding reversely along the medial line of the bottom wall and by folding inwardly along the lines of articulation between the bottom and rear wall and the bottom and the front wall, adhesively securing said triangular portions of the inner flaps to the end walls and the glue flaps.

2. The method of making one piece knocked



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down boxes from blanks having four main body walls comprising a top wall, a rear wall, a bottom wall and a front wall, said rear wall having end walls articulated thereto, each of which end walls has a medial fold line therein, said bottom wall having inner flaps with diagonal lines of fold therein articulated to the ends thereof, and a medial line of fold in said bottom wall and said inner flaps, and said front wall having glue flaps articulated to the ends thereof, applying adhesive to triangular portions of the inner flaps defined by said diagonal lines of fold or to the corresponding meeting surfaces of the end walls and the glue flaps, and by folding reversely along the medial line of the bottom wall and by folding inwardly along the lines of articulation between the bottom and rear wall and the bottom and the front wall, adhesively securing said triangular portions of the inner flaps to the end walls and the glue flaps, and folding said end walls along the medial lines of fold therein, adhesive having been applied between meeting surfaces of said walls and said glue flaps.

3. The method of making one piece knocked down boxes from blanks having four main walls comprising a top wall, a rear wall, a bottom wall and a front wall, said rear wall having end walls articulated thereto, each of which end walls has a medial fold line therein, said bottom wall having end flaps with diagonal lines of fold therein articulated to it, said bottom wall having a medial line of fold therein and passing through said end flaps, said front wall having glue flaps articulated

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to the ends thereof, said method comprising moving the blanks in a direction parallel to the medial fold lines in their bottom walls, applying adhesive to the meeting surfaces of triangular portions of the end flaps defined by said diagonal lines of fold and the corresponding end walls and glue flaps, folding the blank reversely along the medial fold line of the bottom wall and inwardly along the lines of articulation between the bottom wall and the rear and front walls respectively, thereafter changing the direction of motion of said blanks and folding over said end walls on their medial lines with an application of adhesive to the meeting surfaces of said end walls and glue flaps.

4. The process claimed in claim 3 including as a first folding step the folding of the said triangular portions inwardly over the said end flaps.

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The following references are of record in the file of this patent:

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