Oct. 4, 1955 A. ELMENDORF 2,719,808

PROCESS OF MAKING SHELLS FOR FOLDABLE VENEER BOXES

Filed Dec. 3, 1952 3 Sheets-Sheet 1

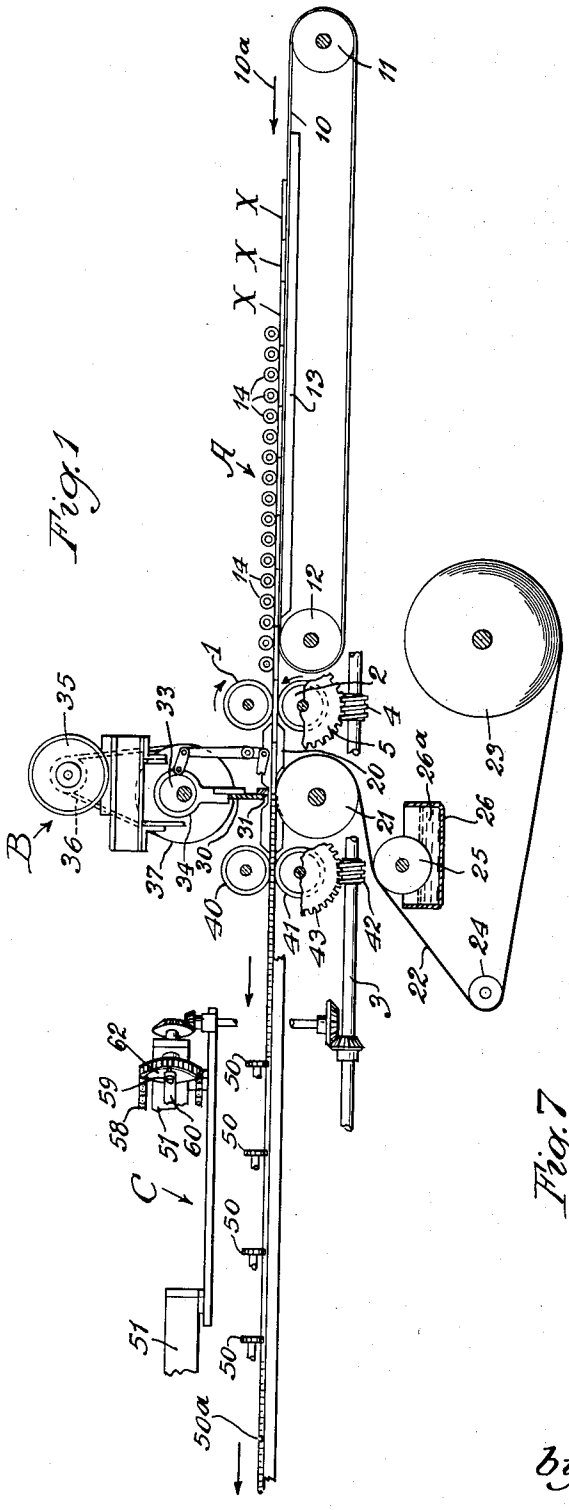

Fig. 1

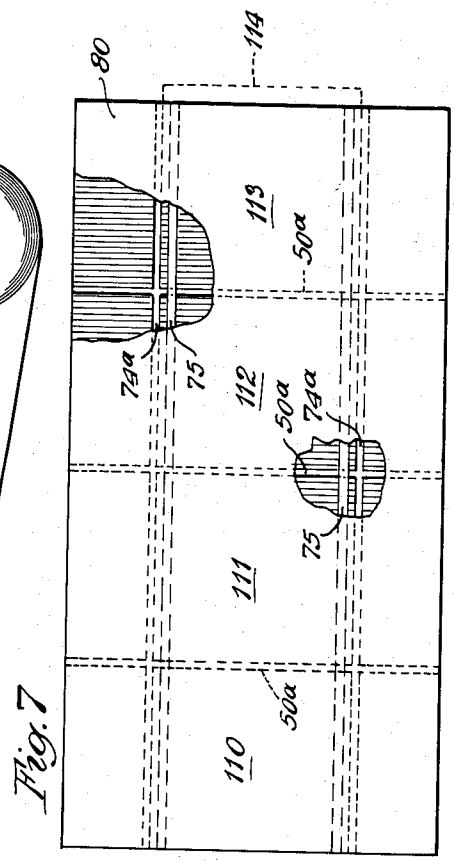

Fig. 7

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Oct. 4, 1955 A. ELMENDORF 2,719,808

PROCESS OF MAKING SHELLS FOR FOLDABLE VENEER BOXES

Filed Dec. 3, 1952 3 Sheets-Sheet 2

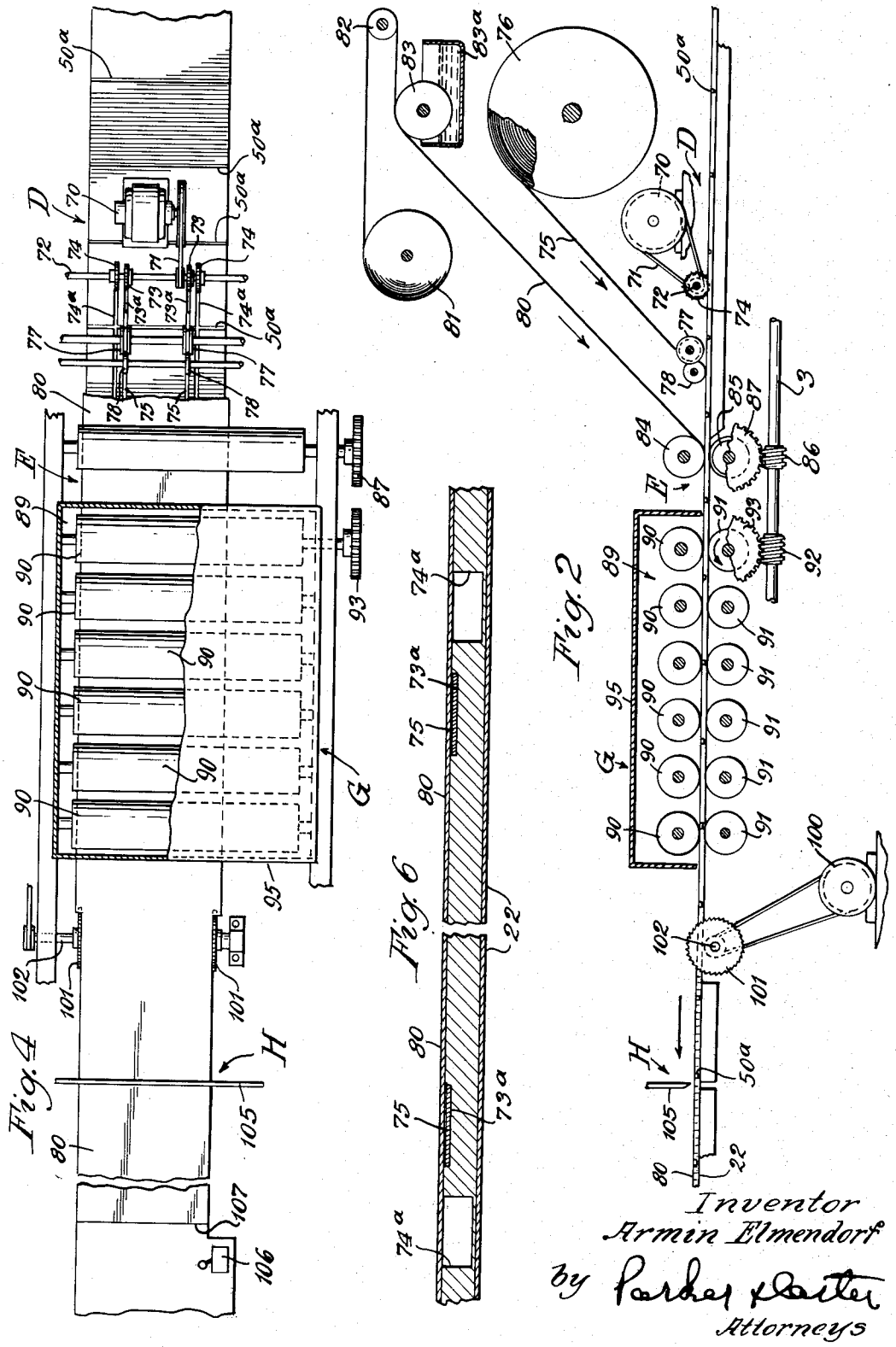

Fig. 4

Fig. 6

Fig. 2

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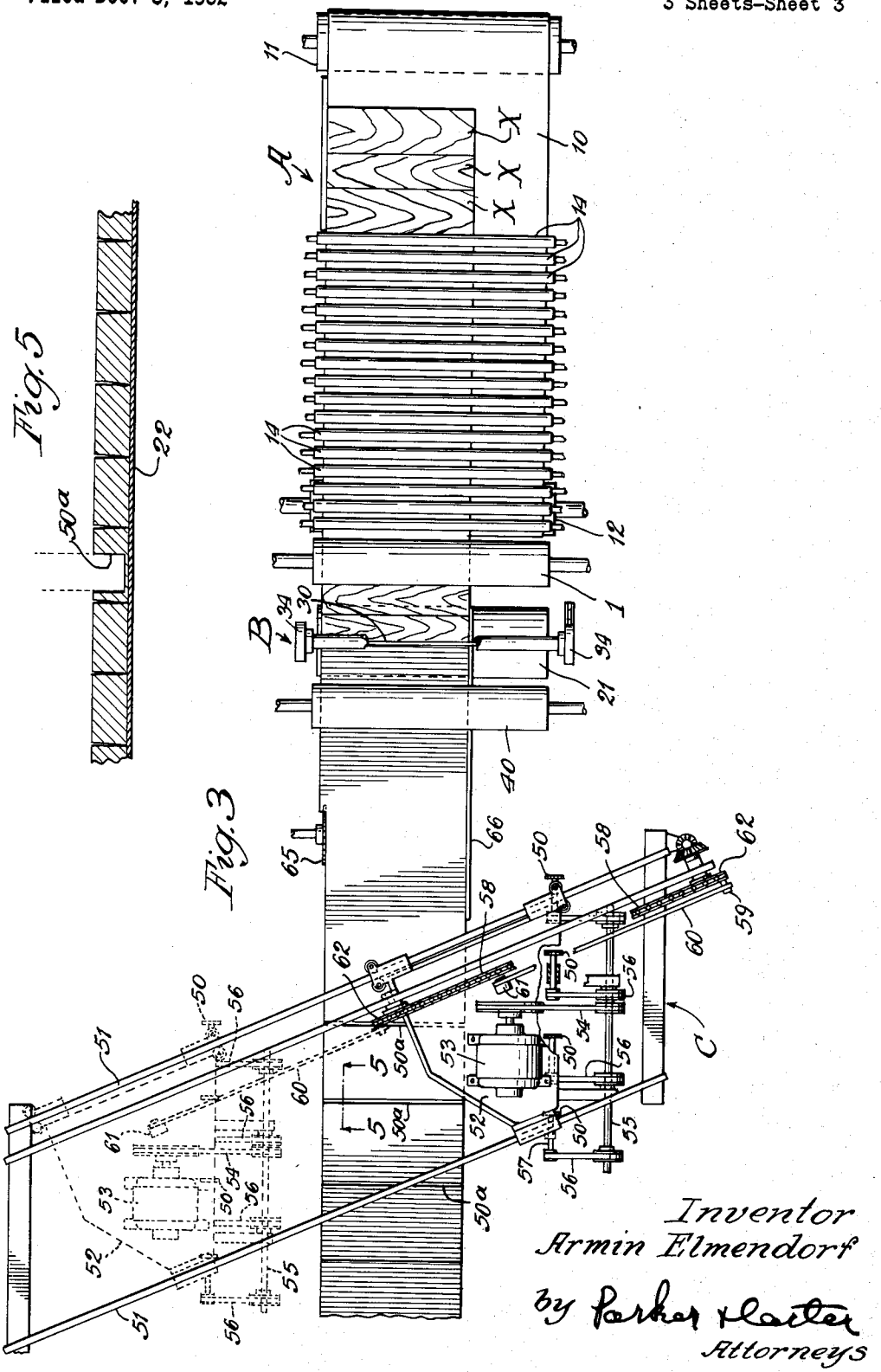
Oct. 4, 1955 A. ELMENDORF 2,719,808

PROCESS OF MAKING SHELLS FOR FOLDABLE VENEER BOXES

Filed Dec. 3, 1952 3 Sheets-Sheet 3



United States Patent Office 2,719,808
Patented Oct. 4, 1955

2,719,808

PROCESS OF MAKING SHELLS FOR FOLDABLE VENEER BOXES

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Application December 3, 1952, Serial No. 323,739

17 Claims. (Cl. 154—118)

My invention relates to a process or method for making the shells for foldable veneer boxes.

One purpose of my invention is to provide a method for making such shells from pieces of veneer positioned between layers of fibrous material having, for example, the general characteristics of kraft paper.

Another purpose is to provide a method of forming such shells of veneer and paper slotted to permit the bending or folding of the material to form boxes or the like.

Another purpose is the provision of a method of forming such shells, in the course of which the veneer component is slotted or grooved to permit ready folding, while avoiding any cutting or damage to the fiber or paper layer.

Another purpose is to provide such a method in which the veneer is slotted or cut both parallel with the grain and across the grain.

Another purpose is to provide the step of slotting or recessing the exterior of the veneer to receive metal strapping applied prior to the final addition of an outer layer of paper or fibrous material.

Another purpose is to provide a method in which the veneer component may, if desired, be severed or partially severed and somewhat expanded across the grain to increase its across-the-grain width, for example, by the order of 1 to 5%.

Another purpose is to provide a method of making veneer containers and shells therefor.

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

I illustrate the invention more or less diagrammatically in the accompanying drawings, wherein:

Figure 1 is a vertical longitudinal section illustrating schematically the initial stages of the method;

Figure 2 is a similar section, illustrating later stages of the method;

Figure 3 is a plan view of the structure shown in Figure 1;

Figure 4 is a plan view of the structures shown in Figure 2;

Figure 5 is a section on an enlarged scale, illustrating the structure as slotted along the grain;

Figure 6 is a similar section illustrating shallow slotting across the grain with a metal strap inserted; and

Figure 7 is a plan view of a shell, with parts broken away.

Referring to the drawings, I illustrate more or less diagrammatically structures which can be employed to perform the various steps of my method or process. It will be understood that whereas I illustrate practical structures, nonetheless various of these structures can be changed substantially without departing from the practice of my method. I wish it also to be understood that since some steps of the method may be omitted, at the desire of the operator, some of the structures may be omitted or may be rendered inoperative.

Referring first to Figure 1, I illustrate a feeding unit

or zone generally indicated at A. This unit includes opposed parallel axised feed rolls **1** and **2**, which may be rotated in the directions indicated by the arrows to draw through them the veneer pieces generally indicated at X. Whereas I do not wish to be limited to any specific mechanisms the rolls or drums **1**, **2** constitute practical means for feeding the veneer pieces or strips towards the below described severing and distending zone. As a matter of convenience, I illustrate as a driving mechanism a shaft **3**, parts of which are indicated at various points in Figures 1 to 4, inclusive. This shaft is simply given as an indication of a type of driving and synchronizing mechanism which may be employed. With reference to the stage or zone A, I show a shaft **3** carrying a worm **4** in mesh with a worm gear **5**, which serves to drive the feed roller **2**. The roller **1** may be frictionally driven, or any suitable positive drive not herein shown, may be provided. As a matter of convenience, I illustrate a lay up table shown as including a belt **10** passing about rolls or pulleys **11**, **12** and passing over any suitable support or table **13**. Any suitable means not herein shown may be used for driving the belt, for example by driving one or both of the pulleys **11**, **12** to feed the veneer to the zone B of Figures 1 and 3. If desired, a series of overlying rollers **14** may be employed. In that event, the veneer pieces, which may be of random widths, but are preferably parallel edged, are laid in abutting relationship upon the upper bight of the belt **10** and are fed thereby, in the direction of the arrow **10***a*, toward the feed rollers **1** and **2**. As each piece reaches the said feed rollers, it is fed thereby across any suitable supporting members or bars **20** into position over a roll or drum **21**. A layer of fibrous material, for example, kraft paper, indicated at **22**, passes from any suitable storage or supply drum **23** about a guiding roll **24** and across an adhesive supplying roll **25**, to the roll or drum **21**. The roll **25** rotates through any suitable adhesive **26***a* in the adhesive container **26**. The adhesive must be of such a composition and viscosity that when heavy paper such as kraft paper .030 inch thick is coated with the adhesive, it has sufficient tack to prevent strips of narrow veneer from slipping and thereby changing their positions relative to each other, after momentary pressure has been applied to the paper and the veneer. Adhesive consisting primarily of soya bean meal or of urea, as normally used in the plywood industry, are satisfactory. Thus, as the web of paper or fibrous material **22** passes about the exterior surface of the drum **21**, it presents its adhesive-coated side to the lower surfaces of the veneer.

At or near the point of contact between the adhesive-coated web and the veneer, I may provide any suitable severing means for severing the veneer, along the grain, into a series of relatively thin strips or slats. The veneer pieces are positioned on the lay-up table with their grain generally perpendicular to the path of movement of the pieces to and through the feed rolls **1** and **2**. I illustrate in Figure 1 a knife **30** actuated by any suitable means to sever or partially separate the veneer pieces along the grain from side to side of the web formed by the paper and the veneer, it being understood that the slats or strips adhere to the adhesive-coated surface of the paper **22**. I find it, under many circumstances, advantageous not merely to divide the veneer into strips or slats, but to distend the veneer to increase its across-the-grain dimension. The knife **30** may have a tapered surface **31** which tends to separate the adjacent slats or strips. I find it also advantageous to provide bonding rollers indicated in Figure 1 at **40**, **41** and driven, for example, from the shaft **3** by the worm **42** and worm gear **43**. The function and result of the rotation of the bond-

ing rollers 40, 41 in the direction of the arrows is to maintain the separation between adjacent strips or slats of the veneer. The peripheral speed of the drums or rolls 40 and 41 is slightly greater than the peripheral speed of the drums or rolls 1 and 2.

I illustrate more or less diagrammatically an actuating means for the knife 30, which includes an eccentric 33 within an eye 34 and an actuating motor 35 which rotates the eccentric through a belt or chain 36, passing about a pulley 37, it being understood that any suitable means may be employed, the essential being that the knife 30 penetrates the veneer sufficiently substantially to sever the adjacent strips or slats. It may be advantageous, or at least not disadvantageous, to leave some loose fibrous connection between adjacent slats.

As the composite web formed by the paper or fiber and the wood continues its travel to the left, referring to the position of the parts in Figures 1 to 4, it enters what I may call the slotting stage, or zone C. In this zone I cut slots in the veneer, along the grain of the veneer and at right angles to the path of movement of the web. I find it important to cut the slots substantially completely through the veneer, but without contacting or cutting or weakening the paper web 22. I may, for example, employ a suitable number of cutters or cutter heads 50, of which four are indicated. These, when moved in unison across the web, cut four parallel slots. Whereas the cross-sectional contour of the slots may be varied, I find a rectangular contour desirable, cut to a depth which leaves a thin layer or skin of wood between the cutter and the paper web 22. The width of the slot is preferably not less than the thickness of the veneer. As will later appear, it may be advantageous to have some of the slots substantially wider, or even twice the width of other slots. In the particular mechanism herein shown, the web may advantageously be moved continuously and preferably at uniform speeds. In order to cut the slots across the web as it moves, I provide an angle cutting unit, the details of which do not of themselves form any part of the present invention. This will, therefore, be only generally described. I illustrate in Figure 3 the parallel guides 51, along which slides any suitable frame or base 52, carrying a suitable motor 53, which drives the belt 54 and through it the shaft 55. Individual belts 56 are employed to rotate cutter shafts 57, which carry the cutters 50. A cross-sectional showing of the cut made is illustrated in Figure 5, it being understood that the inclination of the guides 51 is so related to the speed of movement of the web that the result of traversing the base 52 on the guides 51 is to cut slots 50*a* along the grain of the veneer and at right angles to the path of movement of the web. The actual traversing may be accomplished by a drive chain 58, one link or element of which carries a pivotal connection 59 for a connecting rod 60, the other end of which is pivotally secured as at 61 to the base 52. The chain may be driven about sprockets 62 from the shaft 3, by a suitable connection, which is illustrated, and need not be described. Any suitable trimming or marginal saw or cutter 65 may be employed at one side of the web, the opposite side abutting, for example, against any suitable limit or guide 66.

The cross-slotted web, which carries the spaced, parallel cuts 50*a* along the grain, continues moving toward the left, it being understood that it now passes to the zones or structures illustrated in Figures 2 and 4. D generally indicates a zone in which cuts or grooves may, if desired, be made across the grain of the veneer and in parallelism with the path of movement of the web. I illustrate, for example, any suitable motor 70 which, through a belt 71, drives a shaft 72 carrying any suitable cutters 73 and 74. The cutters 73 are illustrated as shallow cutters which cut a shallow groove properly proportioned to receive metal strip 75 fed from the drum 76 and between the rollers 77 and 78, it being understood that the strip 75 passes between the rollers 77 and 78 to enter the shallow slots 73*a* made by the cutter 73.

The cutters 74 may be employed to cut grooves 74*a* which may be as deep as the grooves 50*a* made by the cutter 50 of the zone C. The purpose of the various grooves will later be considered, it being understood, for example, that where a box or container shell is to be made to be bent along bends at right angles to each other, the deep grooves 50*a* and 74*a* will be formed in the veneer. Where a shell is desired which is bent only along lines parallel with each other, then the cutter 74 may be omitted. When bends of 180° are to be made the width of the grooves must be at least double the thickness of the veneer. In that case, the box may be shipped to the user as a sleeve folded flat with one joint taped. As will be clear from Figures 5 and 6, each deep groove 50*a* and 74*a* has, at its bottom, a thin film of wood, which, in practice, is readily compressible when the shell is bent along the grooves.

No matter what grooving is applied to the veneer, I terminate the web assembly by the application of a second or opposite layer of paper or fiber, indicated at 80. It may come from any suitable supply roll 81 and pass over a guide roller 82 and over an adhesive applying roller 83. It reaches and is applied to the web in the zone generally indicated at E in Figure 2, where it is shown as passing beneath the applying roller 84. The supporting roller 85 is shown as opposed to the roller 84, the web passing between the two rollers, it being understood that adhesive is picked up by the paper layer 80 from the container 83*a* associated with the applying roller 83. Any suitable means may be employed for actuating any of the above described rollers. I show, for example, in Figure 2 a worm 86 on the shaft 3 in mesh with a worm gear 87 suitably connected to drive the roller 85 over which the web passes.

89 generally indicates any suitable press, herein shown as a rotary or roll press, consisting of or including a plurality of pairs of rolls, the upper rolls being indicated at 90 and the lower at 91. At least one pair of these rolls may be driven, for example, by the worm 92 on the shaft 3 in mesh with the worm gear 93 of the first of the lower rolls 91. It is essential merely that adequate means be employed for feeding the web into and through the pressure zone G. The rolls are indicated as surrounded by any suitable housing 95, which may contain heating means. It will be understood also that, if desired, the individual rolls, or some of them, may be heated as by the circulation of a suitable heating fluid. It will be understood that, although I illustrate a hot roll press as a suitable and practical means of completing the adhesion or connection between the paper layers 22 and 80 and the opposite sides of the veneer, under some circumstances it may be desirable to employ a plate press. The employment of rolls permits a continuous movement of the web through all of the above described stages or zones. When a plate press is employed, the movement of the web is intermittent and any suitable intermittent driving means can be employed.

It will be understood that the adhesive present in the containers 26 and 83*a* is suitably selected to respond to the heat and pressure of the pressure zone G, and the now consolidated or completed web passes from the pressure zone G toward any suitable severing zone H. I illustrate, for example, a final trimming stage in which a motor 100 is employed to drive marginal cutting or trimming knives or rotary cutters 101 on any suitable cross-shaft 102. When the web has been suitably trimmed and dimensioned by some such cutting or trimming means, it goes to the knife 105, which is suitably actuated to cut the web along the grain into pieces of the desired across-the-grain width. Any suitable actuating means may be employed for the knife and any suitable control means. I illustrate, for example, an electric switch 106 having a contact member which is actuated by contact with the end of the web as at 107. When so contacted, it is properly connected to

actuate the knife which severs a piece of the desired across-the-grain width.

It will be realized that whereas I have described and shown a practical method, many changes may be made in details of steps and in order of steps without departing from the spirit of my invention. It will be understood also that my method may be carried out with a wide variety of mechanisms and that some of the steps may be omitted at the will of the operator. I therefore wish my description and drawings to be taken as in a broad sense illustrative or diagrammatic, rather than as limiting me to my specific description and showing therein.

Whereas I have described my method primarily in terms of making veneer box shells, it will be understood that the purpose of the shell is to be assembled into, or bent into, or formed into a container. My teachings are therefore directed to a method or methods of making veneer containers and shells therefor. It will be understood that the shells, or, in effect, the box blanks, may be manufactured at one point and may be shipped, in the flat, for use or assembly at another point. Under other circumstances, the shells may at once be assembled into containers, the containers being formed, filled and closed at or near the area or point at which the shells are manufactured.

The use and operation of my invention are as follows:

I provide a method which can be carried out with a variety of mechanisms and I illustrate somewhat diagrammatically a sequence of mechanisms which may be employed.

Breaking the method for convenience into a series of zones and steps, in zone A of Figures 1 and 3, I provide any suitable means or step of feeding abutting random widths or pieces of veneer.

In zone B of Figures 1 and 3, I apply a strip of paper **22**, coated with adhesive on one side, to an opposed side of the veneer. Either at the time of or, if desired, shortly before or shortly after the engagement of the paper **22** with the veneer, I may sever or partially sever the veneer into separate strips or slats, which, if desired, may be somewhat distended or drawn apart, as above described. The initially formed web, consisting of one layer of paper and the adhesively secured veneer, then is moved toward the third zone C of Figures 1 and 3, it being understood that the severing and distending step may under some circumstances be omitted. The web, either with the veneer severed or unsevered, is moved into the cross slotting zone C where transverse parallel grooves are cut through or almost through the veneer, along the grain of the veneer, and at right angles to the path of movement of the web. At or about the same time, if desired, the web may be trimmed as at **65** in Figure 3.

The cross-slotted web is then fed to the zone D where, if desired, slotting may be performed across the grain and along the path of movement of the web. I may employ either or both of two types of such slotting, or may omit such slotting altogether. Where I wish to employ metal strip components, I may cut shallow grooves, as by the cutters **73** of Figure 4. Into these shallow grooves the steel strip **75** may be fed. Where I wish to bend the shell at right angles to the cross-slotting, I may use deeper cutters as shown at **74** in Figure 4 and cut slots **74*a*** as deep as the cross-slots **50*a***. In the product of Figure 7, both types of slot are combined.

After all the desired slotting is completed, I feed an additional adhesively treated strip of paper **80** to the opposite side of the web and then pass the web through the heat and pressure zone indicated at G in Figures 2 and 4. While I do not wish to be limited to an initial temporary or partial securing of the paper to the veneer, I find that it is a convenient arrangement or sequence of steps to apply initially a tacky adhesive to the two paper strips, as by the rollers **25** of Figure 1 and **83** of Figure 2. This tacky adhesive maintains the paper in an initially secured relationship, while permitting slippage where desirable.

Such slippage may be quite important in connection with the use of the particular step shown in Figure 1, in which the veneer is partially severed and distended at a time when the paper is already in adhesive and preferably tacky contact with the veneer. This bond may be finally completed by heat and pressure in the zone G.

The final shell is cut to any desired size as in the cutting zone H.

I illustrate in Figure 7 one typical form of shell prior to its bending into a container. I illustrate in it panels **110**, **111**, **112** and **113**, all connected by the steel strips **75** and all readily bendable into the final container, about any end panels or end panel folds which may be employed. The end panels **110** and **113** may be joined together by an adhesive strip **114** indicated in dotted lines. This is but one of a variety of shells which can be produced, with or without steel strapping.

Whereas I have talked primarily in terms of reinforcing strapping of steel, any suitable metal may be employed and it is within the field of my invention to employ any reinforcing strapping which is substantially stronger per inch of width than the paper used.

I claim:

1. The method of making veneer containers and shells therefor, which includes the following steps; applying an adhesive to a continuous band of paper; bonding veneer to the adhesive while the adhesive is in a tacky state; cutting grooves in the resulting assembly substantially through the veener parallel to the grain; bonding a second layer of adhesive coated paper to the opposite side of the veneer, while the adhesive is in a tacky state, and spanning thereby the grooves; and then permanently bonding both layers of paper to the veneer.

2. The method of making veneer containers and shells therefor, which includes the following steps; adhesively bonding a continuous band of paper to a continuous length of wood veneer having its grain extending across the length, cutting grooves into the open face of the veneer substantially through the veneer and parallel to the grain; adhesively bonding a second band of paper to the open face of the veneer and spanning thereby the said grooves in the veneer.

3. The method of claim 2, characterized in that the grooves in the veneer are generally rectangular in cross-section.

4. The method of claim 2, characterized in that the grooves in the veneer are of a width at least as great as the thickness of the veneer.

5. The method of claim 2, characterized in that the grooves in the veneer are of a width not less than the thickness of the veneer, and that some of the grooves are at least as wide as twice the thickness of the veneer, whereby bends of 180° are rendered possible.

6. The method of claim 2, characterized in that the veneer is distended across its grain.

7. The method of claim 2, characterized in that the paper and the bonded veneer are continuously moved through the various zones of treatment.

8. The method of claim 1, characterized in that a continuously made sheet is cut into sheets of box blank or shell dimensions after the permanent bonding of both layers of paper to the veneer.

9. The method of claim 2, characterized by the additional cutting of across-the-grain grooves in the veneer, the width of which is at least as great as the thickness of the veneer.

10. The method of claim 1, characterized by the further step of cutting shallow grooves across the grain of the veneer and inserting reinforcing strips therein prior to the permanent bonding of the paper layers to the veneer.

11. The method of claim 2, characterized in that the grooves in the veneer are bounded in cross-section by generally parallel wall faces.

12. The method of making veneer containers and

shells therefor, which includes the following steps; bonding a continuous band of paper to one side of veneer; cutting grooves in the resulting assembly substantially through the veneer toward said paper and parallel to the grain; cutting grooves toward said paper and across the grain in the veneer, the width of such grooves being at least as wide as the thickness of the veneer; and thereafter applying a second layer of paper to the opposite side of the assembly over said grooves, and then bonding it to the veneer.

13. The method of claim 12, characterized in that some of the across-the-grain grooves are substantially less in depth than the thickness of the veneer, and by the further step of positioning reinforcing bands in the grooves prior to the application of the second layer of paper to the veneer.

14. The method of claim 12, characterized in that the cross grain grooves extend substantially through the veneer and are of a width at least as great as the thickness of the veneer.

15. The method of claim 12, characterized in that the across-the-grain veneer grooves are substantially less in depth than the thickness of the veneer, and by the further step of positioning reinforcing bands in the grooves prior to the bonding of the second layer of paper to the veneer.

16. The method of making a one-piece veneer box shell adapted to be folded into a rectangular container, which includes the following steps; bonding a continuous band of paper to veneer; cutting grooves inwardly into the veneer, along the grain of the veneer, from the side of the shell which is to form the outside surface of the box, while leaving a thin readily compressible film of wood at the bottoms of such grooves, the width of the grooves being at least as great as the thickness of the veneer; and thereafter applying and bonding a second layer of paper to the opposite side of the veneer, over the grooves; and thereby forming a shell which is readily bendable along its grooves, with the wood film at the inside of the bend; and then cutting the shell to predetermined size.

17. The method of making a one-piece veneer box shell adapted to be folded into a rectangular container, which includes the following steps; bonding a continuous band of paper to veneer; cutting grooves in the resulting assembly substantially through the veneer and parallel to the grain, of a size adequate to accommodate the paper fold formed when the shell is bent along the groove to a right angle; and thereafter bonding a second layer of paper to the opposite side of the assembly and over the grooves thus formed; and then cutting the shell to predetermined size.

References Cited in the file of this patent

UNITED STATES PATENTS

1,402,259	Smith	Jan. 3, 1922
1,944,282	Snyder	Jan. 23, 1934
2,026,698	Nelson	Jan. 7, 1936
2,095,389	Kondolf	Oct. 12, 1937
2,118,841	Elmendorf	May 31, 1938
2,291,542	Filler	July 28, 1942
2,593,863	Elmendorf	Apr. 22, 1952
2,622,276	Wilson	Dec. 23, 1952
2,630,934	Elmendorf	Mar. 10, 1953
2,693,895	Elmendorf	Nov. 9, 1954