Nov. 13, 1962 E. SHUMACHER 3,063,483

FORMING MACHINES FOR WOOD AND LIKE MATERIALS

Filed Jan. 22, 1960

3 Sheets-Sheet 1

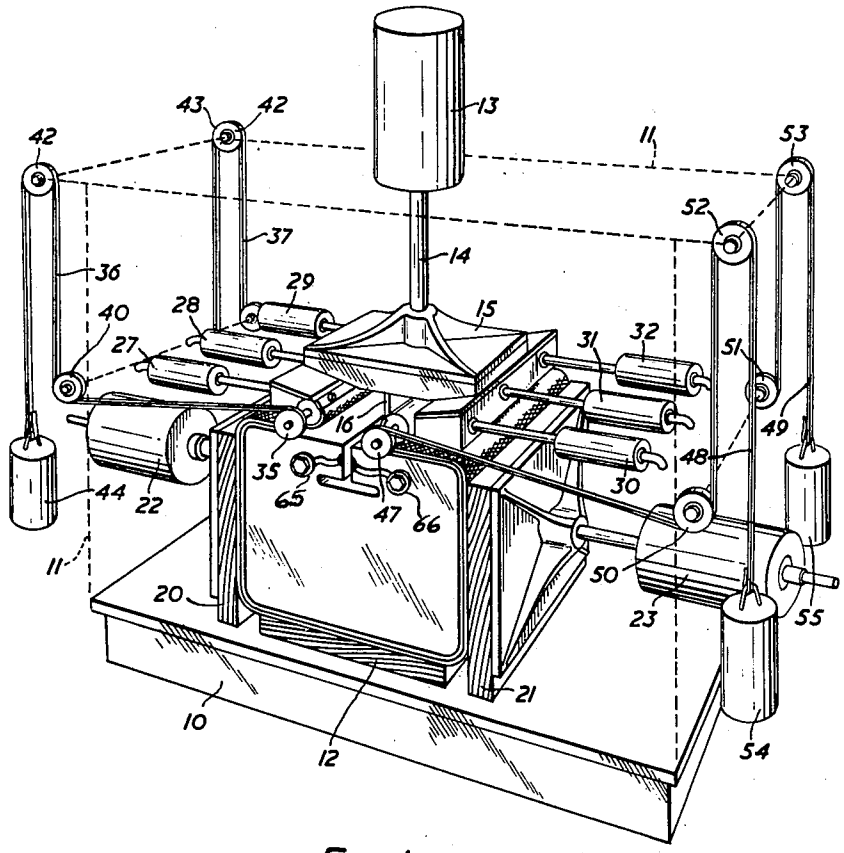

FIG. 1.

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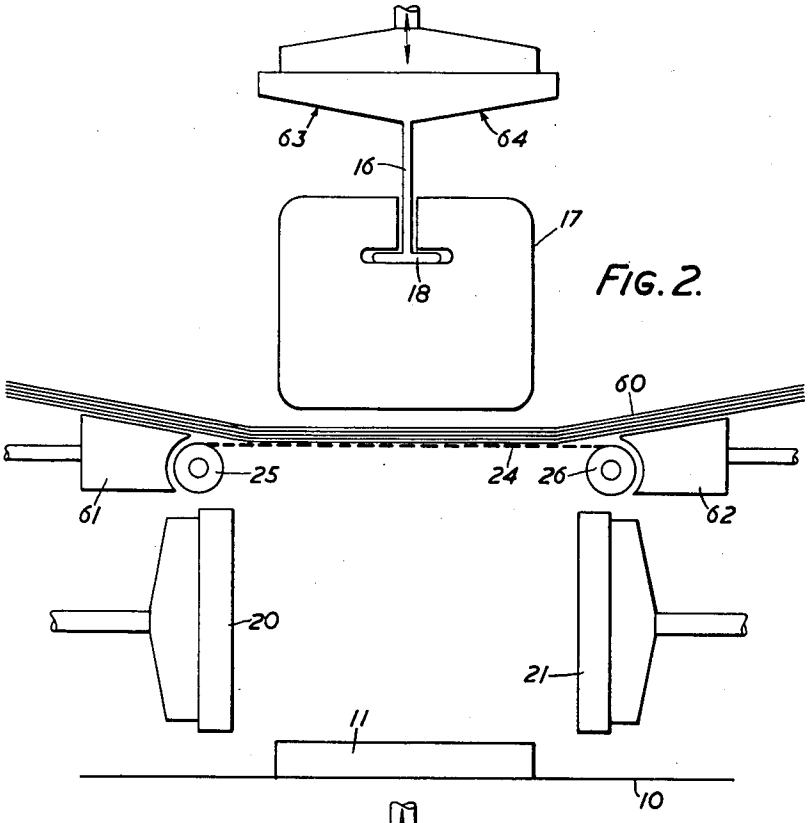

FIG. 2.

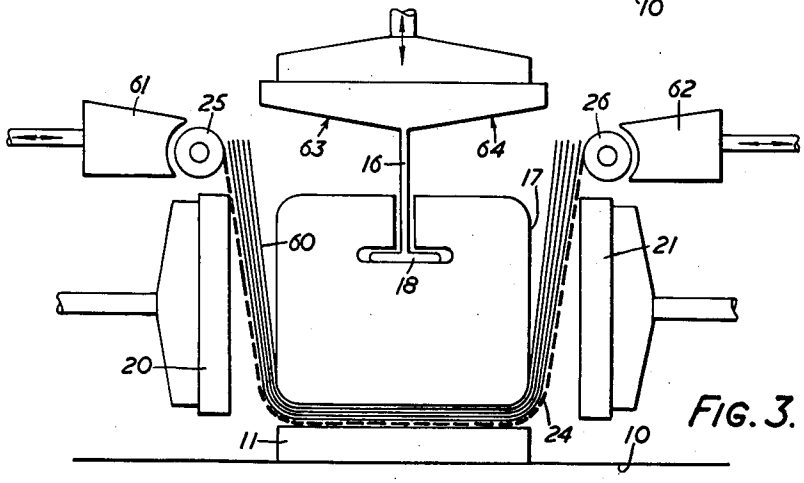

FIG. 3.

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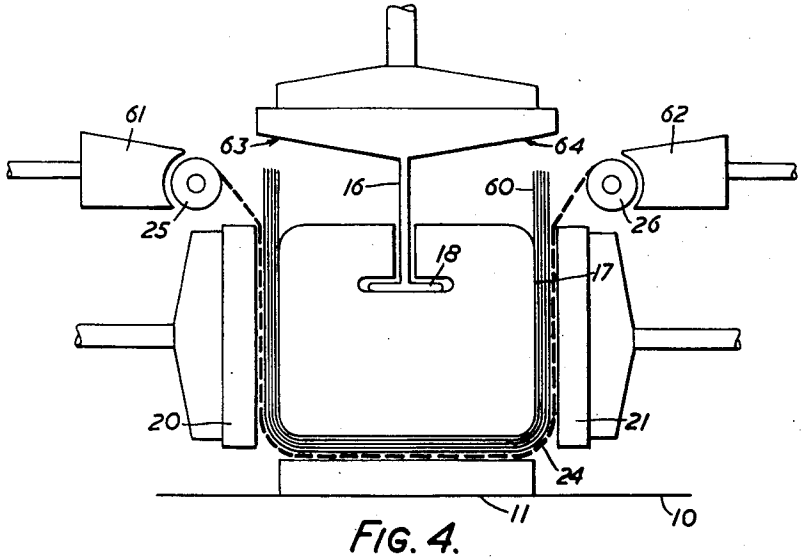

FIG. 4.

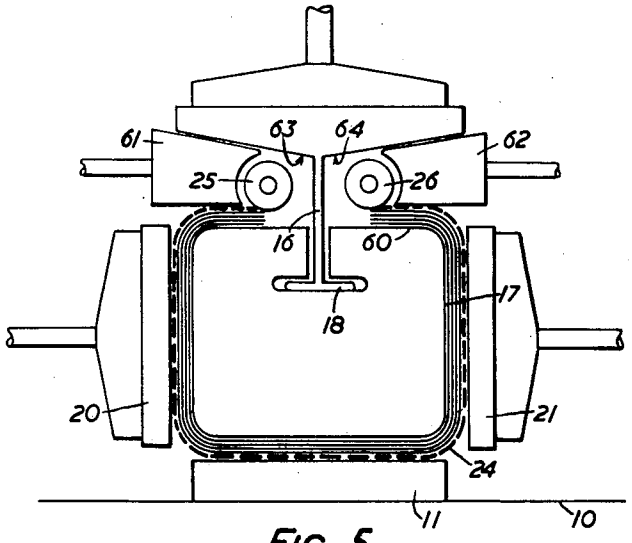

FIG. 5.

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3,063,483
FORMING MACHINES FOR WOOD AND LIKE MATERIALS

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2 Claims. (Cl. 144—266)

This invention relates to machines for handling wood hardboard, composition hardboards and like materials, and for building up composite bodies from a series of sheets or veneers of such material, and to form the assembled sheets into shapes which can be used for the construction of cabinets for radio and like receivers, furniture and other articles. The invention has for its object to provide an improved apparatus for this purpose.

The invention consists broadly of a process for the manufacture of a shaped body from at least one sheet of material which comprises disposing the sheet of material adjacent a first side of a male former while in a generally flat condition, with a flexible band or the like on the side of the sheet remote from the former, moving said band and former relatively to cause said band, under tension, to bend the sheet about two adjacent sides of the former, pressing band and sheet inwardly against the three sides of the former.

In an apparatus embodying the invention a series of sheets of material such as wood veneers, are placed in a stack, the adjacent faces of the veneers being coated with an adhesive such as a heat curable resin. In the usual way, the grain of the successive sheets of veneer are laid at different angles.

The stack of veneers is laid upon a flexible belt, which is held, preferably horizontally, under endwise tension. With the assistance of this belt the veneers are bent round the outside of a male mould, and the sheets are made to conform closely to the shape of this mould by means of the belt and also by means of a series of platens which press the veneers against the inner male mould surfaces.

Other features and advantages of the invention will appear from the following description of one embodiment thereof, given by way of example, in conjunction with the accompanying drawings in which:

FIGURE 1 is a diagrammatic perspective view of the major parts of the apparatus;

FIGURE 2 is a diagram showing the disposition of the belt, the veneers, the male mould and the platens at the beginning of a cycle of operation and

FIGURES 3, 4 and 5 are diagrams corresponding to FIGURE 2 and showing the parts in the positions that they assume in the successive stages of the cycle of operation.

FIGURE 1 of the drawings is a perspective view which shows only the major operating parts of the apparatus, and omits all the constructional features of the apparatus which are used solely to hold these major parts in the correct operating relationship. A variety of ways in which such parts can be appropriately held in position will readily occur to those skilled in the art. In general, however, the apparatus includes a base 10, the supporting structure, being mounted upon this base by any suitable means; the confines of the supporting structure are indicated generally by the broken line 11. Directly supported on base 10 is a bottom platen 12, disposed immediately beneath a pneumatic or hydraulic operating cylinder 13. The ram 14 of cylinder 13 supports a platen 15 from the lower face of which extends a support member 16, in turn carrying a male mould member 17. The mould member 17 is given the shape corresponding to the shape to which the series of wood veneers are to be bent, and in this particular embodiment of the invention the mould is given the form of an approximately rectangular prismatic body. Since it

may be desirable to change the mould member 17 from time to time, the connection between the support 16 and the mould is made so that the latter can be removed when desired. As shown, the support 16 has a lower cross piece 18 which engages in a correspondingly shaped recess in the top surface of the mold. Conveniently the mould member 17 is made of wood, but for a reason which will be apparent hereinafter it is preferable that it is of insulating material.

Arranged on either side of the bottom platen 11 are two further platens 20 and 21. These platens are carried upon the rams of operating cylinders 22, 23 respectively, and by which the platens can be moved inwardly to a position in engagement with the vertical surfaces of the mould 17 when the latter is in its lowermost position. Arranged above the platens 20 and 21, and below the mould 17 in its uppermost position is a flexible metal belt 24 attached at its ends to, and tensioned by, two rolls 25, 26. The roll 25 is supported upon the rams of three operating cylinders 27, 28 and 29, whilst roll 26 is supported in a similar way upon the rams of three further cylinders 30, 31 and 32. To impose the desired tension upon the belt 24, the shafts of the rolls are tensioned by weights. On the shaft of roll 25 are secured two pulleys, of which one is indicated at 35, and around these two pulleys can be passed tensioning belts 36, 37 respectively. These two belts pass over guide pulleys 40, 41 and 42, 43 respectively and are loaded by weights of which that attached to belt 36 is indicated at 44. In a similar manner, pulleys of which one is shown at 47, are fixed on the shaft of roll 26 and tension belts 48, 49 are attached to them; the belts pass over pulleys 50, 51, 52, 53 and are attached to weights 54, 55. The wrap of the belts 36, 37 and 48, 49 around their respective pulleys such as 35 and 47 is in the direction to ensure that the belt 24 is under endwise tension, and it will be seen also that this tension is substantially independent of the relative position, in the horizontal plane, of the rolls 25 and 26.

The manner in which the machine is used by an operator to form a tubular laminated body will now be described, with particular reference to FIGURES 2 to 5. In the first place, the operator prepares a series of wood veneers 60, the length of which is slightly more than the periphery of the tube to be formed, and of which the width is slightly more than the length of the tube to be formed. The adjacent surfaces of the veneers are coated with a suitable adhesive, preferably, and in this case, a heat curing resin. Initially, the parts of the apparatus are as shown in FIGURE 2, with the mould member 17 at its highest position above and clear of the belt 24, and the two platens 20 and 21 are withdrawn outwardly. The belt 24 is in the horizontal position below the mould, and the operator places the stack of veneers 60 upon the top of the belt.

By means of a suitable control system, not shown, operating fluid is fed to the cylinder 13, causing the mould 17 to move downwardly into engagement with the top of the stack of veneers and then the veneers together with the belt are pressed downwardly until they engage the bottom platen 12, as shown in FIGURE 3. In this motion it is to be observed that the belt 24 will unwind from the rollers 25 and 26, but will continue to have tension applied to it, so that there is substantial force applied to the veneers around the corners of the mould 17. Considerable pressure is applied between mould 17 and platen 12, bringing the veneers into intimate contact with each other, and good adhesion of the veneers around the corners of the mould are also secured by the belt in the manner described above. The described arrangement is such that the tension on rollers 25 and 26, imposed by tensioning belts 36, 37, etc., causes the rollers to wind up, with band 24 upon them, when the mould 17 is moved

into the position shown in FIG. 2. When the parts are in the relative positions illustrated in FIG. 1, belts 36, 37 will be fully wound on their pulleys 35 etc., whereas the belts will be fully unwound when they are in the position shown in FIG. 2.

By further operation of the control system, the two platens 20 and 21 are next moved inwardly, by the feeding of operating fluid to cylinders 22, 23. The platens cause the veneers to be pressed closely against the side faces of the mould 17.

After this operation has taken place, so that the veneers are approximately in U-shape, the control system next operates to feed pressure fluid to the cylinders 27, 28, 29 and 30, 31 and 32, so as to cause the two rollers 25 and 26 to move inwardly towards each other. In doing so, they bend the top of the arms of the U over, into the position shown approximately in FIGURE 4. At this stage, the pressure applied to compress the turned over ends of the stack of veneers is that due only to the tension applied by the belt 24, and this is not adequate to secure sufficiently intimate contact between the veneers at this point. Accordingly, the heads of the rams of cylinders 27, 28 and 29 are joined by a shaped cross-head 61, and rams of cylinders 30, 31 and 32 by a similar cross-head 62. As will be seen from FIGURES 3, 4 and 5, these cross-heads are tapered in the inward direction, and are arranged to co-operate with sloping surfaces 63, 64 formed on the underside of the platen 15. The effect of the inward movement of the cross-heads 61 and 62 is thereby to impose an adequate downward pressure on the now inward ends of the veneers.

The veneers are held under pressure in the manner described until the glue has hardened. If this is a heat curable resin, which is advantageous, it is necessary to apply heat to the veneers and this can be done by passing a high current through the belt 24, which is thereby heated. Suitable connections for this purpose can be made to the rolls 25 and 26. The heating effect can be supplemented by electric heaters which are disposed in or near the faces of the mould 17, and for this purpose further suitable electrical connections are provided on the mould 17, for example as indicated at 65, 66.

When the glue has hardened, the rolls 25 and 26 are withdrawn; the platens 20 and 21 are retracted and the mould 17 is raised, so that the completed tubular shell can now be removed forwardly from mould 17. The shell is completed by trimming the edges of the gap which must inevitably be left at its top edge, and the gap filled by a fillet, and a suitable front and/or back applied to the cabinet, according to the use for which it is intended.

The apparatus described can be used for the manufacture of multi-ply shells for use in television, furniture and the like generally, but other materials can be used for example, hardboard can be used; it is necessary first to soak the hardboard until it has a sufficient degree of pliability. Dipping the boards in water and allowing them to stand for about 48 hours in a damp atmosphere will produce a suitable handling quality of the boards. The boards can then be bent as before except that it may be desirable to heat the board, for example by band 24, during the bending operation, to increase pliability. When the board has attained the final shape such as that indicated in FIGURE 5, heating is sustained until sufficient water content of the board has been driven out of the board to be stable in shape when removed from the mould.

The hardboard or the like can be covered with a veneer or other finishing layer in the same machine. Depending upon the nature of the layer and the adhesive used, it may be possible to shape the hardboard and secure it to the finishing layer in the one operation; otherwise the hardboard layer can be shaped and described and substantially dried and the veneer or the like applied in a further operation in the same or a similar machine.

Two stage operation can also be used in other connections, and an example of this kind is a cabinet for a radio receiver, radiogram or the like which consists of a shell similar in shape to that shown in FIGURE 5, but of larger size and having around one end a reinforcing strip which will in effect increase the thickness of the cabinet around the edge of the shell.

Such a shell can be made by first forming a shell in the machine, round a suitable mould; the shell is of a size and shape that it can be slit to make a number of reinforcing strips. One such strip is coated on its outer surface with adhesive and is returned to the mould 17 and placed about it, near one end. A filler is placed on the remaining surface of the mould; the surface of the filler and the strip together define a regular surface. The veneers are inserted in the machine as described above; finally, the finished shell, with the strip secured about the inner edge of the shell is removed from the mould. The filler need not be removed before the process is repeated.

The reinforcing strip can be on the outside of the shell if desired in which case the shell is first formed, and it can be arranged that the joints in the shell and the strip can be at opposite sides.

A considerable advantage of the machine described resides in the fact that, in the manner indicated in FIGURE 2, the loose assembly of veneers, or the softened hardboard, is inserted in the machine while roughly flat. Veneers do not have in practice the idealised flat shape shown in FIGURE 2 before insertion in the machine. They are usually wavy and irregular, but they are in their most tractible condition in the flat. Again, with moistened hardboard or similar material it is most convenient to insert these in the machine in a flat condition. Also, if any of the sheets used in the assembly are thermoplastic or heat curing such as a finishing layer, the same advantage is obtained.

I claim:

1. Apparatus for forming sheet material into an open-ended shaped body, comprising a ram-like former of rectangular section; a depending vertically movable support for said former; a base platen below said former; pressure members movable towards and away from opposite sides of said former connected with its support; means for lifting the former off of said base platen and from between said pressure members and for re-lowering it onto said base platen; horizontally reciprocable opposed holding means above said pressure members for supporting sheet material below said lifted former; means advancing said holding means above the lowered former from both sides to bring the ends of the sheet material inwardly over the top of the former; and means for exerting a downward pressure on said advanced holding means urging it towards the top of the lowered former to form said sheet materal closely around said former.

2. Apparatus as defined in claim 1, having oppositely-acting spring-biased rollers in front of said holding means; a flexible band extending between said rollers and having its opposite end portions wound on the respective rollers; inclined surfaces on the top of said holding means giving an upwardly concave shape to sheet material resting on them and on said band; and wedge surfaces on said support spaced above said former, engaged by said inclined surfaces on the holders when they are advanced between said wedge surfaces and said former, so as to effect said downward urge of the infolded sheet material towards the former.

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