United States Patent [19]

Veneziale, Jr.

[11] **3,753,832**

[45] **Aug. 21, 1973**

[54] **EDGE BANDING MACHINE**

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[22] Filed: **Feb. 8, 1971**

[21] Appl. No.: **113,455**

[52] **U.S. Cl.** **156/499**, 156/322, 156/510, 156/583

[51] **Int. Cl.** **B32b 31/20**, B32b 31/18

[58] **Field of Search** 156/447, 459, 510, 156/468, 486, 493, 499, 523, 526, 527, 574, 581, 297, 322, 391, 446, 522, 583

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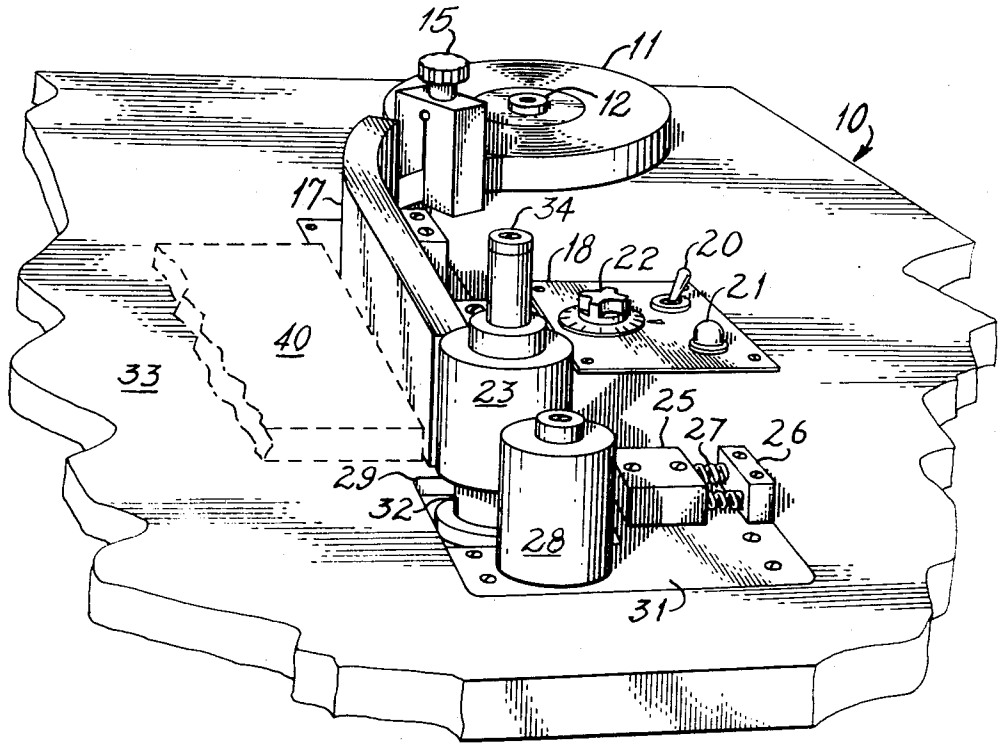
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[57] **ABSTRACT**

Apparatus and method is disclosed for applying a continuous edge band to a panel of woody material which comprises a plurality of elements strategically mounted on a smooth, flat working surface including a bracket for guiding the edge banding material to a heated, curved platen or heating bar, a resiliently mounted pressure roller containing a grooved guide slot in the face surface thereof, and a finishing roller each mounted in sequence.

6 Claims, 2 Drawing Figures



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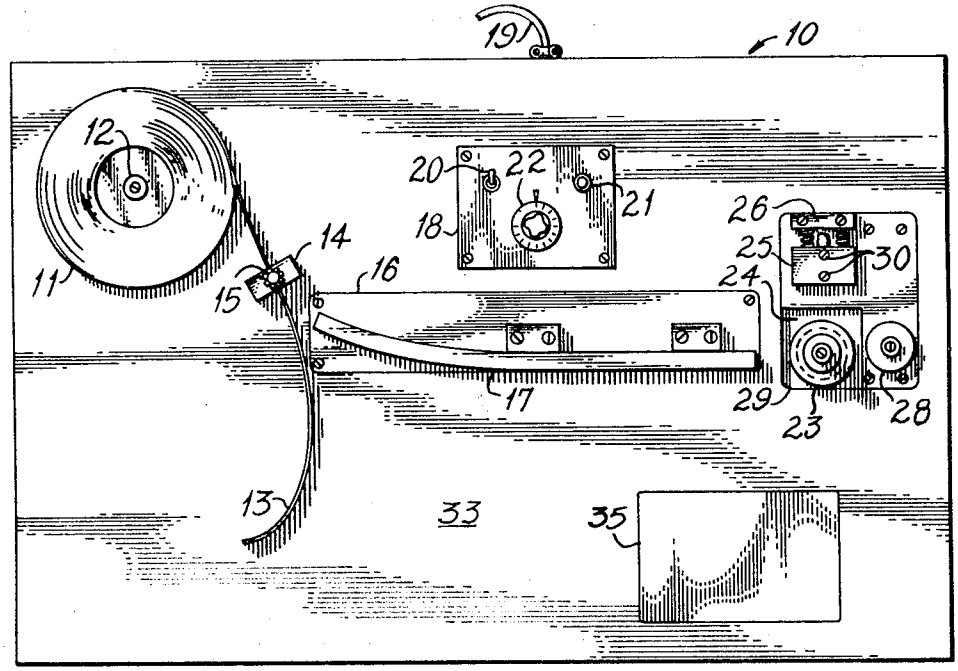


FIGURE 1

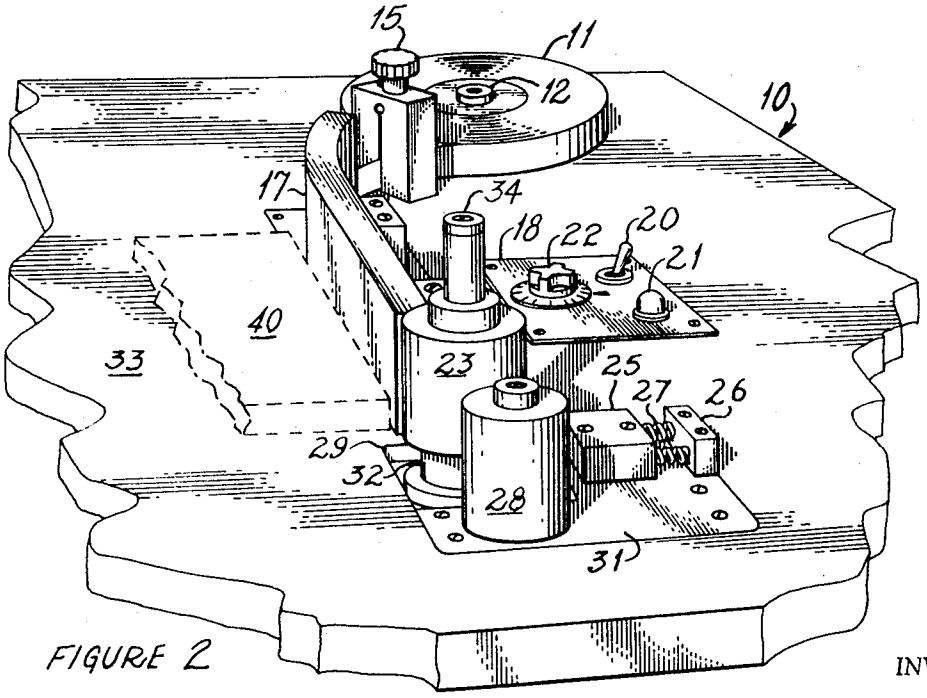


FIGURE 2

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EDGE BANDING MACHINE

SUMMARY OF INVENTION

The invention described herein relates generally to an apparatus and method for applying a prefabricated edge band to a board formed of woody material.

More specifically, this invention relates to a novel apparatus and process for applying a continuous strip material to the unfinished edges of a panel formed from wood or a woody composition material, or any other suitable material.

The sawed edges of boards, and including the edges of plywood panels, have heretofore been covered in various ways due to the fact that such edge surfaces present an unfinished appearance, are rough, irregular, porous or contain small gaps or other imperfections. Attempts have been made to stain or paint the edges of plywood panels to match the faces of such panels, but this technique does not produce similarity of appearance because of the difference in absorptive quality of the end grain and the longitudinal grain of the woody core of the panel edge, and the probable difference in absorptive characteristics between the wood of the woody core material and of the face plies.

The edge-surfacing of boards and plywood panels with strips of edging material is very old and well known. This is an expensive procedure and consequently is employed only in such instances where the value of the completed product justifies the cost of such edge finishing.

Edge-surfacing is also sometimes done with metal strips, as well as with plastic moldings and the like, these strips and moldings being secured to the board edge by screws, nails or other fastenings, or by the use of wet glues employed in wood-working. Such strips or moldings are not satisfactory for all purposes, they are relatively expensive, and require more or less labor for proper mounting in place.

An object of the present invention, is therefore, to provide for a board or panel or similar woody article, an edge banding strip, differing in form, and in many respects, superior to the strips heretofore employed for the same purpose.

A further object of the invention is to provide an edge-surfaced woody product in which the surfaced edge will have a high resistance to abrasion, moisture, deterioration and decay.

Various other expedients to solve the problem of finishing woody panel edges have been tried, but none of them have been very practical because of the time involved, skill necessary or equipment required for the operation, or, some combination of these factors.

Therefore, the principal object of the present invention is to provide a material and process and apparatus for surfacing the edges of woody panels to produce a panel having one or more edges matching the face veneers of the panel. In producing such an end product, it is an object to utilize surfacing strip material of a variety matching the veneer face of the surface plies of the woody material and to utilize the process and apparatus for applying such strip material as disclosed herein.

An additional object is to employ the process and apparatus disclosed herein for applying the surfacing strip material to a woody panel edge at the site and with a minimum of preparation both of the panel edge and of the surfacing strip material.

A further object of this invention is to utilize the apparatus disclosed herein for applying the strip material to the edges of woody panels in such a manner that practically no further finishing steps are required before use.

The resulting edge surfaced panel, while retaining all of the structural and economic advantages of a composite woody panel, will then present the appearance of a sawn lumber panel.

Briefly, for fabricating the edge-banded woody panel using the present novel apparatus, applicant employs a novel edge banding tape which in one embodiment takes the form of a polyester plastic saturate backed with a high viscosity heat activated adhesive. The adhesive is thermoplastic in nature and has certain very definite characteristics which enable the edge band to become bonded to the panel edge surface under certain termperature and pressure conditions. In addition, various other types of materials may be used for the edge banding strip such as fibrous raw materials, wood and paper. Of course, each material would have to be operated on in a particular way to achieve the desired characteristics, but edge banding made from these variety of materials could then be backed with the novel thermoplastic adhesive described herein and then applied to the edges of woody panels using the apparatus disclosed herein without the exercise of invention.

PRIOR ART

At least one known apparatus is available for applying edge banding material to the edges of woody panels. This apparatus is described in literature distributed by the Woodtape Company, 3911 Airport Way, South, Seattle, Washington 98134. In the known apparatus, a heated platen and a hard rubber roller are used in combination for activating a thermosetting adhesive on the back side of edging material, and applying pressure to the face of the edging material to bond the material onto a panel edge. This apparatus operates on edge banding material marketed by Woodtape which has a thermosetting, pressure sensitive adhesive applied to the backside thereof, including a backing layer, and fully described in U.S. Pat. No. 3,011,932 assigned to the Elliot Bay Lumber Company.

The Woodtape apparatus consists of a straight metal platen which is heated to between 350° and 550° F. The plastic Woodtape edge banding material is then fed from a roll through a guide and around a pair of rollers so that the finished side of the edge banding faces the heated platen. An additional roller is supplied adjacent the two previously mentioned rollers and its purpose is to strip the backing layer from the edge banding material thus leaving the adhesive surface exposed. The panel to be edge banded is then brought into contact with the adhesive surface of the edge banding material, which has been previously heated from being in contact with the hot platen, and the combined panel and edge band manually pressed against the rubber roller to fix the edge banding firmly against the panel edge.

This system has not been deemed satisfactory however, because of the generally cumbersome nature of the apparatus, its difficulty in operation and the fact that problems have occurred almost constantly in obtaining a proper orientation of the edge banding with the panel edge. Moreover, the thermosetting nature of the adhesive used on the Woodtape edge banding has made it almost impossible to replace sections of the

edge banding that are not applied properly in the first instance. Accordingly, the apparatus described in detail hereinafter has been developed and fabricated for overcoming the problems and inherent deficiencies of each of the prior art devices.

DESCRIPTION OF DRAWING

FIG. 1 illustrates a top plan view of the novel apparatus disclosed for applying edge banding to panel edges; and,

FIG. 2 shows a perspective view of the same apparatus showing the proper use of the novel apparatus.

DETAILED DESCRIPTION

As set forth hereinbefore, the apparatus disclosed herein was designed to take the best advantage of the discovery that a hot melt thermoplastic adhesive was most desireable for edge banding heretofore unfinished panel edges. The hot melt adhesive allowed the edge banding operation to be performed without the necessity of removing the backing layer normally required for thermosetting adhesives. Hence because the invention herein was developed for use with edge banding having a new type adhesive, substantially different from the adhesives used heretofore, the novel apparatus had to be arranged to permit the use to apply the edge banding material at a greater rate than could be attained with the prior art devices. It became important, for instance, to develop the apparatus for maximum contact between the edge banding material and the heated platen. This feature allowed the hot melt adhesive applied to the backside of the edge banding to become completely melted at the greatest possible rate and permit the adhesive to remain activated for the longest possible time during the edge banding process. It was also an intention of the present invention to provide means associated with the apparatus for properly and continuously aligning the edge band with the panel edge and for applying a uniform initial pressure to the edge banded panel immediately after the edge banding came into contact with the panel edge. The only prior art device available for continuously applying an edge band to a panel edge did not and could not accomplish the achievements of the disclosed apparatus.

The apparatus described herein is constructed from only a few basic elements, but the elements are arranged, one with regard to the other, for efficient, economical and fast operation. Each of the elements of the apparatus is mounted on a suitable smooth, flat and hard work platform **10** leaving sufficient space at the front portion thereof for a working area **33.** The mounting platform **10** may consist of work bench top or a suitable piece of hardboard material of adequate dimensions to yield a working area **33** large enough to accommodate panels of a variety of sizes. The size of this part of the invention would be dictated by the sort of panels desired to be edge banded. Therefore, as shown particularly in FIG. **1,** the edge banding material **13** is stored in roll form **11** on a spindle **12** removably attached to the upper left side of the mounting board **10.** Spindle **12** includes a screw-operated friction device (not shown) for adjusting the drag thereof so as to apply any desired tension to the unreeling of the edge banding material **13.** The edge banding material **13** in loose form next passes through a guide **14,** fixed to the mounting board **10.** Guide **14** includes an adjustable screw **15** for applying very slight pressure to the edge banding material **13** as it passes through the guide for keeping the edge banding material in close proximity to the mounting board surface **10.** Thus, the adjustable screw **15** is arranged to move upwardly or downwardly for accepting edge banding material of different widths.

Next, the curved heating bar, or curved platen **17** is integrally attached to the mounting plate **16** which is in turn fixed to the surface **10** of the mounting board. The curved bar or platen **17** is arranged so that, reading from left-to-right, the platen has an initial its portion with a curvature that is pronounced at ist leading edge adjacent the edge banding guide **14,** where the edge banding **13** in unreeled from the roll **11,** and a straight second portion wherein the curvature is then reduced so that at the trailing edge thereof the bar or platen **17** is substantially straight. Mounting bracket **16** for the curved heating bar or platen is positioned on the mounting board so that the leading edge of the curved heating platen will accommodate the edge banding material **13** as it is unreeled notwithstanding the diameter of the roll **11,** and, so that the edge banding material is not stressed or cracked when reversely bent around the curved bar or platen **17.** Moreover, since the entire bar or platen **17** is heated, the additional curved surface at the leading edge thereof assures an intimate and almost immediate contact of the face of the edge banding material with the heated bar as it is unreeled so that the hot melt glue on the backside thereof is activated as quickly as possible. Hence, the curved first portion of the heated platen **17** is extremely important and critical to the success of the invention. The geometrical shape of the curved portion has not been determined, but it would be dictated by the average size of the rolls of edge banding material used.

The heating element in the curved bar or platen **17** is supplied with electricity through the wire **19** as controlled by the instruments on the control panel **18.** An off/on switch is provided at **20** and a pilot light at **21** to indicate when the heated bar or platen **17** has reached the desired operating temperature. Thermostat **22** is set at the desired temperature, and, after the switch **20** is turned on, the pilot light goes out when the desired temperature is reached. Generally, the desired temperature is one that is dictated by the melting point of the type of adhesive used, and, by the speed of operation of the person using the apparatus. When the preferred hot melt adhesive of the present invention is used, the temperature should be set at approximately 450° F. on the thermostat. This temperature is utilized so that the adhesive will not blister from being exposed to the heated platen too long, but just enough to allow the adhesive to become hot and bubbly. The preferred adhesive to be used on the edge banding material as applied with the herein disclosed apparatus is a hot melt type adhesive having thermoplastic characteristics. It is sold under the tradename P–350 Hi-Viz and is of an ethylene vinyl acetate copolymer type. The thermoplastic adhesive was chosen because of its capability of being melted or deformed by the application of heat, and then repeatedly melted and solidified. Thus if an operator by accident applied the edge banding material to the panel edge in a misaligned fashion, the error could be corrected by reversing the procedure and reapplying heat to soften the adhesive and thereby remove the misaligned edge banding for later reapplication.

The next item associated with the novel apparatus described herein is the spring biased pressure roller **23.** The pressure roller **23** serves the dual purpose of insuring that the edge banding **13,** after coming in contact with the heated platen **17,** will be uniformly held against the woody panel **40,** while also insuring that the edge banding **13** is properly aligned with the panel edge. Note in FIG. **1** particularly wherein the pressure roller **23** is shown as being located adjacent to and downstream of the heated platen **17.** Also note that the pressure roller **23** is positioned in the relaxed or inoperative state as being located forward of an imaginary line drawn through the plane of the straight portion of platen **17.** Thus as the combined panel **40** and edge banding **13** is moved from left to right by the operator, the panel comes in contact with the roller **23** which in turn moves back against the pressure of the springs **27** to maintain an even and uniform pressure on the face of the edge banding **13.** The pressure roller **23** comprises an inner roller and an outer cylindrical sleeve mounted on a plate **24** by means of any adjustable collar **34.** Collar **34** is made adjustable so that for panels having different thicknesses, the guide slot **32** that remains beneath the outer cylindrical sleeve can be adjusted to insure proper alignment of the edge banding **13** against the panel edge **40.** The lower sliding plate member **24** is arranged in a cut out area **29** located within the working platform **10** and beneath the cover panel **31.** For the purposes of the present invention, the plate member **24** is fixedly attached to the front bracket **25** via screws or the like **30.** The attachment means **30** are arranged to move in a slot (FIG. **1**) in the cover panel **31** with the bracket **25** riding on top of the cover panel **31** and the plate **24** sliding beneath the cover panel **31.** The resilient attachment is subsequently carried out by interposing a pair of compression springs **27** between the moving front bracket **25** and the fixed back bracket **26.** Accordingly, as disclosed in the drawing herein, the means for mounting the pressure roller **23** on the mounting surface **10** includes two moveable elements **24** and **25.** The plate member **24** is mounted beneath a cover panel **31** and the front moveable bracket **25** is mounted above the cover panel **31.** The plate member **24** moves within a cut-out **29** in the surface of the platform **10** and the movement is confined to a fore and aft direction. Plate **24** is fixedly attached to the front moveable bracket **25** by means of the screw elements **30,** and they of course must traverse the same movement as the bracket **25** preferably in the slot provided therefor in cover plate **31.** Obviously, however, any other suitable means could be employed for mounting the pressure roller **23** for fore and aft movement. The only requirement for a different type mounting scheme would be that the lower face of the outer cylindrical sleeve of pressure roller **23** remains flush with the upper edge of the edging material being applied. For a different embodiment that would fall within the scope of the present invention, the mounting plate **24** could be directly biased from the back part of the cut-out in the mounting platform **10** by springs or the like located beneath the cover plate **31.** The scheme illustrated was chosen because it was felt that the exposed springs **27** as shown are more easily replaced and kept free from jamming. Thus the preferred mounting embodiment is rather complex but it is desirable from the point of view of easy maintenance and smooth operation.

The cover plate **31** also provides mounting space for the finishing roller **28.** Note that roller **28** is mounted rigidly to the platform board **10** and the periphery of roller **28** is precisely in alignment with an imaginary line drawn through the flat portion of heating the platen **17.** Hence as the operator of the apparatus moves any given panel **40** along the platen **17** in contact with the edge banding material, the pressure applied to the combined edge banding and panel by the resiliently mounted roller **23** remains constant and uniform. However, the operator may force the panel **40** against the finishing roller **28** with any desired force necessary to completely bond the edge banding to the panel edge. Heat and pressure are required to obtain good adhesion of the edge banding **13** to the panel edge **40.** The platen **17** supplies the heat to the edge banding by pressing the face surface thereof against the heated surface of the platen. Meanwhile, the resiliently mounted pressure roller **23** provides a uniform continuous pressure to the combined elements while maintaining proper width control as a result of the guide slot **32** determined by the position of the outer cylindrical member of pressure roller **23** in the lower portion thereof. As illustrated in the drawing, FIG. **1** in particular, the spring loaded pressure roller **23** requires a force to be retracted into alignment with the flat surface of the platen **17** when the panels **40** are being edged. This spring device assures the the operators will apply adequate pressure, but not excessive pressure to the nominally hot edge banding and melted adhesive surface adjacent the panel **40.** Finally, the operator is allowed to complete the edge banding operation by applying whatever final pressure is necessary against the finishing roller **28.** The finishing roller **28** is constructed from any rubber like material that will withstand the temperatures obtained, but still maintain enough softness or resiliency to allow the operator to press the edged panel thereagainst during the finishing step. Obviously there are many synthetic materials on the market that one skilled in the art could select for either roller **23** or **28** having the desired properties noted above.

To apply the edging material **13** to any panel **40** using the herein described apparatus, it would initially be necessary to turn on the switch **20** to allow the platen **17** to be heated in accordance with the temperature indicated on the thermostat dial **22.** When the working temperature is reached, the pilot light **21** goes off to indicate a readiness for use. During the time that the platen **17** is being heated, the edge banding **13** should be guided through the fitting **14** provided therefor and the adjusting unit **15** manipulated to adjust for the width of the edging material to be applied. The adjustment provided by the elements **14, 15** tends to keep the edge banding material **13** in close contact with, or flush with the working surface **33** of platform **10** on which the panel **40** is moved.

When the light **21** on the control panel **18** goes out, the platen **17** is sufficiently heated and a portion of edge banding **13** should then be unreeled to come in contact with the curved portion of the platen for providing an initial heating. The edging process is then started by positioning a panel **40** as shown in FIG. **2** against the platen **17** and separated therefrom by the edging material **13.** The actual bonding of the edging material **13** to the panel **40** begins at a corner with about an inch of loose material extending beyond the first edge. Accordingly, the panel **40** and the associated

edge material 13 are pressed firmly against the platen 17 as shown and moved from left to right, or toward the pressure roller 23. The edging material 13 unreels with only a minimum of effort and remains in intimate contact with the heated platen 17 because of the curved nature thereof so that the actual application of the edge material 13 to the panel 40 can be accomplished rather rapidly.

When the combined panel and edge material reaches the pressure roller 23, the roller is moved back against the force of the springs 27 thereby applying adequate pressure to set the adhesive, with the guide slot 32 therein assuring precise positioning of the edge material on the panel edge. The continued movement of panel 40 brings the operator to the next corner thereof and subsequently the next side of the panel. It is always advisable to apply the continuous edge completely and without delay. Hence, in one smooth motion, each edge of the panel 40 is brought into contact with the heated platen 17 until the first corner where the application of the edging began, is reached. At this point, the edge material 13 is severed using the cutting block 35 embedded in the working platform 10. The portion of edging material 13 purposely left at the beginning of the operation is also cut off and the corner edge neatly trimmed as a final step.

Thus it can be seen that the novel first curved portion of platen 17 serves initially to insure an immediate and intimate cooperation between the edge banding material and the platen as soon as the edging material is stripped from the roll 11. Subsequently, the resiliently biased pressure roll 23 assures an even and uninterrupted pressure against the combined edging material and panel to assure proper bonding and penetration of the adhesive into the panel edge. Finally, the soft-surfaced finishing roll 28 allows the operator to insure a good bond between the edging material 13 and the panel 40.

Accordingly, there has been described herein a novel apparatus and method for applying an edge banding material to the exposed edges of a woody panel or the like. Obviously the apparatus could be used to apply an edge material to panels of any desired shape or consistency as long as the panel could be handled by the operator.

It will further be obvious to one skilled in the art that various modifications of the different elements and the operation thereof may be possible without departing from the spirit of the invention as defined in the appended claims.

I claim:

1. Apparatus for manually applying a continuous edge band to the edges of a panel of woody material comprising:

1. a smooth, flat and hard work platform of dimensions adequate to yield a working area at the front portion thereof and large enough to accommodate panels of a variety of sizes;
2. means for storing a supply of edge banding material having a heat activatable adhesive on the backside thereof on said work platform near the upper edge thereof;
3. an adjustable guide means mounted on said work platform adjacent the supply of edge banding material for directing edge banding material of different thickness from the storage area to the working area of said work platform;
4. a heated means mounted on said work platform adjacent said guide means and in the vicinity of said working area for contacting said edge banding material to activate the adhesive thereon, said heated means further comprising an elongated heated platen having an initial curved portion with a curvature that is pronounced at its leading edge adjacent the adjustable guide means for assuring an immediate and intimate cooperation between the edge banding material and the heated platen after the edge banding material passes through said guide means, and a straight second portion at the trailing edge thereof;
5. a spring biased pressure roller device mounted on said work platform adjacent to and downstream of the trailing edge of said heated means for applying a uniform and continuous pressure to the panel edge after the application of said edging material thereto; and,
6. a finishing means mounted on said work platform adjacent said pressure roller device for providing a substantial bond between the panel edge and the edge banding material.

2. The apparatus of claim 1 wherein said roller device includes an inner roller with an outer cylindrical sleeve which forms a guide slot in the lower portion thereof for guiding the combined panel and edging material during the banding process.

3. The apparatus of claim 2 wherein said roller device is mounted so that the outer cylindrical sleeve thereof can be positioned for varying the width of said guide slot to accommodate different thicknesses of edging material.

4. The apparatus of claim 3 wherein the face surface of the guide slot of said roller device extends forward of the plane defined by the second portion of said heated platen in the inoperative condition, but then moves back against its resilient mounting when the panel comes in contact therewith.

5. The apparatus of claim 4 wherein the resilient mounting for said roller device includes spring devices interposed between a front bracket mounted contiguously with said roller and a rear bracket fixedly attached at a spaced location therefrom.

6. The apparatus of claim 5 wherein the finishing means comprises a second roller having straight sides and being fixedly mounted so that the face surface thereof coincides with the plane defined by the second portion of said heated platen.

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