Nov. 22, 1949 P. F. SKOOG 2,488,835

MECHANISM FOR INLAYING SHEET MATERIAL

Filed Dec. 29, 1945 5 Sheets-Sheet 1

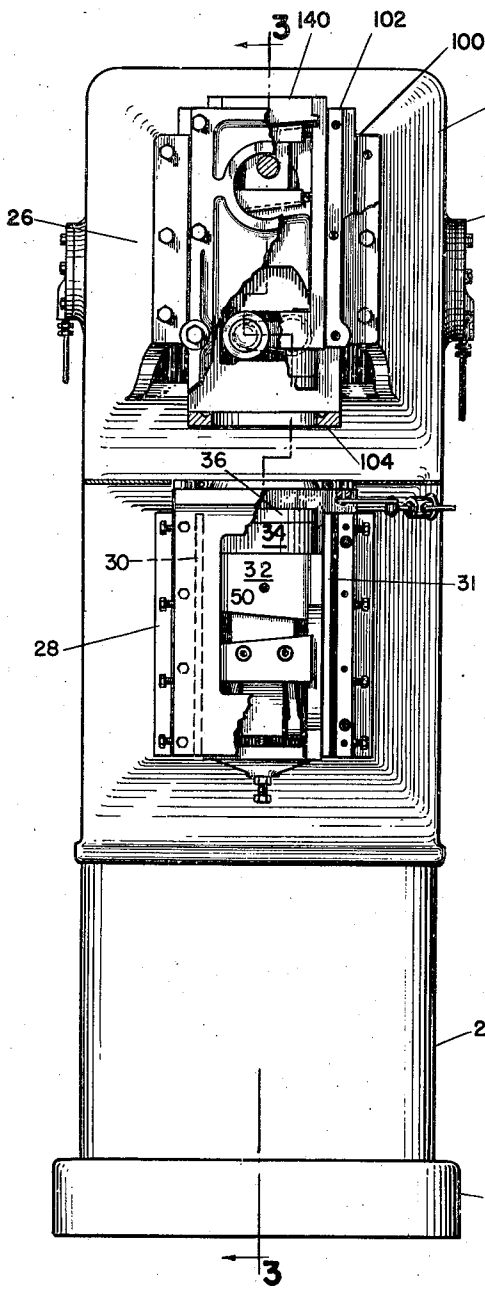


FIG_1

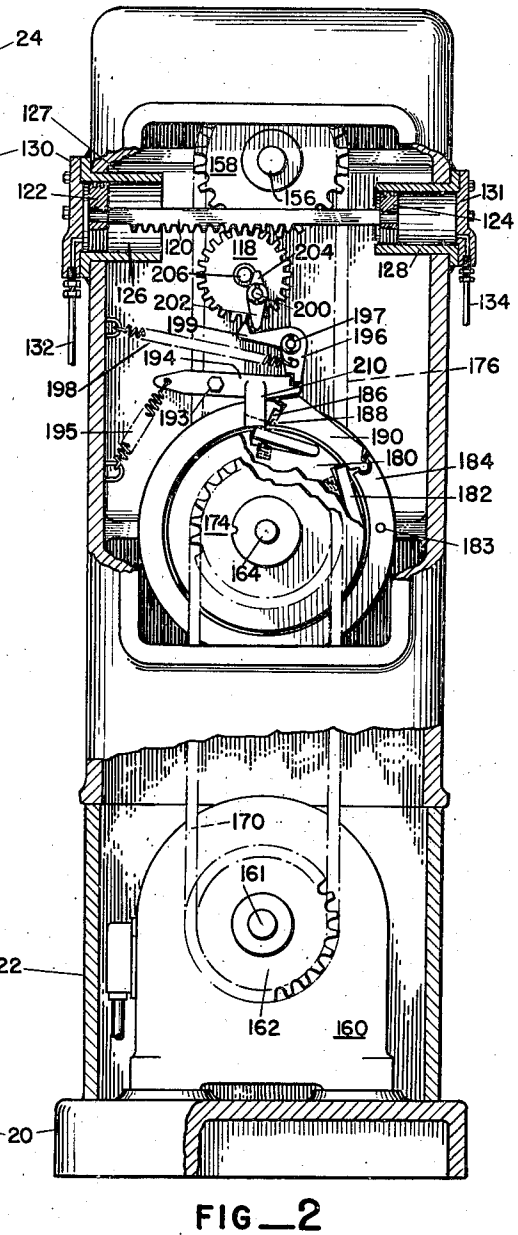


FIG_2

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Nov. 22, 1949 P. F. SKOOG 2,488,835

MECHANISM FOR INLAYING SHEET MATERIAL

Filed Dec. 29, 1945 5 Sheets-Sheet 2

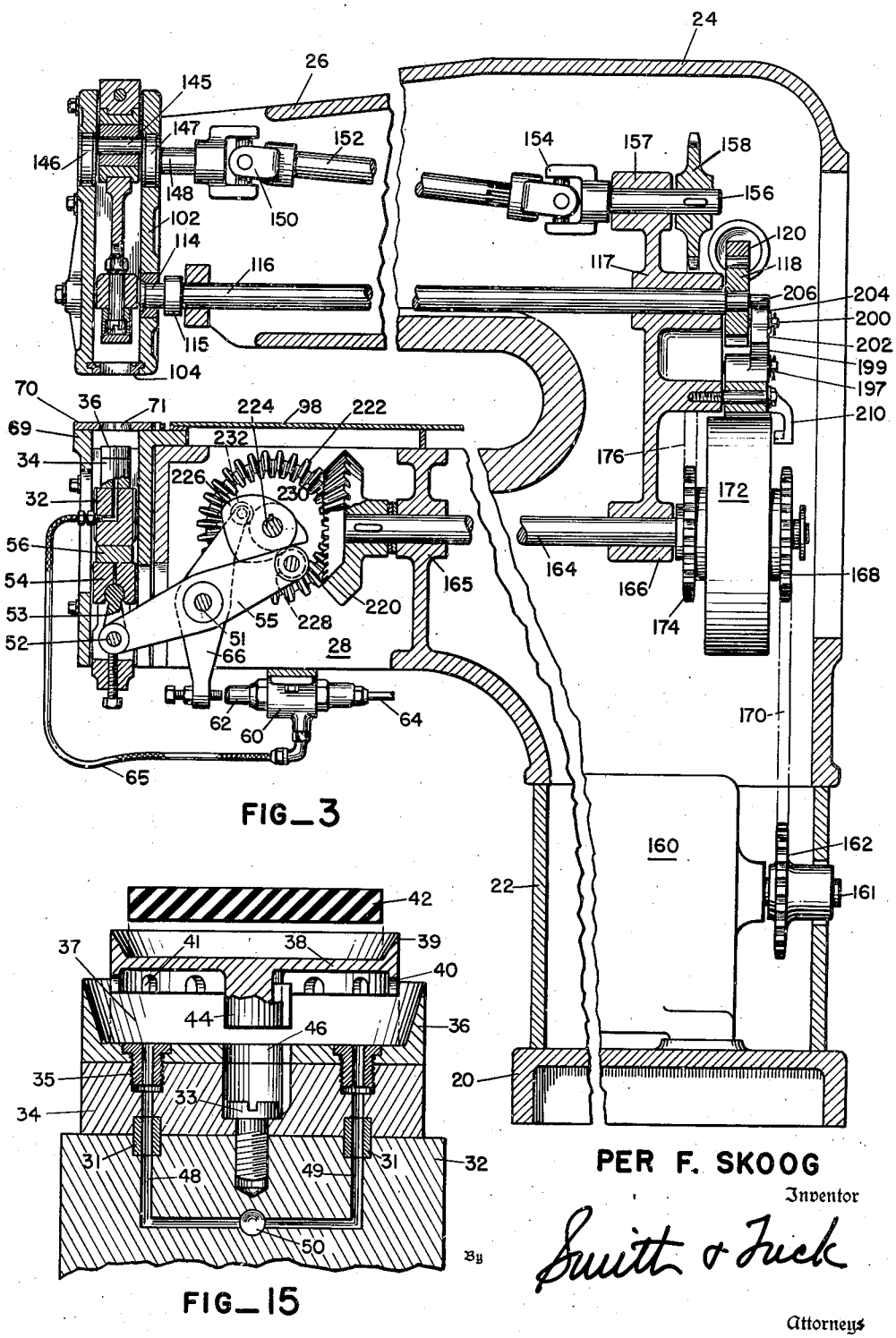


FIG_3

FIG_15

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Nov. 22, 1949 P. F. SKOOG 2,488,835

MECHANISM FOR INLAYING SHEET MATERIAL

Filed Dec. 29, 1945 5 Sheets-Sheet 3

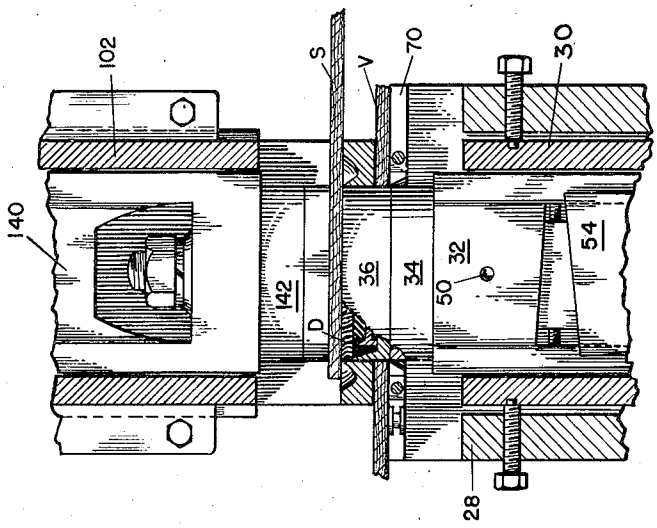


FIG_5

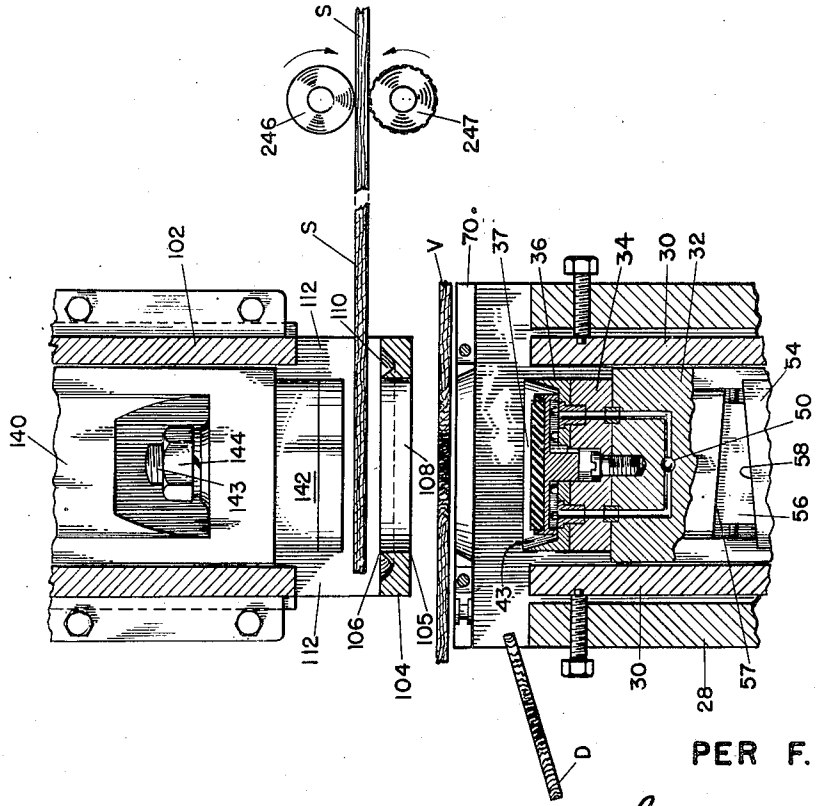


FIG_4

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MECHANISM FOR INLAYING SHEET MATERIAL

Filed Dec. 29, 1945 5 Sheets-Sheet 4

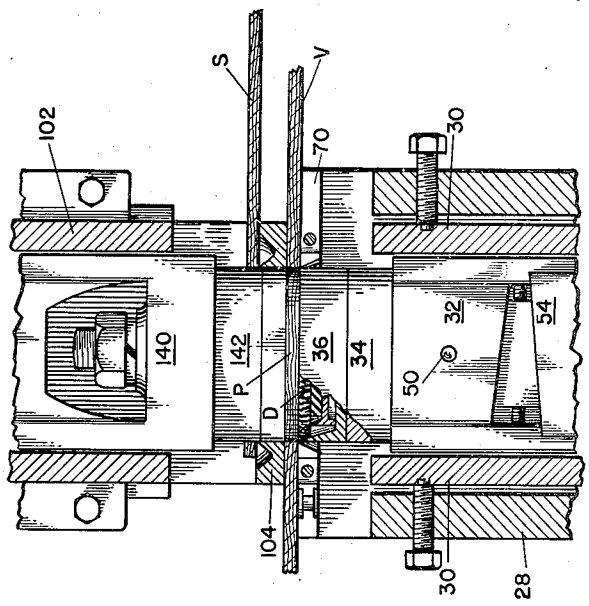


FIG_7

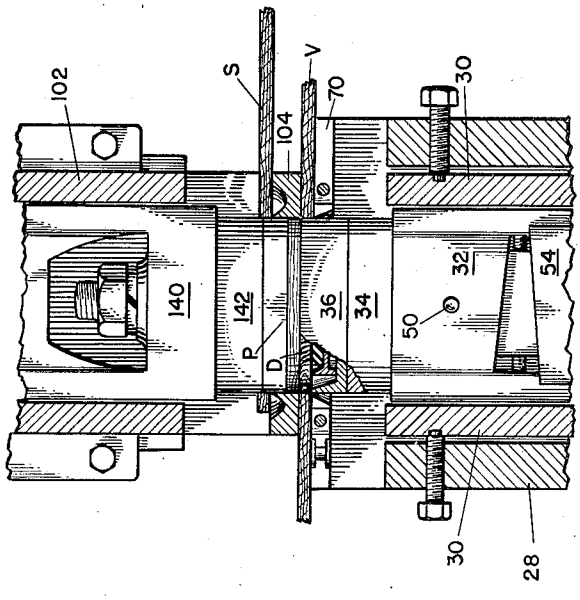


FIG_6

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Nov. 22, 1949 P. F. SKOOG 2,488,835

MECHANISM FOR INLAYING SHEET MATERIAL

Filed Dec. 29, 1945 5 Sheets-Sheet 5

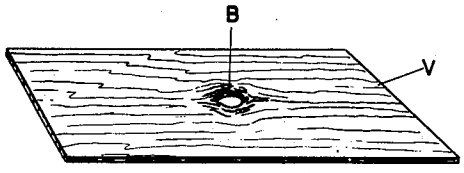


FIG_11

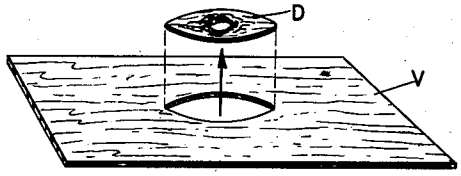


FIG_12

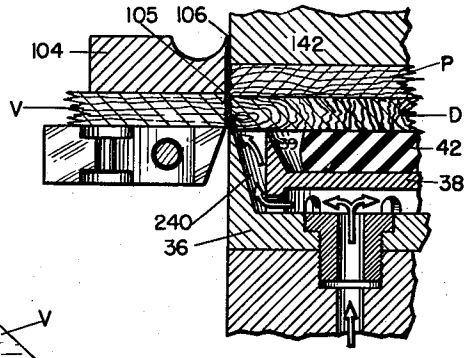


FIG_8

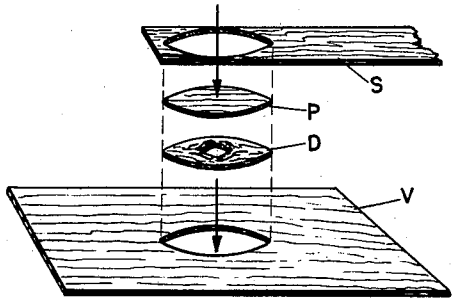


FIG_13

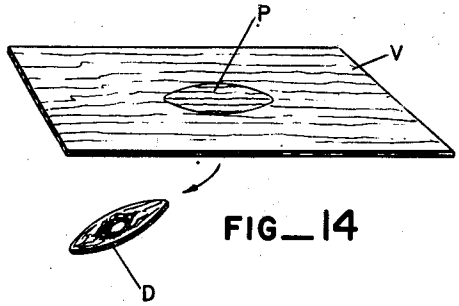


FIG_14

FIG_9

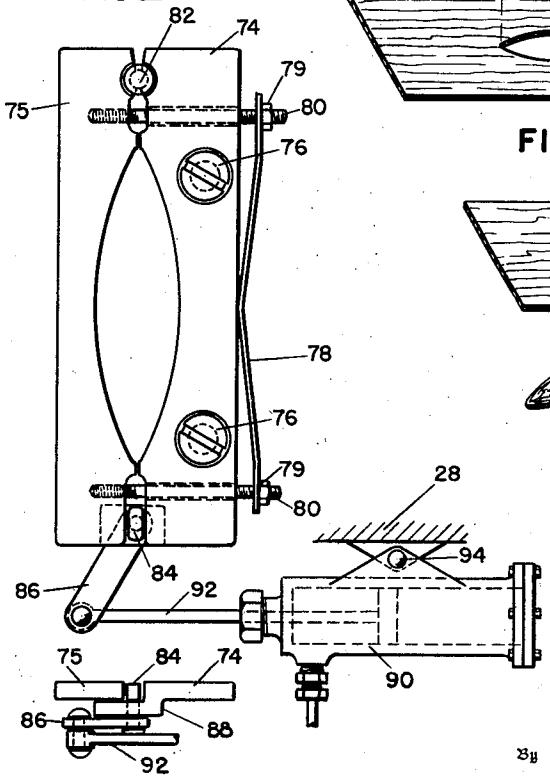


FIG_10

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Patented Nov. 22, 1949

2,488,835

UNITED STATES PATENT OFFICE

2,488,835

MECHANISM FOR INLAYING SHEET MATERIAL

Per F. Skoog, Olympia, Wash.

Application December 29, 1945, Serial No. 637,956

8 Claims. (Cl. 144—2)

1

This invention relates to a mechanism for inlaying sheet material and, more particularly, applies to the veneer and plywood industries wherein the natural wood veneer may be upgraded by the deletion of marred or scarred areas and their replacement by sound wood.

While I herein describe my machine as it may be used in the plywood industry for patching veneer, it will be understood that the same may also be used to decoratively inlay veneer as well as other sheet materials such as linoleum, hardboard, plywood, softboard, and the like.

Wood veneer produced en masse by peeling operations or otherwise, often includes knots or other blemishes due to nature or accidents during growth. In the past such have been cut from the sheet and replaced by inlay pieces or patches which are adhesively secured in place. This operation has largely been manual both as to cutting the opening and the placement of the patch, although powered, V-nosed rotary cutters have sometimes been employed. By this method a marred area that can be patched is limited to the size of a single inlay piece. If the marred area is larger than the patch to be placed, the sheet must clipped entirely across to remove both the marred area and that on either side and between the sheet edges. Naturally this is wasteful because the side wood is often sound and yet is only useful in the lowest grades of plywood, or else it goes to the scrap heap. The operation is also slow and requires greater quantities of labor than is warranted by such gain or up-grading as can be made.

In my Patent No. 2,336,704, issued December 14, 1943, upon a "Means for patching veneer sheets," I showed and described a mechanism which, to a large extent, supplies the need for machine patching. This machine, however, was designed for patching core stock where the patch need only be secured in the sheet until the sheet is assembled into plywood. Such adhesion as was required was largely derived from the adhesive between laminae during laying-up and pressing where the fluid adhesive was forced into the interstices between patch and parent sheet. This was not suitable for facing veneer, especially where the darker colored glues are often used as the latter would be forced to the outer face and another blemish would result.

There is a great need in the plywood industry for a mechanism to patch facing veneer in a manner that conserves raw materials, decreases the labor heretofore required, produces a tighter and more invisible patch than has been possible, and patches areas larger than the unit patches customary in the art.

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Having in mind these and other defects well known in this art, it is an important object of my invention to provide for veneer patching a mechanism which at a single station perforates the veneer, cuts an inlay piece to fit the veneer and places it in the presence of a fluid adhesive tightly into the sheet with but a minimum of skill required of the operator and with great dispatch and efficiency.

Another object of my invention is to provide mechanism capable of placing a patch in place and simultaneously applying glue immediately ahead of the inlaying piece as it moves into place.

A further object of the invention is the provision of an arrangement whereby a hole in veneer being patched is wiped or brushed with adhesive as the patch is being placed; wherein such adhesive is applied in a predetermined measured quantity; and wherein the brushing or wiping element is automatically removed after each operation and replaced prior to the next.

Still another object of this invention is the provision of seals around a glue applying position to prevent vagrant dispersions of glue in an undesirable manner.

Still further, it is an object herein to retain during patching the marred area cut from a sheet being patched and to put the same to useful purposes but without hindering the operation, and, when its usefulness has ceased, to easily dispose of the same.

One other and very important object of the invention is to provide a veneer inlaying mechanism which is simple to construct, efficient in operation, and which requires a relatively unskilled operator to attain great speed and efficiency at a reduction of the normal costs.

The novel features that I consider characteristic of my invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its operation, together with additional objects and advantages thereof, will best be understood from the following description of specific arrangements of steps, when read in connection with the accompanying drawings, in which:

Fig. 1 is an enlarged face view of the machine with portions broken away for convenience of illustration;

Fig. 2 is a rear view with portions broken away of the veneer inlaying mechanism;

Fig. 3 is a vertical sectional view taken on line 3—3 of Fig. 1;

Figs. 4, 5, 6, and 7, are enlarged vertical sectional views of the inlay cutting means and detailing sequentially the steps of the operation;

Fig. 8 is an enlarged fragmentary vertical sectional view showing the adhesive applying operation;

Fig. 9 is a plan view of a divided base plate employed in my inlaying machine;

Fig. 10 is an end view of the divided base plate of Fig. 9;

Figs. 11, 12, 13, and 14, are schematic perspective views showing, respectively, marred veneer; veneer with the marred area cut therefrom; veneer and patching stock with debris and patch in their normal relative positions prior to inlaying; and patched veneer with the debris leaving the scene of operation; and

Fig. 15 is an enlarged partially exploded view of the cutter knife.

Referring to Figs. 1, 2, and 3, the frame elements of the machine comprise the footing 20, housing column 22, and head housing 24, which has a bifurcated cantilevered portion forming lateral upper and lower arms 26 and 28, respectively. Preferably these elements are hollow to receive certain operating mechanism and have access openings for installation or maintenance of such mechanism.

At its outer end, arm 28 mounts in guideways 30, 30, a reciprocal block 32 which carries the base block 34 upon which is secured knife 36. This knife element is formed to the desired perforation to be cut and may be round or, as shown here, boat-shaped. It has a peripheral sharpened portion which slopes downward and inward to form recess 37 in which is secured disc 38 having upper flange 39 and lower notched flange 40. Atop disc 38 is placed the resilient stripper 42 and, below, disc 38 has boss 44 keyed in axial opening 46 of the knife recess 37. By hollow screws 35, knife 36 is secured to block 34, and the latter in turn is secured to reciprocal block 32 by screw 33 where it is retained against twisting by hollow dowels 31.

Glue passages 48 and 49 extend from adit opening 50 through blocks 32, dowels 31, block 34, hollow screws 35 to the space under disc 38, in recess 37, provided by the upward spaced apart positioning of the disc insured by flange 40 from whence it flows through notches 41 to the channel 43 between the inner face of knife 36 and the outer face of flanges 39 and 40.

The knife is caused to reciprocate vertically by rocker 55, pivoted on shaft 51, one end of which is coupled to reciprocator 54 by knuckle arm 53 and pin 52. Variable spacing of block 32 from reciprocator 54 is obtained by laterally shiftable wedge 56 operating upon sloping surfaces 57 and 58 of the two elements respectively.

Glue is supplied by pump 60, having external spring-pressed piston boss 62, to which glue is conducted by conduit 64 from a suitable source. Between pump 60 and adit 50 is flexible conduit 65. Since in operation the machine performs a sequence of steps, the supplying of glue is an intermittent function obtained at a desired moment of short duration. Operation of the pump 60 in such manner is had by an arm of rock lever 66, pivoted on shaft 51, striking boss 62 at the proper instant.

Above the die 34 on head 69 is mounted base plate 70, having a central aperture 71 over which a sheet of veneer is positioned. A blemish to be patched is superposed above the aperture. While this base plate may be undivided in certain cases,

I have found it preferable to divide the same as shown in Fig. 10. In such instance the fixed plate portion 74 is secured by screws 76 to head 69 and is opposed by the movable plate portion 75 which is resiliently held to portion 74 by spring tension blade 78 operable upon nuts 79 on dowels 80. Between plates 74 and 75 at one end and mounted in head 69 is pivot pin 82 forming a fulcrum for the plates which, on occasion, are swung apart by cam 84 that is rocked by crank arm 86 suitably pivoted in bracket 88 of plate 74. Movement of arm 86 is obtained from servomotor 90 by means of the reciprocal link 92. Motor 90 is operated by fluid supplied from conventional sources in a timed relation during operation of the machine, and rocks during camming movement about pivot 94 carried by a bracket offset upon base 28 or other suitable support.

A table 98 is shown between the arms 26 and 28, and it will, of course, be understood that suitable other table means will be provided in substantially the same plane as table 98.

At its outer end, upper arm 26 provides ways 100 in which is vertically movable the clamping head 102 which has at its lower end the female die 104, having lower cutting edge 105 and upper cutting edge 106 around the aperture 108. The upper surface of the female die is recessed at 110 around edge 106 to facilitate cutting. As can best be seen in Fig. 3, the female die is suspended, fore and aft, by front and rear walls respectively of the movable head 102. At each end of the female die the head is ported at 112 for a purpose later to be described.

Head 102 is moved vertically by means of the crank pin 114, journalled therein and carried by arm 115 upon the forward end of the shaft 116. Crank pin 114 moves through a path of approximately 90° by reason of pinion 118, or the rear end of shaft 116, which is rotated through a lateral shifting of rack bar 120, as to the right in Fig. 2. Rack 120 has at each end a piston 122 and 124 mounted in the cylinders 127 and 128, respectively. Heads 130 and 131 close the outer ends of the cylinders and form therebetween and the respective pistons, expansible and contractible chambers to which fluid under pressure is supplied through conduits 132 and 134. For example, when fluid pressure is delivered to the chamber adjacent to piston 122, the rack is shifted to the right in Fig. 2, where it remains until fluid is delivered to the chamber adjacent piston 124. During machine operation compressed air or the like supplied to chamber 126 shifts rack 120 and rotates gear 118 to the right in a clockwise direction as seen in Fig. 2, and, as a result, head 102 is lowered with force toward the base plate 70 to clamp thereon a sheet of veneer to be inlayed.

Slidably mounted within head 102 is the reciprocator 140 which moves vertically and carries on its lower end an upper male die 142 which is attached by means of bolt 143 and nut 144 to the lower face of head 140. Such reciprocal movement of member 140 is obtained by revolution of the crank pin 145 that is eccentrically mounted on rollers 146 and 147, journalled in suitable bearings provided therefor in the head 102. Rotatable shaft 148 fixedly secured to roller 147 couples the same through the instrumentality of the universal joint 150 to propeller shaft 152 which is turned, by means of the universal joint 154, coupled to shaft 156 which has keyed thereto sprocket 158. Shaft 156 is journalled in bearing 157 formed as part of the frame of the

machine and positioned above bearing 117 which journals shaft 116.

The drive mechanism of certain of the moving parts of this machine derives power from motor 160 to the shaft 161 on which is secured sprocket 162. Extending longitudinally of arm 28 is a drive shaft 164 mounted in bearings 165 and 166. To the rear end of shaft 164 is securely attached sprocket 168. An endless drive chain 170 extends between sprockets 162 and 168. Clutch 172 is interposed between sprocket 168 and sprocket 174, and a secondary drive chain 176 transmits power from sprocket 174 to sprocket 158 thereabove.

Clutch 172 is of the single rotation type shown in my Patent 2,368,892, issued February 6, 1945, and has the inner runner 180 which is keyed to shaft 164 and carries a plurality of spring pressed dogs 182. Surrounding the runner is a casing 184 having a shoulder 186 against which, on occasion, one of the dogs 182 may abut to lock the runner to the casing. Shoulder 186, during non-engaged periods of the clutch, is covered by lip 188 of the pivoted dog 190. When dog 190 is in the position shown in Fig. 2, the interior of the casing is cylindrical and the clutch elements are disengaged. When this dog 190 is permitted to swing outward, dog 182 moves outward to pick up the casing and the two are carried in simultaneous rotation.

Controlled movement of dog 190 is obtained by means of the pivoted lever 194 which is normally held in the position shown in Fig. 2 by detent 196 that is tensioned by the spring 198.

Pinion gear 118 carries, on pin 200, a swing dog 202 which has a shoulder 204 that, upon clockwise movement of the gear 118, abuts against end extension 206 of the shaft 116. The detent 196 is pivotally mounted on pin 197 and, during clockwise movement of gear 118, dog 202 strikes arm 199 of the detent, forcing that arm downward and releasing the arm 194 which, under the tension of spring 195, swings in a counter-clockwise direction. Thereupon dog 190 is pressed outward by one of the dogs 182 and the two elements of the clutch are locked together.

Arm 194, pivoted on pin 193, carries an offset hook-shaped camming arm 210 which, during rotation of the casing 184, is engaged by camming pin 183. Through this instrumentality arm 194 is relatched under detent 196. Upon returning counter-clockwise movement of gear 118, as when it is being moved by piston 124, the dog 202 swings freely over the hump of arm 199 and then falls to the upright position illustrated in Fig. 2.

When the elements of clutch 172 are engaged as described, shaft 164 is rotated and with it turns miter gear 220 which meshes with gear 222 to effect rotation of shaft 224 on which is mounted, in a near plane in Fig. 3, the profile cam 226. Roller 228, carried by arm 55, rides the cam, and lever 55 is moved in a rocking motion to raise the knife 34. In a farther plane on shaft 224 is cam 230 which, during a portion of its rotation, operates upon the roller 232 carried by arm 66 which operates the pump 60.

It is to be understood that clutch 172 is of the single rotation type and that, during each operation, shafts 164 and 224 are turned but a single rotation due to the fact that the clutch will be disengaged upon the completion of its single rotation. In similar manner shaft 156 is likewise turned a single rotation whereupon, through propeller shaft 152 or universals 150 and 154, the upper male die 142 is caused to descend and likewise again be elevated.

Referring particularly to Figs. 11 through 14, I have shown a sheet of veneer V having a blemish B. In Fig. 12 the veneer sheet has had removed, by the mechanism previously described, the debris D containing the blemish.

In Fig. 13, from patching strip S, has been cut the patch element P of identical size and shape with the debris D, and in this view the two elements are shown descending simultaneously in an exploded and spaced apart relation. The two elements P and D are then caused to descend as suggested in Fig. 14 to a point where the patch P has been disposed in the opening previously cut in the veneer, and thereafter debris D is removed. This method is more fully set forth in my co-pending application, Serial No. 590,929, entitled "Art of inlaying sheet material," filed April 28, 1945, now Patent Number 2,454,016, issued Nov. 16, 1948.

While I have described the operation of the pump, it will readily be seen that under certain occasions, inlaying may be performed without the patch having been adhesively secured in place. However, the preferable practice of this method includes the gluing of the patch into the veneer, and this is accomplished by means of pump 60 from which adhesive under pressure flows to the space 240 between knife 36 and flanges on the edge of disc 38. Chamber 240 is further defined by the under marginal portion of debris D, since the sharpened edge of flange 39 bites into material D and effectively seals off the chamber and prevents axisward vagrant movement of any glue which may be forced into chamber 240. Glue leaves chamber 240 in a combined squirting and wiping action around the edge of the debris, the fibers of which tend to serve as a brush in applying the adhesive to the edge of the opening in the veneer immediately in advance of the incoming patch P.

As the knife 36 and the upper male die 142 descend, in placing the inlay patch P in place in the veneer, they reach a point where the cam 226 breaks away abruptly, permitting the knife 36 to descend very rapidly. At the same instant die 142 has arrived at low dead center and begins to ascend away from the veneer. At about the same instant the rack 120 is returned to its normal position, causing the clamp head to withdraw from the veneer to permit the operator to move the sheet.

I have found it most expedient in a gluing operation to insure that the aperture of the base plate, formed of elements 74 and 75, be just slightly smaller than the outer perimeter of knife 36, so that when the knife is raised through the base plate, additional tension is derived from spring 78 as the plates are spread slightly apart. Under such circumstances when the knife 36 descends portions 74 and 75 tend to grip the edge of the debris, and that, together with the stripping action of member 42 dislodges the debris from inside the knife. It is to be borne in mind that the tight grip on the outside of the knife further serves to prevent the escape of glue from chamber 240 around the outer surface of the knife. As the knife then withdraws from the base plate the servomotor 90 is actuated and the greater dimension of camming member 84 is disposed by the plate sections 74 and 75 to cause them to spread apart, enlarging the opening whereupon the debris is dropped. At that time

either a negative air current or a positive blast of air against the under face of the base plate removes the debris laterally of the machine for disposal in any suitable manner.

I have suggested in Fig. 4 the manner in which the strip S is fed into position between the upper cutting edge **106** of female die **104** and below the upper male die **142**. This feeding movement is obtained by rolls **246** and **247** offset to one side of the machine and suitably mounted and powered. It will be seen that strip S enters into position for the patches to be cut through an opening **112** and is fed outwardly from the machine through the opposite similar opening for disposal.

With the mechanism herein described the veneer sheet is securely clamped from before perforating until after the patch has been properly inlayed. This clamping action is obtained closely around the area being patched and permits the accurate placement of a single patch large enough to cover a single blemish or the placement of several patches, the area of which would cover a blemish greater than the unit patch. In one experiment conducted eleven patches were placed in such a manner that they were interposed in a group. Some patches were let into others and portions of some were a small fraction of the unit shape, yet all of the parts of this multiple patch were rigidly and securely maintained in place.

While I have shown and described particular embodiments of my invention, it will occur to those skilled in the art that various changes and modifications may be made without departing from the invention, and I therefore aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

Having thus described my invention, I claim:

1. A veneer inlaying mechanism, comprising: a divided base plate having an opening, a female die reciprocably mounted adjacent said base plate and having an opening provided with upper and lower shearing edges, means for moving said female die toward and away from said base plate, a knife reciprocal through said openings and cooperable with the lower shearing edge of the female die to perforate veneer therebetween and the base plate, means to reciprocate said knife in said opening said knife being recessed inwardly from its cutting edge to receive debris cut from the veneer sheet during perforation, a reciprocal ram in line with said knife, means for feeding veneer inlaying stock between said knife and said ram, means for moving said ram to clamp a veneer patch piece upon said knife and the debris in the recess thereof and for moving said ram to the upper veener-sheet face with said knife during retracting movement of the latter to below said opening and relative the upper shearing edge of said female die to cut an inlay piece, means for supplying fluid adhesive under pressure to the space between the edge of the debris and the inner face of the knife recess during withdrawal of said knife through the opening of the veneer and immediately in advance of the inlay piece, and means for separating the portions of the divided base plate following insertion of the inlay piece.

2. A veneer inlaying mechanism, comprising: a base plate having an opening, a female die reciprocally mounted adjacent said base plate and having an opening provided with upper and lower shearing edges, means for moving said female die toward and away from said base plate, a knife reciprocal through said openings and cooperable with the lower shearing edge of the female die to perforate veneer therebetween and the base plate, means to reciprocate said knife in said opening said knife being recessed inwardly from its cutting edge to receive debris cut from the veneer sheet during perforation, a reciprocal ram in line with said knife, means for feeding veneer inlaying stock between said knife and said ram, means for moving said ram to clamp a veneer patch piece upon said knife and the debris in the recess thereof and for moving said ram to the upper veneer-sheet face with said knife during retracting movement of the latter to below said opening and relative the upper shearing edge of said female die to cut an inlay piece, and means for supplying fluid adhesive under pressure to the space between the edge of the debris and the inner face of the knife recess during withdrawal of said knife through the opening of the veneer and immediately in advance of the inlay piece.

3. A veneer inlaying mechanism, comprising: a divided base plate having an opening, a female die reciprocally mounted adjacent said base plate and having an opening provided with upper and lower shearing edges, means for moving said female die toward and away from said base plate, a knife reciprocal through said openings and cooperable with the lower shearing edge of the female die to perforate veneer therebetween and the base plate, means to reciprocate said knife in said opening said knife being recessed inwardly from its cutting edge to receive debris cut from the veneer sheet during perforation, a sharp-edged wall in said recess spaced from said cutting edge, a reciprocal ram in line with said knife, means for feeding veneer inlaying stock between said knife and said ram, means for moving said ram to clamp a veneer patch piece upon said knife and the debris against the sharp-edged wall in the recess thereof and for moving said ram to the upper veneer-sheet face with said knife during retracting movement of the latter to below said opening and relative to upper shearing edge of said female die to cut an inlay piece, means for supplying fluid adhesive under pressure to the space between the edge of the debris and the inner face of the knife recess during withdrawal of said knife through the opening of the veneer and immediately in advance of the inlay piece, and means for separating the portions of the divided base plate following insertion of the inlay piece.

4. A veneer inlaying mechanism, comprising: a base plate having an opening, a female die reciprocally mounted adjacent said base plate and having an opening provided with upper and lower shearing edges, means for moving said female die toward and away from said base plate, a knife reciprocal through said openings and cooperable with the lower shearing edge of the female die to perforate veneer therebetween and the base plate, means to reciprocate said knife in said opening said knife being recessed inwardly from its cutting edge to receive debris cut from the veneer sheet during perforation, a sharp-edged wall in said recess spaced from said cutting edge, a reciprocal ram in line with said knife, means for feeding veneer inlaying stock between said knife and said ram, means for moving said ram to clamp a veneer patch piece upon said knife and the debris against the sharp-edged wall in the recess thereof and for

moving said ram to the upper veneer-sheet face with said knife during retracting movement of the latter to below said opening and relative the upper shearing edge of said female die to cut an inlay piece, and means for supplying fluid adhesive under pressure to the space between the edge of the debris and the inner face of the knife recess during withdrawal of said knife through the opening of the veneer and immediately in advance of the inlay piece.

5. A veneer inlaying mechanism, comprising: a divided base plate having an opening, a female die reciprocally mounted adjacent said base plate and having an opening provided with upper and lower shearing edges, means for moving said female die toward and away from said base plate, a knife reciprocal through said openings and cooperable with the lower shearing edge of the female die to perforate veneer therebetween and the base plate, means to reciprocate said knife in said opening said knife being recessed inwardly from its cutting edge to receive debris cut from the veneer sheet during perforation, a reciprocal ram in line with said knife, means for feeding veneer inlaying stock between said knife and said ram, means for moving said ram to clamp a veneer patch piece upon said knife and the debris in the recess thereof and for moving said ram to the upper veneer-sheet face with said knife during retracting movement of the latter to below said opening and relative the upper shearing edge of said female die to cut an inlay piece, and means for separating the portions of the divided base plate following insertion of the inlay piece.

6. In a veneer inlaying mechanism, a female cutter die; a male die operable through the opening of said female die; means for obtaining relative movement between said dies; said male die having a peripheral cutting edge to cut a portion from the veneer and being recessed axisward from said edge to contain said cut portion; in said recess and spaced from said cutting edge, a sealing means to contact the cut portion and forming with said cutting edge a chamber; and means to deliver fluid adhesive under pressure to the chamber between said cutting edge and said sealing means.

7. In a veneer inlaying mechanism, a female cutter die; a male die operable through the opening of said female die; means for obtaining relative movement between said dies; said male die having a peripheral cutting edge to cut a portion from the veneer and being recessed inward from said edge to contain said cut portion; in said recess and spaced from said cutting edge, a sealer member having an upstanding relatively thin edge to contact the cut portion and forming with said cutting edge a chamber; and means to deliver fluid adhesive under pressure to the chamber between said cutting edge and said sealer member.

8. In an inlaying mechanism, a male die, comprising: a base member having a peripheral knife flange, said base member being recessed axisward from said knife flange, means forming a wall in said recess spaced axisward from said knife flange and extending from the recess bottom a lesser distance than said knife flange and terminating in a thin knife edge, an adhesive reservoir, means forming a conduit between said reservoir and the space between said knife flange and said wall, and means for forcing adhesive from said reservoir through said conduit and to said space.

PER F. SKOOG.

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