

### [54] WOODWORKING MACHINE

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[52] U.S. Cl. .... 144/136, 144/7

[51] Int. Cl. .... B27f 5/00, B27b 7/02

[58] Field of Search .... 144/136 T, 133, 7; 143/47, 143/168 T, 174

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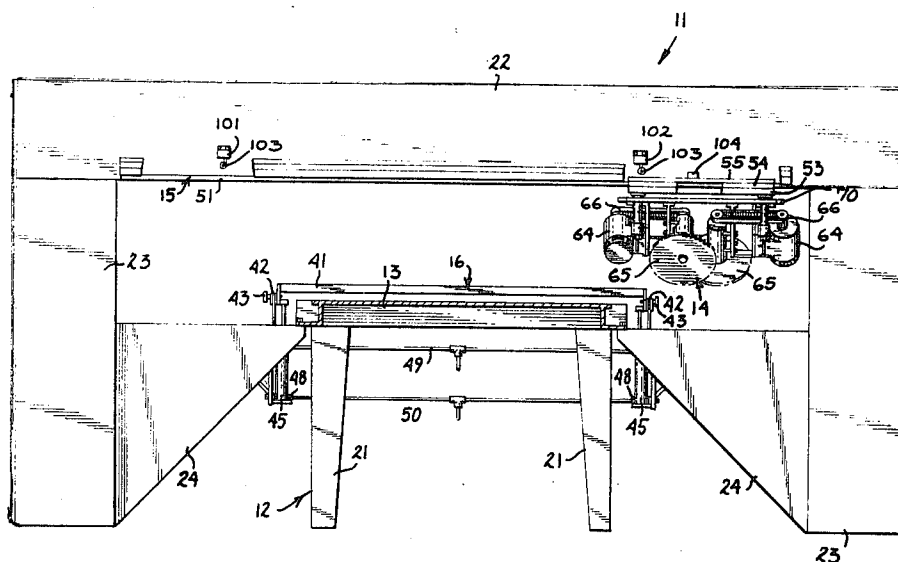
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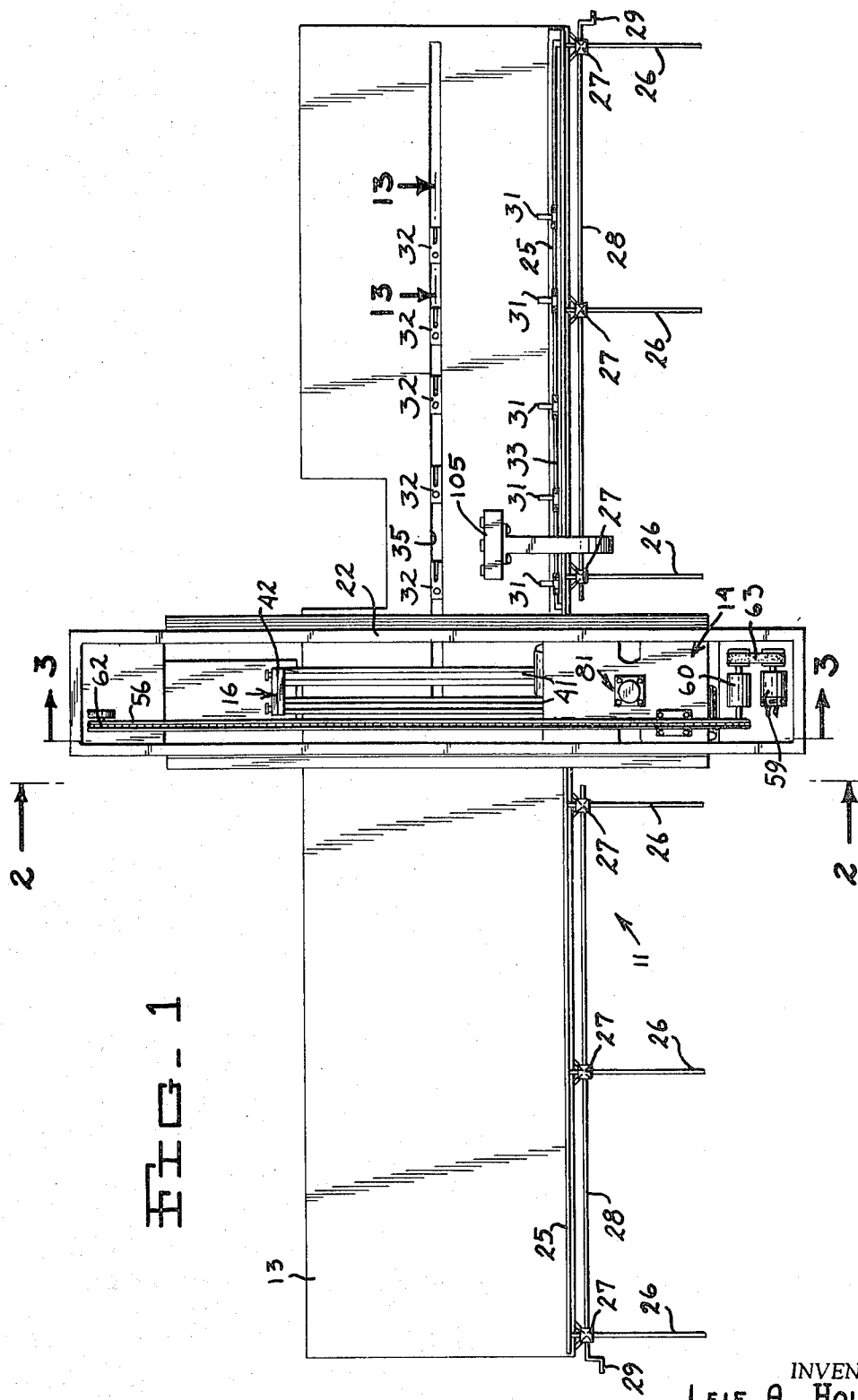
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### [57] ABSTRACT

A woodworking machine is disclosed that forms a plurality of properly oriented grooves in a wood panel to effect simple cabinet fabrication. The panel rests on a horizontal table having an alignment fence and a plurality of selective operable stops that enable placement of the panel on the table in a plurality of predetermined grooving positions. A clamping device holds the panel in one of the positions, and a groove is then formed by a cutting assembly including a pair of rotary cutters both of which are disposed at 45° with respect to the table and at 90° with respect to each other. The machine includes means for lowering the cutting assembly to a desired position above the table and advancing the assembly with respect to the panel to form the groove. The assembly is then elevated to a non-cutting position and returned to its initial position. The machine also includes means for automatically actuating the stops in a preselected sequence to effect the formation of a plurality of properly placed grooves.

13 Claims, 15 Drawing Figures

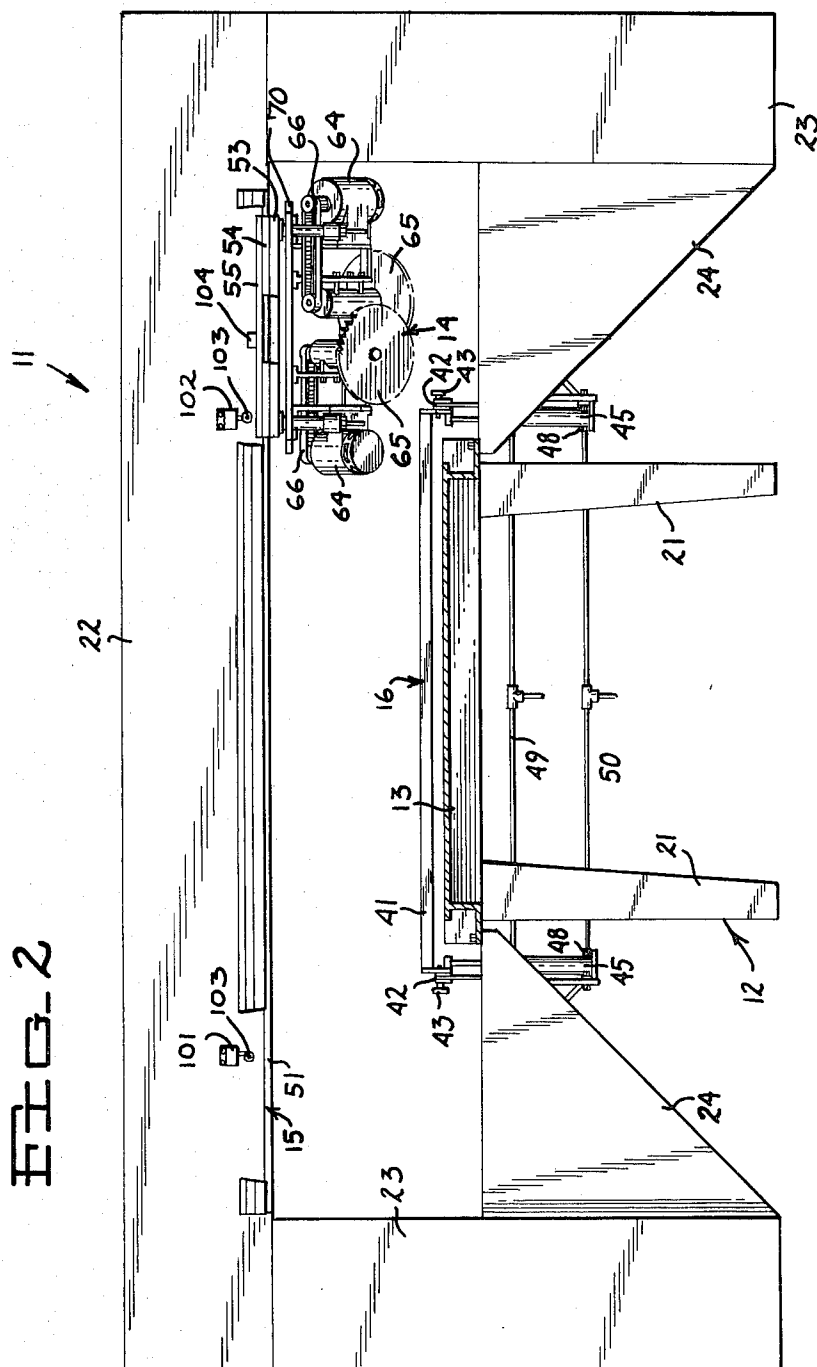




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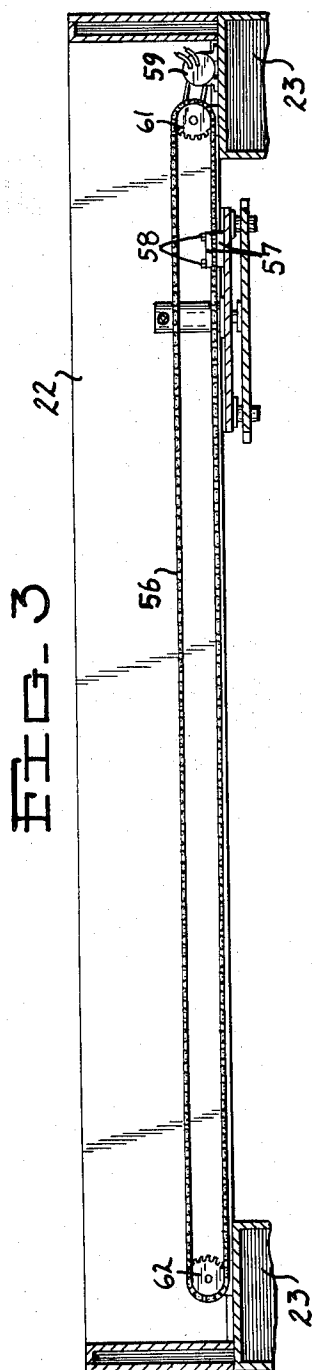


FIG. 11

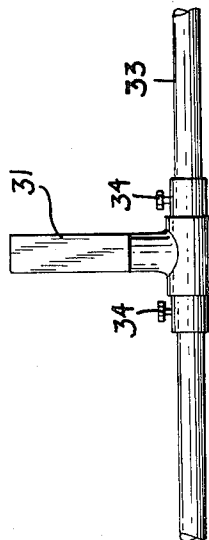


FIG. 12

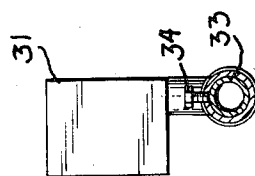


FIG. 14

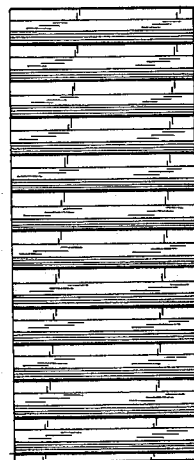


FIG. 15



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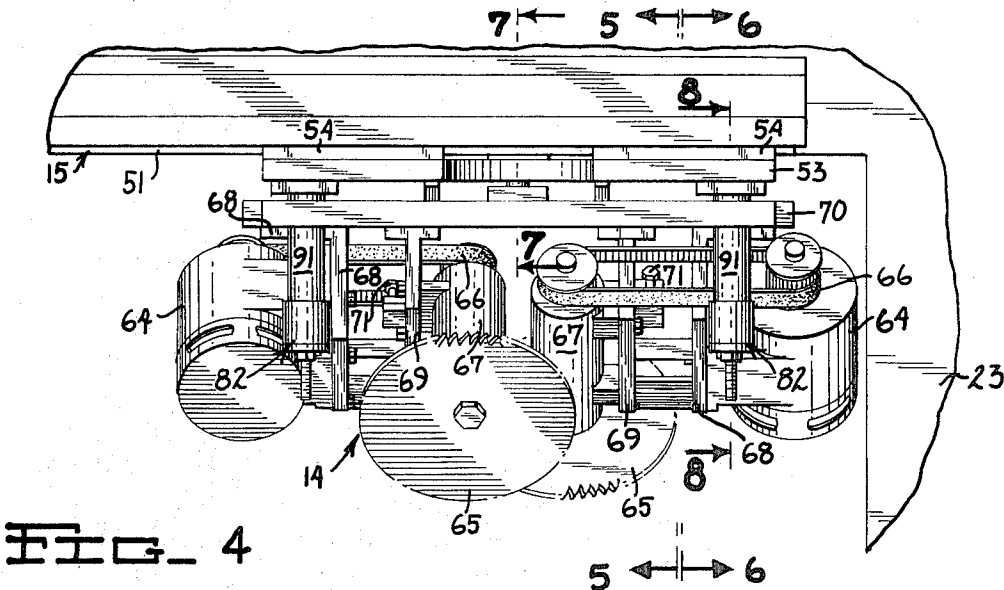


FIG. 4

FIG. 7

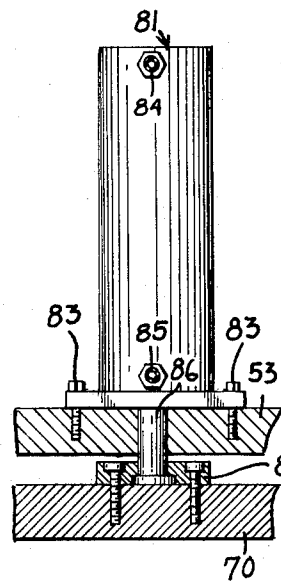


FIG. 5

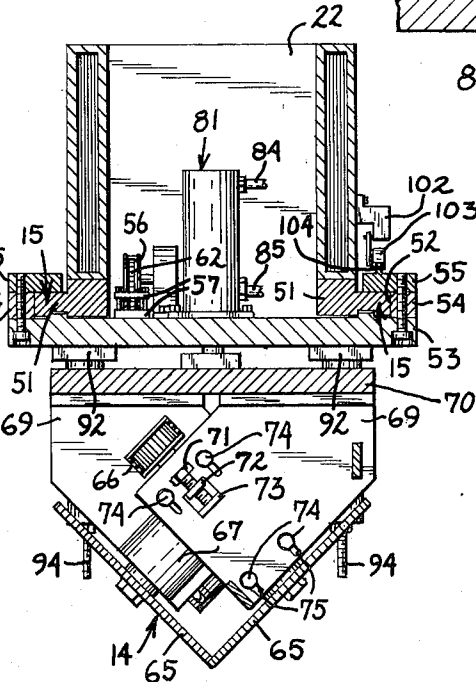
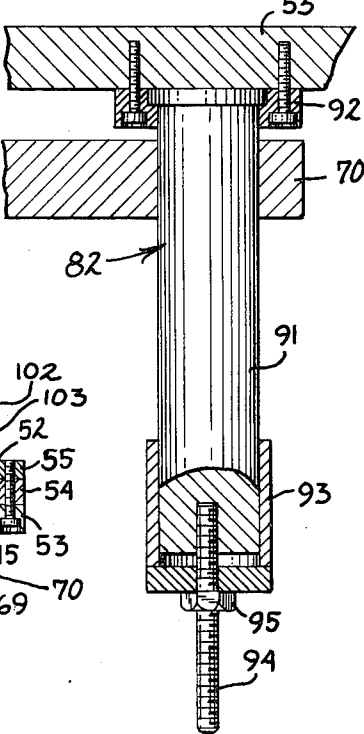
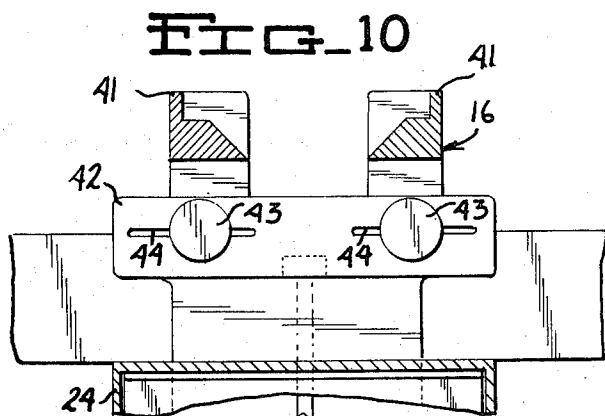
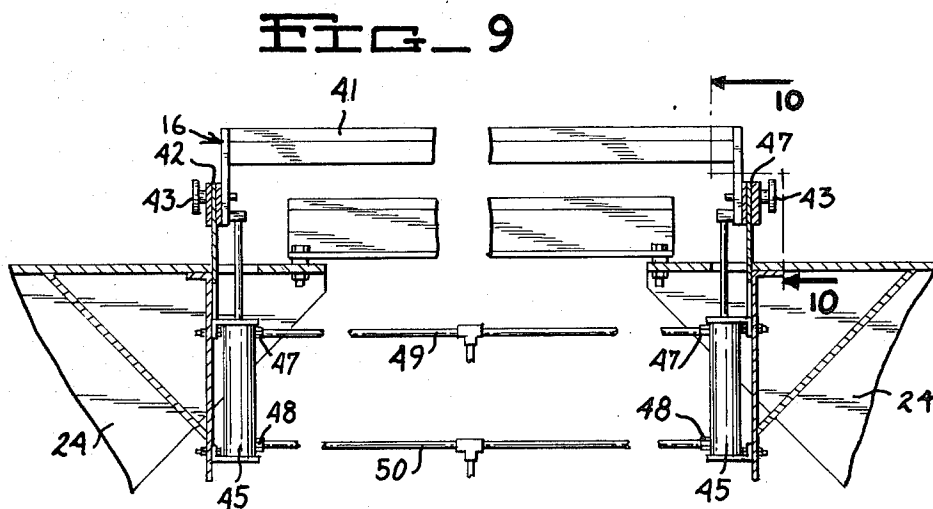
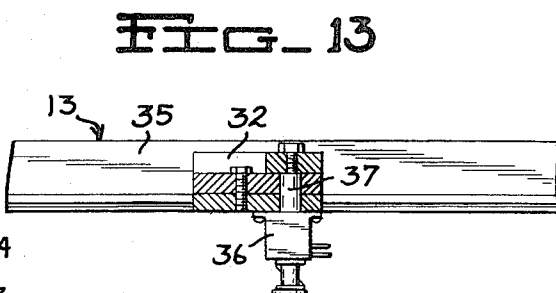
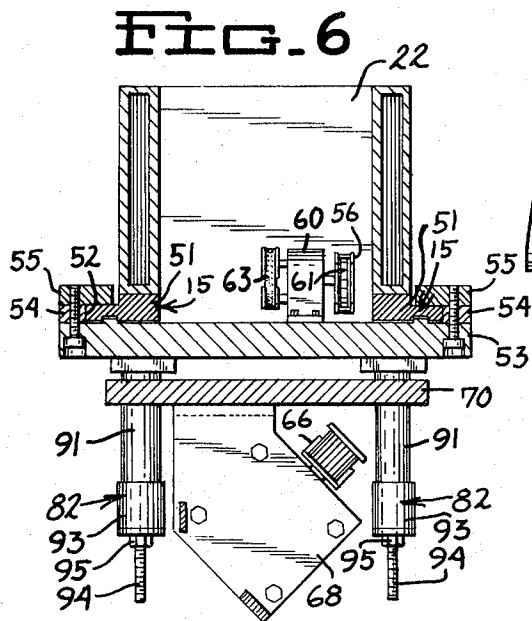


FIG. 8



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## WOODWORKING MACHINE

## BACKGROUND OF THE INVENTION

## 1. Field of the Invention

In the field of mass-production cabinetmaking, the present practice is to produce cabinets from a single panel by cutting a plurality of grooves in the panel to enable the formation of corner miter joints. The single panel can then be quickly assembled into the desired cabinet configuration.

## 2. Description of the Prior Art

My co-pending application "Woodworking Machine," Ser. No. 823,370, filed May 9, 1969, broadly discloses a woodgrooving machine that facilitates the quick assembly of cabinets and the like. That application specifically discloses a machine which simultaneously forms a plurality of grooves in a panel by causing the panel to be advanced with respect to a plurality of novel groove-cutting heads. By virtue of the multiple functions provided, this machine is extremely complex.

Also included in the prior art is a machine that employs a single rotating element to form the desired groove. The single element must, of course, be quite thick to be able to cut a groove in a single pass. Because of this thickness, the cutter has a tendency to splinter or tear the panel, thereby preventing a tight, flush miter joint from being formed.

## SUMMARY OF THE INVENTION

The present invention employs the novel cutting assembly of my previous patent application, thereby avoiding the difficulties of the single, thick rotating cutter, but in a far less complex machine. This is done by providing a supporting surface upon which the panel is held in properly oriented relation, and advancing the cutter assembly, which consists of a pair of rotary cutting elements which are disposed at 45° with respect to the panel and supporting surface and 90° with respect to each other, along a linear tack that is disposed parallel to the supporting surface so that it forms a groove of predetermined depth in the panel. Provision is also made for movement of the panel through a plurality of positions corresponding with the number of grooves to be formed in the panel through the use of a plurality of stops which can be sequentially operated either manually or automatically. Formation of a groove in a panel is also facilitated through the use of elevating means that moves the cutter assembly between a non-cutting position and a cutting position at a predetermined depth in the panel.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view in top plan;

FIG. 2 is an enlarged sectional view taken along line 2—2 of FIG. 1;

FIG. 3 is a sectional view taken along line 3—3 of FIG. 1, portions thereof broken away;

FIG. 4 is an enlarged view of the cutting assembly of FIG. 2, portions thereof broken away;

FIG. 5 is a view taken generally along a line 5—5 of FIG. 5;

FIG. 6 is a view taken generally along the line 6—6 of FIG. 4;

FIG. 7 is an enlarged view taken generally along a line 7—7 of FIG. 4, portions thereof broken away;

FIG. 8 is an enlarged view taken along line 8—8 of FIG. 4, portions thereof broken away;

FIG. 9 is an enlarged sectional view of a panel-clamping portion of FIG. 2, portions thereof broken away;

FIG. 10 is a view taken generally along a line 10—10 of FIG. 9;

FIG. 11 is an enlarged view of a manual stop mounted on the panel-supporting table of FIG. 1, portions thereof broken away;

FIG. 12 is a view taken along line 12—12 of FIG. 11;

FIG. 13 is an enlarged sectional view taken generally along line 13—13 of FIG. 1;

FIG. 14 is a view in top plan of a cut panel; and

FIG. 15 is an elevation of the panel shown in FIG. 14.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1 and 2, a woodworking machine is represented generally by the numeral 11 and generally consists of a frame 12, a support means or table 13, a cutter assembly 14 which rides on a track 15 and a clamping device 16.

Frame 12 includes a plurality of legs 21 which support table 13, an overhead member 22 which carries track 15, and support members 23 therefor. Table 13 and the legs 12 are connected to the supports 23 of the overhead assembly by means of triangular brackets 24, so that track 15 is properly oriented with respect to table 13.

Operating in association with table 13 is an alignment fence 25 which is held in place by a plurality of elongated members 26 which pass through and receive adjustable support from gear boxes 27. Each of the elongated members 26 is formed with a gear rack to enable movement of fence 25 by simultaneous operation of the gear boxes 27. This is done by means of a rod 28 which can be rotated by a handle 29 to bring about the necessary adjustment of fence 25.

Cooperating with the fence 25 to properly align a panel are a plurality of manually operable stops or abutment members 31, and electrically actuated stops 32, as best seen in FIG. 1. Referring also to FIGS. 11 and 12, it can be seen that the manually operable stops 31 are pivotally connected to a rod 33 which is attached to frame 12 and disposed parallel to fence 25. Member 31 can be pivotally moved between panel abutting and non-abutting positions on rod 33, and can be held in the desired position by means of threaded bolts 34 which frictionally engage rod 33. Stops 31 can also be adjustable moved along the length of rod 33 to establish the panel in a predetermined position with respect to the cutter assembly 14.

The stops 32 are disposed in a slot 35 disposed in table 13, and, as further seen in FIG. 13, are each actuated by a solenoid 36 mounted below table 13. Solenoid 36 has a plunger 37 to which the stop 32 is connected, so that upon application of current to the coil of solenoid 36, plunger 37 carries stop 32 above table 13 to abut the panel and hold it in a desired position.

Referring now to FIGS. 9 and 10 in combination with FIG. 2, it can be seen that the clamping mechanism 16 consists of a pair of elongated clamping members 41 which are supported at each end by a frame 42. Frame 42 offers adjustable support to each clamping member 41 by means of a threaded clamping knob 43 which operates through a slot 44 in frame 42.

Disposed at opposite ends of the clamping mechanism 16 are a pair of hydraulic actuators 45 each of which has a plunger 46 that carries its respective frame member 42. Each of the actuators 45 is a piston-cylinder arrangement with hydraulic inlets 47, 48 disposed on either side of the piston. A hydraulic line 49 provides a common connection to both inlets 47, and a similar hydraulic line 50 serves the same function for inlets 48. Thus, upon application of hydraulic fluid from a source (not shown) to hydraulic line 49, the pistons in both actuators 45 would be forced downwardly, causing the members 41 to forcibly clamp the panel to table 13. Application of hydraulic fluid to line 50 moves members 41 to a panel-releasing position.

Referring now to FIGS. 5 and 6, the track 15 can be seen to consist of a pair of outwardly disposed flange portions 51 connected to the overhead member 22 of frame 12. The track-riding portion of cutter assembly 14 consists of a pair of grooves 52 formed by an upper support plate 53 and four members 54 with members 55 bolted thereto. As seen in FIG. 3, cutter assembly 14 is advanced along track 15 by an endless belt or chain 56, to which it is clamped by plates 57 and bolts 58. Endless chain 56 is reversibly actuated by a reversible motor 59, which drives a gear-reducing mechanism 60 by means of a belt 63. Gear-reducing mechanism 60 has a driving sprocket 61 that operates in association with an idler sprocket 62 to advance and retract cutter assembly 14 in accordance with operation of the motor 59.

The cutter assembly 14 is shown in detail in FIGS. 4—8. It includes a pair of electric motors 64 each of which drives a cir-

cular saw blade 65 through a belt 66 and bearing housing 67. The motor 64 and bearing housing 67 are respectively mounted on vertical support plates 68, 69, which are in turn carried by a horizontally disposed support plate 70. As best seen in FIG. 5, each of the bearing housings 67 is adjustable on its associated support plate 69 by means of a threaded bolt 71 which passes through an extension 72 of housing 67 and abuts a flange portion 73 forming part of support plate 69. Adjustment of housing 67 with respect to plate 69 is permitted by the slots 75, and when the proper position is established a plurality of bolts 74 tighten housing 67 to plate 69.

Forming part of the cutter assembly 14 is an elevating mechanism disposed within the overhead support 22, which consists of a hydraulic actuator 81, as best seen in FIG. 7, and four rod-and-guide means 82, one of which is specifically disclosed in FIG. 8.

Actuator 81 is mounted on supporting plate 53 (previously discussed with respect to FIG. 6) by a plurality of threaded bolts 83. Preferably, actuator 81 is a piston-cylinder arrangement having hydraulic inlets 84, 85 disposed at opposite ends of the cylinder to enable reversible movement of the piston in accordance with application of hydraulic fluid to a selected inlet.

Output of the piston-cylinder is realized by a plunger 86 that extends through an opening in support plate 53 and is connected to support plate 70 by means of an overlying flange plate 87 bolted thereto.

The rod-and-guide means 82 consists of a rod 91 that is firmly attached to support plate 53 by means of a bolted overlying flange plate 92. Disposed at the lower end of rod 91 is a cap 93 which is slidably adjustable on rod 91 by means of a threaded member 94 and a nut 95. As constructed, the bottom face of overlying flange plate 92 and the upper edge of cap 93 serve as upper and lower limits, respectively, for the support plate 70 as it is moved upward and downward by the actuator 81. The use of four rod-and-guide means 82 insures accurate alignment of the cutter assembly 14 when it is lowered to a panel-cutting position.

As best seen in FIGS. 2 and 5, there is disposed on one side of the overhead frame 22 a pair of limit switches 101, 102 which are used to control the woodworking machine in part. The limit switches 101, 102 are normally biased into one state of operation, and include a downwardly disposed roller member 103 which can be displaced against the bias to change the state of switch operation. Displacement of the roller 103 is effected by a projecting tab 104 (see also FIG. 2) which forms part of support plate 55.

A small panel 105 (FIG. 1) provides centralized control of the woodworking machine, and manual actuation of any of its control switches can effect movement of the clamping mechanism, advancement or retraction of the cutting assembly 14, upward or downward movement of the elevating mechanism 81 or selective movement of any of the solenoid-actuated stops 32. Although not disclosed, it is possible to incorporate additional control means so that after a particular stop 32 has been selected and the panel properly oriented on table 13 against fence 25 and the selected stop 32, actuation of a single switch on control panel 105 will sequentially cause clamping means 16 to clamp the panel against table 13, lower cutter assembly 14 to a predetermined groove-forming position and advance cutter assembly 14 by endless chain 56 through the panel to form the groove. When roller 103 of limit switch 101 is displaced by tab 104, cutter assembly 14 is elevated to a non-cutting position, clamping means 15 is raised to a panel-releasing position and cutter assembly 14 is retracted toward its initial position where it comes to rest as tab 104 displaces roller 103 of limit switch 102.

What is claimed is:

1. Apparatus for forming grooves in a panel having edges and planar surfaces, comprising:
  - a. frame means;
  - b. support means carried by the frame means for supporting the panel in an operating plane;
  - c. a movable groove forming cutter assembly;

- d. and track means carried by the frame means for supporting and guiding the cutter assembly through straight-line movement with respect to a planar surface of the panel;
- e. the cutter assembly comprising

1. first and second relatively movable frame portions, the second frame portion operably connected to the track means;
  2. first and second rotary cutting elements carried by the first frame portion and lying in planes disposed at predetermined angles relative to the operating plane and which intersect each other at a predetermined point above the support means;
  3. power means carried by the first frame portion for rotating the cutter elements;
  4. rod means carried by one of said first and second frame portions and including first and second abutment surfaces;
  5. guide means carried by the other of said first and second frame portions for guidably receiving the rod means;
  6. the first abutment surface disposed to abut said other frame portion at a position corresponding to a panel-cutting position;
  7. the second abutment surface disposed to abut said other frame portion at a position corresponding to a non-cutting position;
  8. and reversible motor means for effecting guided movement of the first frame portion with respect to the second frame portion.
2. The apparatus as defined by claim 1 and further comprising hold-down means for maintaining the panel in firm engagement with the support means during movement of the cutter assembly.
  3. The apparatus as defined by claim 2 wherein the hold-down means comprises:
    - a. an elongated clamping member disposed parallel to the operating plane;
    - b. and hydraulic means for actuating the clamping member between panel-clamping and non-clamping positions.
  4. The apparatus as defined by claim 1, and further comprising drive means for moving the cutter assembly along the track means.
  5. The apparatus as defined by claim 4, wherein the drive means comprises:
    - a. a reversible motor carried by the frame means and having a first sprocket wheel rotatably mounted thereon;
    - b. idler means carried by the frame means and having a second sprocket wheel;
    - c. and an endless chain operably connected between the first and second sprocket wheels;
    - d. the cutter assembly being operably connected to the chain.
  6. The apparatus as defined by claim 1, wherein the support means has a flat surface, the operating plane is essentially horizontal and the track means is disposed above the flat surface and parallel to the operating plane.
  7. The apparatus as defined by claim 1, wherein:
    - a. the cutter assembly includes first and second grooves disposed on opposite sides thereof;
    - b. and the track means comprises an elongated supporting member having first and second outwardly disposed flange portions, the flange slidably mated with the first and second grooves, respectively.
  8. The apparatus as defined by claim 1, wherein:
    - a. the panel is rectangular;
    - b. and further comprising alignment means operating in association with the support means, the alignment means comprising
      1. fence means disposed essentially perpendicular to the track means, the fence means adapted to slidably receive and align a side edge of the panel.
  9. The apparatus as defined by claim 8, wherein the alignment means further comprises stop means for abutting a selected one of the panel front and rear edges and retaining the panel in a predetermined position along the fence means.

10. The apparatus as defined by claim 9, wherein the stop means comprises:

- a. an elongated rod member carried by the frame means and disposed essentially parallel to the fence means;
- b. and a plurality of abutment members spaced along the rod member and pivotally supported thereby, the abutment members pivotally movable between panel-abutting and non-abutting positions.

11. The apparatus as defined by claim 9, wherein:

- a. the support means includes an elongated slot portion;
- b. and the stop means comprises a plurality of spaced, electromagnetically-operated abutment members disposed in the slot portion and carried by the frame means, the abutment members movable between panel-abutting and non-

abutting positions.

12. The apparatus as defined by claim 8, wherein the fence means is adjustable with respect to the support means along a line parallel with the track means.

13. The apparatus as defined by claim 1, wherein:

- a. the cutter element are circular saw blades;
- b. and the power means comprises
  1. a motor for each saw blade;
  2. an adjustably mounted bearing housing associated with each motor, the circular saw blade rotatably mounted on the respective bearing housings;
  3. and a belt for connecting each of the bearing housings with its respective motor.

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