

April 8, 1958

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2,829,686

DEVICE FOR FORMING CURVED GROOVES IN WOOD

Filed April 25, 1955

3 Sheets-Sheet 1

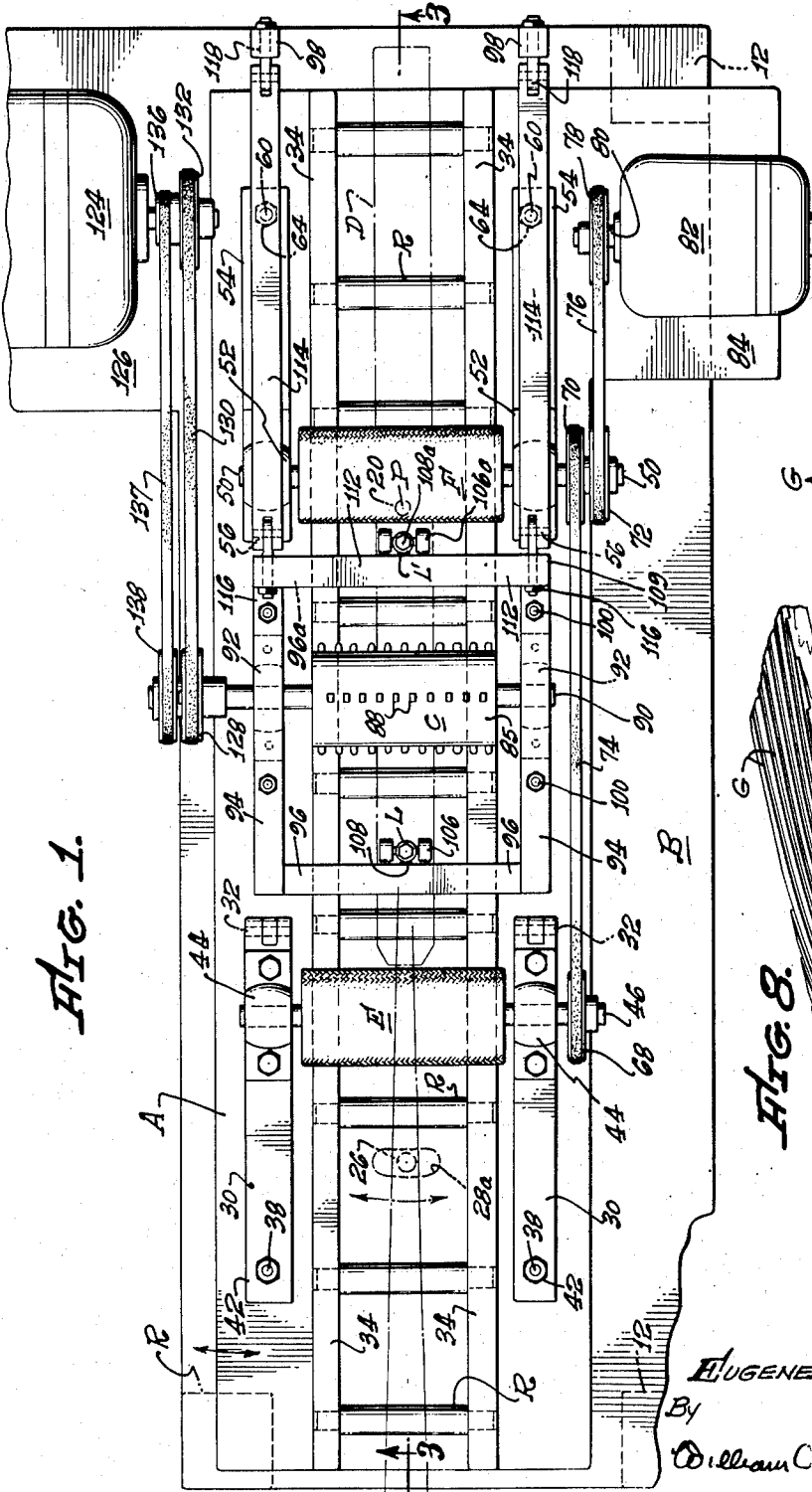


FIG. 1.

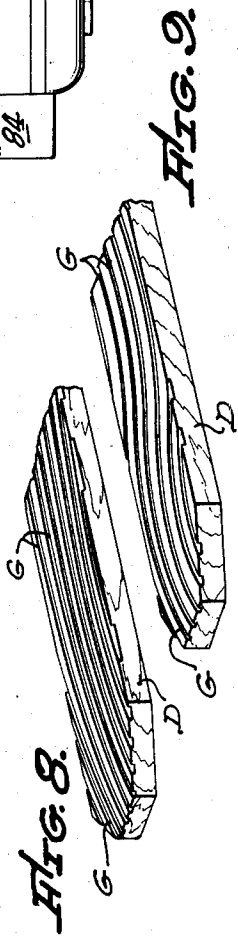


FIG. 2.

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3 Sheets-Sheet 2

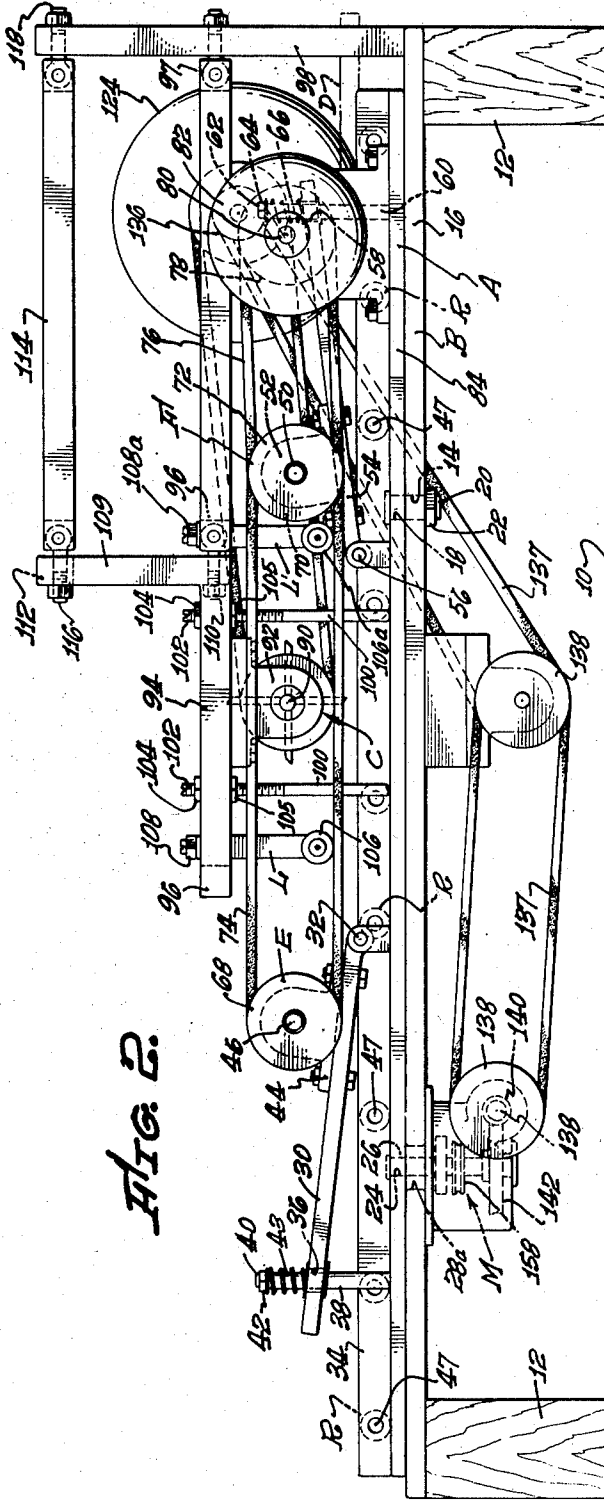


FIG. 2.

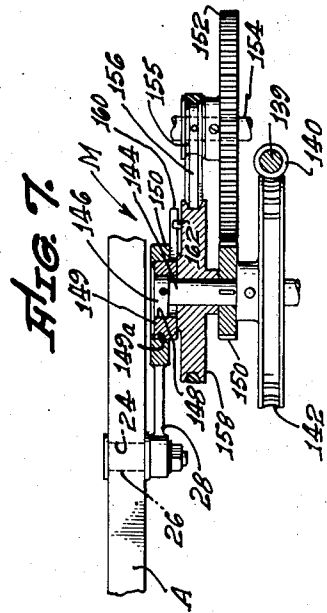


FIG. 7.

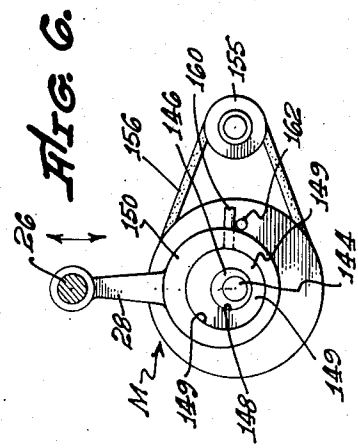


FIG. 6.

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3 Sheets-Sheet 3

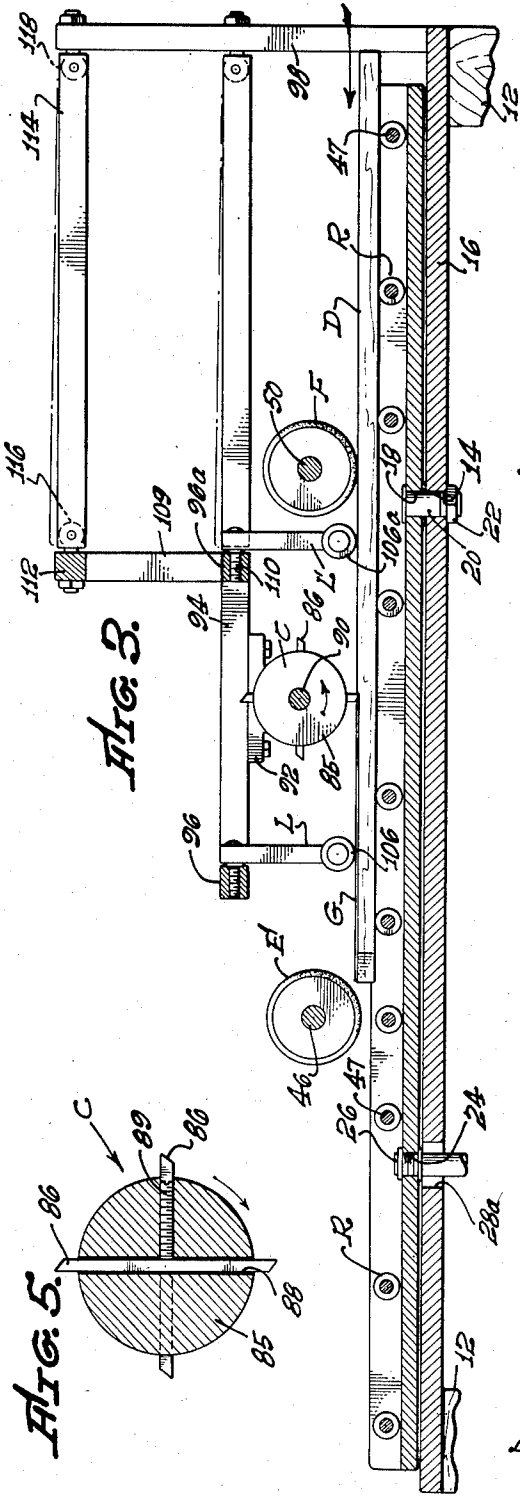


FIG. 3.

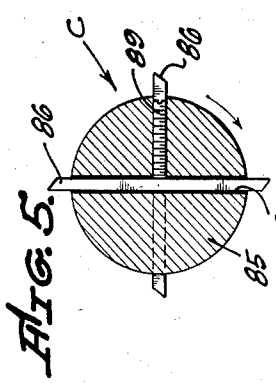


FIG. 5.

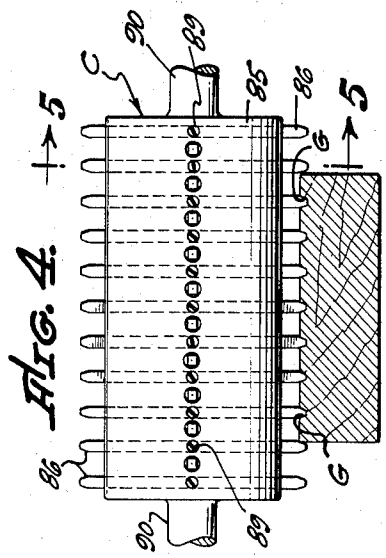


FIG. 4.

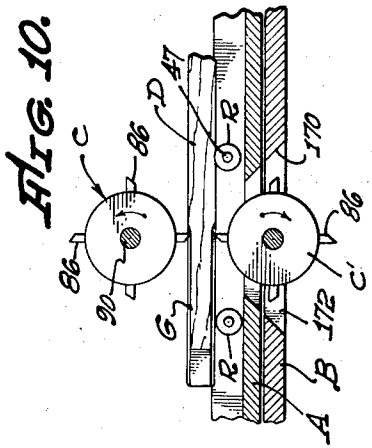


FIG. 10.

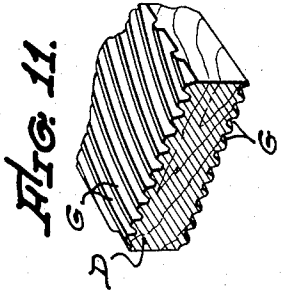


FIG. 11.

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**DEVICE FOR FORMING CURVED GROOVES
IN WOOD**

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Application April 25, 1955, Serial No. 503,608

3 Claims. (Cl. 144-136)

The present invention relates generally to the field of woodworking equipment, and more particularly to an apparatus and method used in imparting a continuous sequence of decorative curved parallel grooves of regular or irregular form to flat wooden surfaces and other flat sheet stock adapted to be so treated.

A relatively recent woodworking development is that of carving a plurality of parallel grooves in the surface of inexpensive soft woods which imparts an improved decorative appearance thereto due to its lack of well-defined grain structure inherently formed in the more expensive hard woods.

A major object of the present invention is to provide an apparatus and method of forming a plurality of parallel curved grooves in the exterior surfaces of fence stakes or the like, which imparts a pleasingly rustic appearance thereto.

Another object of the invention is to provide a carved wooden surface which presents the appearance of being hand worked, in that the configurations formed therein may be carved in an irregular pattern.

Yet another object of the invention is to supply an apparatus and method by means of which a plurality of parallel irregularly curved grooves may be carved in separate flat surfaces, with the individual patterns on each surface being of such design that when assembled to present a continuous surface area, the over-all design thereof is unusually decorative.

These and other objects and advantages of the invention will become apparent from the following description of a preferred form thereof, when taken in conjunction with the drawings illustrating that form, in which:

Figure 1 is a plan view of the device of the invention by means of which parallel grooves of the desired curve or form may be formed in flat sheet stock;

Figure 2 is a side elevational view of the device;

Figure 3 is a vertical cross-sectional view of the device taken on line 3-3 of Figure 1;

Figure 4 is a front elevational view of one of the rotatable cutters utilized with the device;

Figure 5 is a vertical cross-sectional view of the cutter taken on line 5-5 of Figure 4;

Figure 6 is a top plan view of the mechanism employed for reciprocation of the bed of the device;

Figure 7 is a side elevational view of the reciprocating mechanism shown in Figure 6;

Figure 8 is a perspective view of a fragment of a wooden stake showing a plurality of parallel curved grooves formed therein by means of the present invention;

Figure 9 is a perspective view of a fragment of wooden stake in which sequence of parallel irregularly curved grooves has been formed by the invention.

Figure 10 is a fragmentary vertical cross-sectional view of an alternate form of the invention embodying dual cutters which engage both the top and bottom surfaces of sheet stock as it passes therethrough; and

Figure 11 is a perspective view of a fragment of wooden

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material showing a sequence of parallel curved grooves formed in the upper and lower surfaces thereof.

Referring now to Figures 1 and 2 of the drawing for the general arrangement of the invention, it will be seen to include a base B on which a table A is so movably mounted as to permit lateral reciprocation thereof upon actuation of a mechanism M shown in Figures 6 and 7. A vertically movable power-driven cutter C is positioned above table A and is maintained in substantially fixed lateral and longitudinal position relative thereto. A plurality of transversely disposed, longitudinally spaced rollers R are supported on table A, on which rollers sheet stock D movably rest. The sheet stock D on one surface of which grooves are to be formed is inserted into the rear of the apparatus and advanced forwardly over rollers R to be subjected to the action of cutter C. During cutting thereof the sheet stock is gripped between rollers R and one or both of two pressure rollers E and F.

The base B is rectangular, as shown in Figure 1, and may be fabricated from either wood or metal so long as the selected material possesses sufficient rigidity to remain in a substantially horizontal position when subjected to a relatively heavy load. Base B is supported at a convenient elevation above a ground or floor surface by means of four legs 12 disposed at the corners thereof. A first vertical bore 14 is formed in the rear end portion 16 of base B which is in alignment with a vertical bore 18 formed in table A. Bores 14 and 18 are movably engaged by a bolt 20 which is removably held in place therein by a nut 22.

A second vertical bore 24 is formed in the forward end portion of table A, and is pivotally engaged by a pin 26 that extends upwardly thereinto from a transverse, slightly curved slot 28a formed in base B. Slot 28a is sufficiently long to permit lateral reciprocation of pin 26 when it is actuated by an arm 28, as will hereinafter be described in detail. The reciprocating motion imparted to pin 26 causes concurrent lateral reciprocation of table A relative to base B. Bolt 20 serves as a pivot point for table A and determines the radius of reciprocation of each point on the surface of table A. It will be readily apparent that the greater the longitudinal distance is between a point and bolt 20, the greater the transverse distance will be as it reciprocates due to the movement imparted to table A by pin 26.

For the reciprocating motion of table A to effect the line of grooves G carved into the surface of wood D, it is essential that the wood be held laterally stationary on rollers R. To this end, two longitudinally extending arms 30 are provided that are pivotally connected on their rearwardmost ends by pins 32 to two parallel, laterally spaced channels 34 which are affixed by conventional means to the upper surface of table A. Vertically extending bores 36 are formed in the forward portions of arms 30. Bores 36 movably receive rigid rods 38, on the lower ends of which channels 34 are rigidly affixed, as seen in Figure 2. The upper end portions of rods 38 are provided with threads 40 that are engaged by nuts 42. Helical springs 43 encircle rods 38 between the lower surfaces of nuts 42 and the upper surfaces of arms 30. Two journal boxes 44 of conventional design are mounted on the upper surfaces of arms 30 by bolts or other means. A transverse shaft 46 is rotatably supported by journal boxes 44, and the pressure roller E is mounted on shaft 46. The compression on springs 43 may be increased by screwing nuts 42 downwardly, and in this manner the force exerted on roller E may be controlled.

In addition to supporting rods 38 on the forward portions thereof, channels 34 also have a number of longitudinally spaced, transversely disposed shafts 47 extending therebetween that form a part of rollers R. Thus, when

the sheet stock D is positioned on the forward portion of table A, it is gripped between rollers R and pressure roller E whereby lateral movement of the stock relative to the table is prevented.

Stock D is also prevented from moving laterally on the rear portion of table A by pressure roller F, which is mounted on a transversely disposed shaft 50 that is rotatably supported between two journal boxes 52. These journal boxes are affixed to longitudinally disposed arms 54 (Figure 2) which are pivotally connected at their forward end portions to channels 34 by pins 56. Vertical bores 58 are formed in the rear portions of arms 54, which bores movably engage rods 60 that extend upwardly thereinto from channels 34. Threads 62 are provided on the upper end portions of rods 60 which threads are engaged by nuts 64. Helical springs 66 encircle rods 60 between the lower face of nuts 64 and the upper faces of arms 54. When nuts 64 are screwed downward, springs 66 are compressed and exert the desired force on pressure roller F.

As best seen in Figure 1, a pulley 63 is rigidly affixed to one end portion of shaft 46, and two pulleys 70 and 72 are rigidly mounted on shaft 50. Pulleys 63 and 70 are in longitudinal alignment and an endless belt 74 extends therebetween. A second endless belt 76 extends from pulley 72 to a driving pulley 78 that is affixed to the innermost end of a drive shaft 80. Shaft 80 is a part of and rotated by an electric motor 82 mounted on a suitable shelf 84 projecting outwardly from table A. Actuation of motor 82 causes pressure rollers E and F to rotate in a counter clockwise direction to advance sheet stock D forwardly over rollers R.

The cutter C (Figures 1 to 5) is a horizontal transversely positioned cylinder 85 having a number of axially spaced cutter members 86 extending therethrough, which cutter members are removably mounted in transverse bores 88 formed in cylinder 85. Bores 88 and cutter members 86 situated therein are alternately disposed 90° relative to one another. Screws 89 are preferably utilized to hold cutter members 88 in place in cylinder 85. Cutter C is situated intermediate pressure rollers E and F and parallel thereto. Shafts 90 project from the ends of cylinder 85 and are rotatably supported in journal boxes 92. Journal boxes 92 are rigidly affixed to the lower faces of two identical side pieces 94, the forward ends of which are rigidly connected by a cross piece 96. The rear ends of side pieces 94 are pivotally connected by pins to two rigid uprights 98. The lower ends of uprights 98 are affixed to base B by conventional means.

Each side piece 94 is formed with two longitudinally spaced downwardly extending bores in which two vertically adjustable rigid bars 100 are mounted. The upper end portions of bars 100 have threads 102 formed with two longitudinally spaced downwardly extending bores in which two vertically adjustable rigid bars 100 are mounted. The upper end portions of bars 100 are provided with threads 102 which are engaged by nuts 104 and 105. Nuts 104 and 105 grip side pieces 94 with which they are associated to hold bars 100 at the desired downwardly extending positions relative thereto. Bars 100, as may best be seen in Figure 2, restrict downward movement of side pieces 94 relative to table A.

A second cross piece 96a extends between side pieces 94, rearwardly from cutter C, and two rigid legs L and L' depend down from cross pieces 96 and 96a respectively, and rollers 106 and 106a are rotatably mounted on the lower ends of these legs. The upper end portions of legs L and L' are threaded, and they may be vertically adjusted by means of nuts 108 and 108a associated therewith. Rollers 106 and 106a engage the upper surface of sheet stock D as it is advanced forwardly on rollers R.

A pair of rigid uprights 109 are in vertical alignment with side pieces 94. The lower end portions of these uprights are affixed to, and project upwardly from cross pieces 96 by bolts 110. The upper ends of uprights 109

are rigidly joined by a transverse end piece 112. Two longitudinally disposed side pieces 114 are also provided, the forward ends of which are connected to uprights 109 by eye bolts 116, and the rear ends thereof are pivotally connected to uprights 98 by eye bolts 118. It will be seen that the above-described structure provides a rigid, but vertically movable support for cutter C. Due to the pivotal construction of this cutter support, the cutter C may be vertically adjusted to the thickness of sheet stock being worked.

A second electric motor 124 is mounted on a horizontal support that projects from base B. Motor 124 also drives a second pulley 136 from which a belt 137 extends forwardly to a pulley 138 forming a part of mechanism M shown in detail in Figures 2, 6 and 7. Pulley 138 is mounted on a shaft 139, which when actuated causes rotation of a worm 140 that engages a horizontally disposed gear 142. Gear 142 is rigidly affixed to the lower end of a vertical shaft 144, on which shaft an off-centered rigid disc 146 is affixed that serves as a cam. Disc 146 slidably and rotatably engages the side wall of a circular opening 148 formed in a floating cam 149 which in turn engages an opening 149a formed in a plate 150. Arm 28 extends from plate 150 to the pin 26 (Figs. 1, 2, 6 and 7). It will be apparent that actuation of motor 124 causes rotation of disc 146 and floating cam 149 to effect lateral reciprocation of table A. The table A reciprocates equal distances on each side of the centerline of base B. This lateral reciprocal movement of table A in conjunction with the rotation of cutter C results in curved grooves of substantial uniformity being formed in the sheet stock as it is fed through the invention.

When it is desired to form grooves G of irregular curvature as shown in Figure 9 in sheet stock D, a first gear 150 is provided that is mounted on shaft 144 and meshes with a second gear 152 that is rigidly affixed to a shaft 154. The shaft 154 drives a pulley 155 that is engaged by an endless belt 156 that extends to a pulley 158 rotatably mounted on shaft 144.

The floating cam 149 has an arm 160 extending outwardly therefrom that is disposed just above the upper surface of pulley 158. Pulley 158 is provided with a pin 162 that extends upwardly therefrom. This pin 162 when pulley 158 is rotated, contacts arm 160 and causes the floating cam 149 to rotate. It will be apparent that concurrent rotation of both cam 146 and floating cam 149 imparts a complex irregular reciprocating movement to arm 28 and one that is imparted to the motion of table A. By reciprocating the table A in this manner grooves G of an irregular configuration as shown in Figure 9 can be carved in the surface of sheet material D as it advances forwardly on rollers R. When it is desired to form curved grooves G of regular configuration, the belt 156 is simply removed from pulleys 155 and 158.

Upon occasion it may be desired to carve curved grooves G in both the upper and lower surfaces of sheet material D. This is easily accomplished by simply modifying the invention above described by forming a transverse opening 170 in the table A and base B under the cutter C. A second cutter C' is rotatably mounted in this opening and supported by conventional bearings in a suitable frame 172. The cutter C' is driven concurrently from the same power source used in driving cutter C.

The use and operation of the invention is extremely simple. The motors 82 and 124 on the device are caused to rotate, with the cutter C being rotated, and the table A and rollers R mounted thereon concurrently reciprocated due to the actuation of the mechanism M. In addition, the rollers E and F are caused to rotate at a constant speed. The vertically adjustable bars 100, shown in Figure 2, are so adjusted that the rollers E and F forcibly engage the upper surface of the sheet material D that is to have grooves G formed therein. The bars 100 limit the maximum downward movement of cutter

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C relative to the sheet material D, and grooves G of uniform depth are as a result carved therein. It will be particularly noted in the operation of the invention that the material D is at all times rigidly gripped between the rollers R and pressure rollers E and F as it is moved forwardly through the device. Thus, lateral movement or slippage of the sheet material D relative to the table A is avoided, and the reciprocatory movement imparted to the table A by mechanism M is truly reflected in the curved configuration of grooves G.

A particularly important operational advantage of the invention is that the sheet material is advanced there-through at a uniform rate by rollers E and F, and when so advancing can be subjected to regular reciprocatory motion. In this manner it is a simple matter to make numerous carved configurations of grooves G in sheets D, and the carved configurations of grooves on one piece D substantially identical to the configurations on the balance of the sheets.

The manner by which the mechanism M is used to form grooves G of either regular or irregular configuration has been explained in detail and need not be repeated.

Although the apparatus and method used in forming curved carved grooves in both the upper and lower surfaces of sheet material has been found to provide the advantages and produce the results heretofore described, it is to be understood that it is merely the presently preferred embodiment of the invention and that I do not mean to be limited to the details of construction herein shown and described, other than as defined in the appended claims.

The invention claimed is:

1. A device for use in carving a plurality of parallel longitudinally extending grooves of curved configuration in sheet material as said sheet material is moved longitudinally through said device that includes: an elongate substantially rectangular horizontally disposed base; an elongate substantially rectangular table positioned above said base and parallel thereto; means for transversely reciprocating said table relative to said base; two laterally spaced members mounted on the upper surface of said table; a plurality of rollers so rotatably supported in fixed relationship to said members that said rollers movably support said sheet material on said table; a plurality of transversely disposed and longitudinally spaced driven rollers situated above said table-supported rollers; means for driving said driven rollers at a predetermined rate of rotation; spring means supported on said table that at all times urge said driven rollers into contact with said material to advance said sheet material over said table; a plurality of laterally and circumferentially spaced blades of substantially equal length which are disposed in fixed vertical cutting relationship relative to said material as same is advanced over said table; a rigid elongate member on which said blades are rigidly mounted, which member is positioned above said table in transverse relationship thereto; and means for driving said member to cause said blades to cut said grooves of

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said curved configuration in said material during advancement thereof over said table.

2. A device as defined in claim 1 in which two laterally spaced parallel arms are provided that are longitudinally disposed relative to said base and situated above said table, between which arms said elongate member is rotatably supported, and two uprights are affixed to the rearward end of said base to which said arms are pivotally connected.

3. A device as defined in claim 2 in which said arms are provided with a plurality of transverse, longitudinally spaced cross pieces on which a plurality of vertically adjustable members are mounted, which members have a plurality of rollers rotatably mounted on the lower end portions thereof, with said rollers movably engaging the upper surface of said sheet material as it is advanced over said table to control the depth of said grooves cut in said sheet material by said blades.

4. A device as defined in claim 3 in which said arms are provided with upwardly extending first members pivoted thereto, said uprights are provided with upwardly extending first members pivoted thereto, said uprights are provided with forwardly extending second members pivoted thereto, and said first and second members are pivotally connected at their junctions to provide two vertically disposed parallelogram-shaped frames that maintain said elongate member in the position to which it is adjusted.

5. A device as defined in claim 4 in which said means that reciprocate said table is a pin affixed thereto that is pivotally engaged by a rigid arm and a bearing is mounted on said arm, with a cam being provided that is driven by said power means and engages said bearing.

6. A device as defined in claim 5 in which an off-centered annular plate is provided that can be rotated to reciprocate said table, which plate is rotatably engaged by said cam.

7. A device as defined in claim 6 in which said floating cam is provided with means to rotate same by first drive means for said power means, and said annular plate is rotated by second drive means independent from said first drive means, which first and second drive means is actuated by said power means.

8. A device as defined in claim 7 in which a member is provided that extends outwardly from said floating cam; an upwardly extending pin that contacts said member; a rotatably supported pulley on which said pin is mounted; an endless belt that drives said pulley; a vertically positioned shaft on which said plate is disposed and on which said pulley is freely rotatable; and power transmission means for driving said belt and shaft, which transmission means is interposed between said belt and shaft and said power means.

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