United States Patent

[11] **3,540,498**

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[54] **MULTIPLE-CUT SAWING DEVICE**
1 Claim, 15 Drawing Figs.

[52] U.S. Cl. **143/6,** 143/36, 143/47; 144/3
[51] Int. Cl. **B27b 5/00**
[50] Field of Search ..... 143/47, 47.6, 38, 1, 6, 6.1—1, 6.2, 6.47, 33, 35, 36; 144/39, 3.3, 3.5, 3.6

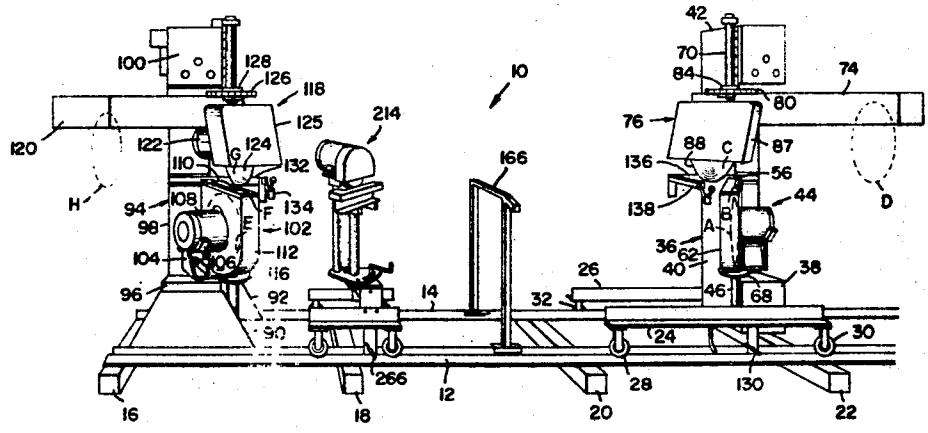
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2,662,563	1953	Grove	144/3UX

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ABSTRACT: Apparatus for making cuts on a workpiece which includes a pair of saws pivotal about a common axis and movable into and from the workpiece to make cuts therein, and another pair of saws disposed further along the workpiece and pivotal about another common axis and movable into and from the workpiece to make cuts therein.



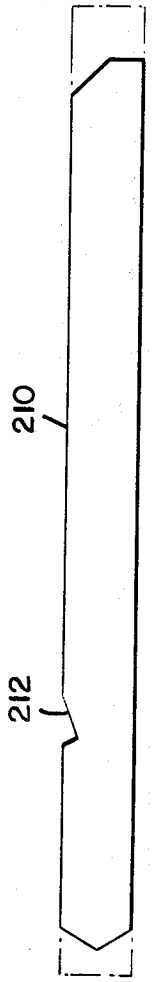


FIG_11

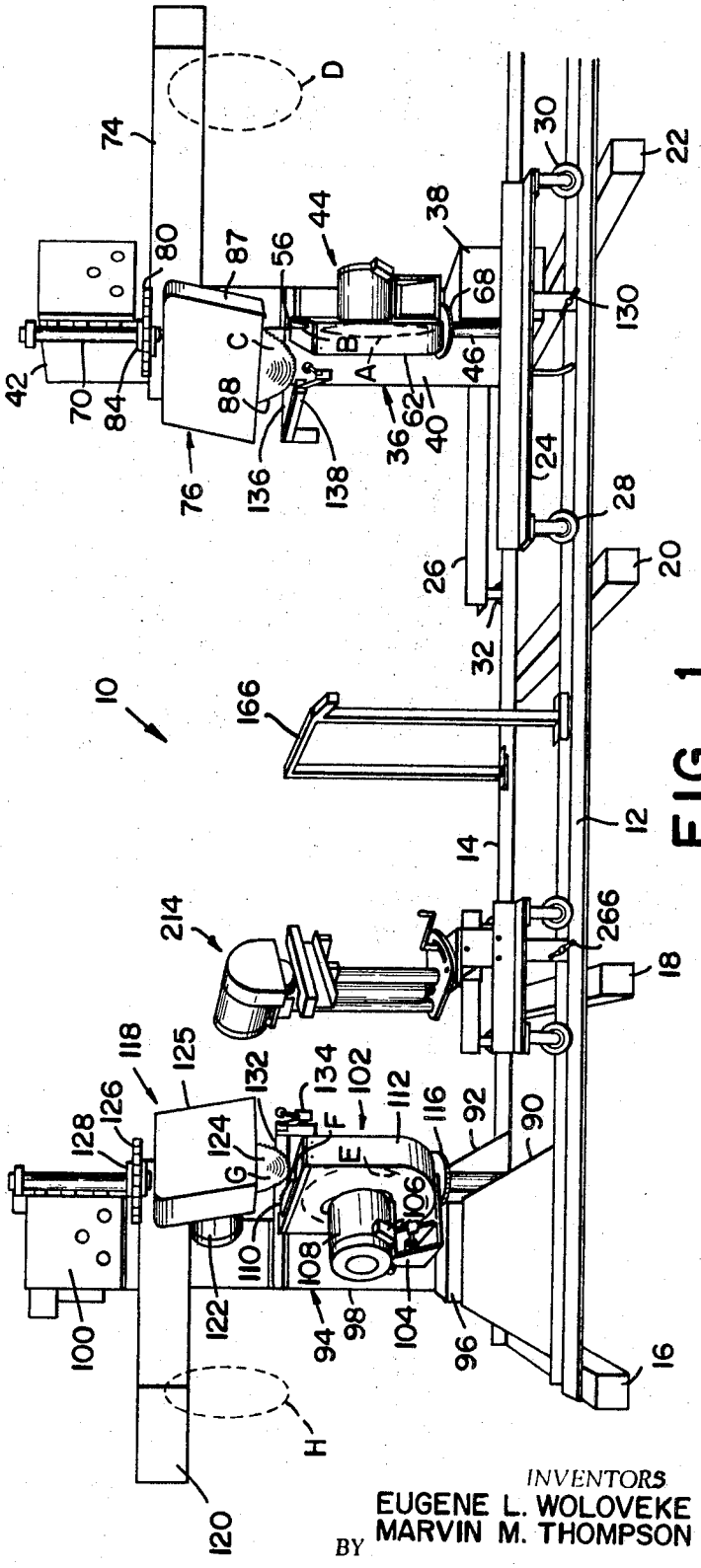


FIG_1

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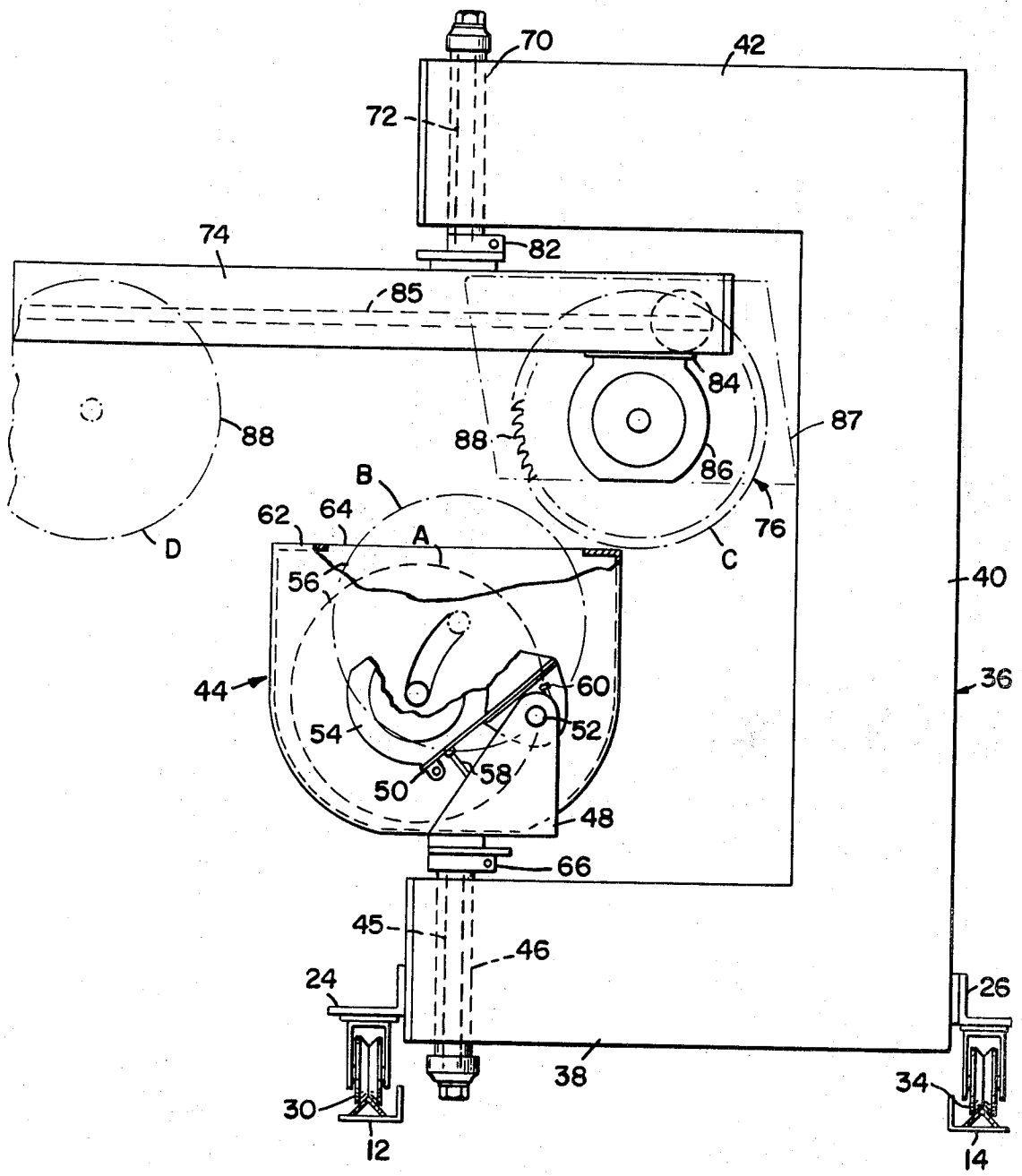


FIG_2

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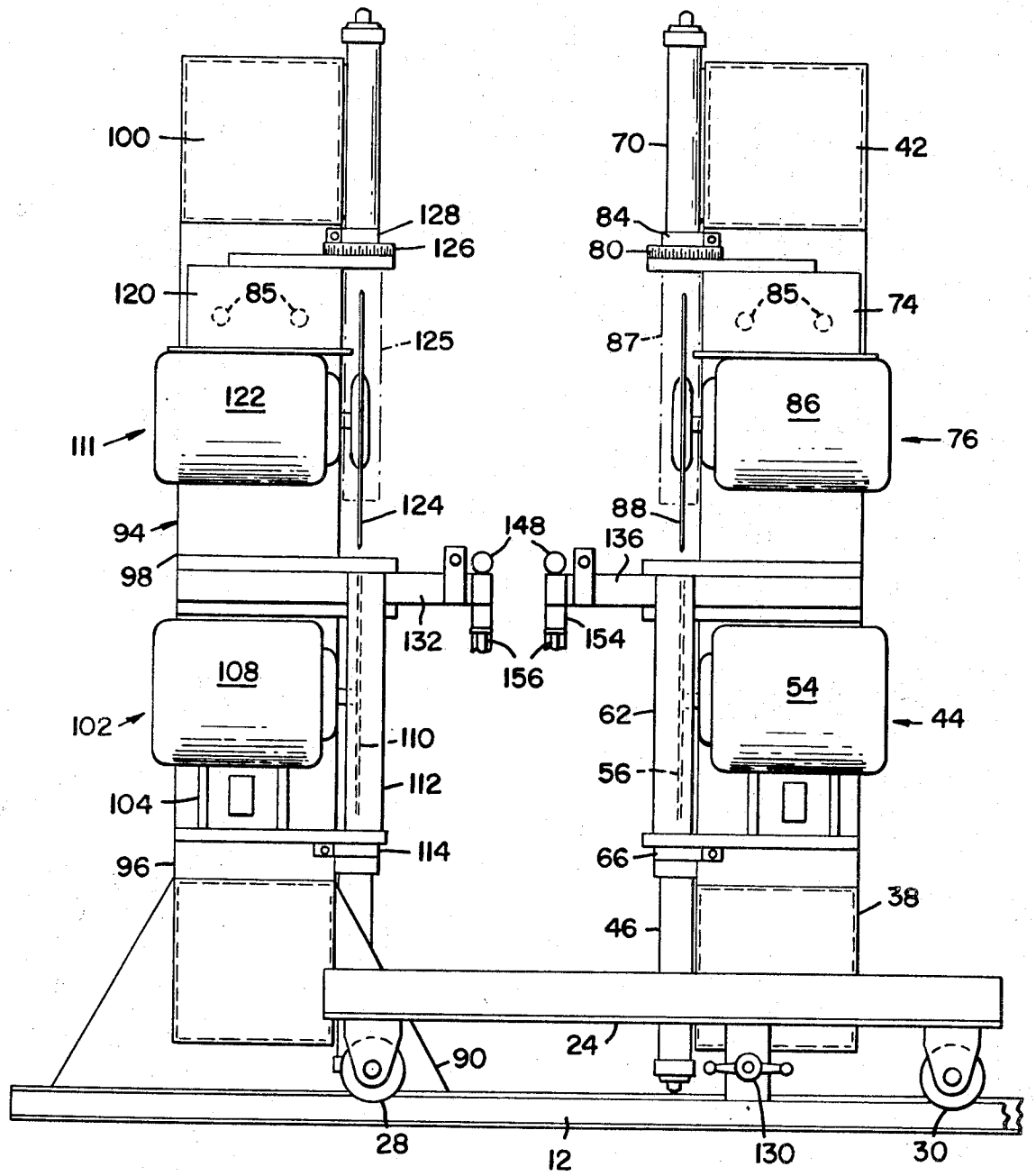


FIG_3

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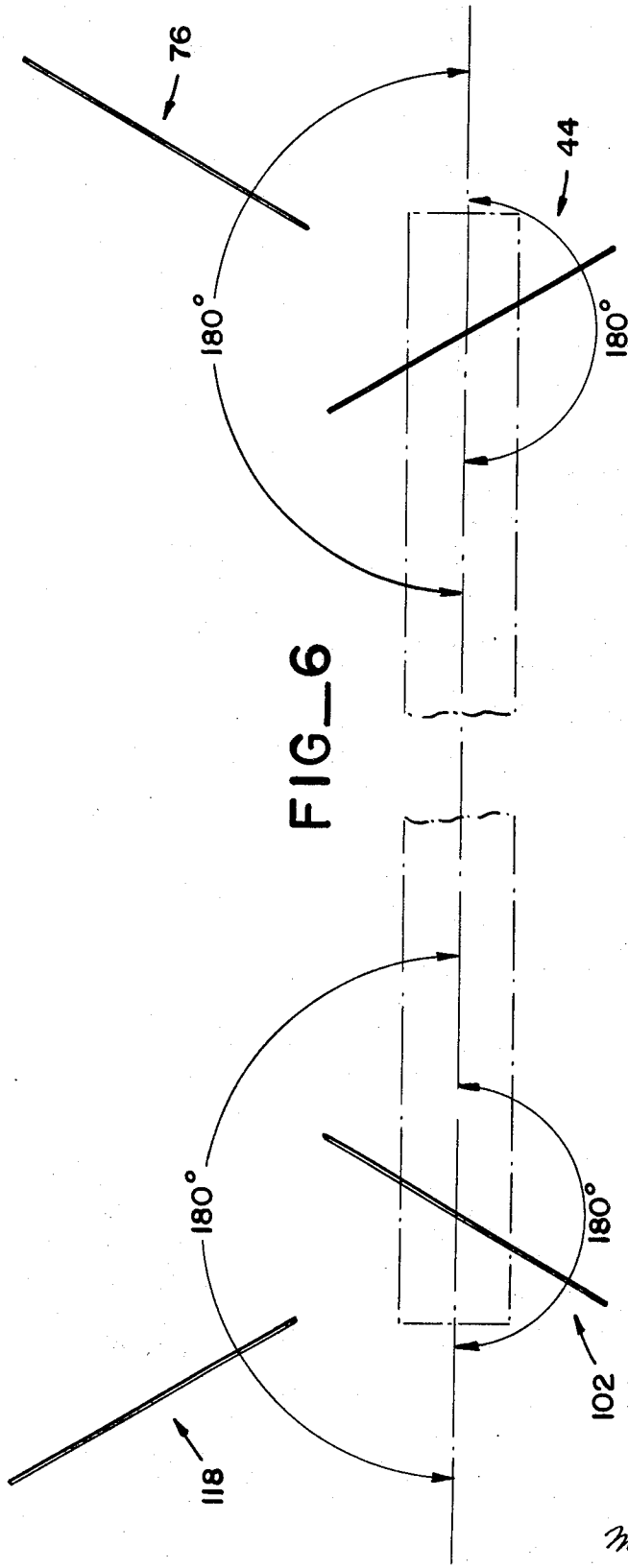


FIG_6

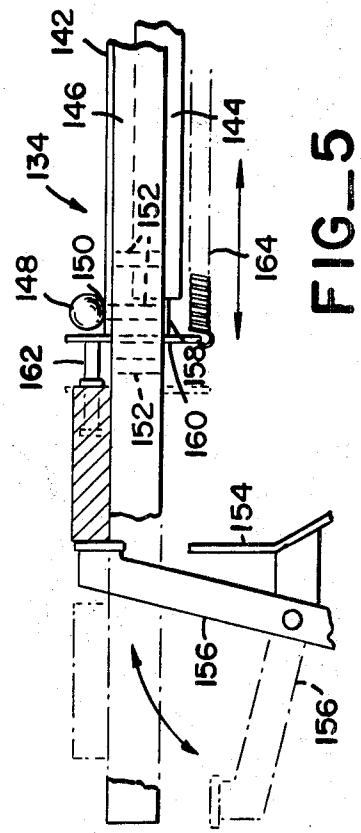


FIG_5

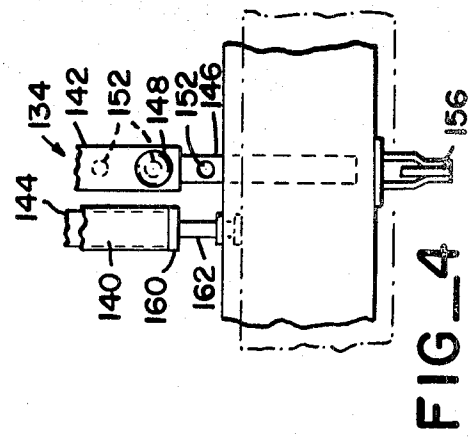


FIG_4

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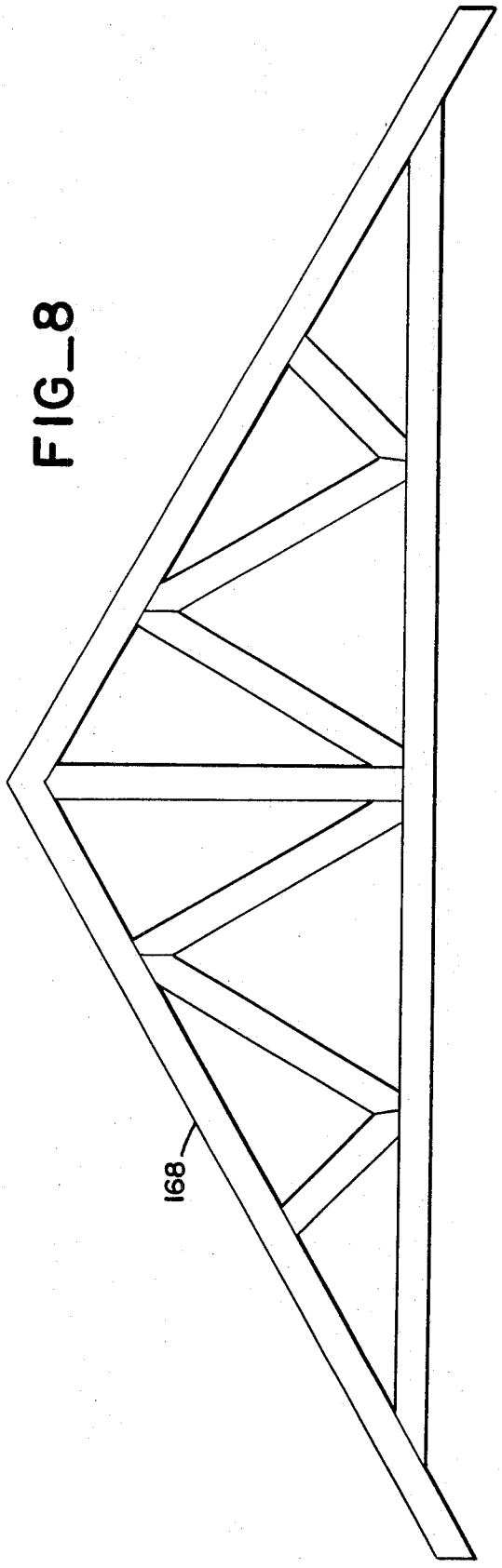


FIG_8

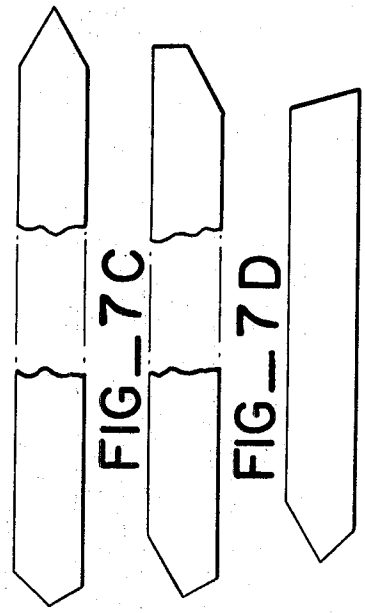


FIG_7C FIG_7D FIG_7E

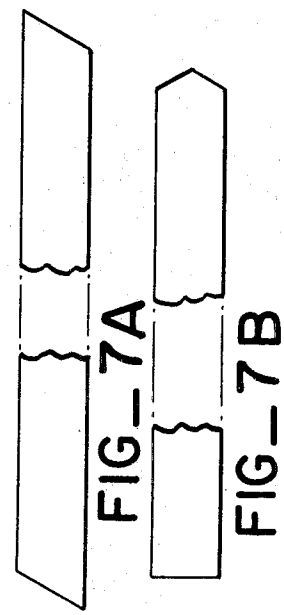


FIG_7A FIG_7B

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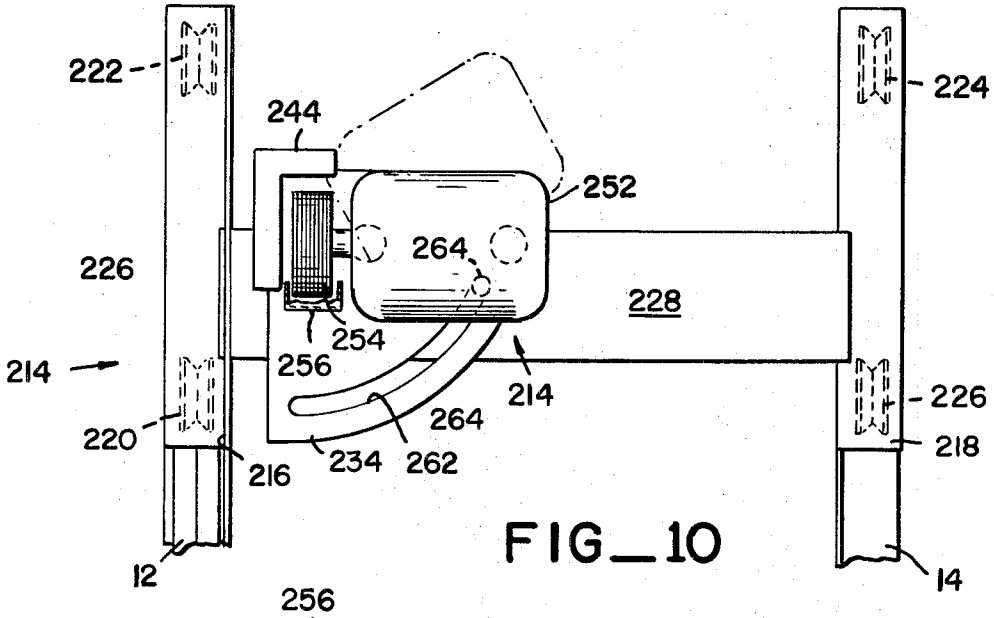


FIG_10

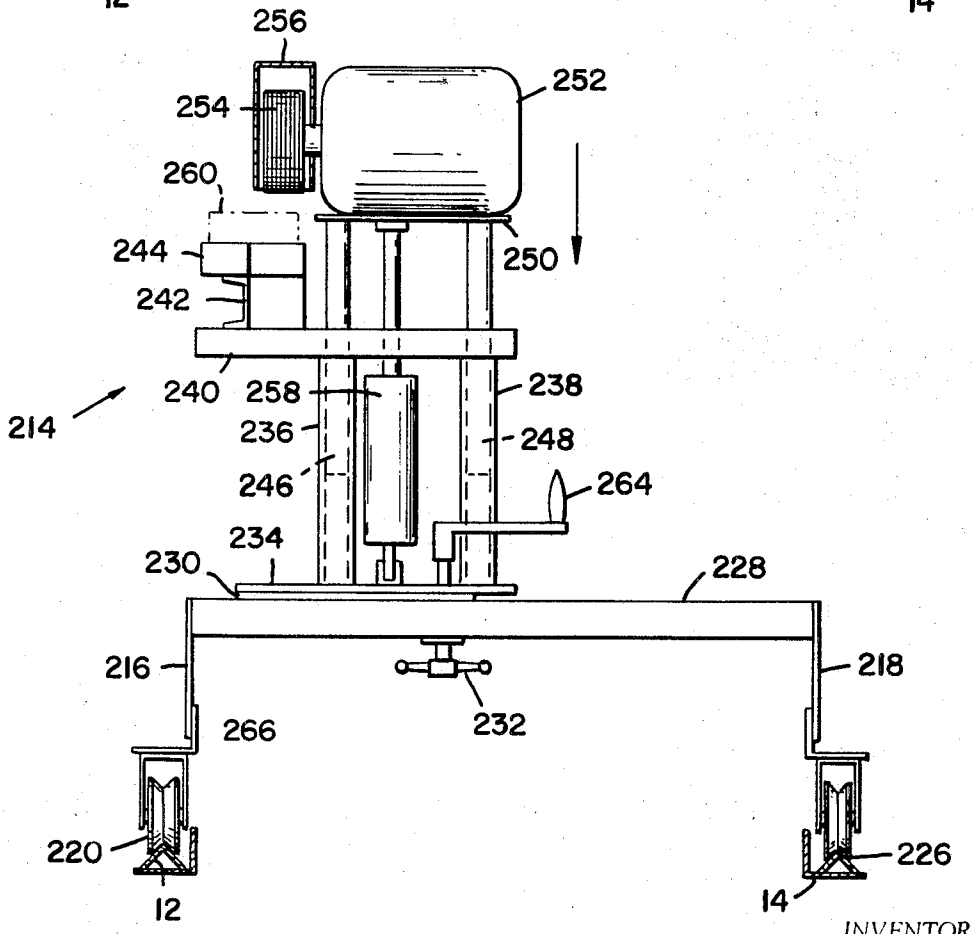


FIG_9

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MULTIPLE-CUT SAWING DEVICE

BACKGROUND OF THE INVENTION

This invention relates to a device which makes cuts in a workpiece, and more particularly to a device which is capable of making cuts on the ends of a workpiece by movement of saws into and from the workpiece.

In construction of houses, and the like, it is desirable, of course, to precut certain wooden frame pieces so that they can be assembled into a truss easily and conveniently. Generally, these frame pieces are relatively long, and require either a single cut or a pair of cuts on either end thereof. These cuts may vary in angle and depth from workpiece to workpiece, since the dimensions of the trusses vary from house to house. Obviously, it would be highly desirable to provide a device which is capable of making either a single desired cut or a pair of desired cuts on the ends of a workpiece, meanwhile being capable of performing on a variety of workpieces and operating in a most simple and efficient manner.

Devices for precutting a workpiece, such as a piece of wood or metal, are, of course, well known. These devices generally fall into one of two categories: cuts are made in the workpiece (1) by moving it into and from saws, or (2) by moving saws into and from it. The devices disclosed in U.S. Pat. Nos. 2,684,088 (Miller), 3,125,138 (Bolenbach), and 3,080,895 (Mayo) fall into the first category, while the devices in U.S. Pat. Nos. 2,917,089 (Ennis I), 3,295,570 (Olbrich), 2,918,950 (Le Tarte), 3,251,388 (Ennis II), and 2,814,319 (Hetman et al.) fall into the second.

Those devices which move the workpiece into the saws have the problem of moving the workpiece so that proper cuts are made, it of course being important that the saws actually cut in the manner desired. For any consistency of cuts to be achieved from workpiece to workpiece, it is clear that means must be provided to guide the workpieces in an accurate manner. This guiding problem is a substantial one, and becomes even greater when the workpiece to be moved is of relatively great length or of unusual configuration. None of the devices of the type found appear to overcome this problem in an efficient manner.

Of those devices found which move the saws into the workpiece to make cuts, U.S. Pat. Nos. 2,917,089 (Ennis I) and 3,251,388 (Ennis II) are concerned with mitering and kerfing machines, and while each of these machines is capable in a broad sense of making a pair of cuts on an end of a workpiece, neither is adapted to making a pair of cuts on that end as required for use in the usual type of truss. This is so because one of the cuts is actually a kerf. U.S. Pat. Nos. 2,814,319 (Hetman et al.), 2,918,950 (Le Tarte), and 3,295,570 (Olbrich) each teach a device which has a saw which moves to make a cut on the end of a workpiece. But none of these devices is capable of making a pair of cuts on the end of a workpiece, with the advantages attendant thereto.

It is therefore an object of this invention to provide a device which is capable of making a variety of pairs of cuts on a workpiece by moving saws relative to the workpiece.

It is a further object to provide a device which is capable of making a variety of pairs of cuts on both ends of an elongate workpiece by moving saws relative to the workpiece.

It is a still further object of the invention to provide a device which, while capable of fulfilling the above objects, is simple and efficient in operation.

SUMMARY OF THE INVENTION

Broadly stated, the apparatus for making a pair of adjacent cuts in a workpiece held thereby comprises a fixed saw mounted to the apparatus and movable into and from the workpiece. Means are included for moving the first saw into the workpiece, whereby a first cut is made in the workpiece. Means are included for moving the first saw from the workpiece. A second saw is pivotally mounted to the apparatus and movable independent of such pivoting into the workpiece adjacent the first cut made in the workpiece and from the workpiece. Means are included for moving the second saw into the workpiece, whereby a second cut is made in the workpiece adjacent the first cut, the pivotal mounting of the second saw allowing a variety of second cuts to be made in the workpiece. Means are included for moving the second saw from the workpiece.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects of the invention will become apparent from a study of the following specification and drawings, in which:

FIG. 1 is a perspective view of the device;

FIG. 2 is an end elevation of the device;

FIG. 3 is a side elevation of the device;

FIG. 4 is a plan view of a holding arm of the device;

FIG. 5 is a side elevation of the device of FIG. 4;

FIG. 6 is a plan view of the saw blades in the device, showing their pivotal travel;

FIGS. 7A through 7E are plan views of a number of workpieces cut by the device;

FIG. 8 is a side elevation of a truss which utilizes a number of workpieces cut by the device;

FIG. 9 is a side elevation of a device for making an intermediate cut in a workpiece;

FIG. 10 is a plan view of the device of FIG. 9; and

FIG. 11 is a plan view of a workpiece having an intermediate cut thereon as made by the device of FIGS. 9 and 10.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, the sawing device 10 is generally shown in FIG. 1. The device 10 includes a pair of parallel tracks 12 and 14 mounted on blocks 16, 18, 20, 22. A pair of runners 24, 26 each mounted on a pair of wheels 28, 30, and 32, 34, respectively, have fixed thereto a substantially C-shaped member 36 made up of a base portion 38, an upright portion 40, and a top portion 42. The wheels 28, 30, 32, 34 are disposed on and are rollable over the tracks 12, 14.

A saw assembly 44 is pivotally mounted to the base portion 38 by means of a shaft 45 disposed in a sleeve 46 fixed to the base portion 38. Suitable bearings (not shown) are provided to allow easy pivoting of the saw assembly 44 relative to the base portion 38.

The structure of the saw assembly 44 is best shown in FIG. 2. Mounted to the shaft 45 is a U-shaped bracket 48 to which a motor mount 50 is pivotally mounted by means of a pin 52. An electric motor 54 is fixed to the motor mount 50 and has a saw blade 56 mounted thereon. As seen in FIG. 2, the structure allows a degree of pivoting of the motor 54 and motor mount 50 about the axis of pin 52. Stop means 58 and 60 are mounted to bracket 48 to limit the pivotal movement of the motor 54 and motor mount 50. The saw blade 56 is thus pivotable from position A to position B and back again. Fixed to the bracket 48 is a casing 62 disposed about saw blade 56 and having a slot 64 therein to allow movement of the saw blade 56 from position A to position B, the saw blade 56 extending from the casing 62 when in position B. A split ring 66 is fixed relative to sleeve 46 about shaft 45 and is tightenable therearound to fix the position of the shaft 45 in the sleeve 46. The shaft 45 and sleeve 46 allow pivoting of the saw assembly 44 of 180°. Scale means 68 are fixed to the sleeve 46, whereby the desired position of the saw assembly 44 may be set.

Top portion 42 has fixed thereto a sleeve 70 in which a shaft 72 and suitable bearings are disposed. Fixed to the end of the shaft 72 is a longitudinal guide member 74 having a saw assembly 76 slidably mounted thereon. Suitable means are provided on the end of the shaft 72 to keep it disposed in the sleeve 70. It will be seen that the guide member 74 and saw assembly 76 are together pivotable relative to the top portion 42. The shaft 72 and sleeve 70 allow pivoting thereof 180°. Scale means 80, and a split ring 82, similar to split ring 66, are provided so that the position of the guide member 74 and saw assembly 76 may be set.

Saw assembly 76 is made up of a motor mount 84 slidably mounted on rods 85 mounted in guide member 74, an electric motor 86, a casing 87 held relative to the motor and a saw blade 88 fixed to the motor 86. The assembly 76 is slidable from one end of the guide member 74 to the other. The saw blade 88 may thus be moved from position C to position D and back again.

Fixed to an end of the tracks 12, 14 are a pair of braces 90, 92 to which a substantially C-shaped member 94 is fixed. This member 94 has a lower portion 96, an upright portion 98, and a top portion 100, similar to member 36. A saw assembly 102, similar to saw assembly 44, is pivotally mounted to the lower portion 96. The saw assembly includes a U-shaped bracket 104, motor mount 106, an electric motor 108 and a saw blade 110. The motor mount 106 and motor 108 are pivoted about a pin (not shown) in the bracket 104, whereby the saw blade 110 is movable from position E to position F and back to position E again. This movement is similar to the movement of motor mount 50, motor 54, and saw blade 56 as shown in FIG. 2. A casing 112 serves the same function as casing 62. A split ring 114, similar to split rings 66 and 82, is included to fix the position of the saw assembly 102 relative to the base portion 96. The saw assembly 102 is pivotable to the extent of 180° relative to the base portion 96. Scale means 116 are included so that the desired position of the saw assembly 102 may be set.

Top portion 100 has pivotally fixed thereto structure similar in construction and operation to guide member 74 and saw assembly 76 of FIG. 2. This structure includes a longitudinal guide 120, along which a saw assembly 118 (having a motor 122, saw blade 124 thereon, and a casing 125) is slidable from one end to the other thereof. The saw blade 124 is thus movable from a position G to a position H and back again to position G. Pivoting of 180° of the saw assembly 118 relative to the top portion 100 is allowed. Scale means 126 are included so that the proper position of the saw assembly 118 can be set, and a split ring 128, similar to split ring 82, is included to fix the position of the guide member 120 and saw assembly 118 relative to the top portion 100.

A locking member 130 is fixed to runner 24 and is adapted to grip the track 12 to hold the member 36 relative to the member 94.

Fixed to upright portion 98 and extending inwardly therefrom parallel to tracks 12, 14 is a bracket 132 having an arm 134 extending therefrom to adjacent the saw assemblies 102 and 118. Similarly, fixed to upright portion 40 and extending inwardly therefrom parallel to tracks 12, 14 is a bracket 136 having an arm 138 extending therefrom to adjacent the saw assemblies 44 and 76. The arms 134, 138 are similar in construction, and one (134) of these is shown in FIGS. 4 and 5.

Arm 134 is made up of two sleeves 140, 142 in which cylinder 144 and 146 are respectively disposed. The rod 146 is slidable in the sleeve 142 and the position of rod 146 relative to sleeve 142 may be fixed by means of a ball-and-pin assembly 148 the pin of which may be disposed in an aperture 150 in the sleeve 142 and one of a series of apertures 152 in the rod 146. The rod 146 has extending therefrom an angle arm 154 to which a pivotal arm 156 is attached. Piston rod 158 of cylinder 144 has fixed to one end a plate 160 which in turn has a stop 162 fixed thereto. A spring 164 runs from plate 160 to bracket 132 to keep the plate 160 against sleeve 140 in its rest position.

In the operation of the device as described, the saw blades 88 and 124 are normally in positions C and G respectively, being resiliently held there by air pressure in a system not shown. Saw blades 56 and 110 are normally in positions A and E, being held there by air pressure. A piece of wood or other workpiece is then placed on casing 62, arm 138, arm 134 and casing 112, lying across the top of each of them. The pivotal arm 156 and the pivotal arm connected to arm 138 are in the lower position shown in FIG. 5. Pneumatic cylinders, and lines connected from them to a source of air pressure, are used to move these pivotal arms to the upper position shown in FIG. 5 and hold them there, whereby the piece of wood will be held between these pivotal arms and the stops (as 162). The position of the rod 146 relative to stop 162 (in the set position) may be varied by sliding the rod 146 (and the pivotal arm 156 with it) and placing the ball-and-pin assembly 146 in the proper aperture 152 in the rod 146. The structure of arm 138 may be adjusted in the same manner. Various widths of wood may thus be properly held thereby. A support stand 166 may be included near the middle of the device to aid in supporting the workpiece if it is long (*i.e.*, if C-shaped members 36 and 94 are spaced relatively far apart).

The saw assemblies 44, 76, 102, 118 are then pivoted so that saw blades 56, 88, 110, 124 will move into the workpiece at a chosen angle to make a desired cut, and are locked from pivoting as described above. Motors 54, 86, 108, 122 are then actuated to rotate the saw blades. Pneumatic cylinders, connected by lines to an air pressure source are used with the saw assemblies 44, 102 to pivot the saw blades 56, 110 from their normal positions (A and E respectively) to their positions B and F respectively, whereby cuts are made in the workpiece. The air pressure to these pneumatic cylinders is then cut off, and the saw blades 56, 110 will be moved back to positions A and E respectively, by air pressure, as described above, and removed from the workpiece. Pneumatic cylinders, connected by lines to an air pressure source, are used with the saw assemblies 76, 118 to move them (and saw blades 88, 124) along guide members 74, 120 respectively, the saw blades 88 and 124 moving from position C to position D and from position G to position H respectively. Cuts are thereby made in the workpiece, the saw blades 88, 124 traveling along paths into the workpiece but just above the casings 62, 112 respectively. The air pressure to these pneumatic cylinders is then cut off, and the saw blades 88, 124 are moved back to positions C and G respectively by the air pressure described above, and from the workpiece. The air pressure to pneumatic cylinders holding the pivotal arm 156 and the like pivotal arm on arm 138 is then cut off, whereby the workpiece is no longer held relative to the device 10. Pneumatic cylinder 144, and a like cylinder in arm 138, are then actuated for a short time to kick the workpiece by stop means 162 and a like member on arm 138. These cylinders are then moved back to normal position by spring 164 and a similar spring in arm 138.

It will be seen that a variety of cuts may be made on a workpiece so that the ends of the workpiece may be cut to desired configuration. A few of these cuts are shown in FIGS. 7A through 7E. A single cut on one end of the workpiece, as in FIG. 7B, may be made by only actuating one of the same assemblies mounted on a C-shaped member. If preferred, only the saw assemblies mounted on one of the C-shaped members may be actuated, and the other end of the workpiece left uncut. A great variety of lengths of workpieces may be cut by the device 10 by merely moving C-shaped member 36 along tracks 12, 14 toward or away from C-shaped member 94 and locking it in place by locking member 130. Each member of the truss 168 of FIG. 8 may be cut to proper specification by the device.

In this embodiment, each saw blade 56, 88, 110, 124 is moved to cut entirely through the workpiece. However, it will be seen that alterations can be made to the device so that the cuts are made only into the workpiece and then withdrawn if so desired.

As best shown in FIG. 6, the saw assemblies 44 and 76 are pivotable about a common axis, and the saw assemblies 102 and 118 are pivotable about another common axis. The desired length of the resulting workpiece may thus be chosen and will not vary even though the saw assemblies 44, 76, 102, 118 may be pivoted to various positions.

The embodiment described is set up so that the complete operation is to a great extent automated. As described above, the workpiece is placed in position. A button is pushed to simultaneously actuate the pivoting of the arms on arms 134, 138 and start the saw motors 54, 86, 108, 122. Pushing that

button also actuates pneumatic cylinders which substantially simultaneously move saw blades **56, 110** into the workpiece. As these saw blades **56, 110** move into their positions B and F respectively, this movement trips switches which deactuate those pneumatic cylinders to allow the saw blades to be moved back to positions A and E respectively. As they move to these positions, switches are tripped by such movement to actuate pneumatic cylinders which move saw blades **88, 124** substantially simultaneously into the workpiece. As these saw blades **88, 124** move into positions D and H respectively, the movement trips switches which deactuate these pneumatic cylinders to allow the saw blades **88, 124** to be moved back to positions C and G respectively. As they move back to these positions, switches are tripped to release the hold on the workpiece. The operator may actuate cylinder **144** and the like cylinder in arm **138** to kick the workpiece from the device, all as described above. The device **10** is then ready to receive another workpiece. With this manner of operation, it has been found that up to 18 pieces per minute may be cut.

In certain situations, it may be desirable to make a cut intermediate the ends of a workpiece for use in construction, for example, as a roof member. Such a workpiece **210** is shown with an intermediate cut **212** therein in FIG. **11**. For making such a cut, a device **214** is shown in FIGS. **1, 9** and **10**. The device **214** includes a pair of flanges **216, 218** on which wheels **220, 222, 224, 226** are mounted to run on tracks **12, 14**. A crossmember **228** is fixed to flanges **216, 218**. A plate **230** is movable longitudinally along crossmember **228** and lockable in position by means of lock **232**. Pivotally connected to a corner of the plate **230** is a second plate **234** having a pair of upright tubular sleeves **236, 238** fixed thereto. These tubular sleeves **236, 238** support a brace member **240** on which is fixed a support beam **242**, on which is fixed in turn a wood block **244**. Rods **246, 248** are slidably disposed in tubular sleeves **236, 238** respectively, and fixed to ends of rods **246, 248** is a plate **250** to which is fixed an electric motor **252**. A dado blade **254** is fixed to the electric motor to be rotated thereby. A casing **256** substantially surrounds the dado blade **254** and is fixed relative to brace member **240**.

A pneumatic cylinder **258** interconnects the second plate **234** and the plate **250**. Air pressure is applied to the pneumatic cylinder **258** to move the electric motor **252** and dado blade **254** upward or downward in FIG. **9**, the rods **246, 248** sliding in sleeves **236, 238** respectively as such movement takes place. In such manner, the dado blade **254** can be moved into and from a workpiece **260** disposed on wood block **244**.

A slot **262** in second plate **234** allows that plate, and the motor **252** and dado blade **254**, to be pivoted, and locking means **264** are included to lock the blade **254** in position relative to the plate **230**.

In the use of the device **214**, it is disposed on tracks **12, 14** of the device **10**. Locking means **266** are included to lock the device **214** relative to the tracks **12, 14**, and to a workpiece to be held by the device **10**. The position of plate **230** relative to crossmember **228** may then be chosen and fixed by locking member **232**. The motor **252** and blade **254** may then be pivoted to a desired position and locked in place by means of locking means **264**. A workpiece **260** is then disposed on and held by the device **10** as disclosed above. The position of the motor **252** and blade **254** are chosen so that the workpiece rests on wood block **244**. The pneumatic cylinder **258** may then be actuated to move the dado blade **254** into the workpiece to make a cut therein of the type shown in FIG. **11**. The pneumatic cylinder **258** then withdraws the blade **254** from the workpiece **260**.

The operation of the device **214** may be going on during the operation of saw assemblies **44, 76, 102, 118** and may, of course, be actuated automatically by switches similar to those described previously.

It will be seen that herein is provided a device which is capable of making a variety of cuts on a workpiece by moving saws relative to a workpiece held by the devices. As described, pairs of cuts on both ends of a workpiece can be made by moving the saws. The device described to make these cuts is extremely simple and efficient in operation, and can turn out a great number of finished workpieces in a relatively short time. This allows a great number and variety of, for example, wooden frame pieces to be cut so that they can be assembled into a truss easily and conveniently. The device can easily be adjusted, as described, to allow for a single cut, or no cuts at all, on one end of a workpiece and a accommodate a great variety of lengths of workpieces. If desired, the device may be set up so that a saw blade (or saw blades) do not cut entirely through the workpiece, or may be set up so that a full cut is made, severing a piece from the workpiece.

The adjustment feature of the support arms may be utilized to accommodate varying widths of workpieces. The stops (as **162**) can be changed to vary the overall position of the workpiece so that cuts of proper disposition can be in the workpiece.

Obviously, the invention can be carried out in many different ways, and the embodiment shown and described is merely illustrative. Consequently, we do not desire to be limited by the embodiment shown and described, but only by the scope of the following claims.

We claim:

1. Apparatus for making adjacent, intersecting cuts in a workpiece, comprising:

a. a frame member;

b. an elongated guide member mounted on said frame member for pivotal movement about a first axis;

c. a first rotary saw mounted on said guide member for movement longitudinally of said guide member so that its blade moves in a first plane including said first axis;

d. bracket means mounted on said frame member for pivotal movement about said first axis, said guide member and bracket means being spaced from one another along said first axis;

e. a second rotary saw mounted on said bracket means for pivotal movement about a second axis generally normal to said first axis;

f. means for positioning a workpiece between said saws;

g. means for moving said first saw longitudinally across said workpiece;

h. means for moving said second saw pivotally about said second axis into said workpiece; and

i. whereby said first and second saws are adapted to make adjacent intersecting cuts in said workpiece, the point of intersection of said cuts being on said first axis regardless of the angle said cuts make with one another.