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Krauss

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[45] **Aug. 28, 1973**

[54] **SHEET CUTTING APPARATUS**

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[52] **U.S. Cl.** **83/380,** 83/390, 83/461, 83/639

[51] **Int. Cl.** **B26d 5/42**

[58] **Field of Search** 83/461, 374, 375, 83/390, 452, 639, 658, 379, 380, 381

[56] **References Cited**

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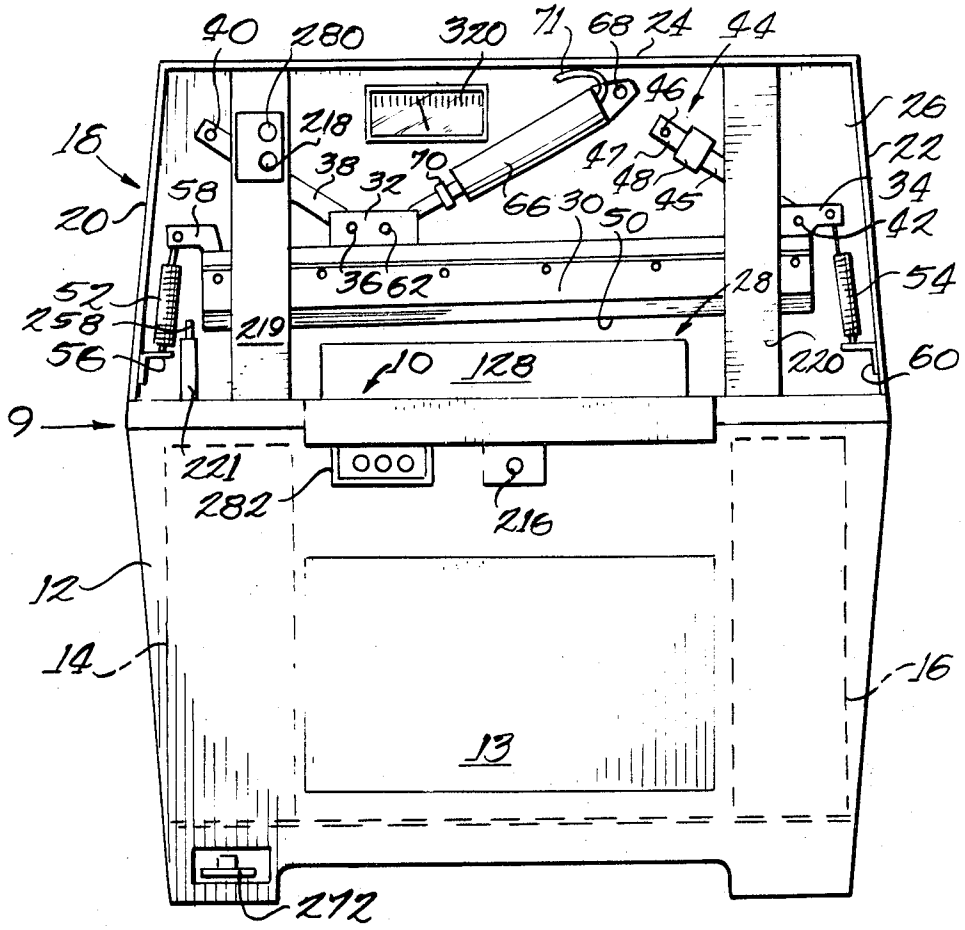
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[57] **ABSTRACT**

Sheet cutting apparatus powered wholly by hydraulics including a blade for cutting and a hydraulically operated clamping bar for holding the sheet material in place for cutting after clamping has been effected.

7 Claims, 8 Drawing Figures



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SHEET 1 OF 4

Fig. 1.

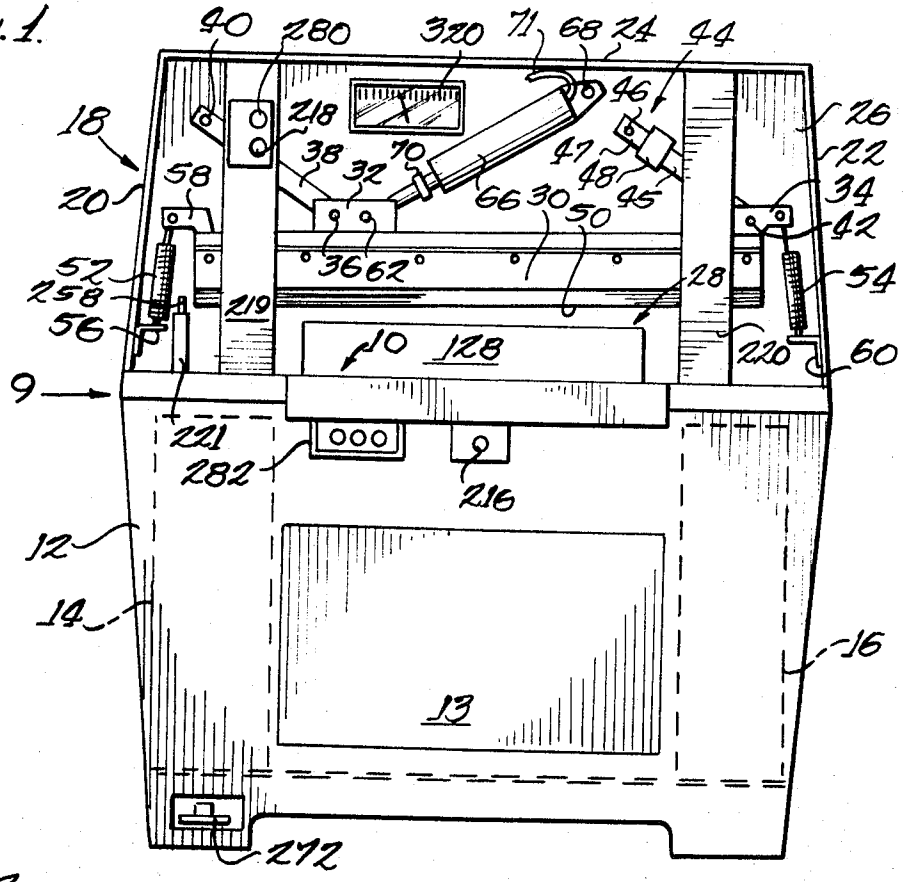
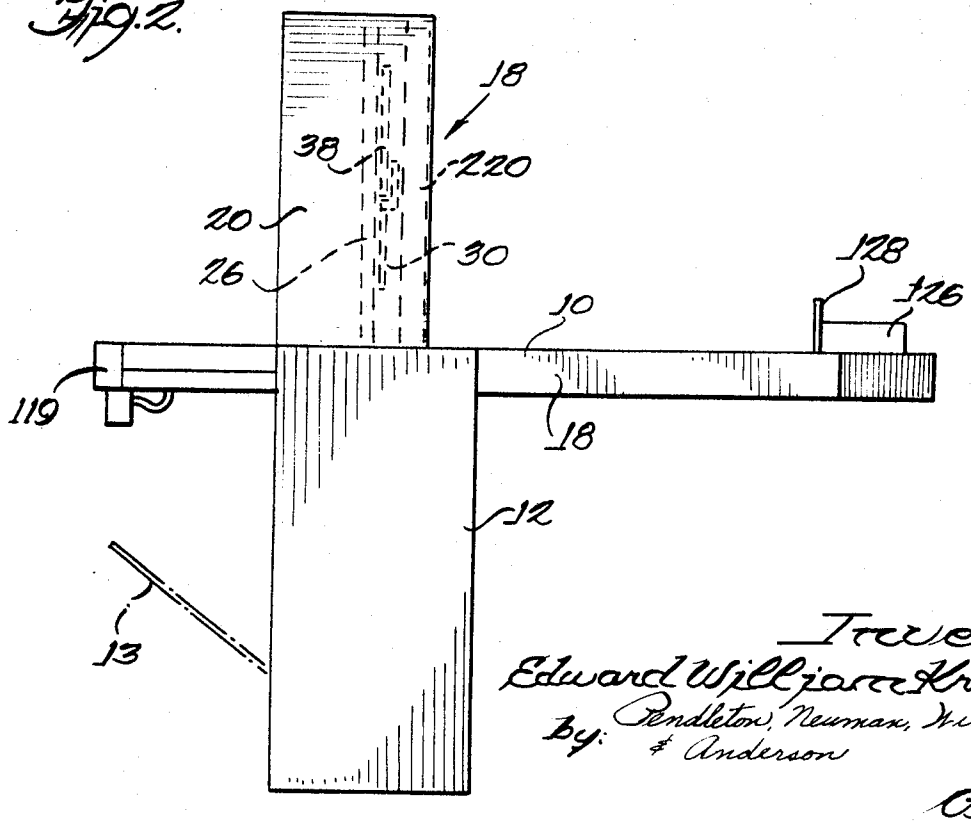


Fig. 2.



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Fig. 3.

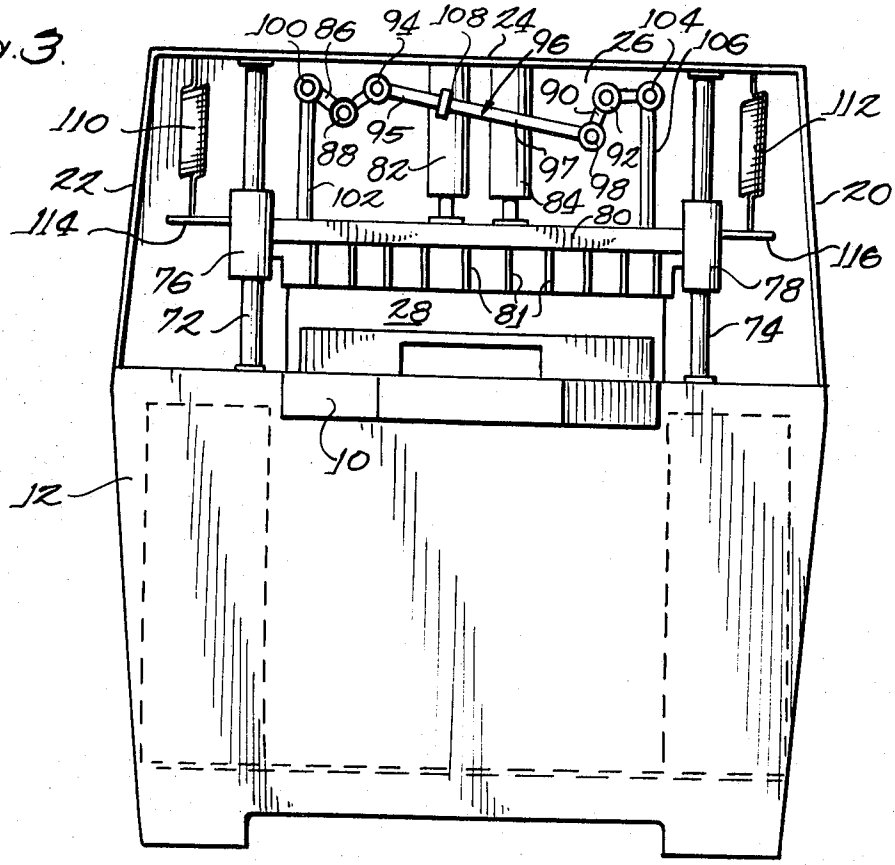
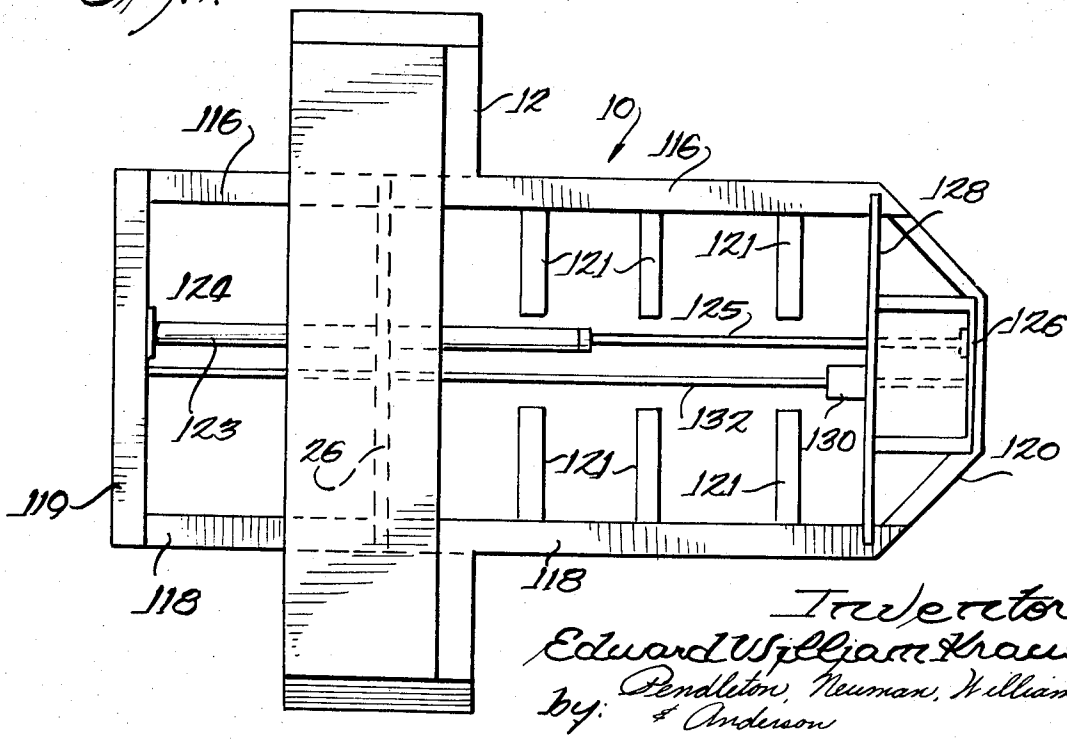


Fig. 4.



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Fig. 5.

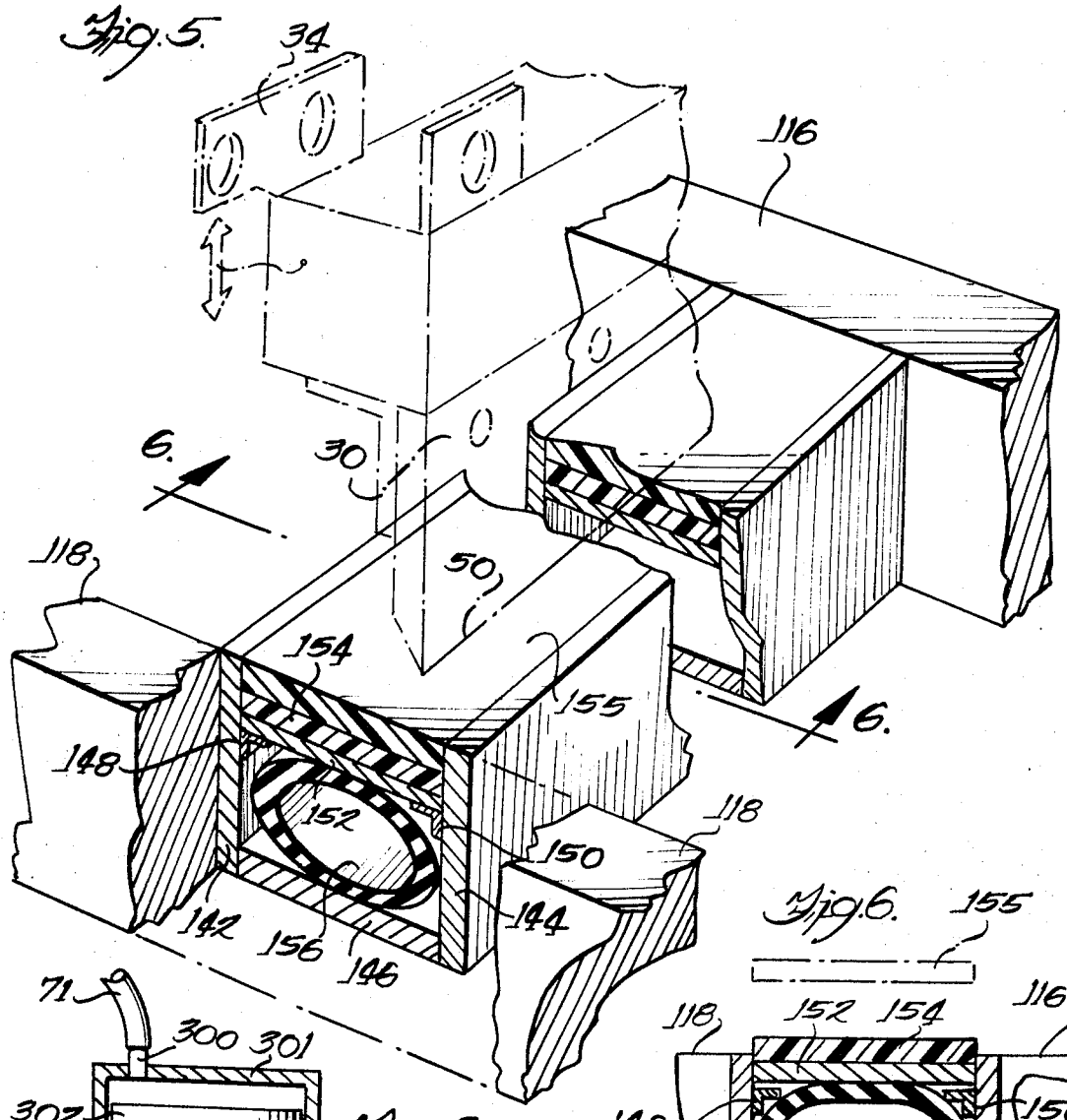


Fig. 6.

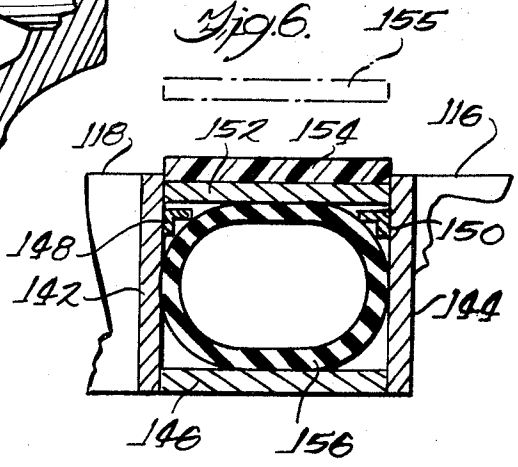
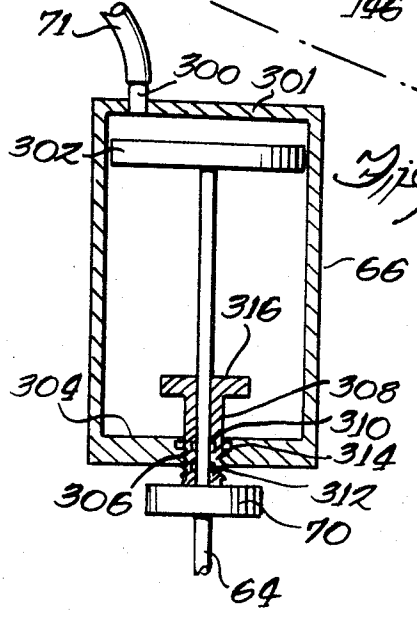
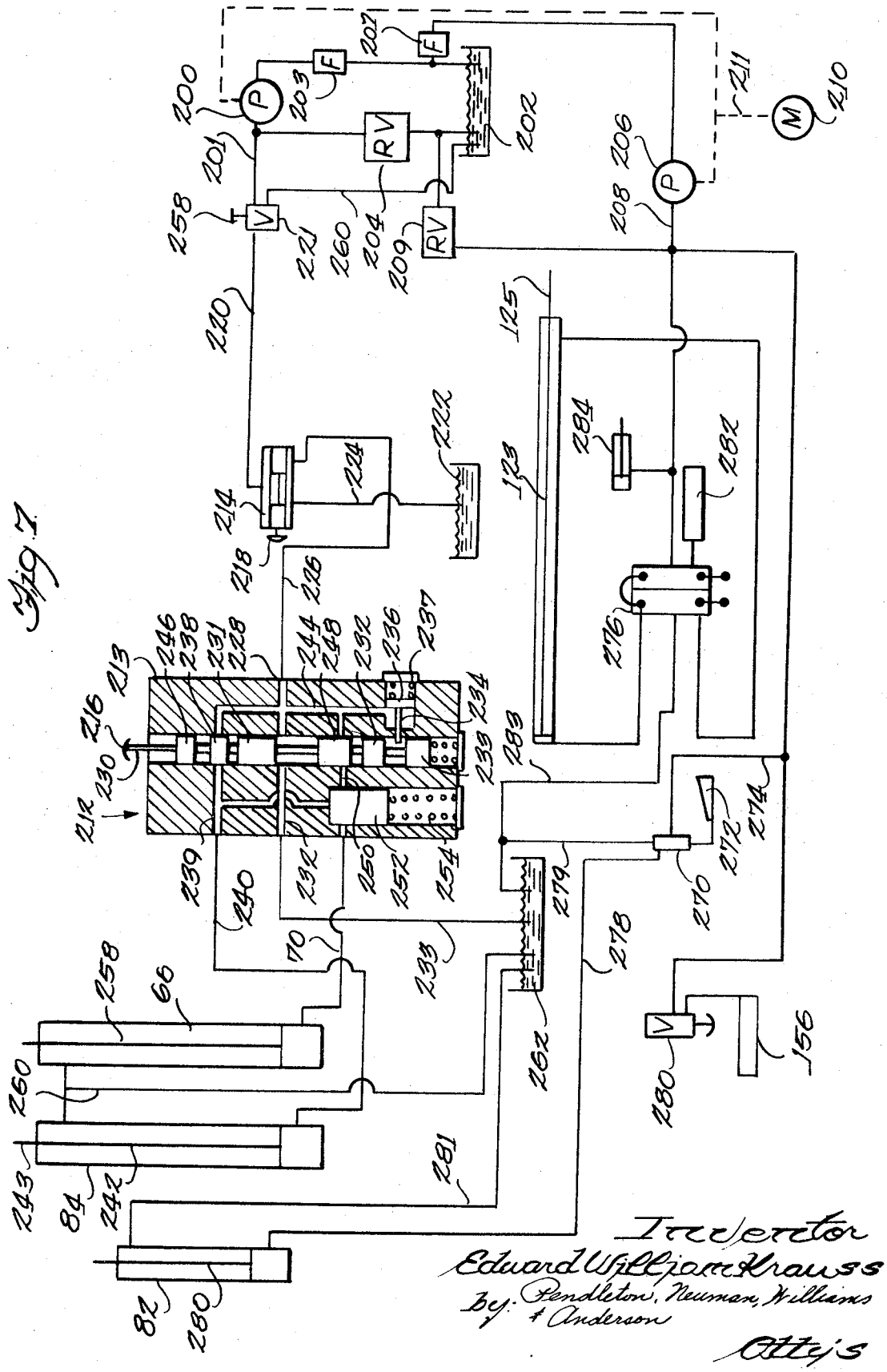


Fig. 8.



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Fig. 7
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SHEET CUTTING APPARATUS

BACKGROUND

The present invention relates to apparatus for cutting sheet material, and more particularly to cutters having hydraulically power-operated blades for simultaneously cutting many sheets of paper, fiberboard and the like.

In the past, paper cutters have generally been electrically operated. Because of the complexity of the electrical circuits necessary to control and operate these cutters, these cutters were expensive. Also, breakdowns frequently occurred so that maintenance and repair was costly; and short-circuiting could sometimes cause unexpected operation which in some instances could cause serious injury to the operator.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a sheet cutting apparatus which is relatively safe to use, inexpensive, and requires a minimum of repair and maintenance. It is a further object to provide a cutter which is powered wholly by hydraulics, rather than by electrical power. It is a further object of the present invention to provide such a cutter in which the length of the stroke and the attitude of the cutting blade are readily adjustable. Another object of the present invention is to provide such a cutter in which the anvil is readily replaceable.

A further object of the present invention is to provide a sheet cutting apparatus equipped with a hydraulically power-operated clamp, and with means for automatically operating the clamp before the cutting blade can cut the sheet material. Another object of the present invention is to provide a sheet cutting apparatus in which the clamping apparatus may be operated alone or in sequence with operation of the cutter blade.

These and other objects of the present invention will become manifest by an examination of the following description and accompanying drawings.

In one form, the invention consists of a sheet cutting apparatus having a horizontal bed for supporting a stack of sheet material, such as paper sheets, means for supporting a cutting blade for movement in a vertical plane, hydraulically operated means for urging said cutting blade downwardly toward said bed, hydraulically operated clamp means for clamping said sheet material in position on said bed, and means for causing said hydraulic clamping means to become operative prior to the operation of said cutting blade which include two spaced-apart controls adapted to be manually operated. These controls must be simultaneously actuated to initiate operation of the clamp and blade. In this way the machine operator must use both hands and is thereby prevented from accidentally cutting one of his hands. The apparatus is powered entirely by hydraulics, the sole nonhydraulic component being an electric driving motor for, among other things, driving the hydraulic pumps, and such lighting as may be required.

DESCRIPTION OF THE DRAWINGS

Reference will now be made to the accompanying drawings in which:

FIG. 1 is a front elevation of an exemplary embodiment of the present invention;

FIG. 2 is a side elevation of the apparatus of FIG. 1;

FIG. 3 is a rear elevation of the apparatus of FIG. 1;

FIG. 4 is a plan view of the apparatus of FIG. 1;

FIG. 5 is a perspective view of a portion of the apparatus of FIG. 1, showing the interrelationship of the cutting blade and the anvil, and the mechanism for ejecting the anvil;

FIG. 6 is a partial vertical cross section of the apparatus of FIG. 5, taken along the section line 6—6;

FIG. 7 is a schematic circuit diagram of the hydraulic system associated with the apparatus of FIG. 1; and

FIG. 8 is a cross-sectional view of a hydraulic cylinder employed in the apparatus of FIG. 1.

DESCRIPTION

Referring now to the drawings, and especially to FIGS. 1–4, there is shown a sheet cutter 9 having a sheet-supporting bed 10 supported by a hollow frame 12, preferably formed of sheet metal which is welded together. Within the frame 12 are contained tanks 14 and 16, for storing hydraulic fluid used in the operation of the cutter. The frame 12 also houses two pumps 200 and 206 (FIG. 7), by which the hydraulic fluid is pressurized, and an electric motor 210 for driving both of the pumps, as well as other apparatus associated with the hydraulic control system. Access to the apparatus is obtained by means of a door 13 hinged so as to open toward the front of the frame 12.

Located above the bed 10 and supported on the frame 12, is an upper housing 18, formed of two side walls 20 and 22, interconnected at their top edges by an upper wall 24. A vertical bulkhead 26 is located within, and welded to, the walls 20, 22 and 24. The bulkhead 26 supports a cutting blade 30 and a clamping bar 80 (see FIG. 3). The clamping bar will be hereinafter described in greater detail. The central area of the lower part of the bulkhead 26 is provided with an opening 28, so that sheet material may be moved on the bed 10 from one side of the bulkhead 26 to the other, and thereby be brought into the area of operation of the cutting blade 30 and the clamping mechanism 80.

A pair of brackets 32 and 34 are secured to the top of the cutting blade 30. The bracket 32 has a pivot pin 36 which is pivotally connected to the lower end of a link 38. The upper end of the link 38 is pivoted to the bulkhead 26 by means of pin 40. The bracket 34 is provided with a pin 42 pivotally connected to the lower section 45 of a link 44. The upper section 47 of the link 44 is pivotally connected to a pin 46 supported on the bulkhead 26.

By means of the links 38 and 44, the blade 30 may swing about the axes of pins 40 and 46. As it swings downwardly from its upper position, shown in FIG. 1, it executes a slicing movement, ending with the bottom or cutting edge 50 of the blade 30 in the plane of the upper surface of the bed 10.

The attitude of the blade 30 is adjustable by means of a connector 48 which joins the two sections 45 and 47 of the link 44. Preferably, the connector 48 is threaded to each section of the link 44, with the threads on each section being of reverse pitch, (in turnbuckle fashion), so that turning the connector 48 relative to the axis of the link 44 in one direction serves to lengthen the link, whereas turning the connector 48 in the opposite direction serves to shorten the link 44. In this way, parallelism of the lower edge 50 of the blade 30 with the surface of the bed 10 may be maintained, even though the blade 30 may wear at different rates

along its length. The blade **30** is biased towards its upward position, as illustrated in FIG. **1**, by means of springs **52** and **54**. Spring **52** is connected at its lower end to a bracket **56** mounted to the side wall **20**, and at its upper end to a bracket **58**, which is secured to the top of the cutting blade **30**. Spring **54** has its lower end connected to a bracket **60** mounted on the side wall **22** and its upper end is connected to the bracket **34** secured to the top of the blade **30**.

The bracket **32** is provided with a second pivot pin **62**, to which is connected the lower end of the operating shaft **64** of a hydraulic cylinder **66**. The cylinder is pivotally connected to the bulkhead **26** by means of a pin **68**. Hydraulic cylinder **66** furnishes the power to drive the cutting blade **30** downwardly toward the top surface of the bed **10**. As the hydraulic fluid is supplied to the cylinder **66** by way of line **71**, a piston within the cylinder is forced downwardly, the force of this piston is transmitted through the shaft **64** to the bracket **32**, and the blade **30** is thereby moved downwardly. The blade **30** continues its downward movement until the piston within the cylinder **66** reaches the end of its stroke, at which point further movement is arrested. The stroke of the piston within the cylinder **66** may be adjusted by means of a control wheel **70**, in a manner described hereinafter with reference to FIG. **8**.

In FIG. **3** the rear of the machine is illustrated. A pair of vertical guides **72** and **74** are mounted between the top of the frame **12** and the lower surface of the upper wall **24**. Slides **76** and **78** are slideably mounted on the guides **72** and **74**, respectively, and the clamping bar **80** is connected between the slides **76** and **78**. The clamping bar **80** is formed of rigid material for effective gripping and clamping of a stack of sheet material to the bed **10**. A plurality of ribs **81** extend rearwardly from the bar to distribute the clamping force rearwardly over the surface of the stack.

Motive power for lowering the clamp bar **80** is furnished by either one of two hydraulic cylinders **82** and **84**, both of which are connected between the clamping bar **80** and the top wall **24**. Hydraulic cylinder **82** is a low pressure cylinder and the cylinder **84** is a high pressure cylinder. The cylinder **82** is operated when a small clamping force is desired, so that the stack may be adjusted in its position prior to cutting. The cylinder **84** is operated as part of an automatic sequence in which the stack is first clamped and then cut by operation of the blade **30**.

Parallelism of the clamp bar **80** with the bed **10** is assured by means of a regulating mechanism, including a bell crank **86**, pivotally mounted to the surface of the bulkhead **26** by means of a pin **88**, and a bell crank **90**, pivotally mounted on the surface of the bulkhead **26** by means of a pin **92**. One end **94** of the bell crank **86** is connected to one section **95** of a link **96**. The other section **97** of the link **96** is connected to an end **98** of the bell crank **90**. The end **100** of the bell crank **86** is connected by a link **102** to the clamp bar **80**, and the end **104** of the bell crank **90** is connected to the clamp bar **80** by a link **106**. The length of the link **96** is adjustable by means of connector **108**, interconnecting the sections **95** and **97**, which is similar in its construction and operation to the connector **48** illustrated in FIG. **1**.

The clamp bar **80** is biased toward its upward position, shown in FIG. **3**, by means of springs **110** and **112**. The lower end of the spring **110** is connected to a bracket **114**, mounted on the slide **76**, and the upper end of the spring **110** is connected to the upper wall **24**. The lower end of the spring **112** is connected to a bracket **116**, secured to the slide **78**, and the upper end of the spring **112** is secured to the upper wall **24**. By means of the springs **110** and **112**, the clamp bar **80** is urged towards its upper position until one of the hydraulic cylinders **82** and **84** is actuated.

As best illustrated in FIG. **4**, the bed **10** is formed of two parallel slabs **116** and **118**, which are supported in spaced-apart relationship. A bar **119** is connected preferably by welding, between the slabs at the front end of the machine, and a bar **120** connects the slabs at their other ends. A plurality of additional bars **121** are connected preferably by welding, to the slabs **118** and **119**, and extend inwardly nearly to the center of the space between the slabs **116** and **118**.

In the space between the slabs **116** and **118**, near the inward ends of the bars **121**, a cylinder **123** is located, with an end secured to the bar **119** by means of a bracket **124**. An actuating shaft **125** of the cylinder **124** extends toward the other end of the machine and is connected to a bracket **126** secured to a pusher plate **128**, supported by the slabs **116** and **118**.

The bracket **126** has connected thereto a tubular guide **130**, adapted to slide on a guide shaft **132** supported between the bars **119** and **120**.

When the cylinder **123** is actuated, it draws the shaft **125** forward and moves the pusher plate **128** toward the cutting blade **30**. Sheet material which is to be cut is thereby carried toward the blade **30**.

Referring now to FIG. **5**, the slabs **116** and **118** are interconnected with a U-shaped body having side walls **142** and **144** and a bottom wall **146**. Preferably the U-shaped body is welded together and welded to the slabs **116** and **118** so that they form a rigid assembly. A pair of elongate L-shaped brackets **148** and **150** extend along the length of the side walls **142** and **144**, and are welded thereto. The brackets support a rigid, unyielding plate **152**. Two rectangular plates **154** and **155**, preferably formed of a hard plastic material, are located above plate **152**. The top plastic plate **155** serves as the anvil for the cutting blade **30**, and the bottom plate **154** serves as a spare anvil and also resiliently supports the anvil **155**. The unyielding plate **152** forms a rigid base under the assembly.

The cutting blade **30** compresses the sheet material to be cut between its cutting edge and the anvil **155**, and, as a result, the anvil **155** eventually becomes scarred in the area immediately under the cutting edge **50** of the blade **30**. Preferably, this area is offset from the center of the anvil **155**, so that when the anvil **155** is removed and rotated 180° about a vertical axis, it can be replaced to provide a new surface directly under the cutting blade **30**. In addition, the opposite side of the anvil **155** may also be used (in two different attitudes) so that a single anvil **155** may be employed in four different arrangements to provide four new surfaces under the cutting blade **30**.

When it is desired to remove the anvil **155** for readjustment or replacement, an expandable tube **156**, located in the area between the plate **152** and the walls **142**, **144** and **146**, is expanded by application of a suitable hydraulic force, which forces the plate **152** upwardly, thereby bringing the anvil **155** into a position above the surface of the bed **10**. In this position the anvil **155** may be readily turned over or replaced with a new anvil, as the need may be.

FIG. 6 shows the expandable tube in expanded condition, with the anvil 155 raised above the level of the bed 10.

Referring now to FIG. 7, there is shown, in schematic form, the hydraulic circuit associated with the sheet cutting apparatus. A pump 200 furnishes high pressure fluid to an outlet line 201. It communicates with a sink 202 by means of a filter 203, so that hydraulic fluid may be drawn into the pump through the filter 203 and furnished to the output line 201. A relief valve 204 passes fluid from the line 201 back to the sink 202, in order to establish a predetermined maximum pressure on the line 202. The volume of pressurized fluid produced by the pump 200 is, however, limited, so that when one of the power cylinders is being operated, the pressure in the line 201 is less than the maximum value determined by the relief valve 204.

The second pump 206 communicates with the hydraulic fluid in the sink 202 through a filter 207, and furnishes pressurized fluid on a line 208. A relief valve 209 is provided to establish a predetermined maximum pressure in the line 208, which is substantially less than that in the line 201.

The two pumps 200 and 206 are both powered by a motor 210 by connections shown by the dashed line 211.

The control system of the present invention incorporates two manual hydraulic valves 212 and 214. The valve 212 is the primary control valve, and the valve 214 is the secondary control valve. Both valves must be operated simultaneously, and they are positioned on the machine so that both of the operator's hands are necessary to actuate the valves at the same time. This insures that the cutting operation occurs only when the operator's hands are outside the vicinity of the cutting blade.

The valve 212 has a body 213 and a control member 216 (see FIG. 1) by which valve 212 may be operated. When the cutting blade 30 is to be operated, the member 216 is pushed downwardly (as viewed in FIG. 7) by one of the operator's hands. Simultaneously the control member 218 of the valve 214 is also manually pushed into energized condition (rightwardly as viewed in FIG. 7), in order to complete a connection of pressurized hydraulic fluid to the clamp mechanism and to the mechanism for powering the cutting blade 30. As shown in FIGS. 1 and 2, the control member 216 is located under the forward end of the bed 10, beneath the bar 119, while the control member 218 is located on a guard member 219, secured between the frame 12 and the wall 24, forwardly of one end of the blade 30. An identical guard member 220 is secured to the frame 12 forwardly of the other end of the blade.

When the valve 214 is in unactuated condition, it connects the line 201 through a normally open valve 221 to a line 220 which leads through the valve 214 to a line 224 and to a sink 222. The sink 222 communicates directly with the sink 202 to return hydraulic fluid to the intake of the pump 200.

When the valve 214 is actuated, pressurized fluid is conducted to line 226 and thereby to an inlet port 228 of the valve 212, and to the inlet passageway 244.

Connected to the control member 216 of the valve 212 is a shaft 230 which extends downwardly, as shown in FIG. 7, and which has a plurality of spools which control the sequence of operation of the several functions of the valve 212. The spools are all connected rigidly to the shaft 230 and operate both to limit the position of the shaft 230 from time to time, and also to open and close passageways for hydraulic fluid.

Before the valve 212 is operated, a chamber between two spools 231 and 248 connects an inlet passageway 244, which communicates with the inlet port 228, with an output passageway 232. The outlet passageway 232 leads to a line 233, which in turn is connected to a sink 262.

When the member 216 is initially depressed, the shaft 230 moves downwardly, and the spool 231 closes the passageway 232. Downward motion of the shaft 230 continues until a spool 232 comes into engagement with a pin 234. The pin 234 is connected to a piston 236, resiliently urged inwardly of the valve body 213 by means of spring 237 disposed in a chamber provided in the body 213. The downward movement of the shaft 230 is sufficient to enable a spool 238 to clear the entrance to a passageway 239 which leads to an output line 240, and hydraulic fluid is thereby permitted to flow from the line 226 through the valve 212 to the line 240. A spool 246 seals the top end of the valve 212. The line 240 is connected to the cylinder 84, which powers the clamping mechanism as described above. The cylinder 84 is energized to clamp a stack of sheet material on the bed 10 in a position to be cut by the cutting blade 30, a piston 242 within the cylinder 84 forcing its actuating shaft 243 outwardly, and lowering the clamping bar 80 (FIG. 3).

The volume of space within the cylinder 84 increases as the piston 242 is forced out of the cylinder and prevents the pressure of fluid on the line 240 from rising to the level set by the relief valve 204. The pressure is therefore kept at a relatively low level until the clamping bar 80 reaches the top of the stack of sheets to be cut, and clamps the stack to the bed 10. Then the volume of the cylinder 84 ceases to expand and the pressure of the fluid rises. The inlet port 228 is connected by means of a passageway 244 within the valve 212 to the chamber in which the piston 236 is located. The rising pressure of the hydraulic fluid in the line 226 forces the piston 236 outwardly against the force of the spring 237, and withdraws the pin 234 from the path of the spool 232. Thereafter the control member 216 may be moved further downwardly to initiate the next function, which is the actuation of the cutting bar 30. The spool 233 seals the bottom end of the valve 212.

As the shaft 230 resumes its downward movement, spool 248 opens the inlet passageway 244 to a chamber between spools 248 and 231, which leads to a passageway 250. Outlet from the passageway 250 is normally blocked by a piston 252, urged upwardly by a spring 254, disposed in a chamber within the valve body 213. Increased pressure on the line 240, when the clamping bar 80 has reached the top of the stack to be cut, causes the piston 252 to move downwardly in its chamber and open a path from the passageway 250 to an output line 70. The output line 70 is connected to the cylinder 66 so that the piston 258 within it is moved outwardly, thereby causing the cutting blade 30 to be forced downwardly toward the bed 10 (See FIG. 3).

The piston 252 insures that there is adequate pressure in the line 240 whenever the cutting blade is operated. This prevents the cutting blade from being operated until after appropriate clamping force has been applied to the clamp bar 80, and insures that there is

sufficient pressure available to operate the cutting blade properly.

When the cutter bar **30** reaches its lowermost position, in which the edge **50** is located in substantially the same plane as the top surface of the bed **10**, the valve **221** is actuated by a control member **258**, interposed in the path of the bracket **58** (see FIG. **1**). The valve **221** thereby senses when the edge **50** of the cutting blade **30** has reached its final position. Actuation of the valve **221** cuts off the communication between the line **201** and the line **220**, and instead connects the line **220** with a line **260** so that fluid may flow in reverse direction from the cylinders **66** and **84** through the valves **212, 214** and **221** to the sink **202**. The springs **52** and **54** furnish the necessary force to return the cutting blade **30** to its non-operative position, while the springs **110** and **112** perform this function for the clamping bar **80** (FIGS. **1** and **3**). Thus, the normal position of the cutting blade **30** and the clamping bar **80** is at their upper non-operative attitude. This serves to protect the operator in the event of a hydraulic or electrical failure. In such instances, the blade and clamping bar will always return to the upper position.

The operation of the valve **221**, which removes power from the cutting blade **30**, provides for very accurate control over the movement of the blade, especially when employed in conjunction with the adjustable stroke feature of the cylinder **66**. Both valves **214** and **212** are spring loaded, so that their control members **218** and **216** return to the position illustrated in FIG. **7** as soon as manual pressure is released. The operation cycle including first clamping and then cutting can be repeated only by the actuation of both valves a second time, after the valve **218** has been reset.

The cylinder **82** (FIGS. **3** and **7**), which is provided for low pressure clamping, is controlled by a valve **270**, operated by a foot switch **272** (FIGS. **1** and **7**). The valve **270** is connected by a line **274** from the line **208** to the line **278**, which is connected to the cylinder **82**, to force the clamping bar **80** downwardly into clamping position. The pressure of the fluid provided by the pump **206** is sufficiently low so that there is no danger of injury to the operator's fingers should they be trapped underneath the clamping bar **80**. The foot switch **272** and the cylinder **82** are normally employed by the operator in order to properly position the sheet material for cutting. When the foot switch **272** is not actuated, the line **278** is connected through the valve **270** to a line **279** which communicates with the sink **262** so that the piston **280** is free to move within the cylinder **82** when the clamping bar **80** is operated by the cylinder **84**. The end of the cylinder **82** which is not connected to the line **278** is connected via line **281** to the sink **262**.

A valve **280** (FIGS. **1** and **7**) is located on the front of the machine adjacent the control member **218** of the valve **214**. This valve controls ejection of the anvil **155**. Upon actuation of the valve **280**, pressurized fluid is conveyed to the interior of the expandable tube **156**, as has been described hereinbefore in connection with FIGS. **5** and **6**. As the tube **156** expands, it pushes the anvil **155** upwardly above the surface of the bed **10**, where the anvil's position can be changed or the anvil can be replaced by a new anvil.

A valve **276** is provided for control of the cylinder **123** (FIGS. **4** and **7**), by which the feed is powered. The cylinder **123** moves the pusher plate **128** toward the area under the cutting blade **30**, so that one or more sheets of material may be correctly positioned for cutting. The valve **276** gives the cylinder **123** a reversible capability so that the operating shaft **125** connected to the piston within the cylinder **123** is driven forward, and later rearwardly to resume its starting position. The valve **276** connects a selected end of the cylinder **123** to the line **208** and the other end to the sink **262** via a line **283**. A control mechanism **282** is connected with the valve **276** and has adjustable means for providing a fast speed of advancement of the pusher plate **128**, and a slower creeping speed for fine adjustment of the position of the sheet material on the bed **10**. The details of the valve **276** and the control mechanism **282** are well known to those skilled in the art and therefore need not be specifically described herein. The control mechanism **282** is located adjacent the control member **216** of the valve **212** (FIG. **1**).

Referring now to FIG. **8**, the cylinder **66**, shown in FIG. **1**, is illustrated in cross-section, showing the arrangement for providing a variable stroke. The inlet for the fluid is by way of tube **71**, which enters the cylinder through a threaded connector **300** in an end wall **301** thereof. A piston **302** is slidably mounted inside the cylinder **66** and has attached thereto the operating shaft **64** (FIG. **1**) by means of which the cutting blade **30** is forced downwardly toward the bed **10**. The end wall **304** of the cylinder is provided with an aperture having threads **306**, and a sleeve **308** surrounds the shaft **64** within that aperture. The sleeve **308** is adjustably positioned with respect to the wall **304** by means of threads on the sleeve which cooperate with the threads **306**. Gaskets **310, 312** and **314** provide against leakage from within the cylinder **66** around the shaft **64** or the sleeve **308**. The inner end of the sleeve **308** terminates in a flange portion **316**, which is adapted to receive and stop the movement of the piston **302**. The position of the flange **316** within the cylinder **66** establishes the maximum stroke that the cylinder **66** can produce. A wheel **70**, secured to the outer end of the sleeve **308**, adjusts the flange position and, thus, the stroke of the cutting blade **30**.

The operator of the cutting apparatus must use both hands in controlling the valves **214** and **216**, in order to effect the cutting operation. Therefore, the operator must be positioned in front of the machine, and the position of the pusher plate **128** is not readily visible to the operator. Accordingly, a visual indicator **320**, illustrated in FIG. **1**, is provided to indicate the precise position of the pusher plate **128**. The visual indicator **320** may be constructed with lenses and mirrors to show the operator either the position of the pusher plate **128** or an edge of the sheet material being cut. As such apparatus is well known to those skilled in the art, it is not specifically described herein.

The apparatus disclosed herein has been described particularly with reference to a sheet cutting machine for cutting a stack of sheet material at one time. It will be obvious to those skilled in the art, however, that the principles herein disclosed may be applied to other apparatus within the scope of the present invention. It is intended that the claims include any such apparatus and modifications as fall within the spirit of this invention.

What is claimed is:

1. Apparatus for cutting sheet material comprising:

1. a bed for supporting the sheet material;

2. first hydraulically operated means for clamping said sheet material to said bed;
3. a cutting blade;
4. second hydraulically operated means for actuating said cutting blade downwardly through said sheet material;
5. a hydraulic control system for controlling the operation of said clamping means and said blade including
a. a first source of fluid under pressure,
b. a first manually operated valve means hydraulically connected to said first source of fluid,
c. a second manually and hydraulically operated valve means hydraulically connected to said first valve means and to said first and second hydraulically operated means,
d. said first valve means adapted to selectively transmit said fluid to said second valve means,
e. said second valve means movable to a first position for transmitting said fluid from said first valve means to said first hydraulically operated means to actuate said clamping means whereby the pressure of said fluid increases from a lower pressure to a higher pressure as the actuation of said clamping means is complete,
f. said second valve means manually movable to a second position as said fluid attains said higher pressure whereby said fluid is transmitted to said second hydraulically operated means.

2. Apparatus for cutting sheet material comprising: a bed for supporting the sheet material, hydraulically operated means for clamping said sheet material to said bed, a cutting blade, hydraulically operated means for actuating said cutting blade downwardly through said sheet material,
said bed including a U-shaped channel member disposed below said blade with the open end of said U-shaped channel member even with the upper surface of said bed, a rigid plate supported within said channel, a resilient anvil supported by said plate with its top surface even with the upper surface of said bed, inflatable tube means disposed within said U-shaped channel below said rigid plate, and means for selectively inflating said tube to force said plate and said anvil upwardly and raise said anvil above the upper surface of said bed.

3. Apparatus for cutting sheet material comprising: a bed for supporting the sheet material, hydraulically operated means for clamping said sheet material to said bed, a cutting blade, hydraulically operated means for actuating said cutting blade downwardly through said sheet material,
said blade actuating means including a source of pressurized fluid, a hydraulic power cylinder connected to said blade,
said hydraulic power cylinder comprising a hollow cylindrical body, a piston adapted for longitudinal sliding movement within said cylinder, an operating shaft connected to said piston and extending through a wall closing one end of said body, and a stop sleeve surrounding said shaft at said one end, said sleeve having threads adapted to cooperate with corresponding threads provided in said wall, the inner end of said sleeve being adapted to engage and stop said piston at a position determined by the position of said sleeve relative to said wall.

4. The apparatus of claim 1 wherein the apparatus includes a supporting frame and said blade actuating means includes a pair of links each pivotally connected to said frame so that said blade pivots simultaneously about spaced apart axes as it moves downwardly through said sheet material, means associated with at least one of said links for adjusting the length of said link whereby the attitude of said blade may be regulated.

5. The apparatus of claim 1 including:
third valve means hydraulically connected to said second valve means and to said second hydraulically operated means for preventing said fluid from being transmitted to said second hydraulically operated means until said fluid reaches a predetermined pressure.

6. The apparatus of claim 1 including:
additional hydraulically operated means operably connected to said means for clamping said sheet material to said bed;
a second source of fluid supplying said fluid at a pressure less than the pressure of said first source of fluid; and
additional manually operated valve means for selectively transmitting fluid at said lesser pressure to said additional hydraulically operated means.

7. The apparatus of claim 1 including:
releasable stop means associated with said second valve biased to positively hold said second valve means in said first position;
said releasable stop means adapted to move against said bias under the influence of said fluid at said second higher pressure whereby said second valve means is permitted to move to said second position under the influence of said manual operation.

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