Jan. 21, 1964 L. D. BARLEY 3,118,338

CUTTING MACHINE

Filed Dec. 19, 1957 2 Sheets-Sheet 1

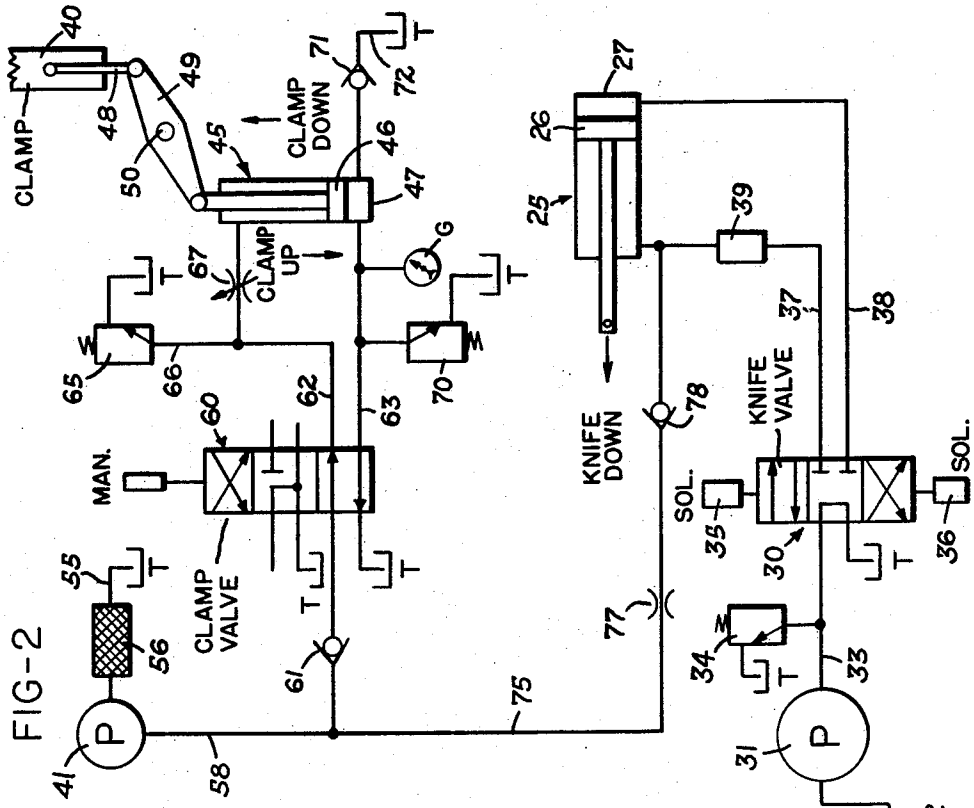


FIG-2

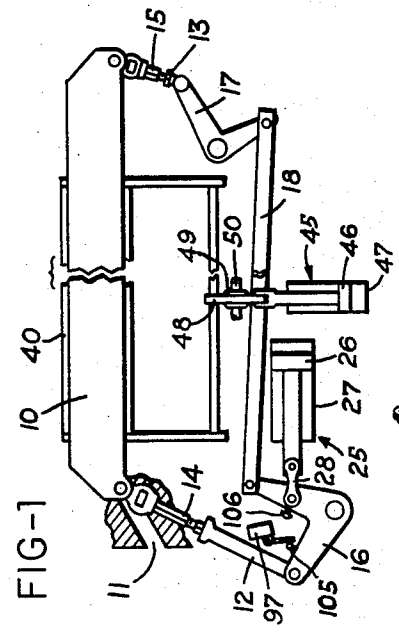


FIG-1

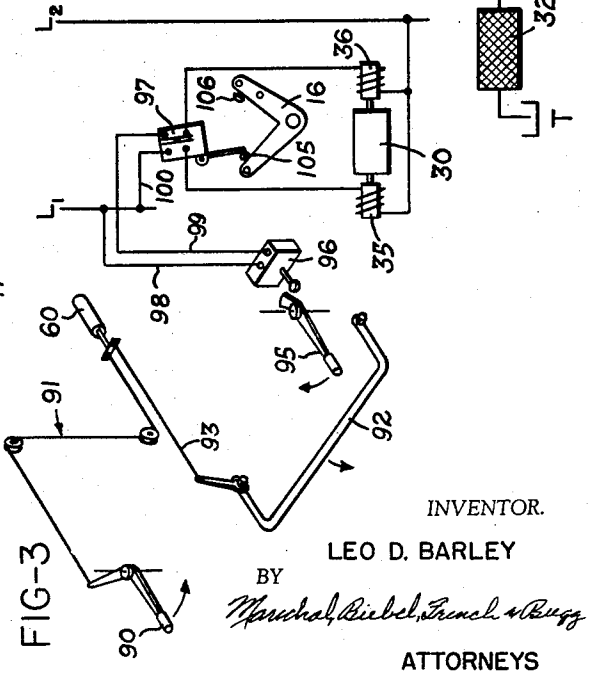


FIG-3

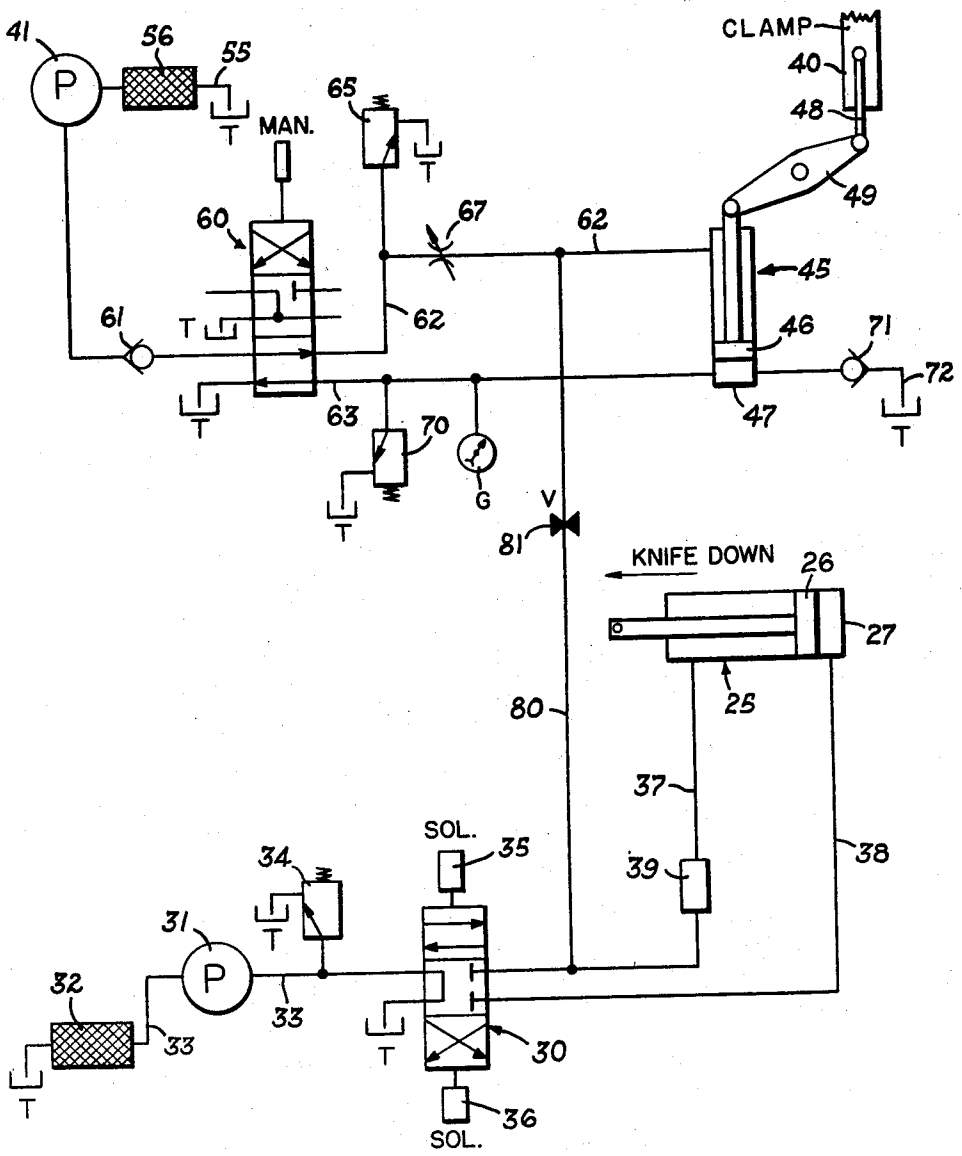
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Jan. 21, 1964 L. D. BARLEY 3,118,338

CUTTING MACHINE

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FIG-4



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3,118,338

CUTTING MACHINE

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9 Claims. (Cl. 83—461)

This invention relates to cutting machines and more particularly to machines for cutting paper and like material.

Power operated cutting machines capable of cutting through comparatively thick stacks of sheet material necessarily involve the use of substantial forces to effect the cutting. In order to accomplish even, uniform cutting of the stacked sheet material and prevent ragged edges it is essential that the stack of material be firmly held in position against movement. Such positioning is normally accomplished by means of a clamp which reciprocates immediately in back of the cutting blade and which defines the cutting line along which the blade operates. In view of the fact that the blade requires large operating forces it is clear that the force created by the clamp during the cutting stroke must be at least the equivalent of that of the knife blade if the effective position of the stack is to be obtained.

The pressures present in the knife and clamp mechanisms are capable of causing severe injuries to workers' hands and arms that may be placed accidentally within the line of travel of these elements, the hazard being particularly troublesome when some portion of the operating mechanism, such as the knife blade, must be changed to compensate for wear or other adjustments made.

Further, in many present day cutting machines the knife and clamping mechanisms are retained in raised position between successive cutting strokes by means of latches or other similar mechanical locking mechanisms, the locking mechanisms being disengaged prior to reciprocation of these mechanisms. In view of the fact that during the interim between successive cuts the operator will often find it necessary to place his hands and arms beneath the clamping and cutting mechanisms to adjust the stack of material to the desired position, possible disengagement of one of the locking mechanisms at this time represents a potential hazard. Should a latch become accidentally disengaged while the worker has his hands in a vulnerable position, severe injury could occur from the falling of the comparatively heavy knife or clamp.

It is a principal object of this invention to provide a cutting mechanism having a hydraulically operated knife and clamp in which both the knife and the clamp can be supported in raised inoperative position by pressures comparatively less than those used during the cutting and clamping operations.

It is another object of this invention to provide a cutting device in which the clamping mechanism can be reciprocated at lower hydraulic pressures than those used during the clamping operation.

It is another object of this invention to provide a cutting device in which the clamping mechanism can be moved to its raised position at relatively high hydraulic pressures and supported at comparatively lower hydraulic pressures.

Another object of this invention is to provide a cutting mechanism having a hydraulically actuated and supported clamp in which the supporting pressure is comparatively less than the clamping pressure.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings:

FIG. 1 is a fragmentary front view showing the relative positioning of the cutting and clamping members;

FIG. 2 is a schematic diagram of the hydraulic circuit used to effect operation of the clamp and knife;

FIG. 3 is a schematic view with certain parts shown in perspective for clarification of the operating means; and

FIG. 4 is a schematic diagram of a modified hydraulic circuit used to effect operation of the clamp and knife.

A general type of cutting and clamping apparatus to which the present invention may advantageously be adapted is schematically shown in FIG. 1. A knife **10** is removably carried upon a knife bar in the usual way, and the knife bar is guided for reciprocating travel in guides such as **11** in the frame of the machine. A pair of links **12**, **13** are secured to the knife bar and have connecting bars **14**, **15** which are adjustable to provide for the accurate locating of the knife at the bottom of its stroke with reference to the cutting table, so that the knife will cut through the last sheet of paper and merely touch but not cut into the cutting stick provided below the knife. Bars **14** and **15** are actuated respectively by bell cranks **16**, **17**, the action of which is correlated by cross bar **18**, extending across the machine from one crank to the other. A suitable construction for this purpose is shown in Patent No. 2,649,153 issued to the same assignee as the present application.

The knife linkage is actuated by a hydraulic motor indicated at **25** including a double actuating piston **26** movable in cylinder **27** and connected to bell crank **16** by means of a link **28**. Thus it will be evident that movement of the piston toward the left as shown in FIG. 1 will cause a downward pull upon both links **12** and **13**, causing the knife **10** to move downwardly and with a component of transverse movement, one end traveling downward at a faster rate than the other, thereby providing the desired action in the course of the work stroke. It will be understood that the mechanism is such that at the bottom of the stroke the knife assumes a position parallel with the cutting stick to thereby produce a uniform cut throughout the entire depth of the pile.

Selective control of the operation of the knife cylinder is obtained by means of a solenoid controlled valve **30** (FIG. 2), such valve conveniently being of the type known as an open tandem center valve. Fluid is supplied to the valve **30** by means of a relatively large capacity pump **31** which draws fluid from tank T through filter **32** and is capable of pumping fluid at a relatively high rate, for example, 11 gallons per minute. The line **33** leading from pump **31** to valve **30** has a pressure adjusting relief valve **34** by means of which the desired maximum operating pressure produced within the knife hydraulic circuit is determined. When valve **34** opens at the predetermined pressure for which it is set, excess fluid returns to tank T.

As indicated, the valve **30** is self-centering so that when neither solenoid **35** nor solenoid **36** is energized to move the valve from its centered position, the fluid flowing through line **33** from pump **31** will circulate directly through the valve and return to tank, thereby requiring comparatively little pumping pressure from pump **31**, and hence the load on the drive motor for the pump is minimized. Hydraulic lines **37** and **38** lead from the other side of valve **30** to each end of hydraulic motor **25** to provide for the introduction and removal of hydraulic fluid into and from each end of cylinder **27**, the direction of fluid flow in either of the pipes being reversed upon reversal of valve **30** from the up to the down position.

When solenoid **35** is actuated the valve **30** is moved from its centered position and the flow of fluid is from pump **31** through line **37** into cylinder **27** for action

against the left hand face of piston 26 causing the piston to move to the right, this movement of the piston resulting in upward movement of knife 10. Meanwhile the fluid contained within cylinder 27 to the right of piston 26 escapes through line 38 and valve 30 into tank T. Conversely, actuation of solenoid 36 moves valve 30 in the opposite direction from center and fluid flow is from pump 31 through line 38 into cylinder 27 for action against the right hand face of piston 26 to move the knife 10 down. Thus, solenoid 35 will be referred to as the "Up" solenoid and solenoid 36 as the "Down" solenoid.

When knife 10 is lowered in beginning a cutting stroke, it is important that the knife move downwardly at a substantially uniform rate in order that proper cutting of the paper material be effected. If no means were present for controlling the rate of downward movement of the knife it would fall freely and, due to its weight, piston 26 would be drawn rapidly toward the left of cylinder 27. During such movement the hydraulic fluid contained in cylinder 27 to the left of the piston 26 would be forced out through line 37 to tank T. Therefore a counter balance valve 39 is connected in line 37 to retard the flow and cause a low back pressure on piston 27 as it moves toward the left but to permit unrestricted flow of fluid in the opposite direction. Thus the knife 10 cannot fall freely and proper cutting action is obtained without hesitation when entering the pile.

In the center position of valve 30, as long as neither Up solenoid 35 nor Down solenoid 36 is energized, the piston 26 is held stationary, and the knife will remain stationary in its raised or inoperative position.

The clamp 40 is actuated by a separate hydraulic pump 41 which has less pumping capacity than pump 31, for example 3 gallons per minute, the hydraulic actuating system for the clamp being essentially separate from that actuating the knife 10. In operating clamp 40 it is desirable to be able to regulate the force with which the clamp engages the pile of material to be cut, because different types of material require more or less clamping pressure. It is also desirable to provide for a rapid rate of downward travel of the clamp toward the pile but without requiring such a large capacity pump as to increase the power requirements or to increase the losses. It is further desirable to return the clamp to its inoperative position and maintain it in that position under a comparatively lesser hydraulic pressure than is normally present during the clamping operation, thus reducing the work done by the clamp pump and its drive motor.

The clamp operating motor is indicated generally at 45 and comprises a piston 46 movable in a cylinder 47. The piston is connected to clamp 40 by a link 48 and a crank 49 which is secured to cross shaft 50 suitably journaled in the frame of the machine. It will be seen that the mechanism is such that the travel of the piston 46 upwardly as shown in FIGS. 1 and 2 results in downward clamping movement of the clamp 40 and, conversely, that downward movement of piston 46 causes upward movement of clamp 40. The separate supply pump 41 for supplying the clamp operating pressure has an intake pipe 55 leading from filter 56 and tank T. The output pipe 58 of the pump is connected to a modified open-center directional valve 60 and contains a check valve 61 preventing reverse flow of hydraulic fluid toward the pump 41 when the machine is shut down.

The normal static condition for the directional valve is in a biased position causing the piston 46 to move in the direction holding clamp 40 in its raised, inoperative position. This is indicated in FIG. 2 where the fluid flow is directed into line 62 from valve 60 into the upper end of cylinder 47, thereby exerting a downward force on piston 46 and causing the clamp 40 to rise. Fluid beneath piston 46 flows through line 63 back to valve 60 and to tank T.

Since the application of full or high hydraulic pressure into the upper end of cylinder 47 to merely hold clamp 40 in its raised position is unnecessary and would represent wasted energy, line 62 has a pressure adjusting relief valve 65 connected thereto by means of a line 66, its outlet side being vented to tank T. The pressure as determined by relief valve 65 is relatively low, in comparison with that required when the clamp is in engagement with the pile. Valve 65 provides simple and expedient means for adjusting the amount of fluid pressure which will be applied to piston 46 in effecting upward movement and retention of clamp 40 in its raised position. The pressure can be adjusted to a value just sufficient to raise the clamp or it can be increased to some greater value to fulfill the preferences of individual users. The actual value of the hydraulic pressure set by valve 65 will be determined by operating experience and safety considerations.

The clamp 40 does not depend upon or use hydraulic pressure in moving from its raised inoperative position to its lowered operative position in contact with the work material but is permitted to fall freely and the clamping pressure is developed in motor 45 after the clamp is down. This feature eliminates the necessity for the much larger clamping pump which would be required if the cylinder 47 had to be filled with fluid fast enough to keep pace with the increase in cylinder volume occasioned by the rapid travel of piston 46. The portion of line 62 lying between the upper end of cylinder 47 and valve 65 contains a restrictor 67 which limits the rate of fluid flow through the line to a safe maximum. The restrictor is useful in damping the movement of the piston to thereby achieve a more uniform and constant descent of the clamp 40.

Movement of clamp 40 in the downward or clamping direction is caused by shifting valve 60 to discharge fluid from line 62 and simultaneously introducing fluid through line 63 into the lower end of cylinder 47 to move piston 46 upwardly. The movement of piston 46 in the upward direction is effected by the weight of clamp 40 so that the piston will actually tend to move at a higher rate of speed than can be brought about through the positive introduction of hydraulic fluid. The clamping pressure is determined by a relief valve 70, separate from valve 65, which is operably connected to line 63 between valve 60 and the clamp motor 45, the clamping pressure in line 63 being readable from gauge G. A relatively high pressure is usually required for this operation. A check valve 71 is located in a connecting line 72 adjacent the lower end of cylinder 47 and when movement of the piston enlarges the working volume of cylinder 46 at a rate exceeding the rate of introduction of fluid from pump 41, the negative pressure created in the lower part of the cylinder will cause check valve 71 to open and additional hydraulic fluid will be drawn into the cylinder from tank T.

Whether fluid flow is through line 62 into the upper end of cylinder 47 to cause upward movement of clamp 40 or is through line 63 into the lower end of cylinder 47 concurernt with downward movement of the clamp, the fluid pressures on either side of piston 46 can be separately controlled by valves 65 and 70. For example, the valve 65 can be set to unseat at a relatively low pressure of 180 p.s.i. to 200 p.s.i. in lines 62 and 66 and in the upper end of motor 45 holding the clamp 40 in its raised, inoperative position when valve 60 is in its normally biased, static condition. At the same time valve 70 can be adjusted to achieve a much higher clamping pressure of 2000 p.s.i., for example, in line 63 and the lower end of motor 45, when valve 60 is moved to its other operating position.

When valve 60 is moved to its central position the line 62 is blocked to prevent flow of hydraulic fluid from the upper end of motor 45. Concurrent with blocking of line 62 the valve 60 connects both pump supply line 58 and line 63 to tank T. While the weight of clamp 40 tends to move piston 46 upwardly within cylinder 47,

it cannot effect any actual movement due to the fact that fluid above piston 46 cannot escape through valve 60 to tank T. Controlled release of fluid through line 62 by moving valve 60 a slight distance beyond center enables accurate lowering of clamp 40 under its own weight without the use of a positive operating pressure from pump 41.

While clamp motor 45 is supplied with a continuous supply of fluid from pump 41 when the clamp is raised, because valve 60 is biased to the position causing such flow, the valve 30 through which fluid is supplied to knife motor 25 acts only to block the ports at each end of cylinder 27. Any leakage of fluid from within cylinder 25 for any reason might possibly permit the knife to drift from its inoperative position. One type of hydraulic system for alleviating this difficulty is described and claimed in Patent No. 2,667,922 issued to the same assignee as the present application.

In the present instance elimination of drifting caused by fluid leakage is achieved by connecting a continuously open fluid pressure line 75 to output line 58 leading from the clamp pump 41 to the knife motor 25 on the side causing raising of the knife. A small restrictor 77 prevents any large transfer of fluid through the line 75, and a check valve 78 stops reverse flow of fluid from the knife to the clamp hydraulic system. During idling conditions fluid line 75 supplies relatively small quantities of additional fluid to the knife motor 25 to compensate for any fluid losses. Through the interconnection between the separate hydraulic systems a continuous supply of hydraulic fluid at a pressure being determined by the setting of valve 65, is delivered to the knife system to assure that the knife will be maintained in its inoperative or raised position.

In the preceding system raising of clamp 40 is effected by application of fluid pressure from the low capacity pump 41 into cylinder 47 on the upper side of piston 46. Since the pressure from pump 41 is relatively low, it follows that the upward movement of clamp 40 will be comparatively slower than the corresponding upward movement of knife 10 due to the fact that the knife is actuated by the high pressure fluid coming from pump 31. Under normal operating conditions succeeding clamping and cutting strokes should not be undertaken until both the knife and the clamp have returned to their raised positions. It is therefore important, in high speed operations, that the clamp and knife return to the raised positions as rapidly as possible.

FIG. 4 shows a hydraulic system similar to the system of FIG. 2 which makes possible the application of high pressure fluid from pump 31 to the upper end of motor 45 to move piston 46 downwardly and raise clamp 40 at a faster rate than would be possible with low pressure fluid coming from pump 41. This is accomplished by the use of a hydraulic line 80 which is connected to line 37 at one end and to line 62 at the opposite end, a needle valve 81 being placed within line 80 to control the quantity and pressure of fluid which can flow through the line.

Thus, line 80 can supply high pressure fluid to the upper end of motor 45, and the left end of motor 25, when valve 30 is actuated by Up solenoid 35 to raise both the clamp 40 and the knife 10 at a rapid rate. Of course during the time that the clamp is being raised by fluid from pump 31, the pump 41 is operating but it is not of any value in raising the clamp since its pressure is materially less than that coming from pump 31. The variable restrictor 67 prevents excess reverse flow of fluid through line 62 and out of relief valve 65 to tank so that sufficient pressure will be built up within motor 45 to effect the desired rapid rise of clamp 40.

After the clamp and knife have been raised to their uppermost positions, the valves 30 and 60 are returned to their normally biased positions. The normal position for valve 30 unloads pump 31, as before. Return of valve 60 to its biased position connects the pump 41 to line 62, and into the upper end of motor 45 to hold the clamp 40 in its raised position. Since line 80 is connected to the left end of motor 25 fluid pressure will also be supplied to the motor 25 to retain the knife 10 in its raised position under the continuing supply of low pressure fluid from pump 41. Thus the large or high pressure pump 31 acts to raise both the clamp and the knife during normal operating periods but is removed from the hydraulic circuit during periods of inactivity during which periods the small pump 41 supplies the pressure to the system.

Referring to FIG. 3, manual operation of clamp valve 60 can be effected by means of the left-hand lever 90, which is operably connected to the valve through pulley system 91, or by means of foot treadle 92 which is also connected to the clamp valve 60 through flexible cable 93. Initial movement of either lever 90 or treadle 92 causes the valve to move to its center position removing fluid pressure from the bottom of cylinder 47 and blocking flow from the upper end thereof so that clamp 40 cannot begin its downward movement until additional movement of the clamp valve beyond the center position takes place and escape of fluid from the upper end of the cylinder is permitted.

To produce a working cycle, immediately following the movement of the left-hand lever 90 or foot treadle 92 the operator will normally move a right-hand lever 95, this lever actuating an electric switch 96 to complete an electric circuit from line L1 to the switch 97 through lines 98 and 99. Switch 97, which is here shown somewhat schematically, can be of the double-pole, double-throw type to connect one side of the switch to line L1 through lines 98 or 99 or to connect the other side of the switch to line L1 through line 100. When knife 10 is in its raised position switch contact 105 on bell crank 16 operates against switch 97 completing the circuit from line 99 to solenoid 36. However, no current is supplied to solenoid 36 until manually operated switch 96 is closed by the operator to connect lines 98 and 99, so that valve 30 will be in its normally centered position preventing flow of hydraulic fluid either into or from hydraulic motor 25. Actuation of switch 96 and subsequent energization of solenoid 36 moves valve 30 to the position supplying fluid to cylinder 27 for action against the right-hand face of piston 26 causing downward movement of knife 10.

When the knife has progressed to its lowermost position the switch contact 106 on bell crank 16 will operate switch 97 causing opening of the circuit to solenoid 36 and closing of the circuit 100 to solenoid 35. This reversal will shift valve 30 and cause the fluid to flow in the opposite direction into cylinder 27. Activation of switch 97 effects automatic energization of Down solenoid 36 throwing valve 30 to the position supplying fluid to cylinder 27 for action against the right-hand face of piston 26 to raise the knife.

At the time the blade 10 contacts the cutting stick the operator normally releases his grip on both the right and left-hand levers and the foot treadle thereby permitting valve 60 to automatically return to its biased position causing upward movement of the clamp and opening of switch 96. When knife 10 has reached its uppermost position the bell crank 16 will have returned to a position where switch contact 105 throws switch 97 to its original position and solenoid 35 is deenergized. The valve 30 is then returned to its open center position and the fluid within cylinder 27 is kept from flowing in either direction.

Upon the return of the various parts to their inoperative positions the large capacity pump 31 will be unloaded and direct its flow into tank T, thereby requiring very little power, while the small capacity clamp pump 41 supplies the system with the particular pressure determined by relief valve 65 to keep the knife 10 and clamp 40 in their upper, inoperative positions.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be under-

stood that this invention is not limited to this precise form of apparatus and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In a cutting machine having a cutting table for receiving work material thereon, the combination comprising a cutting knife reciprocable in a working stroke to cut the work material on the table, a clamp movable from a raised inoperative position to a lowered operative position in clamping engagement with the work material, a reversible hydraulic motor for selectively actuating said clamp in one direction to apply clamping pressure to the work material and in the opposite direction to return the clamp to its raised inoperative position, a hydraulic circuit including a pair of supply lines operably connected to said motor for supplying hydraulic fluid under pressure to said motor for operation thereof in forward and reverse directions to reciprocate said clamp, a pressure control valve connected with each of said supply lines for establishing separate pressure conditions for the operation of said motor in opposite directions, and means for adjusting one said pressure control valve for a relatively high pressure to be supplied during the clamping operation and for adjusting the other said pressure control valve to a relatively low pressure for returning said clamp to and retaining it in said inoperative position.

2. In a cutting machine having a cutting table for receiving work material thereon, the combination comprising a cutting knife reciprocable on a forward and reverse stroke to cut the work material on said table, a clamp movable from a raised inoperative position to a lowered operative position in clamping engagement with said work material, a reversible hydraulic motor for selectively actuating said clamp in one direction to apply clamping pressure to the work material and in the opposite direction to return the clamp to its raised inoperative position, a pump for supplying hydraulic fluid under pressure, separate supply conduits for supplying pressure fluid from said pump to said motor for forward and reverse operation thereof respectively, a control valve for controlling the supply of said fluid pressure selectively to said supply lines to cause operation of said clamp in said opposite directions, means for normally biasing said control valve in the position to cause the raising of said clamp, a pressure control valve connected with each of said supply lines for establishing separate pressure conditions for the operation of said motor in opposite directions, and means for adjusting one said pressure control valve for a relatively high pressure to be supplied during the clamping operation and for adjusting the other said pressure control valve to a relatively low pressure for retaining said clamp in said raised inoperative position.

3. In a cutting machine having a cutting table for receiving work material thereon, the combination comprising a cutting knife reciprocable on a forward and reverse stroke to cut the work material on said table, a clamp movable from a raised inoperative position to a lowered operative position in clamping engagement with said work material, a reversible hydraulic motor for selectively actuating said knife on a working stroke and on a return stroke, a reversible hydraulic motor for selectively actuating said clamp in one direction to apply clamping pressure and in the opposite direction to return to said inoperative position, a high capacity pump for supplying hydraulic fluid under pressure to said knife actuating motor, a lower capacity pump for supplying hydraulic fluid under pressure to said clamp operating motor, supply lines for supplying pressure fluid from said low capacity pump to said clamp operating motor, a control valve for effecting selective application of fluid pressure from said high capacity pump to cause the forward and reverse travel of said knife, a control valve for selectively controlling the supply of fluid pressure from said low capacity pump to said clamp motor, means for controlling the pressure produced by said high capacity pump, a pressure control valve connected with each of said supply lines for establishing separate pressure conditions for the operation of said clamp motor in opposite directions, and means for adjusting one said pressure control valve for a relatively high pressure to be supplied during the clamping operation and for adjusting the other said pressure control valve to a relatively low pressure for retaining said clamp in said inoperative position.

4. In a cutting machine having a cutting table for receiving work material thereon, the combination comprising a cutting knife reciprocable on a forward and reverse stroke to cut the work material on the table, a hydraulic circuit including a high capacity pump operatively connected to a reversible motor for effecting reciprocation of said knife on said forward and reverse stroke, a clamp movable from a raised inoperative position to a lowered operative position in clamping engagement with said work material, a reversible hydraulic motor for selectively actuating said clamp in one direction to apply clamping pressure to the work material and in the opposite direction to return the clamp to its raised inoperative position, a low capacity pump for supplying hydraulic fluid under pressure to said clamp operating motor, supply lines for supplying pressure from said low capacity pump to said clamp motor, a pressure control valve connected with each of said supply lines for establishing separate pressure conditions for the operation of said clamp motor in opposite directions, means for adjusting one said pressure control valve for a relatively high pressure to be supplied during the clamping operation and for adjusting the other said pressure control valve to a relatively low pressure for retaining said clamp in said inoperative position, and means for supplying pressure from said low capacity pump to said knife motor to maintain the knife in its inoperative position.

5. In a cutting machine having a cutting table for receiving work material thereon, the combination comprising a cutting knife reciprocable on a forward and reverse stroke to cut the work material on the table, a hydraulic circuit including a high capacity pump operatively connected to a reversible motor for effecting reciprocation of said knife on said forward and reverse stroke, a clamp movable from a raised inoperative position to a lowered operative position in clamping engagement with said work material, a reversible hydraulic motor for selectively actuating said clamp in one direction to apply clamping pressure to the work material and in the opposite direction to return the clamp to its raised inoperative position, a low capacity pump for supplying hydraulic fluid under pressure to said clamp operating motor, supply lines for supplying pressure from said low capacity pump to said clamp motor, a pressure control valve connected with each of said supply lines for establishing separate pressure conditions for the operation of said clamp motor in opposite directions, means for adjusting one said pressure control valve for a relatively high pressure to be supplied during the clamping operation and for adjusting the other said pressure control valve to a relatively low pressure for retaining said clamp in said inoperative position, a continuously open supply line for supplying pressure fluid from said low capacity pump to said knife motor to maintain the knife in its inoperative position, and flow controlling means in said open supply line limiting the rate of flow of fluid therethrough.

6. In a cutting machine having a cutting table for receiving work material thereon, the combination comprising a cutting knife reciprocable on a forward and reverse stroke to cut the work material on the table, a hydraulic circuit including a high capacity pump operatively connected to a reversible motor for effecting reciprocation of said knife on said forward and reverse stroke, a clamp movable from a raised inoperative position to a lowered operative position in clamping engagement with said work material, a reversible hydraulic motor for selectively

actuating said clamp in one direction to apply clamping pressure to the work material and in the opposite direction to return the clamp to its raised inoperative position, a low capacity pump for supplying hydraulic fluid under pressure to said clamp operating motor, supply lines for supplying pressure from said low capacity pump to said clamp motor, a pressure control valve connected with each of said supply lines for establishing separate pressure conditions for the operation of said clamp motor in opposite directions, means for adjusting one said pressure control valve for a relatively high pressure to be supplied during the clamping operation and for adjusting the other said pressure control valve to a relatively low pressure for retaining said clamp in said inoperative position and means for supplying pressure from said high capacity pump to said clamp motor to return said clamp to its inoperative position and from said low capacity pump to said knife motor to maintain the knife in its inoperative position.

7. In a cutting machine having a cutting table for receiving work material thereon, the combination comprising a cutting knife reciprocable on a forward and reverse stroke to cut the work material on the table, a hydraulic circuit including a high capacity pump operatively connected to a reversible motor for effecting reciprocation of said knife on said forward and reverse stroke, a clamp movable from a raised inoperative position to a lowered operative position in clamping engagement with said work material, a reversible hydraulic motor for selectively actuating said clamp in one direction to apply clamping pressure to the work material and in the opposite direction to return the clamp to its raised inoperative position, a low capacity pump for supplying hydraulic fluid under pressure to said clamp operating motor, supply lines for supplying pressure from said low capacity pump to said clamp motor, a pressure control valve connected with each of said supply lines for establishing separate pressure conditions for the operation of said clamp motor in opposite directions, means for adjusting one said pressure control valve for a relatively high pressure to be supplied during the clamping operation and for adjusting the other said pressure control valve to a relatively low pressure for retaining said clamp in said inoperative position, a continuously open supply line for supplying pressure fluid from said high capacity pump to said clamp motor to return said clamp to its inoperative position and from said low capacity pump to said knife motor to maintain the knife in its inoperative position, and valve means in said open supply line limiting the rate of flow of fluid therethrough.

8. In a cutting machine having a cutting table for receiving work material thereon, the combination comprising a cutting knife reciprocable on a forward and reverse stroke to cut the work material on the table, a hydraulic circuit including a high capacity pump operatively connected to a reversible motor for effecting reciprocation of said knife on said forward and reverse stroke, a clamp movable from a raised inoperative position to a lowered operative position in clamping engagement with said work material, a reversible hydraulic motor for selectively actuating said clamp in one direction to apply clamping pressure to the work material and in the opposite direction to return the clamp to its raised inoperative position, a low capacity pump for supplying hydraulic fluid pressure to said clamp operating motor, supply lines for supplying pressure from said low capacity pump to said clamp motor, a pressure control valve connected with each of said supply lines for establishing separate pressure conditions for the operation of said clamp motor in opposite directions, means for adjusting one said pressure control valve for a relatively high pressure to be supplied during the clamping operation and for adjusting the other said pressure control valve to a relatively low pressure for returning said clamp to and retaining it in said inoperative position, a continuously open supply line for supplying pressure fluid from said low capacity pump to said knife motor to maintain the knife in its inoperative position, and means in said open supply line preventing reverse flow of fluid therethrough.

9. In a cutting machine having a cutting table for receiving work material thereon, the combination comprising a cutting knife reciprocable on a forward and reverse stroke to cut the work material on said table, a clamp movable from a raised inoperative position to a lowered operative position in clamping engagement with said work material, a reversible hydraulic motor for selectively actuating said knife on a working stroke and on a return stroke, a reversible hydraulic motor for selectively actuating said clamp in one direction to apply clamping pressure and in the opposite direction to return to said inoperative position, a high capacity pump for supplying hydraulic fluid under pressure to said knife actuating motor, a low capacity pump for supplying hydraulic fluid under pressure to said clamp operating motor, supply lines for supplying pressure from said low capacity pump to said clamp motor, a first control valve having operative positions for effecting selective application of fluid pressure from said high capacity pump to cause the forward and reverse travel of said knife, means in said first valve defining a centered position intermediate said operative positions for unloading said high capacity pump and retaining fluid within said knife motor, a second control valve having operative positions for selectively controlling the supply of fluid pressure from said low capacity pump to said clamp motor, means for controlling the pressure produced by said high capacity pump, a pressure control valve connected with each of said supply lines for establishing separate pressure conditions for operation of said clamp motor in opposite directions, and means for adjusting one said pressure control valve for a relatively high pressure to be supplied during the clamping operation and for adjusting the other said pressure control valve to a relatively low pressure for returning said clamp to and retaining it in said inoperative position.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,118,338 January 21, 1964

Leo D. Barley

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 58, for "concurernt" read -- concurrent --; column 5, lines 20 and 21, for "a continuously open" read -- an auxiliary --; column 8, line 35, after "motor" insert -- only when said knife is moved substantially to the limit of its reverse stroke --; line 61, for "a continuously open" read -- an auxiliary --; same column 8, line 63, after "position," insert -- check valve means preventing reverse flow from said circuit of said knife motor through said auxiliary supply line, --; column 9, lines 14 and 15, after "position" insert a comma; line 15, after "and" insert -- circuit --; line 16, after "motor" insert -- only --; line 17, after "and" insert -- to apply pressure --; line 18, after "motor" insert -- only --; same column 9, line 34, for "under" read -- to --; column 10, line 2, after "fluid" insert -- to --; line 12, for "a continuously open" read -- an auxiliary --; line 16, strike out "reverse"; same line 16, after "therethrough" insert -- from the circuit of said knife motor into the circuit of said low capacity pump --; same column 10, after line 63, add the following reference:

2,825,404 Barley----------Mar. 4, 1958

Signed and sealed this 16th day of June 1964.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents