Sept. 14, 1948. R. L. McBRIDE 2,449,172

CLAMPING MECHANISM

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Fig. 1

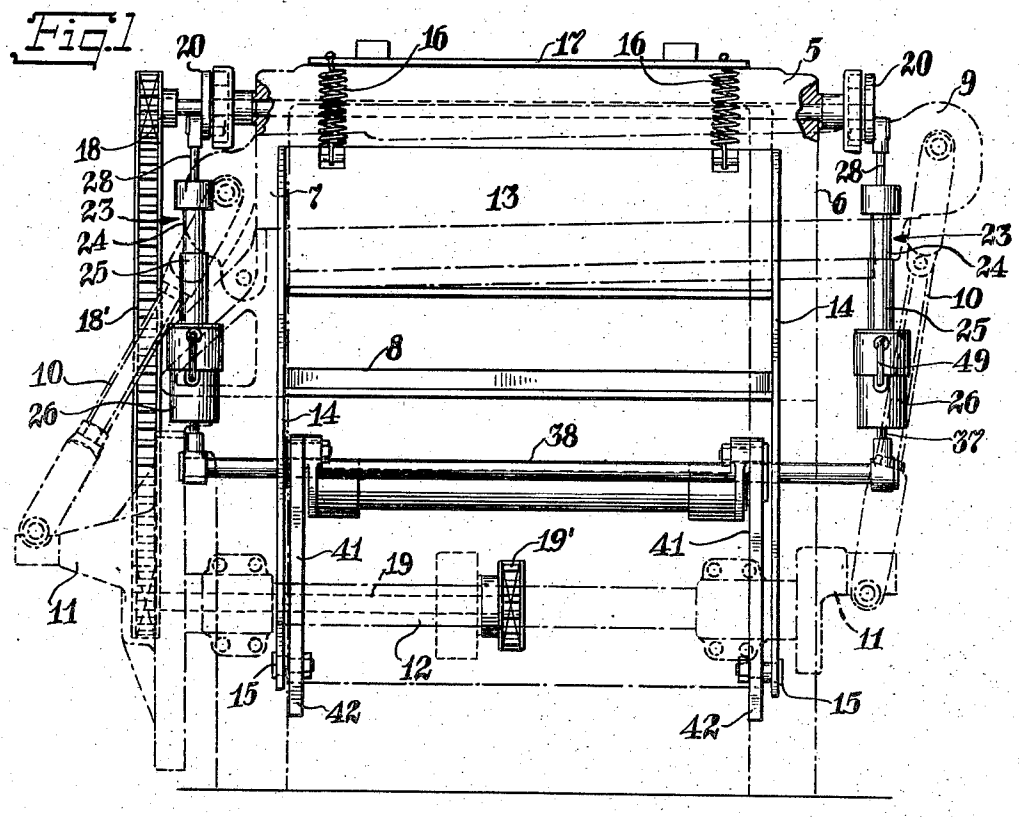


Fig. 4

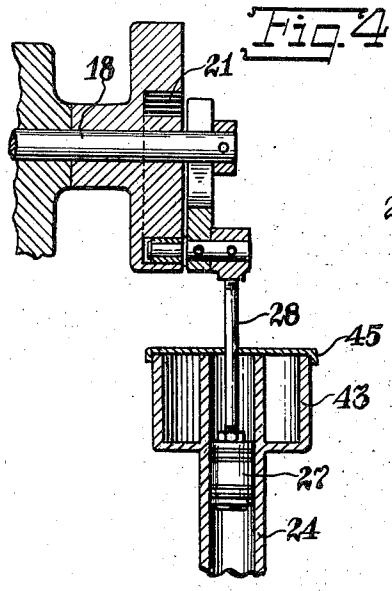
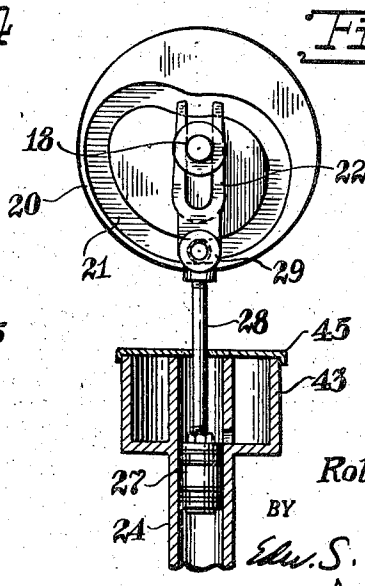


Fig. 5



INVENTOR.
Robert L. McBride
BY
Edw. S. Higgins
ATTORNEY

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Fig. 2

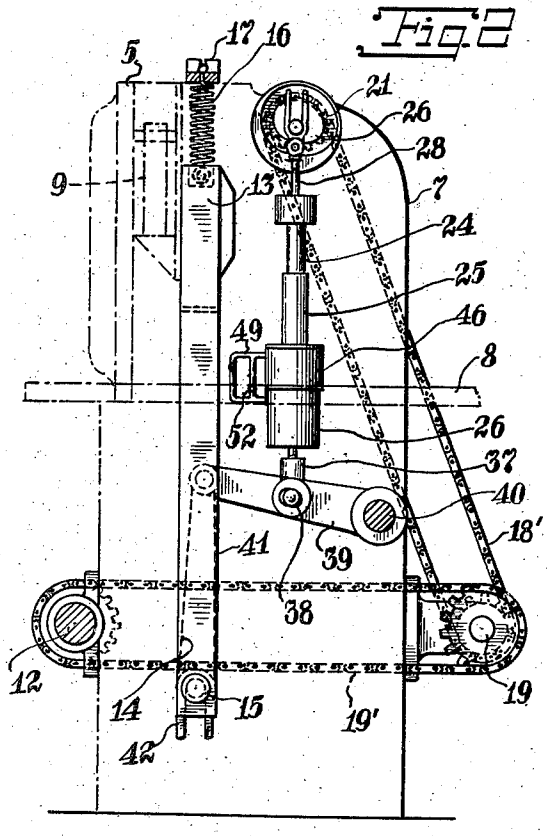


Fig. 3

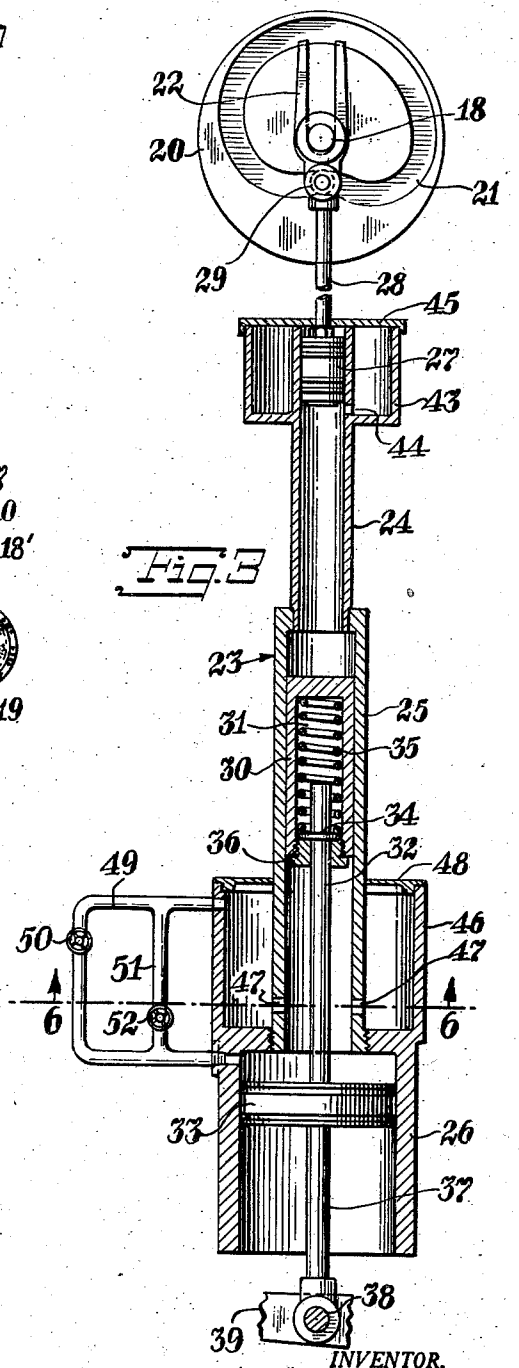
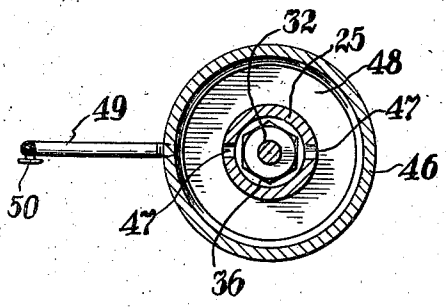


Fig. 6



INVENTOR.
Robert L. McBride
BY
Edw. S. Higgins
ATTORNEY

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CLAMPING MECHANISM

Robert L. McBride, New York, N. Y.

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4 Claims. (Cl. 164—51)

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This invention relates generally to paper cutting machines and more particularly to hydraulically actuated clamping means therefor adapted to exert pressure on the pile of papers to be cut immediately prior to and during the fall of the knife.

Various friction clamping devices have heretofore been used for clamping the pile of paper when the same has been properly positioned in order to make the desired cut and also for exerting pressure on the clamping devices when the cut is made. Such devices have however proven unsatisfactory. Some of them are noisy to an objectionable degree and are subjected to an undue amount of shock and cause pile disturbances on the return stroke of the knife. Furthermore these devices must be operated at a limited speed. Also in such devices pressure is lost due to oil soaking and mechanical wear of the parts. Such friction clamping devices are generally erratic in action resulting in variations in pressure and in disturbance of the pile of paper. Again in such devices usually the highest peak of the pressure load is exerted at the moment of cutting which is objectionable. Also in such devices, excessive pressure adjustment or seizure of friction is likely to cause breakage of parts of the machine.

It is a primary object of my invention to overcome the foregoing objections and disadvantages.

Another object is to provide improved clamping means for paper cutting machines and the like that moves at a rapid speed toward the pile of paper and upon engagement therewith exerts a sustained and regulated pressure thereupon during the cutting and until the knife leaves the pile.

Another object is to provide a clamping device that provides instantaneous and sensitive control of the pressure.

Another object is to reduce the driving loads.

Another object is to eliminate faulty adjustment or reduce it to a minimum.

Another object is to provide clamp actuating mechanism for paper cutting machine and the like embodying means for applying pressure to such clamp, such means being automatically operative in timed relation to the fall of the knife and upon engagement with the pile of paper being adapted to exert a sustained and regulated pressure thereupon during the cutting and until the knife leaves the pile.

Another object is to provide clamping mechanism that is simple in construction, inexpensive to manufacture and flexible and positive in action.

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Other objects and advantages of my invention will be apparent from the description thereof to follow taken in connection with the accompanying drawings in which—

Fig. 1 is a front elevational view of a paper cutting machine embodying my invention, parts being shown in section.

Fig. 2 is a side elevational view thereof.

Fig. 3 is a sectional view on an enlarged scale of the improved clamping apparatus, with the parts in inoperative position.

Fig. 4 is a fragmentary view of the clamping apparatus of Fig. 3 with the parts in operative position.

Fig. 5 is a sectional view of the parts shown in Fig. 4, looking from the front thereof.

Fig. 6 is a sectional view taken on the plane of the line 6—6 of Fig. 3.

Referring now more particularly to the drawings, and especially Fig. 1 thereof, the paper cutting machine shown therein comprises a frame 5 having side members 6 and 7 and a bed or table 8. Reciprocably mounted in slots in the side members is a knife 9, means being provided including connecting rods 10 and cranks 11 for imparting reciprocation. The cranks are fastened to the respective ends of shaft 12 which is driven by a motor (not shown).

A clamp 13 is mounted for vertical reciprocal movement to the rear of the knife, said clamp being provided with side bars 14 carrying headed studs 15 at their bottom ends. The clamp is raised to and held in uppermost inoperative position such as shown in Fig. 1 by means of coil springs 16 suitably fastened to a bar 17 mounted on the frame.

The present invention is particularly concerned with improved mechanism for lowering the clamp into engagement with the pile of paper and for applying further pressure to the clamp in order to compact and firmly hold the pile of paper during the cutting operation. This actuating and pressure applying mechanism includes a rotatable shaft 18 supported in the top of the frame and extending on both sides thereof and operatively connected to and driven by shaft 12 by means of a chain 18', rotatable stub shaft 19 and chain 19'. Fastened on each end of the shaft 18 is a cam member 20 provided with a camming groove 21 and a guiding fork 22.

Suitably mounted on the frame underneath and substantially in alignment with the cam members 20 are vertically disposed tubular casings 23. Each casing includes an upper section or cylinder 24, an intermediate section or cylinder 25 and a

lower section or cylinder 26, as shown in Fig. 3. The intermediate section is greater in diameter than the upper section, and the lower section is greater in diameter than the intermediate section.

Slidable in the upper section or cylinder 24 is a piston 27 with its connecting rod 28 carrying a roller 29 at its upper free end which is connected to the cam member 20 thereabove and which roller is movable in the camming groove 21. Another piston 30 is slidably mounted in the intermediate cylinder 25. Piston 30 is provided with a central recess 31. A rod 32 connects the piston 30 with a piston 33 in the lower cylinder 26. The upper end of rod 32 extends into the recess 31 in the piston 30 and has a flange or collar 34 disposed in the recess. A stout coiled spring 35 in recess 31 has its upper end impinging against the roof of the recess 31 and its lower end seated on flange 34. A nut 36 having a central opening for receiving the rod 32 closes the lower end of the recess and holds the piston on the rod. A rod 37 connects the piston 33 with a rod 38 extending across and reciprocally mounted in the frame. A lever or link member 39 is connected midway its length to rod 38, the rear end of the lever being pivoted to a stub shaft 40 mounted on the frame on each side thereof. The front end of the lever is pivotally connected to a vertically disposed lever 41 disposed parallel to and adjacent to each of the side bars 14 of the clamp 13. Each lever 41 has a slotted bottom end 42 adapted to receive and coact with the stud 15 carried by the side bar adjacent thereto, for driving the clamp downwardly into engagement with the pile of paper.

A reservoir 43 containing fluid such as oil and the like is formed on the upper end of the upper cylinder 24 of the casing and this reservoir is provided with an outlet 44 communicating with the interior of the cylinder whereby a constant volume of pressure fluid is maintained in said cylinder 24 in spite of any leakage of fluid in the cylinder. Reservoir 43 may have a cover 45.

Another auxiliary reservoir 46 for fluid is formed integrally with the top of the lower cylinder 26 and is disposed around the lower end of the intermediate cylinder 25. Outlets 47 in the reservoir communicate with the interior of cylinder 25. This reservoir 46 is provided with a cover 48. Connecting reservoir 46 with the interior of the lower cylinder 26 is a pipe line 49 and interposed in this pipe line is a valve 50 which may be operated at some remote point by the operator. Control for operation of said valve 50 may be calibrated. A by-pass pipe 51 is provided with a similar valve 52.

In operation, the crank shaft 12 driven by the motor actuates the knife 9 through the rods 10. At the same time said crank shaft actuates the camming members 20 by means of the chains 18' and 19'. Actuation of the cam members moves the pistons 27. A constant volume of fluid is moved by pistons 27. A constant volume of fluid under pressure is present in the upper cylinders 24. Downward movement of pistons 27 closes the outlets 44 and thereby provides fluid pressure against the pistons 30 in cylinders 25. This fluid pressure on pistons 30 forces each set of said pistons 30, springs 35, push rods 32, pistons 33 and rod 38 downwardly as a unit. The levers 41 connected to the side bars 14 of the clamp 13 being connected to said rod 38 by means of the levers 39 are moved downwardly forcing the clamp 13 downwardly at the same time. The springs 35 are sufficiently strong to move this load without compressing. As the pistons 33 in the lower cylinders 26 move, fluid flows from the auxiliary reservoirs 46 through the outlets 47 into the cylinders 25 keeping the spaces between the pistons 30 and 33 in the cylinders 25 and 26 filled with fluid. Instantly upon the clamp 13 touching or engaging the top of the pile of paper, such paper stops further movement of the clamp which in turn stops further movement of the rod 38, pistons 33 and push rods 32. Fluid pressure on the top of pistons 30 however will continue and the springs 35 will commence to compress allowing pistons 30 to continue moving in cylinders 25 until the pistons 30 close the outlets 47. This closing of outlets 47 produces in effect a straight hydraulic thrust by pistons 27 against pistons 30, with the pistons 30 floating in the hydraulic line. By reason of this, a constant regulated pressure is exerted by the clamp on the pile of paper compacting said papers and holding them for the cutting operation by the knife. The pressure is maintained during the cutting operation and until the knife leaves the pile of paper.

Pressure in each of the lower cylinders 26 is limited and controlled by the fixed safety pressure valve 52. As the cam members 20 are turned they retract the pistons 27 thereby drawing fluid from cylinders 24. The springs 35 expand moving pistons 30 upwardly away from outlets 47 allowing the fluid in lower cylinders 26 to flow into the reservoirs 46 as the atmospheric pressure against pistons 33 together with the action of springs 16 moves the rod 38, pistons 33, push rods 32, springs 35 and pistons 30 to their original upward positions ready for another cycle of operations.

It will be understood that any suitable driving mechanism might be used for bringing the drive from shaft 12 to shaft 18 instead of the chains 18' and 19' and stub shaft 9 illustrated.

Furthermore while I have shown and described duplex pressure means, that is, a casing 23 with associated parts on each side of the frame, it will be understood that such apparatus might be provided on only one side of the frame.

It will also be understood that the improved mechanism might also be used for purposes other than for clamping piles of paper, that is, it might be used for clamping any other kind of work desired wherein a rapid linear movement culminating in a sustained pressure is required.

Details of construction might be changed without departing from the principle and scope of the invention and I desire to be limited only by the state of the prior art and the appended claims.

I claim:

1. In a paper cutting machine, the combination of a motor, a support for a pile of paper to be cut, a reciprocal knife, mechanism for moving said knife into engagement with the pile of paper for cutting same including a crank shaft operatively connected to the motor, a reciprocal clamp member and hydraulically actuated mechanism for moving said clamp into engagement with the pile of paper and subsequently exerting a pressure thereupon for compacting the paper and holding same firmly during the cutting operation, said hydraulically actuated mechanism including a rotatable cam member, a casing containing fluid under pressure, pistons in said casing, one of said pistons being operatively connected to the cam member and movable thereby and the other pistons being movable under the influence of the fluid moved by the cam actuated piston and

means of connection between one of the fluid movable pistons and the clamp member for moving said clamp member.

2. In a paper cutting machine, the combination of a motor, a support for a pile of paper to be cut, a reciprocal knife, mechanism for moving said knife into engagement with the pile of paper to be cut for cutting the same including a crank shaft operatively connected to the motor, a reciprocal clamp member and hydraulically actuated mechanism for moving said clamp into engagement with the pile of papers and subsequently exerting a pressure thereupon for compacting the paper and holding same firmly during the cutting operation, said hydraulically actuated mechanism including a cam member operatively connected to said crank shaft, a casing containing fluid under pressure, a piston in said casing connected to said cam member and movable thereby, another piston in the casing operable under the influence of the fluid movable by said first-named piston and a third piston in said casing operatively connected to said second-named piston and movable thereby, said last named piston being operatively connected to said clamp member for moving the same.

3. In a paper cutting machine, the combination of a motor, a support for a pile of paper to be cut, a reciprocal knife, mechanism for moving said knife into engagement with the pile of paper for cutting same including a crank shaft operatively connected to the motor, a reciprocal clamp member and hydraulically actuated mechanism for moving said clamp into engagement with the pile of paper and subsequently exerting a pressure

thereupon for compacting the paper and holding same firmly during the cutting operation, said hydraulically actuated mechanism including a cam member operatively connected to said crank shaft, a tubular casing having upper, intermediate and lower cylinders, said cylinders containing fluid under pressure, a piston in the upper cylinder operatively connected to the cam member and movable thereby, a piston in the intermediate cylinder movable under the influence of the fluid moved by the piston in the upper cylinder, a piston in the lower cylinder flexibly connected to the piston in the intermediate cylinder and movable therewith and means of connection between the piston in the lower cylinder and the clamp member for moving the latter.

4. Apparatus as defined in claim 3 characterized by a spring in the intermediate cylinder for cushioning the movement of the clamp member.

ROBERT L. McBRIDE.

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