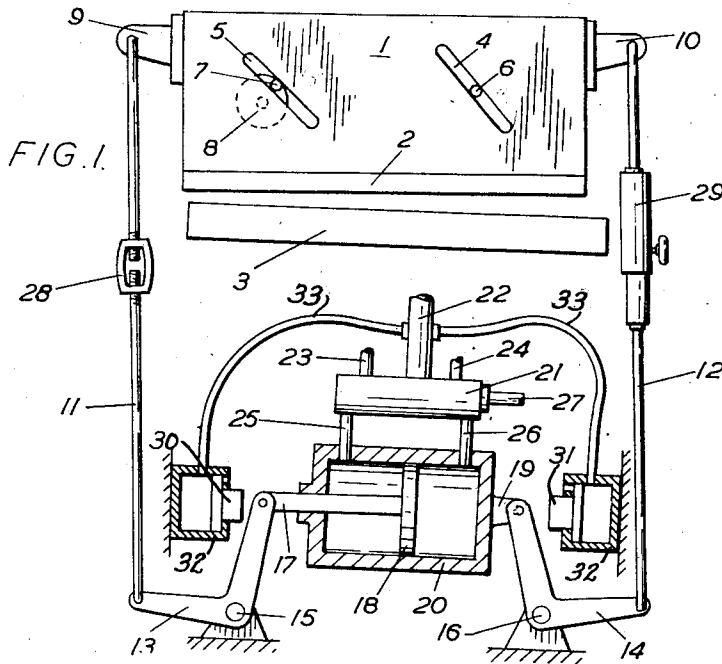
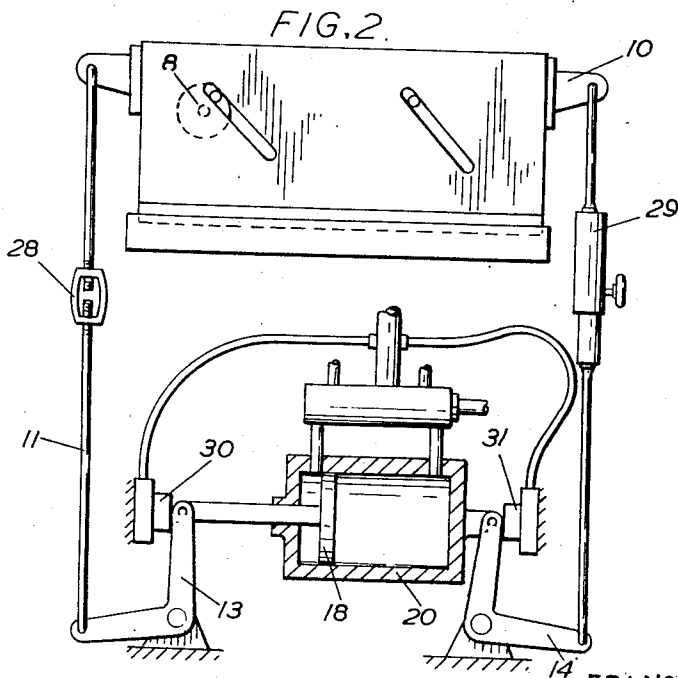


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HYDRAULIC RAM MECHANISM
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HYDRAULIC RAM MECHANISM

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This invention relates to hydraulic ram mechanism for moving an operating member against a resisting force, in which the operating force is applied to the operating member at two points. The invention is applicable more particularly but not exclusively to guillotine machines, for instance for cutting stacks of paper sheets, in which the cutting force is applied at both ends of the guillotine knife.

According to the present invention hydraulic ram mechanism of the kind specified comprises a piston and cylinder both of which are movable and to which hydraulic fluid under pressure can be applied in order to move the piston axially relatively to the cylinder, and two linkages at least one of which includes a fixed abutment or pivot and which respectively connect the piston and the cylinder to the operating member in such a manner that on the application of hydraulic pressure both linkages tend to move the operating member in the same direction.

Conveniently, each linkage includes a bell crank lever one arm of which is connected to the piston or cylinder, as the case may be, while the other arm is connected to the operating member, and these bell crank levers are oppositely disposed so that movement of the first mentioned arms in opposite directions causes the arms connected to the operating member both to move in the same direction.

It may often be desirable to provide some sort of stop for limiting the movement of the operating member, and it is desirable for this stop to provide a certain cushioning effect. Thus in one form of the invention a hydraulic stop is provided to limit the movement of each of the linkages and hence of the operating member.

Where the operating member is a guillotine knife the linkages may act at opposite ends of the knife which may be constrained to move in a desired path by means of guide members. Preferably the knife is given a combined diagonal and rotary movement during its stroke relative to the guillotine base block by means of two non-parallel straight guides engaged by suitable guide members, at least one of which guide engaging members may be adjustable to permit adjustment of the attitude of the knife. By "the attitude of the knife" is meant the alignment of its cutting edge with respect to the upper surface of the bed which the cutting edge engages at the completion of its cutting movement. In many cases the knife is in its correct attitude at the end of its stroke when the cutting edge is exactly parallel with the surface of the bed.

Where there is a stop for limiting the movement of each linkage, each linkage preferably includes an adjustable section to permit adjustment of the end position and attitude of the knife at the end of its stroke.

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The invention may be carried into practice in various ways, but one particular arrangement intended for use with guillotine machines for cutting sheets of material will be described by way of example with reference to the accompanying diagrammatic drawings in which,

Figure 1 illustrates an arrangement showing the knife of the guillotine in mid-stroke, and

Figure 2 illustrates the same arrangement at the end of the stroke.

In the apparatus shown the guillotine knife 1 has a straight cutting edge 2 and moves up and down in a plane perpendicular to the surface of the bed shown at 3. The bed is a block of hard wood sandwiched between two metal plates which lie parallel with the plane of the knife. In order to provide the necessary slicing action, the knife is provided with a pair of inclined guide grooves 4 and 5 in each of which lies a roller 6 and 7 mounted on a pivot. The slot 5 is inclined at approximately 45° to the vertical while the slot 6 is inclined at about 40° to the vertical and thus as the knife 1 is moved up or down, the inclined guides impart a combined rotary and diagonal movement to it. In order to permit adjustment of the attitude of the knife with respect to the bed, the roller 7 is mounted on an eccentric 8 which can be rotated so as to alter the position of the roller.

The mechanism for raising and lowering the knife comprises two linkages connected to opposite ends of the knife, each linkage being approximately a mirror image of the other. Pivoted to brackets 9 and 10 at each end of the knife are approximately vertical thrust arms 11 and 12, the lower ends of these arms being pivotally connected to bell crank levers 13 and 14 the pivots 15 and 16 of which are fixed. The second arm of the bell crank lever 13 is connected by a link 17 to a piston 18, while the second arm of the other bell crank lever 14 is connected by another link 19 to a cylinder 20 in which the piston 18 fits. Neither the piston 18 nor the cylinder 20 is rigidly anchored. Means is provided for admitting hydraulic fluid under pressure to the ends of the cylinder 20 and for releasing it therefrom in accordance with the movements of a suitable control valve 21, so that the piston can be made to move within the cylinder. A pipe 22 leading from a suitable source of hydraulic pressure is connected to the valve 21, which is also provided with two exhaust ports 23 and 24, and two connections 25 and 26 to the ends of the ram cylinder 20. Movements of the control spindle 27 cause fluid under pressure to be admitted at will to either end of the piston in a well known manner and it will be appreciated that as the piston moves along the cylinder, the cylinder will also move axially in the opposite direction. Thus the bell crank levers 13 and 14 will be turned about

their pivots in opposite directions, so that both the thrust arms 11 and 12 will move in the same direction, carrying with them the guillotine knife 1.

Since the relative axial positions of the cylinder 20 and the piston 18 are determined solely by the position of the linkages, and since the knife is constrained to move by means of the guide rollers 6 and 7 in a predetermined path, the system is largely self-adjusting. However, in order to adjust the depth of penetration of the knife into the bed and also the attitude of the knife in this position, both linkages are provided with adjusting devices whose operation will be explained below. The thrust rod 11 contains an adjusting device such as a turn-buckle 28 while the thrust rod 12 is provided with a telescopic sliding adjustment 29.

In order to ensure that the knife only penetrates the bed to a predetermined extent, stops 30 and 31 are provided for arresting the movement of each of the linkages at the ends of the operating stroke. In order to overcome the inertia of the moving parts the stops are preferably hydraulically cushioned, and may be arranged each in its hydraulic cylinder 32 as shown for the stop 30 in Figure 1 of the drawings, each cylinder being connected by means of pipes 33 with the pressure pipe 22 so as to be subject to the same hydraulic pressure supply as is the operating ram cylinder.

The adjustment to fix the position of the knife 1 at the end of its stroke and its attitude at this position as shown in Figure 2 is effected as follows:

The telescopic adjuster 29 is first freed for easy sliding and hydraulic pressure is admitted to the right-hand side of the ram cylinder 20. Owing to the freeing of the adjuster 29 the immediate effect of applying pressure to the cylinder is to rock the lever 14 hard up against the hydraulic stop 31, and thereafter the piston 18 is moved to the left under the influence of the hydraulic pressure thereby causing the knife to move downwards to the end of its stroke, until the lever 13 comes up against its corresponding stop 30. By adjusting the turn-buckle 28 and the eccentric 8 it is then possible to adjust the attitude and position of the knife, since the bracket 10 is still quite free to move, after which the telescopic adjuster 29 is locked and the mechanism is then ready for operation.

What I claim as my invention and desire to secure by Letters Patent is:

1. Hydraulic ram mechanism comprising an elongated operating member arranged for bodily movement in a plane, means for guiding the movement of said member in said plane, said means being capable of causing said member to rotate about an imaginary pivotal axis which is transverse to said plane and capable of movement with respect thereto, a floating cylinder, a piston within the cylinder, a source of hydraulic pressure and means for connecting the source to the cylinder so as to move the piston and cylinder axially relative to each other, and two linkages connecting the piston and cylinder respectively to the operating member at longitudinally spaced points, both said linkages acting on said relative axial movement of said piston and cylinder to move the operating member substantially in the same direction and subject to said guiding means.

2. Hydraulic ram mechanism as claimed in claim 1, in which the linkages include two bell crank levers one arm of one of which is connected

to the piston while the corresponding arm of the other is connected to the cylinder, the other arms of the said levers being connected to the operating member, and the levers being mounted in opposed relationship to cause the arms connected to the operating member both to tend to move substantially in the same direction relatively to the operating member upon relative axial movement of said piston and cylinder.

3. Hydraulic ram mechanism as claimed in claim 2 including at least one hydraulic stop limiting the floating movement of the piston and cylinder and connected mechanism and having its pressure chamber connected to the source of hydraulic pressure from which hydraulic pressure is delivered to the cylinder.

4. Hydraulic ram mechanism comprising an elongated operating member arranged for bodily movement in a plane, guide means for guiding the movement of said member in said plane, said guide means being capable of causing said member to rotate about an imaginary pivotal axis which is transverse to said plane and movable with respect to said plane, adjusting means for said guide means to vary the travel of said imaginary pivotal axis with respect to said plane, a floating ram cylinder, a piston within said cylinder, a source of hydraulic pressure, and means for connecting the source of pressure to the cylinder so as to move the piston and cylinder axially relative to each other, and two linkages connecting the piston and cylinder respectively to the operating member at longitudinally spaced points, both said linkages acting on said relative axial displacement of said piston and cylinder to move the operating member substantially in the same direction, subject to said guide means.

5. Hydraulic ram mechanism as claimed in claim 4, in which the means for guiding the movement of said operating member comprise two cooperating guide elements, one of said guide elements comprising a pair of non-parallel straight guide members, and the other guide element comprising a pair of guide-engaging members, one of said two guide elements being connected to the operating member, while the other guide element is fixed in relation to said plane; and including means for adjusting the displacement between the two members of at least one of said pairs so as to vary the travel of said imaginary pivotal axis.

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References Cited in the file of this patent UNITED STATES PATENTS

Number	Name	Date
178,278	Dooley	June 6, 1876
182,994	Dooley	Oct. 10, 1876
296,191	Lawlor	Apr. 1, 1884
657,458	Schulz	Sept. 4, 1900
1,051,381	Berry	Jan. 28, 1913
1,556,581	Booth	Oct. 13, 1925
1,712,786	Bosserdet	May 14, 1929
2,223,637	Newkirk	Dec. 3, 1940
2,306,541	Clay	Dec. 29, 1942
2,320,373	Meyer	June 1, 1943
2,371,411	Rhodes	Mar. 13, 1945
2,441,275	Keagle	May 11, 1948

FOREIGN PATENTS

Number	Country	Date
955	Great Britain	Apr. 29, 1858
618,399	Great Britain	Feb. 21, 1949
284,052	Germany	May 4, 1915