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W. J. SMITH

HYDRAULIC OPERATING MEANS

Filed May 23, 1923

Fig. 1.

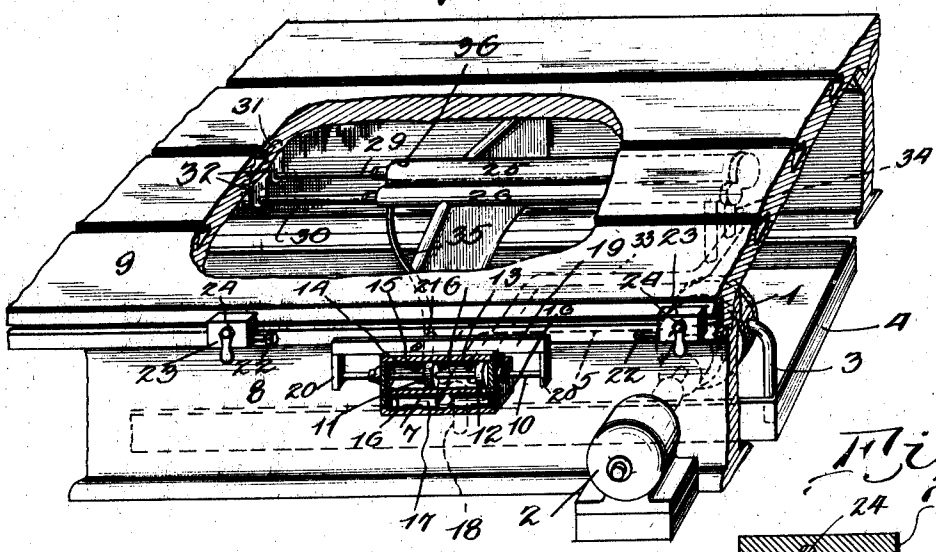


Fig. 3.

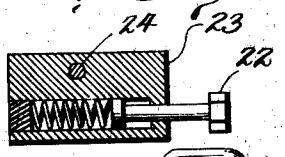
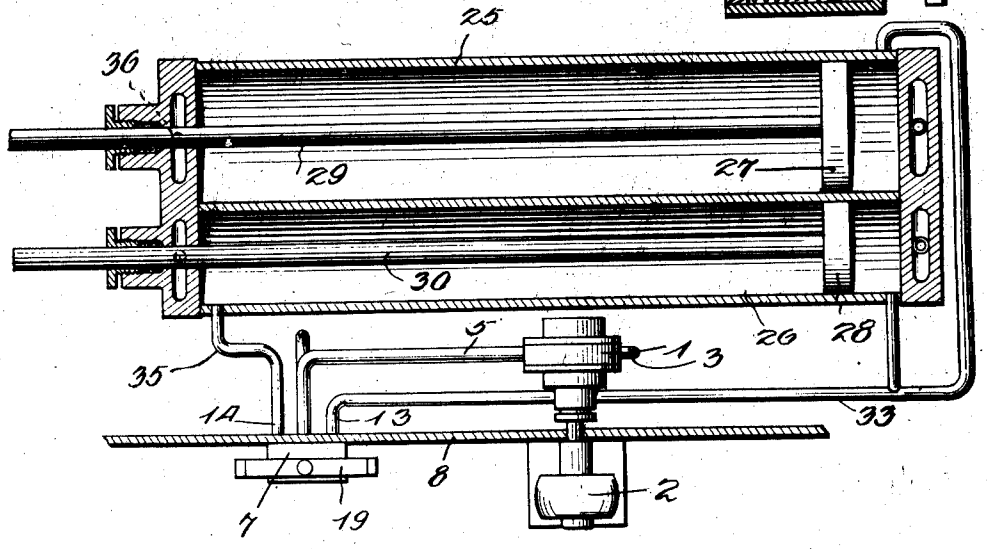


Fig. 2.



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HYDRAULIC OPERATING MEANS.

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This invention relates to means for imparting a reciprocatory movement, and it relates particularly to means for reciprocating the work table of a planer, the tool slide of a shaper, the ram of a hydraulic press, to similarly movable parts in machine tools other than those mentioned, and to the reciprocating of parts of other structures.

A great desideratum in machine tools of the character referred to is to effect the return, idle or non-working movement or stroke of a part with greater speed than that of the operative movement, in order that for economic reasons an operation under way may be rendered as nearly continuous as practicable.

The object of the present invention is to provide means for imparting a reciprocatory movement to parts of machine tools and similar devices in which the motive power, for instance, a liquid under pressure, may, through suitable instrumentalities, be governed to impart a working stroke to operative parts of such machinery and a return or idle stroke of greater speed than that of the working stroke. A further object is to provide means for imparting a reciprocatory movement, for instance, to parts of machine tools by the utilization of a fluid under pressure having incorporated therein means whereby the entire pressure of the fluid may automatically be directed to the accomplishment of a rapid return or non-working stroke of the reciprocated part, by concentrating the pressure on a smaller area of the actuating means than that utilized in the working stroke.

As an illustration of the generic idea involved in the invention, one form of embodiment is herein shown and described. A device incorporating the idea is shown and described in detail applied to a planer for operating the work table of the latter. It will be clear from an understanding of the invention that it is applicable to many uses other than the one described, without altering its nature or scope by modifications and additions necessary to adapt it for employment in other organizations.

In the accompanying drawings:

Figure 1 is a perspective view of the work table of a planer and of a part of the frame of a planer, the work table being broken away to show the disposition of the operating cylinders employed.

Figure 2 is a diagrammatic sectional view, showing the general arrangement of the operating parts.

Figure 3 is a detail, sectional view, showing the spring plungers by which the valve employed, is operated.

The driving means herein described contemplates the use of a fluid, for instance, and preferably, oil, which is supplied to the motive parts constantly and under a uniform pressure during the operation of the tool or other mechanism to which such parts are applied. To this end a force pump 1 of any suitable construction is connected with an electric or other motor 2 by which the pump is driven, and which is run constantly during such operation. The suction port of the pump is connected by a pipe 3 with an oil tank 4, and the discharge pipe 5 of the pump is connected with the inlet port 6 of a valve 7 which is secured to the frame 8 of a planer adjacent to the work table 9 of the planer.

The valve has arranged in it a sliding valve stem 10 having heads 11 and 12 movable to permit passage of oil received into the valve through the inlet port 6, through the outlet port 13 of the valve or through the outlet port 14 thereof. The chamber 15 in which the valve stem and heads are located is connected at each end, by a passage 16, with a discharge chamber 17, and this chamber is connected by a pipe 18 with the oil tank 4.

A slidable bar 19 located at the upper end of the valve is connected by rods 20 to the valve stem, and the bar has on it a projection 21, which extends at one end into the paths of movements of spring plungers 22 attached to the work table 9. The other end of the projection 21 extends outward from the bar and affords a handle by which the valve may be operated manually. The spring plungers are secured to the work table by hangers or brackets 23 movable longitudinally of the work table, and provided with jam nuts operated by handles 24 for securing them in place.

By means of the described construction and arrangement of parts an automatic operation of the valve takes place when, in

the movement of the work table, one or the other of the spring plungers contacts with the projection from the sliding bar of the valve. Thus, for instance, should the parts of the valve be in such positions that the inlet port 6 of the valve is in communication with the outlet port 13 a forward movement of the work table would, when the rear spring plunger contacts with the projection, shift the valve to its opposite position and establish a communication between the inlet port 6 and the outlet port 14. When the parts are in the first positions referred to a communication is established between the outlet port 14, through one of the passages 16, the discharge chamber 17, and the pipe 18 to the tank, and when the parts are in the other position referred to a like connection between the port 13 and the tank is established. From this it will be clear that as the work table reciprocates the oil is alternately projected through and discharged from the outlet ports of the valve automatically, and that the times of operating the valve, in respect of the movements of the work table, may be determined by the adjustment of the hangers by which the spring plungers are maintained.

The reciprocation of the work table is effected by the utilization of the oil under pressure alternately forced through and discharged from the outlet ports of the valve operating as hereinbefore described. To accomplish this a plurality of cylinders 25, 26, having pistons 27 and 28 connected by their rods 29 and 30, and the yoke 31 with a projection 32 extending from the lower face of the work table, are employed. In the present embodiment of the invention two cylinders are shown, the cylinder 26 being smaller in diameter than the cylinder 25. The rear end of the cylinder 26 is connected with the outlet port 13 of the valve by a pipe 33, and the rear end of the cylinder 25 is connected with the pipe 33 by a branch pipe 34. The forward end of the cylinder 26 is connected to the outlet port 14 of the valve by a pipe 35.

The forward end of the cylinder 25 is not connected with the valve, and, in order that air may freely be drawn into and expelled from the forward end of the cylinder during the movements of its piston, to avoid impeding the movements of the latter, such end is provided with a vent opening 36.

During the operation of the planer oil is continuously supplied, and under uniform pressure, by the pump to the valve, and by the latter is controlled in its introduction into and discharge from the cylinders. Assuming that the pistons of the valves are at the limits of their rearward movements, the valve is operated by hand to bring the valve heads to the positions shown in the drawing. This allows admission of oil through the outlet port 13 of the valve to the rear ends of the cylinders, causes forward movements of the pistons of the cylinders, and, by reason of the described connection, a corresponding forward working stroke of the work table. The forward movements of the parts continue until the rear spring plunger contacts with the projection from the slide bar of the valve. When this takes place the valve stem is shifted to the opposite position, establishing a communication between the rear ends of the pistons and the tank to allow the discharge from the cylinders of the oil utilized for effecting the forward movements of the parts. Simultaneously with the establishment of this connection the forward end of the cylinder 26 is connected through the valve with the pump and receives the entire discharge of the oil from the pump. The imposition of the pressure of oil delivered from the pump upon the forward side of the piston of the cylinder 26 results in rearward movements of the pistons of the cylinders and of the work table. This rearward, non-working movement is caused by the concentration upon the single piston of the entire pressure of oil induced by the pump, and consequently is very rapid and results in great economy of time in the use of the tool.

Preferably, as herein shown, where two operating cylinders are used, that by which the idle or return movement is caused is smaller in diameter than its fellow, in order that the area of surface on which the oil operates during the return stroke shall, for the purpose of attaining speed of movement, be much smaller than that operated upon to cause the working stroke.

The piston rods of the cylinders being connected by the yoke 31, the piston of the cylinder 25 is carried rearward on the rearward stroke of the piston of the cylinder 26. Consequently, when on the rearward movement of the work table the forward spring plunger contacts with the projection from the sliding bar of the valve, and shifts the parts of the latter to cause them to assume their initial positions, the pistons of both cylinders are in positions to receive the impact of the oil to cause a forward operative movement of the work table. The forward and rearward movements of the work table, the lengths of which may be governed in an obvious manner by the shifting of the hangers carrying the spring plungers, and the automatic reversal of the movements, will continue until the valve is manually operated to cut off passage of oil from the pump through the valve.

While two operating cylinders are hereinbefore described as being used for imparting a forward or working stroke to the work table, and one specified as used to cause the return stroke, it will be clear that any

number of cylinders may be used for the purposes, provided a lesser number, receiving the entire pressure of oil supplied, is used to effect the return stroke than is used to cause the working stroke.

I claim:

1. In a device for accomplishing the working stroke of a reciprocating member of a machine tool and a more rapid idle or return stroke, a plurality of separate cylinders having pistons which are connected to the reciprocatory member, means for supplying fluid at a constant pressure to one end of each cylinder to effect a working stroke of the reciprocatory member and for directing fluid at the same pressure to the opposite end or ends of a less number of cylinders, having a total capacity less than that utilized in the forward stroke, to accomplish the idle or return stroke.

2. In a device for accomplishing the working stroke of a reciprocating member of a machine tool and a more rapid idle or return stroke, a plurality of separate cylinders having pistons which are connected to the reciprocating member, means for supplying fluid at a constant pressure, a valve connected to the fluid supply and to the cylinders for directing the fluid to one end of each cylinder to effect a working stroke of the reciprocating member and for directing fluid at the same pressure to the opposite end or ends of a less number of cylinders having a total capacity less than that utilized in the forward stroke, to accomplish the idle or return stroke.

3. In a device for accomplishing the working stroke of a reciprocating member of a machine tool and a more rapid idle or return stroke, a plurality of separate cylinders having pistons which are connected to the reciprocating member, means for supplying fluid at a constant pressure, a valve automatically operated during the movements of the reciprocating member connected to the fluid supply and to the cylinders for directing the fluid to one end of each cylinder to effect a working stroke of the reciprocating member and for directing fluid at the same pressure to the opposite end or ends of a less number of cylinders having a total capacity less than that utilized in the forward stroke, to accomplish the idle or return stroke.

In testimony whereof I affix my signature.

WILLIAM J. SMITH.