Feb. 28, 1928. 1,661,016

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HYDRAULIC OPERATING MEANS

Original Filed May 23, 1923

Fig. 1.

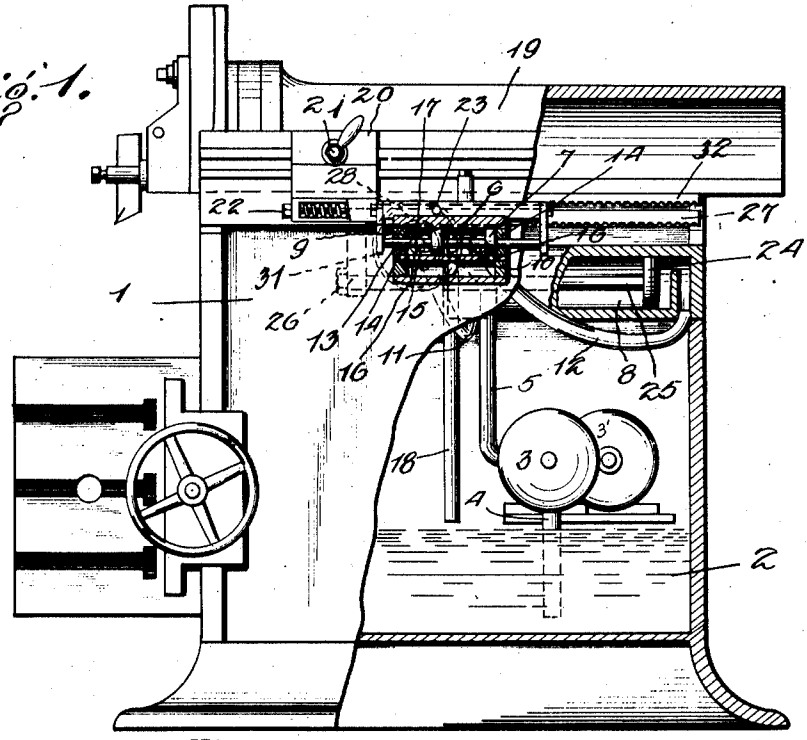
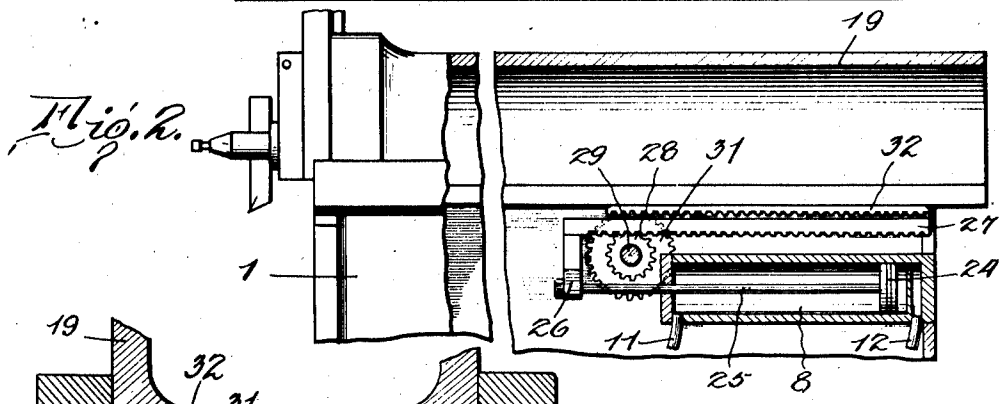


Fig. 2.



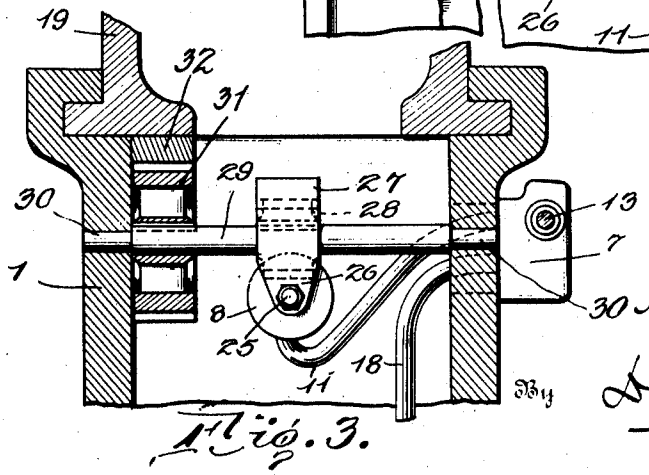


Fig. 3.

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HYDRAULIC OPERATING MEANS.

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This invention relates to means for imparting a reciprocatory movement to parts of machinery or other bodies, and it relates particularly to means by which such movement is imparted to the tool slide of a shaper or to the work table of a planer.

The primary object of the invention is to provide means whereby a reciprocatory movement may be imparted, for instance, to the parts of machine tools referred to, by the utilization of a fluid under pressure applied to the moving parts through the instrumentality of a cylinder having its piston connected to the part to be moved, and in which the actuating mechanism may for practical purposes, economy, etc., occupy a small amount of space. The specific object of the invention is to provide means of such construction and relative arrangement of parts for operating the tool slide of a shaper, by the employment of a fluid under pressure, that the principal operating parts shall be of such construction that they may be contained wholly within the casing of the tool.

Having the above mentioned objects in view, the invention consists of means for imparting a reciprocatory movement to the tool slide of a shaper by utilizing a fluid under pressure, and in which the mechanism employed in such utilization includes a cylinder into which the fluid is introduced to actuate a piston which is connected with the part to be moved by means which will impart to such part a greater length of movement than that of the piston.

By the hereinafter described construction and arrangement of the parts the required lengths of movements of the tool slide are attained by compact means which may entirely be inclosed in the casing of the shaper to which such means are applied. While in the description and illustration of the present embodiment of the invention specific reference is made to the application to a shaper, this is not intended to limit the scope of the claims, as it will be clear from an understanding of the mechanism that it may be utilized with advantage for many other purposes.

In the drawing:

Figure 1 is a side view of a shaper incorporating the invention, the side of the casing of the shaper being broken away to show the arrangement of the operating cylinder, the pump connections, etc., located within the casing, the controlling valve on the outside of the casing being shown with its case broken away.

Figure 2 is a fragmentary side view showing a portion of the tool slide of a shaper, an actuating cylinder, and the means by which the slide and the piston of the cylinder are connected, and

Figure 3 is an end view, partly in section, showing the arrangement of the racks and gears by which movement is transmitted from the piston of the actuating cylinder to the tool slide to impart to the latter a longer movement than that of the former.

In the drawings 1 represents the casing of a shaper in the interior of which, at the lower end, is a tank 2 for containing a liquid, for instance, oil, which is drawn from the tank by a pump, forced under pressure by the latter into a cylinder to actuate the piston of the cylinder, and then returned to the tank for reuse. Arranged in the casing is a pump 3 which may be of any suitable construction and which is preferably continuously operated by a motor 3′ during the use of the tool, a part of which is to be operated by the oil under pressure. The inlet of the pump is connected by a pipe 4 with the tank, and its discharge is connected by a pipe 5 with the inlet port 6 of a slide valve 7 by which the flow of the oil is governed to cause it to be alternately introduced into and discharged from the ends of one or more actuating cylinders 8. The valve 7 has on it two outlet ports 9 and 10 which are connected by pipes 11 and 12 to the respective ends of the operating cylinder 8, and arranged in the valve is a slidable valve stem 13 having heads 14 for covering or exposing the ports. Located in the valve is a discharge chamber 15 connected by passages 16 with the chamber 17 in which the valve heads are located, and the discharge chamber is connected by a pipe 18 with the oil tank 2.

The reciprocation of the valve from one end to the other of its permitted stroke moves the valve heads to allow passage of oil from the pump to one end of the operating cylinder to actuate the piston of the

cylinder, and to establish a communication between the other end of the cylinder and the tank to allow the expulsion of oil remaining in the cylinder after a previous operation. The position of the valve shown in the drawing is such that the pump is connected through the pipe 5, the inlet port 6 of the valve, the outlet port 10, and the pipe 12 with the rear end of the cylinder 8. The pressure of the oil imposed upon the piston of the cylinder causes the latter, and, through the connection to be hereinafter described, the tool slide of the shaper, to move forward. When the described connection is established between the rear end of the cylinder and the pump and the piston is moved forward, the discharge of oil contained in the cylinder from the forward end of the cylinder to the tank takes place through the pipe 11, the port 9 of the valve, the valve chamber 17 of the valve, the passage 16, discharge chamber 15, and pipe 18. When the valve stem is shifted to the other end of its stroke, to the position indicated by dotted lines, communication is established between the forward end of the cylinder and the pump, resulting in a rearward movement of the piston of the cylinder, and a discharge passage for oil is established between the rear end of the cylinder and the tank. Thus by the shifting of the valve stem from one end to the other of its stroke, oil is alternately admitted and discharged from the ends of the cylinder, resulting in the reciprocation of the piston of the cylinder.

The shifting of the valve stem is accomplished automatically by means of stops attached to the tool slide 19 of the shaper and which contact with a part of the valve connected to the valve stem. As herein shown, hangers 20, adjustable longitudinally of the tool slide and retained by jam nuts 21, depend from the slide and have spring bolts 22 which contact with a bar 23 connected with the valve stem. As the slide approaches the end of its movement in either direction, one of the spring bolts contacts with the bar 23, and as the movement is completed the impact of the bolt, and the action of the spring of the bolt on the bar 23, shift the valve stem from the position it occupies to the opposite one, resulting through the described connections in inducing an opposite movement of the piston of the operating cylinder. The automatic shifting of the valve and the imparting of a reciprocatory movement to the piston continues as long as oil is supplied under pressure from the pump, and the length of the reciprocatory movement may be varied at will by the adjustment of the hangers carrying the spring bolts.

The piston 24 of the cylinder 8 is connected through its piston rod 25 to the tool slide 19 of the shaper by such means that a movement of the tool slide greater to any desired extent than that of the piston may be obtained, in order that a cylinder of convenient size to be located within the casing of the shaper may be employed, and at the same time the maximum required length of movement be given the slide. In the mechanism herein shown for accomplishing the purpose the piston rod 25 has attached to it by a yoke 26, a rack bar 27, which is arranged parallel to the piston rod. The teeth of the rack bar mesh with the teeth of a pinion 28 keyed to a shaft 29 located within the casing of the planer, extending transversely thereof, and having bearings 30 in its sides.

The shaft 29 has keyed to it a gear 31, and the under face of the tool slide has attached to or formed with it a rack 32 the teeth of which mesh with the gear. The relative diameters of the pinion and gear are such that the length of movement of the tool slide, when the piston rod is actuated, is greater than that of the latter, and the relative distances of movements of the parts may readily be increased or decreased by employing pinions and gears of different relative diameters.

By the use of the described means for communicating movement from the piston to the tool slide, an operating cylinder of a size permitting of its location entirely within the casing of the tool may be used, thus offering nothing objectionable to the user of the tool or in any way interfering with his manipulation of it.

I claim:

1. In a device of the kind described, a reciprocatory part of a machine tool, a cylinder having a piston, means for reciprocating the piston, and a rack and pinion connection between the reciprocatory part of the machine tool and the piston, whereby the length of movement of the reciprocatory part is rendered greater than that of the piston.

2. In a device of the kind described, a reciprocatory part of a machine tool, a container for a liquid, means connected with the container for forcing the liquid, automatic means connected with the forcing means for governing the flow of the liquid, a cylinder having its piston connected with the reciprocatory part of the machine tool by means whereby the length of movement of the reciprocatory part is rendered greater than that of the piston, connections between the governing means and the ends of the cylinder, and a connection between the governing means and the container.

3. In a device of the kind described, a reciprocatory part of a machine tool, a container for a liquid, means connected with the container for forcing the liquid, automatic means connected with the forcing means for governing the flow of the liquid, a cylinder

having its piston connected to the reciprocatory part of the machine tool, connections between the governing means and the ends of the cylinder, and a connection between the governing means and the container.

4. In a device of the kind described, a shaper having a casing, a cylinder having a piston and located within the casing, means for reciprocating the piston, a rack bar attached to the piston and meshing with a pinion, a tool slide having a rack extending into the casing, and a gear of larger diameter than the pinion meshing with the rack on the tool slide and rigidly connected to the pinion.

In testimony whereof I affix my signature.

WILLIAM J. SMITH.