

July 3, 1934.

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1,965,261

GRINDING MACHINE

Filed Nov. 18, 1931

3 Sheets-Sheet 1

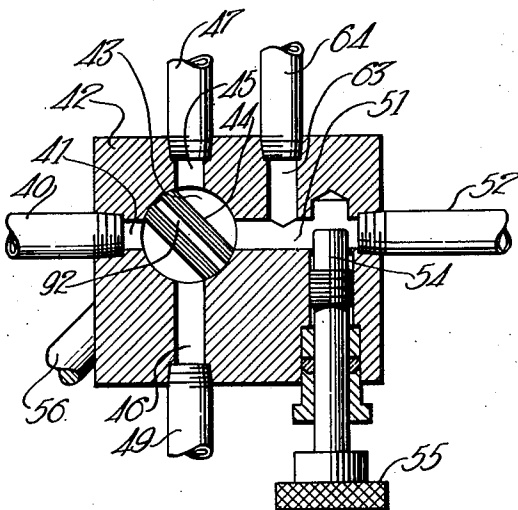
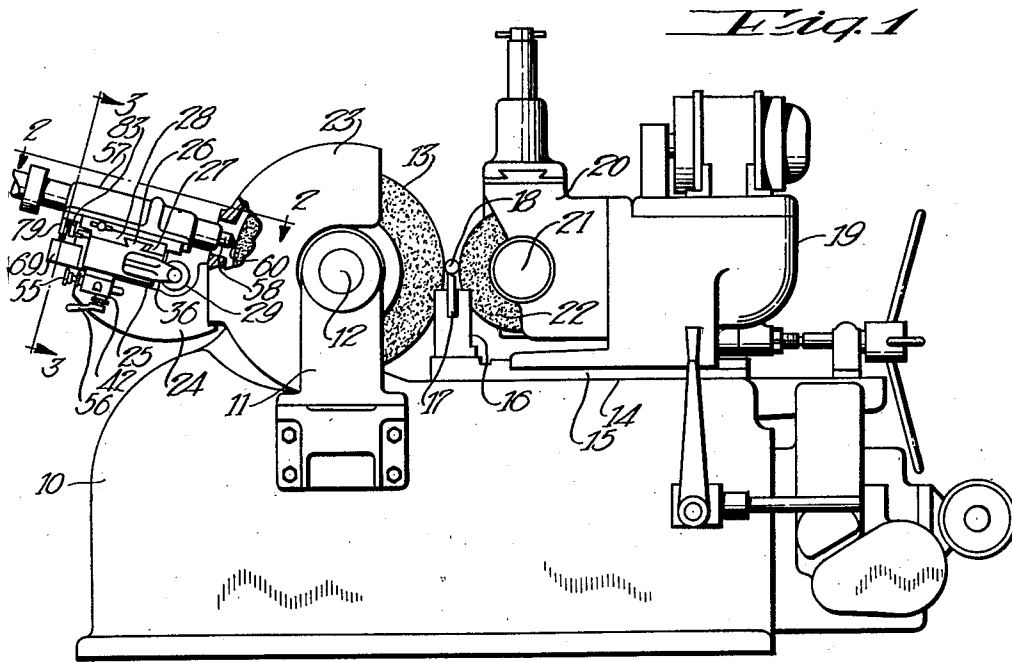


Fig. 4

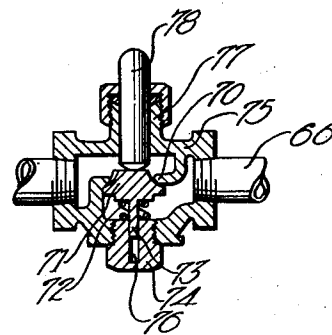


Fig. 5

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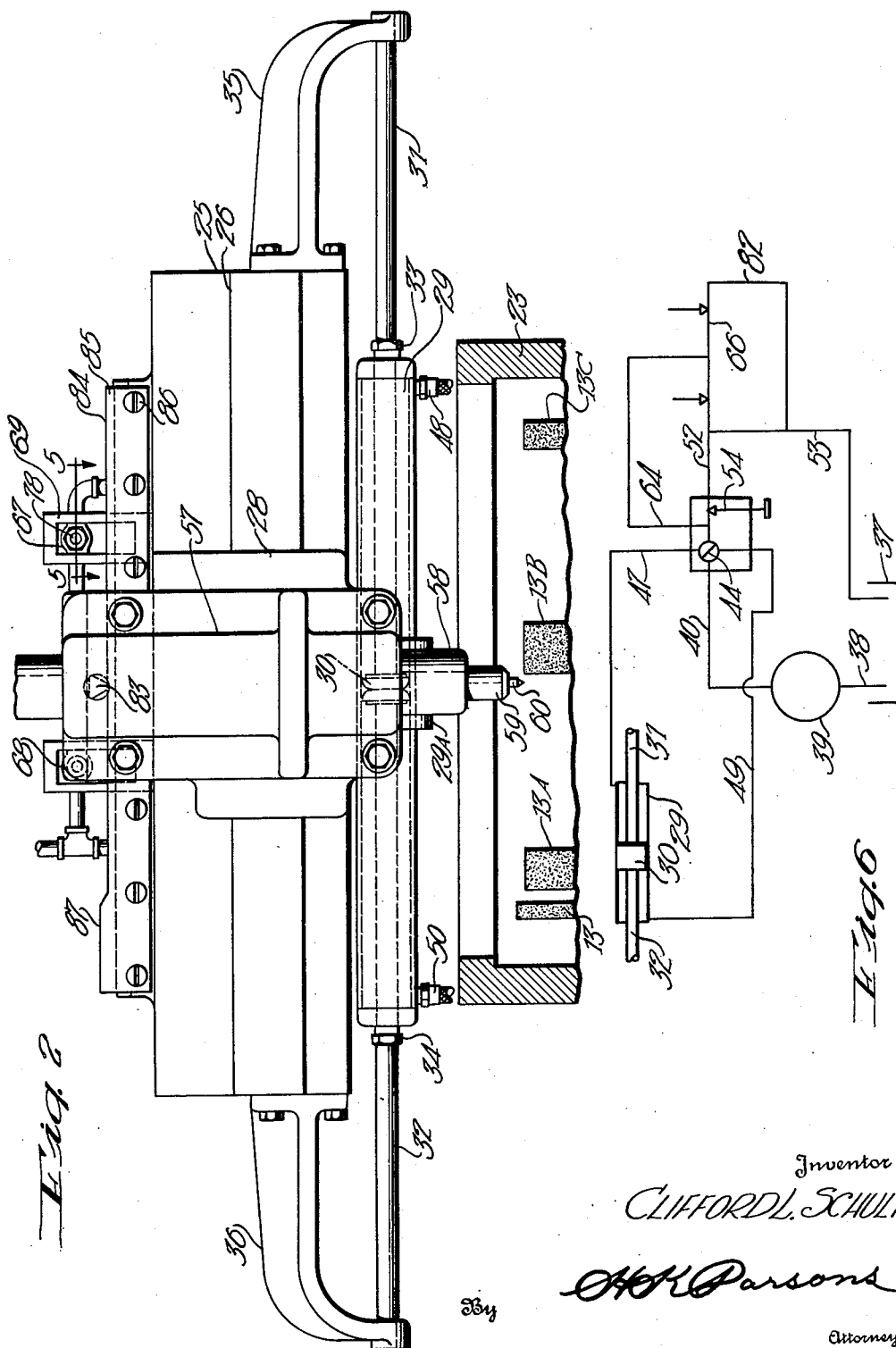
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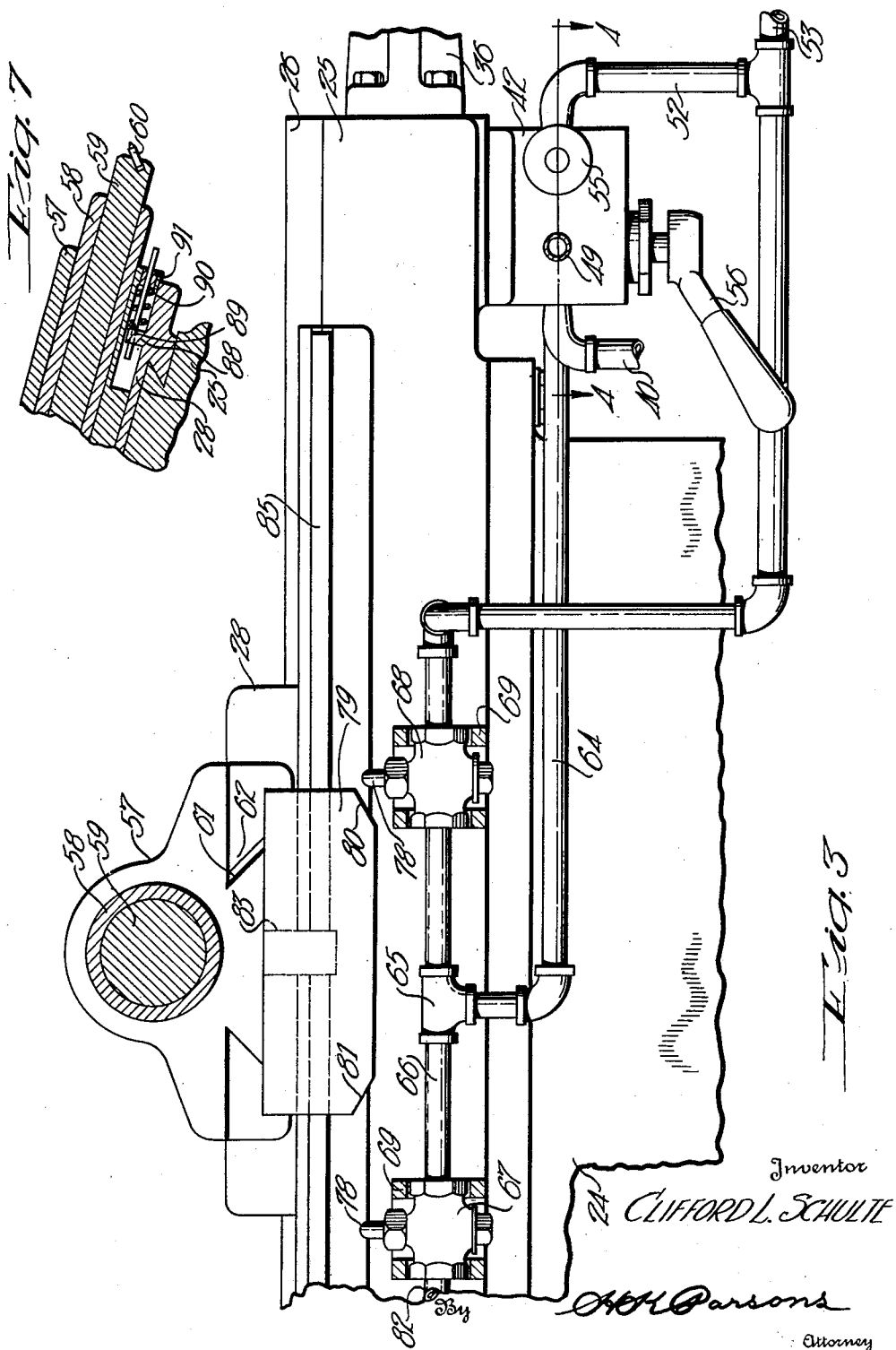
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UNITED STATES PATENT OFFICE

1,965,261

GRINDING MACHINE

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3 Claims. (Cl. 125—11)

This invention relates to improvements in machine tools and especially to improvements in grinding machines.

5 An object of the invention is the provision of an improved truing mechanism for truing the active face of grinding wheels.

Another object of the invention is the provision of an improved truing tool for simultaneously truing or resurfacing the face of a plurality
10 of grinding wheels.

A further object of the invention is the provision of control means for actuating a truing tool relative to a plurality of grinding wheels in which the time for effecting such truing operation is
15 reduced to an absolute minimum.

A still further object of the invention is the provision of a truing tool for accomplishing the above objects with the further provision of means for truing the active face of one or more of a
20 plurality of grinding wheels to a different diameter than the remaining wheels.

A further and specific object of the invention is the provision of a truing mechanism for operation on a plurality of grinding wheels in which
25 the truing tool is actuated at the proper slow feeding rate while in contact with the wheels and at a high or rapid rate from wheel to wheel.

Other objects and advantages of the present invention should be readily apparent by reference to the accompanying drawings taken in connection with the following specification and it is to be understood that any modifications may be made in the exact structural details there shown and described within the scope of the
30 appended claims without departing from the spirit of the invention.

In the drawings:

Figure 1 is a front elevation of a grinding machine embodying the improvements of this invention.
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Figure 2 is a view taken on line 2—2 of Figure 1 showing certain of the parts in cross section and others in elevation.

Figure 3 is a view taken on line 3—3 of Figure 1.
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Figure 4 is a sectional view taken on line 4—4 of Figure 3.

Figure 5 is a sectional view on line 5—5 of Figure 2, illustrating the construction of one of the valves forming a detail of the invention.
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Figure 6 is a diagrammatic view illustrating the hydraulic circuits involved in this invention.

Figure 7 is a fragmentary sectional view through the truing slides illustrating yielding
55 connection between the slides.

Throughout the several views of the drawings similar reference characters are employed to denote the same or similar parts.

Present day grinding machines are frequently provided with a plurality of grinding wheels for simultaneously grinding individual portions of an elongated work piece. These wheels are spaced at variable distances depending on the relative spacing of the portions of the part being ground. The overall length of the work piece is frequently comparatively long so that if a truing tool is actuated across the face of all of the wheels at a given slow rate of truing, considerable time is consumed in the truing process thereby rendering the cost of production of the parts beyond a reasonable figure. By the construction illustrated in the drawings, the time consumed in truing the wheels is reduced to substantially only the time necessary for actually traversing the operative faces of the wheels and not in slowly traveling from wheel to wheel.

A grinding machine of the nature above described may comprise a bed 10 having rising therefrom a bearing 11 supporting a spindle 12 to which is secured the grinding wheels 13, 13A, 13B and 13C. The bed 10 may further be provided on its upper surface with ways 14 for a slide 15 which has secured to its forward end a block 16 for a work rest blade 17. The blade 17 supports a work piece 18 for engagement with the active faces of the grinding wheels. The slide 15 has superimposed thereon a slide 19 supporting a head or carriage 20 in which is journaled a spindle 21 having a plurality of regulating wheels 22 which are opposed to the grinding wheels and engage the work for effecting or controlling its rotation.

The grinding wheels are enclosed within a suitable housing or guard 23 which is carried by the bed in any suitable or desirable manner. The guard 23 has secured to it a bracket 24 to which is secured a fixed slide 25. The slide 25 has formed on its upper surface a dove-tailed guiding tongue 26 received in a correspondingly shaped guideway 27 formed on the under surface of a movable slide 28. The slide 28 is actuated by hydraulic pressure, for which purpose it has secured to it a cylinder 29, as by bracket 29A, enclosing a piston 30. The piston 30 has extending from opposite ends the piston rods 31 and 32 respectively passing through stuffing boxes 33 and 34 secured to the ends of the cylinder 29. The outer ends of piston rods 31 and 32 are respectively secured to brackets 35 and 36 respec-
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tively secured to opposite ends of the fixed slide 25.

As diagrammatically shown in Figure 6, there is provided a tank or sump 37 containing a hydraulic medium, preferably oil, adapted to be drawn therefrom through a pipe or conduit 38 by a pump 39. The pump discharges the medium into a line 40 which terminates in a port 41 formed in valve block 42, see Figure 4. The port 41 empties into valve chamber 43 containing an oscillatable valve 44 for connecting the port 41 with either of ports 45 or 46 formed in the valve block 42. The conduit 47 extends from the port 45 and terminates at one end of the cylinder 29 by a coupling 48 shown in Figure 2, for example. A pipe or conduit 49 extends from the port 46 and terminates adjacent the other end of the cylinder 29 in a coupling 50, as shown in Figure 2. The valve 44 is positioned for connecting the conduits 40 and 49 causing the hydraulic medium under pressure to enter the left hand end of the cylinder. Since the piston 30 is fixed against movement, the cylinder 29 will be actuated to the left due to the pressure thereof against the left hand head thereof. The hydraulic medium on the other side of the piston 30 is at this time discharged through the pipe or conduit 47 and is connected by the valve 44 with a port 51 formed in the valve block 42. The port 51 empties into a conduit 52 which, as shown in Figure 6, connects with the discharge conduit 53 terminating in the tank or sump 37. The port 51 is adapted to be restricted by means of an adjustable valve 54 threadedly mounted in the valve block 42 and actuated relative thereto through a knob or the like 55 secured to the end thereof. This valve 54 determines the rate of travel of the cylinder and consequently the rate of travel of the slide 28 during the actual truing operation.

The valve 44, see Figure 3, extends beyond the valve block 42 and has secured to its extended end a handle or lever 56 whereby the said valve is oscillated.

The movable slide 28, as noted above, carries the truing tool for which purpose it is provided with a housing 57 having mounted therein a rotatable sleeve 58 which carries the truing tool, the diamond holder 59 to which the diamond 60 is attached. As is customary in this type of tool, rotation of the sleeve 58 effects an axial adjustment of the holder 59 toward and from the active face of the grinding wheels. It is to be noted that the housing 57 is provided with a dove-tailed guide 61 received in a correspondingly shaped guideway 62 formed in the slide 28. The purpose of this slide will be later made evident.

As will be noted from Figure 4, the valve block 42 is formed with an additional port 63 which extends from the port 51 at a point between the oscillatable valve 44 and the throttle valve 54. A pipe or conduit 64 connects with the throttle valve co-incidental with the port 63 and extends to a T 65 placed in a conduit or line 66 connecting pop valves 67 and 68. The pop valves 67 and 68 are mounted in suitable supports or holders 69 secured to and extending from the stationary slide member 25. As shown in Figure 5, each of the pop valves 67 and 68 is provided with a valve seat 70 adapted to receive a valve 71 pressed against it by means of a spring 72, which surrounds the guide pin 73 extending from the valve 71. The spring 72 abuts on opposite ends with the valve 71 and a plug 74 carried by the valve body 75, said plug having a guide bore 76 therein

receiving the pin 73. The valve body 75 is provided on the side opposite to the plug 74 with a guide boss 77 through which the slide pin 78 extends. The pop valves 67 and 68 and the conduit 66 lie in a plane parallel to and beneath the outer end of the housing or slide 57. In other words, the outer end of the slide or housing 57 passes in a plane directly above the plane in which the said valves 67 and 68 lie. To the said end of the housing or slide 57 there is secured a cam plate 79 having cam faces 80 and 81 respectively adapted to engage the poppet valves shifting stem 78. In the diagrammatic illustration of Figure 6, the line or conduit 66 is illustrated as a continuation of the pipe or conduit 52. This pipe or conduit 66 is connected by means of a pipe or conduit 82 with the main discharge conduit 53.

The operation of the truing mechanism is as follows. Referring to Figure 2, it is presumed that the tool 60 and slides carrying same are traveling to the left as seen therein, having passed and trued the grinding wheels 13C and 13B. The oscillatable valve 44 is in the position illustrated in Figure 6, connecting the pressure with the left hand end of the cylinder 29 for effecting the above indicated movement of travel of the tool 60. It will be noted that the tool 60 has just passed beyond the active face of the wheel 13B. It will also be seen from Figure 3 that the cam plate 79 is through its cam face 80 about to depress the pop valve 68 for opening same. At this time the hydraulic pressure will flow in the same direction for effecting the movement of the truing tool, but the exhaust fluid behind the piston will pass from the port 51 into and through the port 63 and conduit 64. Since the pop valve 68 is opened the fluid will continue to flow at a high rate of speed through the conduit 66, conduit 82 and main return line 53. This rapid movement will continue until the diamond 60 nears the operative face of the grinding wheel 13A at which time the cam plate 79 will pass off of the pop valve 68 allowing it to close, whereupon the speed of travel of the slide will be automatically reduced.

By reference to Figure 2, it will be noted that the operative face of the wheel 13 extends beyond the operative face of the wheel 13A. This difference in diameter of the two wheels is necessary to grind, of course, different diameters on the work piece being operated upon. In order to true this wheel to its proper diameter, the diamond or truing tool must be retracted for which purpose the housing or slide 57 is provided with a depending cam follower 83 engaging the operative face 84 of a cam or control bar 85 secured as by means of screws 86 to the fixed slide member 25. It will be noted that at a point substantially in line with the wheel 13 the face 84 is raised as at 87 which shifts the slide or housing 57 outwardly as seen in Figure 2. The slide 28 has formed thereon a lug 88 having an aperture therein through which one end of a pin 89 passes. The pin 89 has coiled about it a spring 90 which abuts on one end with the guiding lug 88 and on the other end with a boss 91 depending from the slide 57 in which the pin is secured. From this it will be seen that the slide or housing 57 carrying the diamond or other truing tool 60 is always yieldably actuated toward the grinding wheels and that the cam follower 83 is at all times held in contact with the operative cam face 84 of the cam bar 85. It should be noted, however, that the width of the cam plate 79 is sufficient to permit this shifting thereof relative to the pop valves without being

disengaged from the said valves, whereby the speed of the diamond or truing tool relative to the active face of this grinding wheel is at the necessary slow rate of speed,

For convenience of operation the valve block 42 is mounted on the under surface of the fixed slide member 25 near its forward end which is adjacent the operative station of the machine operator.

When the truing mechanism is idle the oscillatable or reversing valve is actuated to a neutral position thereby cutting off the ports 45 and 46 from the ports 41 and 51. This would prevent any flow of the hydraulic medium and would cause a building up of pressure in the line between the pump and said valve unless a separate relief valve were provided. To this end the oscillatable or reversing valve 44 is provided centrally thereof with a passage 92 which connects the ports 41 and 51 when the valve is in its neutral position thereby permitting a continuous flow of the hydraulic pressure under normal pressure and keeping the truing structure in condition for instantaneous use.

From the foregoing it will be seen that there has been provided a truing mechanism for resurfacing or redressing the active face of a plurality of spaced grinding wheels and that the time for performing this retruing or redressing operation has been reduced to an absolute minimum.

It should further be noted that while the invention has been illustrated in connection with a centerless grinder, it is to be understood that it can be used with equal facility on any type of grinding machine having a plurality of grinding wheels.

What is claimed is:

1. In an hydraulic control system the combination of a support, a slide mounted thereon for movement relative thereto, a piston and cylinder mechanism, one of which is carried by the support and the other by the slide for effecting the movement of the slide, an hydraulic medium for actuating the piston and cylinder relative to one another, a conduit extending from each end of the cylinder, a reversing valve at the termini of the conduits for alternately connecting the cylinder conduits with a pressure conduit and an exhaust conduit, a throttle valve in the exhaust conduit for controlling the rate of flow of the medium therethrough and consequently the rate of actuation of the slide, a by-pass conduit

around said rate control conduit, and depressible valve means in the exhaust conduit operable to render ineffective the rate control means and effect a rapid movement of the slide.

2. In an hydraulic control system the combination of a support, a slide mounted thereon for movement relative thereto, a piston and cylinder mechanism, one of which is carried by the support and the other by the slide for effecting the movement of the slide, an hydraulic medium for actuating the piston and cylinder relative to one another, a conduit extending from each end of the cylinder, a reversing valve at the termini of the conduits for alternately connecting the cylinder conduits with a pressure conduit and an exhaust conduit, a throttle valve in the exhaust conduit for controlling the rate of flow of the medium therethrough and consequently the rate of actuation of the slide, a by-pass conduit around said rate control conduit, depressible valve means in the exhaust conduit operable to render ineffective the rate control means and effect a rapid movement of the slide, means associated with the slide for effecting the operation of said depressible valve, and means for closing said depressible valve when beyond the slide actuating means.

3. In an hydraulic control system the combination of a support, a slide mounted thereon for movement relative thereto, a piston and cylinder mechanism, one of which is carried by the support and the other by the slide for effecting the movement of the slide, an hydraulic medium for actuating the piston and cylinder relative to one another, a conduit extending from each end of the cylinder, a reversing valve at the termini of the conduits for alternately connecting the cylinder conduits with a pressure conduit and an exhaust conduit, a throttle valve in the exhaust conduit for controlling the rate of flow of the medium therethrough and consequently the rate of actuation of the slide, a by-pass conduit around said rate control conduit, and depressible valve means in the exhaust conduit operable to render ineffective the rate control means and effect a rapid movement of the slide, said reversing valve having a by-pass associated therewith for connecting the pressure and exhaust conduits for thereby stopping actuation of the piston and cylinder mechanism.

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