Oct. 4, 1932. E. W. BULLOCK ET AL 1,880,234

DRESSING MECHANISM

Filed Jan. 2, 1931 3 Sheets-Sheet 1

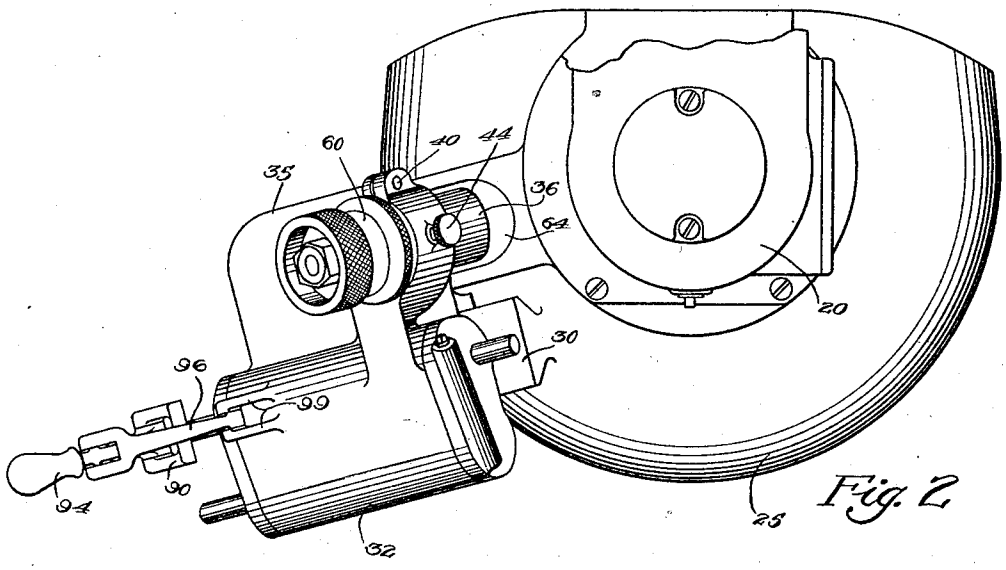


Fig. 2

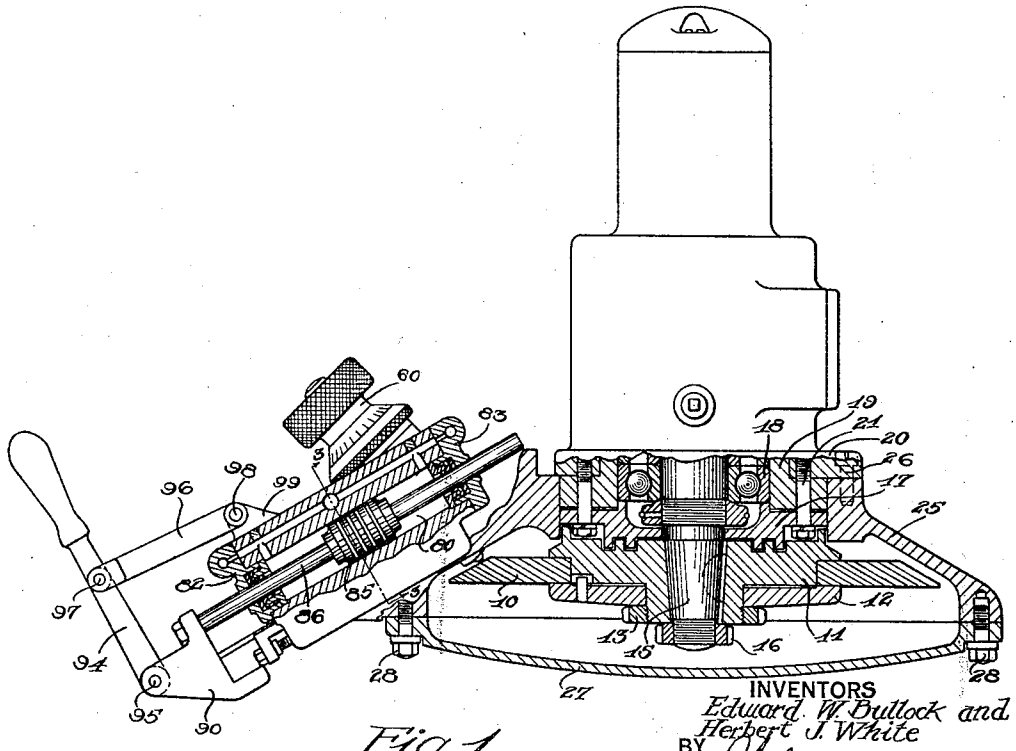


Fig. 1

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DRESSING MECHANISM

Filed Jan. 2, 1931 3 Sheets-Sheet 2

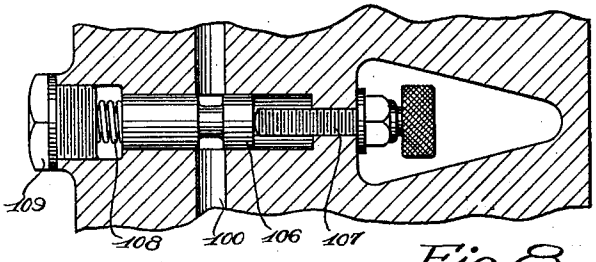


Fig. 8

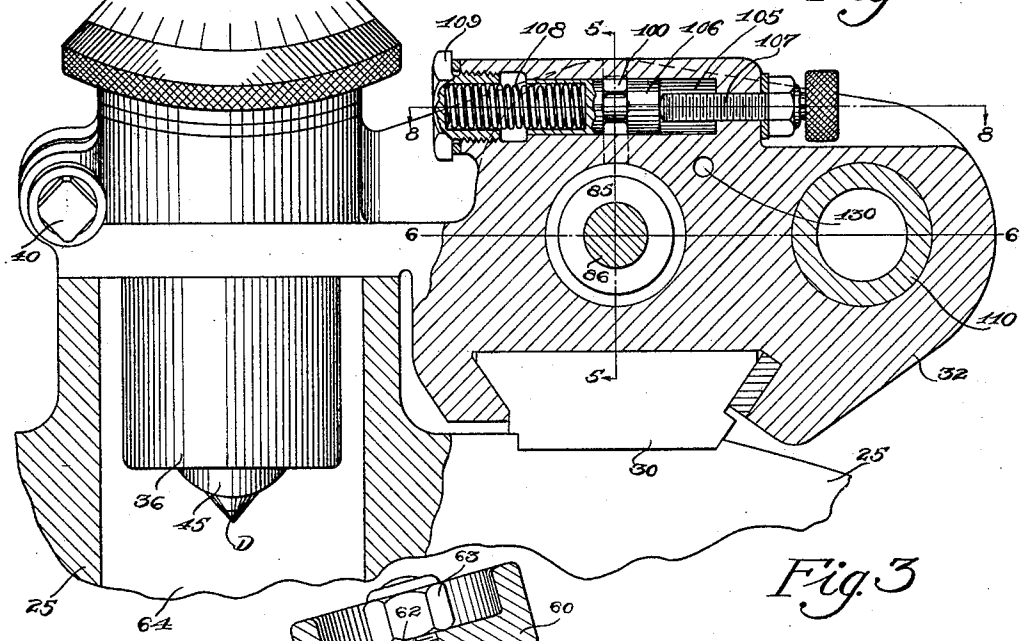


Fig. 3

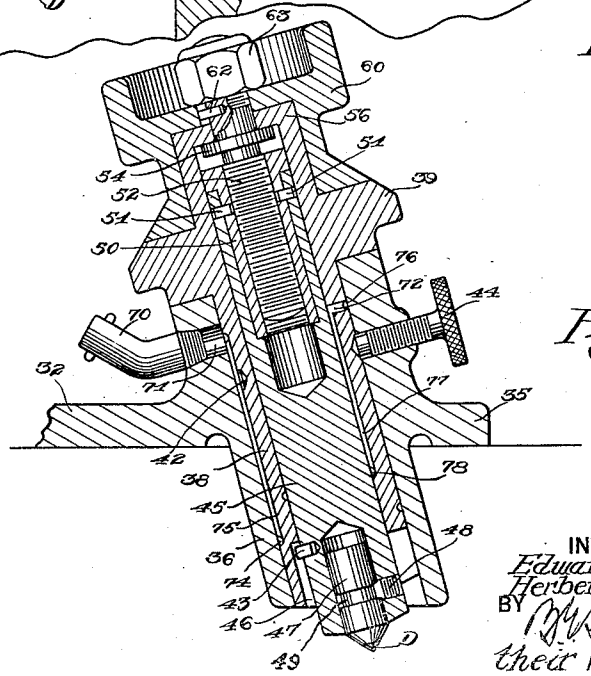


Fig. 4

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Filed Jan. 2, 1931 3 Sheets-Sheet 3

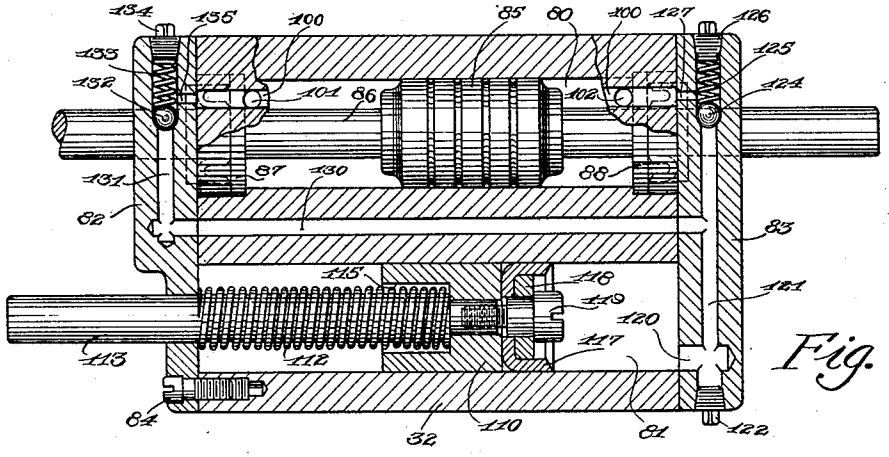


Fig. 6

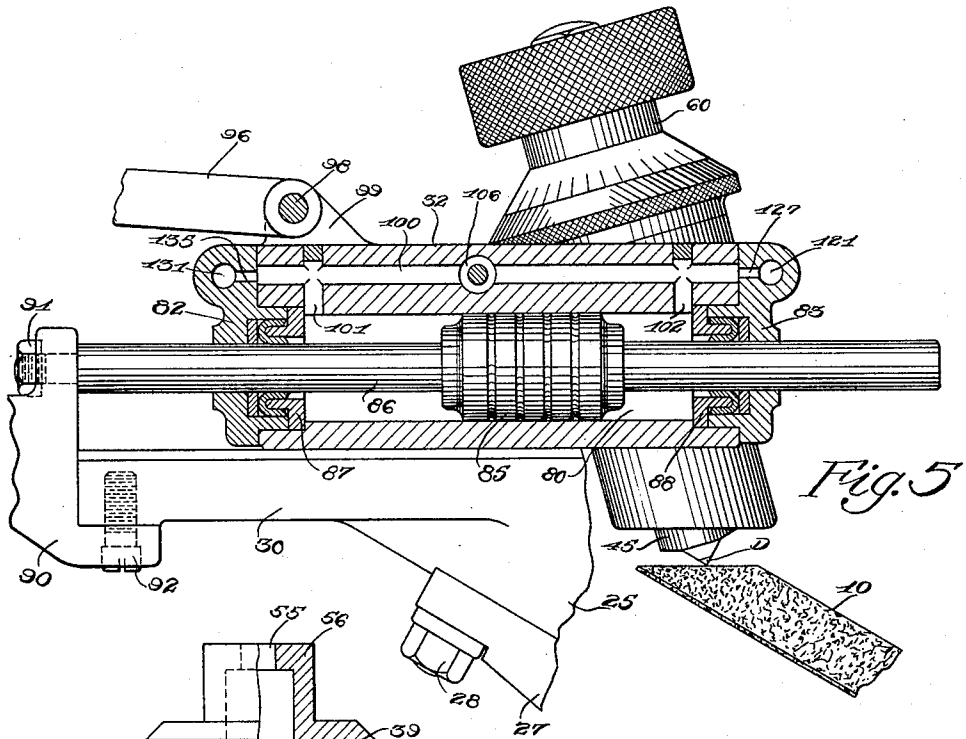


Fig. 5

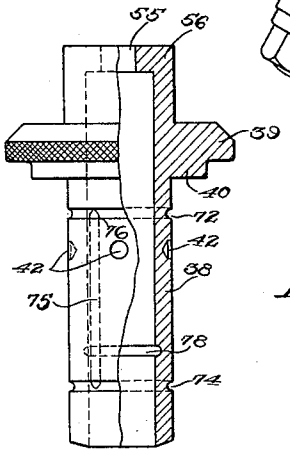


Fig. 7

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UNITED STATES PATENT OFFICE

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DRESSING MECHANISM

Application filed January 2, 1931. Serial No. 506,214.

The present invention relates to dressing mechanism such as is employed in truing the operating surfaces of grinding wheels and particularly to a hand operated dressing mechanism.

To dress a grinding wheel, a diamond or other suitable truing tool is moved across the face of the rotating grinding wheel. Thus, the truing tool turns a continuous helix in the wheel. The finer the lead of the helix and the more uniform that lead, the finer and the smoother the surface which the grinding wheel will grind. In hand operated dressing mechanisms particularly, difficulty has always been experienced heretofore because the human element has entered into the dressing operation. One time an operator will move the truing tool across the wheel faster than at another time and no operator's nerves are so steady that he can move the truing tool across the wheel at any time at a uniform speed. Thus, hand operated dressing is always reflected in the smoothness of the finish of the work to be ground.

The primary purpose of the present invention is to eliminate the human element as a factor in hand dressing grinding wheels. To this end, a dressing mechanism has been provided in which the movement of the truing tool across the surface of the grinding wheel is still manually actuated but in which the manual actuating means serves simply to furnish the power for the movement of the truing tool and the speed and uniformity of this movement are controlled by means wholly independent of the actuating means. A hydraulic control has been incorporated in the new dressing mechanism and in the preferred embodiment of the invention the construction is such that the speed of movement of the truing tool is governed directly by the rate at which a hydraulic medium can be exhausted from a cylinder that is connected to the slide on which the dressing tool is mounted. Since the flow of the exhausting hydraulic medium will be uniform always, depending solely on the setting of a throttle valve, the slide cannot be moved at anything but a uniform rate and hence, the truing tool cannot be moved across the face of the grinding wheel at anything but a uniform speed. Thus, with the present invention, a helix of uniform lead will always be turned in a grinding wheel in the dressing operation, that is, the grinding wheel will be uniformly dressed across its whole grinding surface. A further feature of the present invention is that the fineness of the dressing of the wheel can be adjusted by simply adjusting a throttle valve.

Means is incorporated in the preferred form of dressing mechanism for automatically keeping a uniform volume of liquid in the hydraulic system so that the truing device will repeat, that is, so that the truing tool will always move at the same rate for any one setting of the throttle valve.

Beside the principal features referred to above, the present invention includes several constructional improvements in dressing mechanism. Among these is, for instance, the mounting of the diamond holder so that it can be turned around, when one side of the diamond becomes worn, so as to bring a sharp edge into truing position, without taking the diamond holder off the slide or without disturbing the feed setting of the diamond. Another improvement is the provision of a complete grease seal around the parts of the truing device which prevents water or abrasive from getting up into these parts to foul them or cause wear. Still other features of the invention will be apparent hereinafter from the specification and from the recital of the appended claims.

In the drawings:

Figure 1 is a view showing a grinding wheel spindle with a dressing mechanism constructed according to the present invention mounted on the guard for the grinding wheel

in position to dress the wheel, parts of the wheel mounting and of the dressing mechanism being shown in section;

Figure 2 is a plan view of the parts shown in Figure 1;

Figure 3 is a transverse sectional view on an enlarged scale, the view being approximately on the line 3—3 of Figure 1 looking in the direction of the arrow;

Figure 4 is a sectional view, on the scale of Figure 3, of the diamond holder and its mounting;

Figure 5 is a view on an enlarged scale of parts of the dressing mechanism shown in Figure 1, the view of the parts shown in section being on the line 5—5 of Figure 3 looking in the direction of the arrows;

Figure 6 is a sectional view taken substantially on the line 6—6 of Figure 3 although some of the parts shown in section are slightly above the basic plane of the section as indicated in the figure;

Figure 7 is a detail view showing one of the parts of the diamond support proper; and

Figure 8 is a section on the line 8—8 of Figure 3.

The present dressing device may, of course, be employed for dressing any type of grinding wheel. It is illustrated in use dressing a conical grinding wheel such as is employed on the automatic face mill gear cutter sharpener described in the application of E. W. Bullock et al., Serial No. 220,704, filed September 20, 1927.

In the drawings, 10 designates the grinding wheel. This wheel is secured to a holder 11 by the clamping disc 12 and the nut 13. The holder 11 is formed with a taper bore corresponding to the taper of the nose of the grinding spindle 15 and is keyed to the spindle to rotate therewith. A nut 16 which threads on to the spindle serves to hold the holder 11 against axial movement on the spindle. The rear face of the holder 11 is formed to cooperate with the front face of a disc 17 to provide a labyrinth seal preventing dirt or grit from getting into the anti-friction bearing 18 in which the spindle 15 is journaled. The disc 17 is secured to the bearing member 19 and to the wheel carrier 20 by bolts 21.

There is a guard 25 secured to the wheel carrier 20 by screws 26 and there is a guard plate 27 secured to the guard 25 by screws 28. The guard 25 and the guard plate 27 enclose the grinding wheel in such a way as to protect the operator from injury should the wheel break. The guard 25 is formed at one side with a dove-tailed guide portion 30 (Figs. 2 and 3) and the dressing or truing tool is mounted on a slide 32 which is movable back and forth on this guide 30 to move the truing tool across the face of the grinding wheel to dress the same.

The slide 32 is formed at one side with an extension 35 which rests on the upper face of the guard 25. This extension 35 is formed to provide a tubular portion 36 that is adapted to receive an adjusting sleeve 38 (Figs. 4 and 7). The adjusting sleeve 38 is formed midway its length with a gripping portion 39 which is of larger external diameter than the remainder of the sleeve. The lower face 40 of the gripping portion 39 of the sleeve 38 seats on the upper face of the tubular portion 36 of the extension 35 of the slide 32.

There are four equi-spaced notches 42 formed circumferentially around the periphery of the sleeve 38. A set-screw 44 that threads into the tubular portion 36 of the extension 35 is adapted to be engaged selectively with one of these notches to hold the sleeve 38 against rotation, in any position to which it is indexed, for positioning the diamond to maintain a sharp edge thereof in dressing position, as will be more clearly described hereinafter. The tubular portion 36 of the extension 35 is split adjacent its upper end to provide a split clamp, as clearly shown in Figures 2 and 3. By tightening up the bolt 40 this split clamp can be tightened to clamp the sleeve 38 rigidly in its indexed position.

There is a rod or bar 45 which fits in the sleeve 38 and is slidable axially therein, a pin 43 which is secured to the bar and which engages in a slot 46 in the sleeve, serving to hold the bar against rotation in the sleeve. This rod 45 is bored at its lower end to receive the diamond holder 47 which is secured in the rod against rotation and axial movement by a set-screw 48 that engages in a groove 49 turned in the periphery of the holder 47. In the present instance, a diamond is used as the truing tool. The diamond D is secured in the diamond holder 47 in any usual or suitable manner.

The bar 45 is bored at its upper end to receive a thimble 50. This thimble 50 is secured in the bar 45 against rotation or axial movement by pins 51. The thimble 50 is threaded internally to receive the screw 52. This screw is formed with a shoulder as indicated at 54. The stem of the screw passes through an opening 55 (Fig. 7) in the upper end 56 of the sleeve member 38 and the upper end 56 of the sleeve member 38 seats against the collar 54 of the screw.

60 designates a graduated dial which is bored and shaped to fit around the sleeve 38. This dial member 60 seats against the upper face of the gripping portion 39 of the sleeve and against the outer face of the end 56 of the sleeve. The dial member 60 is secured to the screw 52 to rotate therewith by a pin 62. A nut 63 that threads on the outer end of the screw 52 serves to hold the dial member 60 and the sleeve 38 together. The dial mem-

ber 60 is rotatable relative to the sleeve 38 while the sleeve 38 can be rotated in the tubular portion 36 of the extension 35 when the set-screw 44 is released and the split-clamp formed in the tubular portion 36 released.

The diamond holder and the tube 36 in which it is mounted extend through an elongated opening 64 in the guard 25 so that the diamond can be adjusted into operative position and moved across the face of the grinding wheel.

When the dial member 60 is rotated, the bar 45 will be advanced or withdrawn to move the diamond D toward or away from the grinding wheel 10. This adjustment is used for feeding the diamond into the grinding wheel to dress the grinding wheel to size and, also, to compensate for wheel wear. The dial member is graduated to allow this adjustment to be made very accurately.

When the diamond becomes so worn on one side that its edge is no longer sharp enough to suitably dress the wheel, the bolt 40 can be loosened to release the split clamp formed in the tubular portion 36 and the set screw 44 released to allow the sleeve 38 to be turned around in the tubular portion 36 to bring another portion of the diamond into dressing position. It is to be noted that this can be done without in any way affecting the setting of the diamond or the reading of the dial 60. The new structure presents several advantages over previous known constructions for heretofore it was either necessary to remove the whole diamond holder from the machine to reset the diamond or the feed adjustment of the diamond would be disturbed.

There is a grease fitting 70 threaded into an opening 71 (Fig. 4) in the tubular portion 36 of the extension 35. There is a groove 72 turned in the periphery of the sleeve 38 and this groove registers with the opening 71 when the sleeve 38 is in position in the extension 35. There is another peripheral groove 74 turned in the sleeve 38 adjacent the lower end of the sleeve. The two grooves 72 and 74 are connected by a shallow longitudinal groove or duct 75 (Figs. 4 and 7). There is a hole or duct 76 drilled through the sleeve 38 and opening into the groove 72. A longitudinal duct 77 formed in the interior of the sleeve 38 connects the duct 76 with a circular groove 78 formed in the interior of the sleeve adjacent its lower end.

When grease is forced under pressure into the fitting 70 it passes through the opening 71 around the groove 72 and from that groove down the outside of the sleeve 38 to the groove 75 and down the inside of the sleeve 38 to the groove 77, filling the groove 74 on the outside and the groove 78 on the inside of the sleeve. Thus a complete grease seal is formed around the inside and the outside of the sleeve 38 preventing grit or dirt from getting up between the exterior of the sleeve and the tubular portion 36 or between the interior of the sleeve and the bar 45. Thus the parts of the diamond holder which rotate and slide are protected against wear.

The means for reciprocating the diamond holder to pass the diamond across the face of the grinding wheel will now be described. The slide 32 is bored to provide two parallel cylinders 80 and 81. The end of these cylinders are closed by the cover plates 82 and 83, which are secured in position by screws 84.

The piston 85 reciprocates in the cylinder 80. The piston rod 86 which is integral with the piston 85 extends at both ends through the cover plates 82 and 83, respectively. Suitable packings or stuffing boxes are provided at 87 and 88, respectively, to prevent leakage along the piston rod. The piston rod 86 is secured at one end to a bracket 90 by a nut 91 which threads onto the piston rod. The bracket 90 is secured by screws 92 to the guide-way 30 which is formed integral with the wheel guard 25 as already described.

There is a hand lever 94 pivotally mounted at 95 (Fig. 1) on the bracket 90. This lever is connected to the slide 32 by a link 96 which is pivotally connected at one end, at 97, to the lever and at its opposite ends, at 98, between ears 99 formed on the exterior of the slide 32. By moving the hand lever 94 back and forth the slide 32 is reciprocated on the guide 30 to carry the diamond across the face of the grinding wheel.

There is a duct 100 drilled in the casting 32 parallel to the cylinder 80 and above that cylinder (Figs. 3 and 5). Ducts 101 and 102 connect this longitudinal duct 100 with the opposite ends of the cylinder 80.

The casting 32 is drilled transversely of the duct 100 to provide a chamber 105 (Figs. 3, 5 and 8) in which there is mounted an adjustable throttle valve 106. An adjusting screw 107 that threads into the casting 32 is provided for adjusting this throttle valve. A coil spring 108 serves to hold the valve in engagement with the inner end of the adjusting screw 107. This spring 108 is interposed between the valve 106 and a nut 109 that threads into the casting 32 closing the drilled hole 105. The spring seats at one end in a socket formed in the valve 108 and at its other end in a socket formed in the nut 109.

When the hand lever 94 is oscillated to move the diamond across the face of the grinding wheel, the oil or other hydraulic medium in the cylinder 80 is forced out of one end of the cylinder through the duct 100 into the other end of the cylinder, the cylinder, duct 101, duct 100 and duct 102 forming a closed hydraulic system adapted to contain a substantially constant volume of liquid. By adjusting the throttle valve 106 to control the rate of flow of the hydraulic medium from one end of the cylinder 80 to

the other, the rate of movement of the diamond across the face of the grinding wheel can be controlled. In Figures 3 and 8, the throttle valve is shown in full open position simply for the purpose of clearness in illustration as the throttle valve is employed to throttle the flow of the fluid.

As it is impossible to wholly prevent leakage from the cylinder 80 along the two ends of the piston rods 86, means has been provided for automatically replenishing the amount of liquid in the hydraulic system to maintain a constant volume of liquid therein. This means will now be described. There is a piston 110 mounted in the cylinder 81 for movement therein. This piston is constantly urged in one direction in the cylinder 81 by a coil spring 112 which is mounted on the piston rod 113 and which is interposed between the cover-plate 82 and the piston 110 (Fig. 6). The inner end of the spring 112 enters into a socket 115 formed in the piston 110. There is a cupped pack-washer 117 secured to the oposite face of the piston 110 by a disc 118 and by a screw 119 that threads into the piston rod 113.

There is a duct 120 that communicates with the cylinder 81 drilled into the cover plate 83. This duct 120 leads into an elongated duct 121 which is also drilled in the cover plate 83. One end of the duct 121 is closed by a plug 122 that threads into the cover plate 83. The other end of the duct 121 is closed normally by a ball check-valve 124, that is resiliently held in position by a coil spring 125. This spring 125 is interposed between the ball 124 and the plug 126 that threads into the cover plate 83. Beyond the check valve 124, there is a duct 127 that lead into the duct 121. This duct 127 leads into the duct 100 in the casting 32.

There is a duct 130 drilled in the casting 32 and in the cover plates 82 and 83 in parallelism with the cylinders 80 and 81 and between the cylinders. At one end, this duct 130 communicates with the duct 121. At its opposite end, this duct 130 leads into a duct 131 drilled in the cover plate 82 parallel to the duct 121. The duct 131 is normally closed by a ball check valve 132 similar to the ball check valve 124 and resiliently held in position by a coil spring 133 similar to the coil spring 125. The coil spring 133 is interposed between the ball valve 132 and the plug 134 that threads into the cover plate 82. Beyond the valve 132, there is a duct 135 drilled into the cover plate 82 and leading from the duct 131 into the duct 100 formed in the casting 32.

When the dressing mechanism is assembled, the cylinder 81 and the ducts 131, 130, 121 and 120 are filled with oil or the hydraulic medium used. The system comprising the cylinder 80, duct 101, 100 and 102 is also filled with oil. Normally the check valves 132 and 124 close off the ducts 131 and 121 from communication with the ducts 100 and the cylinder 80, ducts 101, 100 and 102 constitute, therefore, as we have already stated, a closed hydraulic system, but if any leakage should occur from the system, the valve 132 or the valve 124 depending on the direction of movement of the cylinder 80 will be opened by suction and the system would be replenished through either the ducts 131 or the duct 121. The spring 112 is powerful enough to continuously urge the piston 110 to the right in Figure 6, reducing the effective length of the cylinder 81, as oil is drawn out of the ducts 131 and 121, and maintaining always a head of pressure on the oil in the ducts 131 and 121. Thus, the operating system is maintained at all times full of oil. When all of the oil has been forced out of the cylinder 81 to replenish the operating system, the cylinder 81 can be refilled.

In using the present dressing device, the operator first adjusts his diamond into dressing position by rotation of the feed screw 52 which is rotated by the knurled adjusting dial 60. He then oscillates the operating handle 94 back and forth to pass the diamond across the rotating grinding wheel. Since the piston rod 86 is fixed, the oscillation of the handle 94 reciprocates the casting 32, which contains the cylinder 80, on the guide-way 30. As the lever 94 is moved to the right from the position shown in Figures 1 and 5, the diamond is moved to the right, the oil flowing from the cylinder 80 through the duct 101, the duct 100, the opening in the throttle valve 106 through the duct 102 to the opposite end of the piston 85. As the lever arm is moved in the opposite direction, the reverse of this takes place, the casting 32 moving to the left, the oil flowing from the right-hand end of the piston 85 through the duct 102, the duct 100, the opening in the throttle valve 106, and the duct 101 to the left-hand end of the piston 85. The throttle valve is adjusted initially to control the speed of movement of the diamond across the face of the wheel and as the oil cannot flow from one end of the cylinder 80 to the other faster than it can pass through the opening in the throttle valve 106 the speed of movement of the diamond across the face of the wheel is absolutely controlled. The moment that leakage occurs from the piston, either the valve 132 or the valve 124, depending upon the direction of movement of the slide 32, will be opened by suction and by the loss of pressure in the system, and oil will flow from either the duct 131 or the duct 121 into the cylinder 80 to replace the leakage so the supply of oil in the system is always maintained at a constant volume.

While a particular embodiment of the invention has been described, it will be understood that the invention is capable of various

further modifications. The present application is intended to cover any adaptations, uses, or embodiments of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practise in the art to which it pertains and as may be applied to the essential features hereinbefore set forth and as fall within the scope of the invention or the limits of the appended claims.

Having thus described our invention, what we claim is:

1. In a dressing mechanism, a support for the dressing tool, manually operable means for moving said tool to effect the dressing operation, and hydraulically operated mechanism adjustable to control the rate of said movement.

2. In a dressing mechanism, a cylinder and a piston reciprocable therein, a dressing tool connected to one of said parts for movement on relative movement between the piston and cylinder, manually operable means for effecting said movement, and means for adjustably throttling the flow of liquid from the exhaust end of the cylinder on relative movement of the piston in the cylinder to control the speed of movement of the dressing tool.

3. In a dressing mechanism, a closed hydraulic system comprising a cylinder, a piston reciprocable therein, a dressing tool connected to one of said members, a duct connecting the two ends of said cylinder and forming with said cylinder a substantially closed hydraulic system, means for adjustably throttling the passage of liquid from one end of the cylinder to the other to control the rate of relative movement between the piston and the cylinder, and manually operable means for effecting relative reciprocation between the piston and cylinder to actuate said dressing tool.

4. In a dressing mechanism, a cylinder and a piston reciprocable therein, a dressing tool connected to one of said parts for movement on relative movement between the piston and cylinder, a duct connecting the two ends of the cylinder and forming with said cylinder a substantially closed hydraulic system, means for adjustably throttling the passage of liquid from one end of the cylinder to the other to control the rate of movement of the dressing tool, manually operable means for effecting reciprocation between the piston and cylinder to actuate the dressing tool and means for automatically supplying liquid to said system when leakage from the system occurs.

5. In a dressing mechanism, a guide, a slide reciprocable on said guide, a dressing tool mounted on said slide, means for reciprocating said slide, and means for controlling the rate of reciprocation of said slide, said last-named means comprising a cylinder secured to one of the two first-named parts, a piston secured to the other of the two first-named parts and reciprocable in said cylinder, a duct connecting opposite ends of said cylinder, said cylinder and duct constituting a closed hydraulic system, and means for adjustably throttling the passage of liquid from one end of said cylinder to the other through said duct.

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