July 7, 1931. K. JUNG 1,813,165

ADJUSTMENT DEVICE, PARTICULARLY FOR THE CROSS SLIDES OF GRINDING MACHINES

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Fig.1

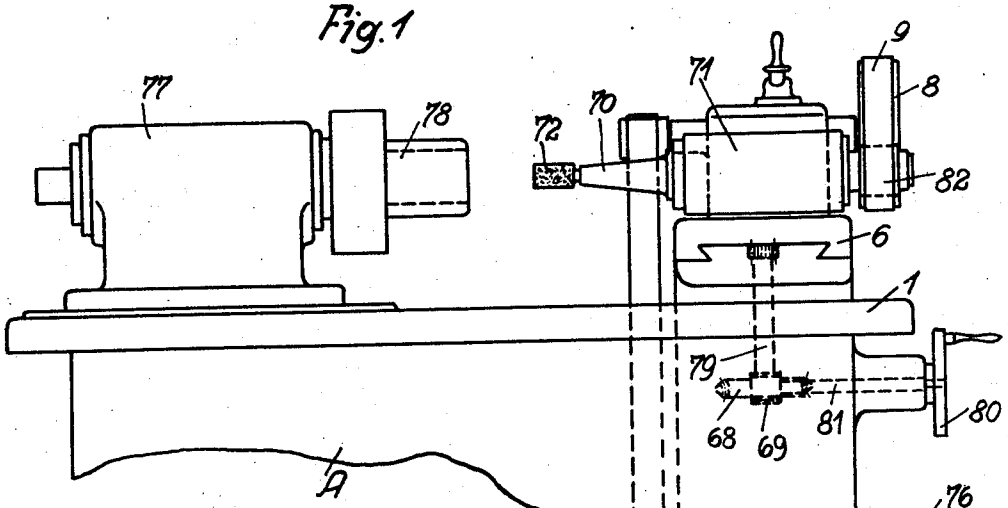
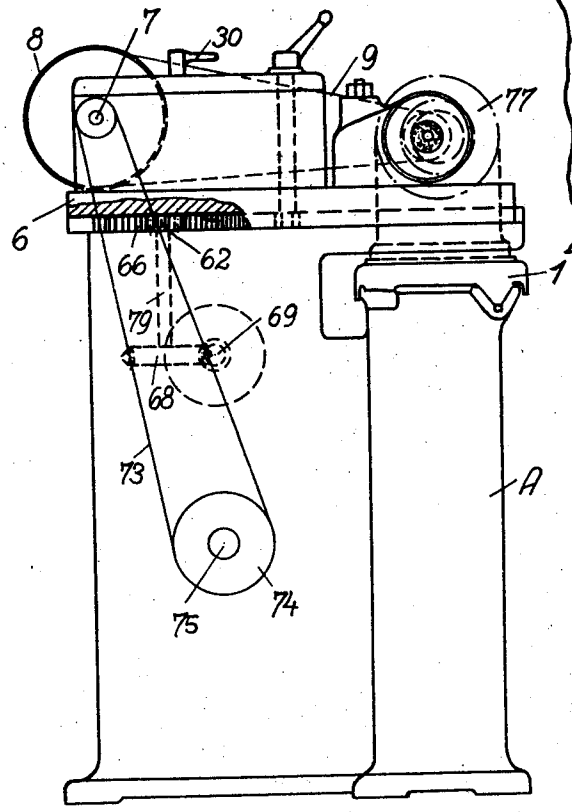


Fig.2



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Fig.3

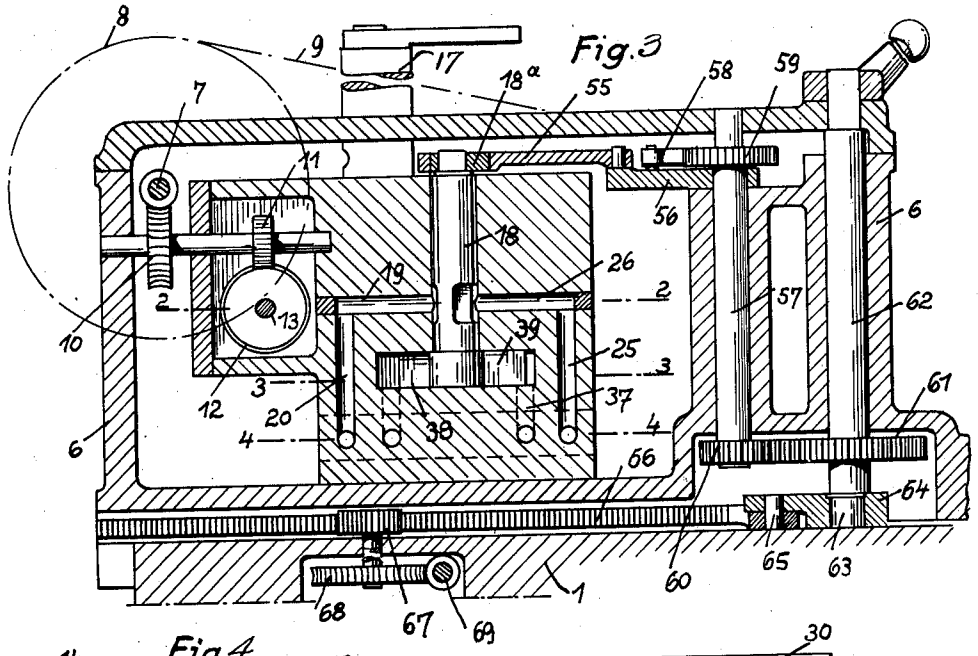


Fig.4

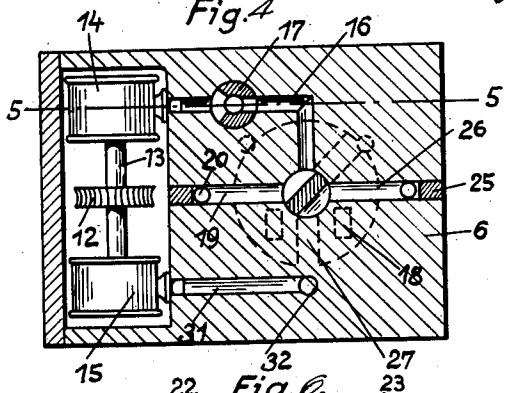


Fig.7

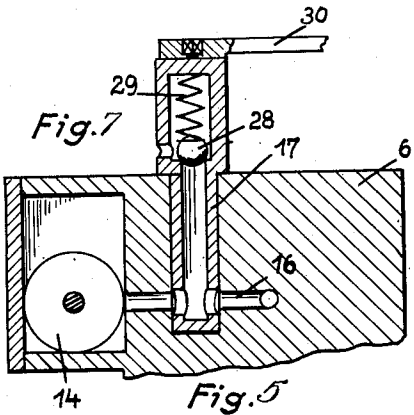


Fig.6

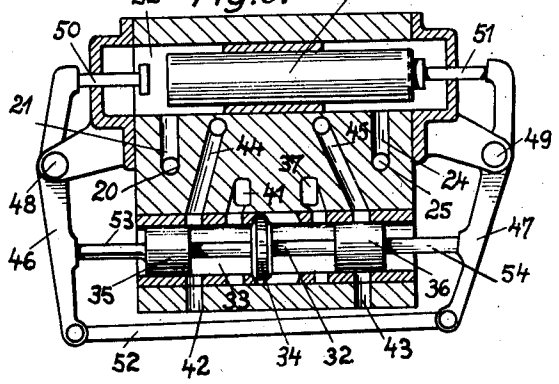
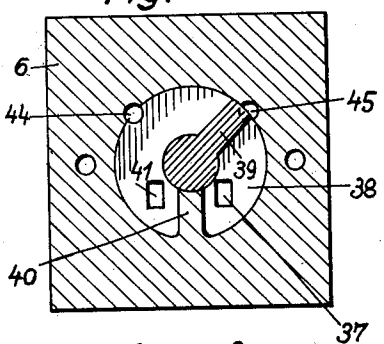


Fig.5



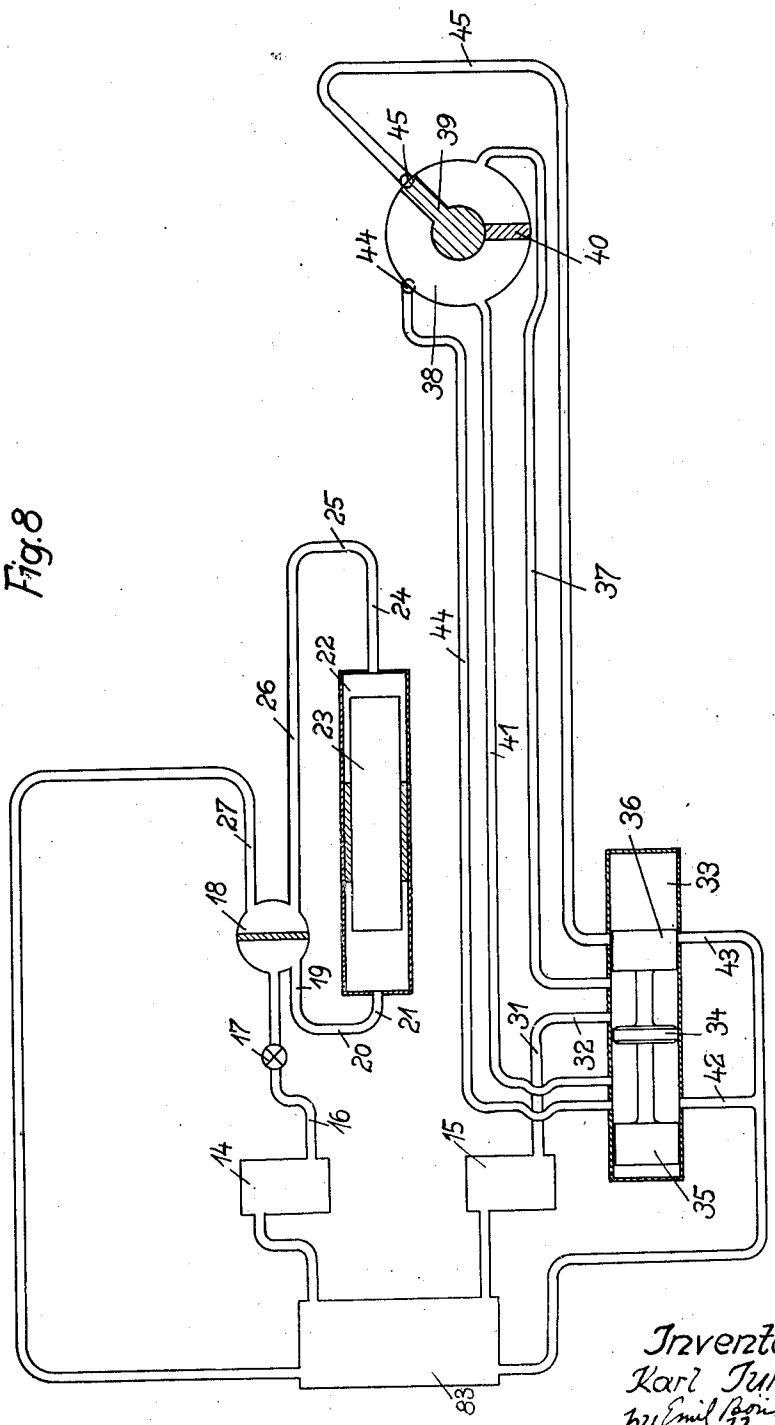
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ADJUSTMENT DEVICE, PARTICULARLY FOR THE CROSS SLIDES OF GRINDING MACHINES

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Fig. 8



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UNITED STATES PATENT OFFICE

KARL JUNG, OF BERLIN, GERMANY

ADJUSTMENT DEVICE, PARTICULARLY FOR THE CROSS-SLIDES OF GRINDING MACHINES

Application filed March 8, 1928, Serial No. 260,043, and in Germany March 5, 1927.

In machine tools, especially grinding machines, which possess a tool or work-piece carrying slide moved longitudinally backwards and forwards and also a cross-slide serving for carrying out the adjustment movement, precaution is taken to carry out the control of the cross-slide either by hand, for the purpose of the adjustment, or automatically. In the latter case the driving mechanism controlling the cross-slide is controlled by the longitudinal slide, which at the end of one or at the end of a number of backwards and forwards movements strikes against a stop or the like, which effects the adjustment control. In all these automatic controls the adjustment is always therefore dependent upon the movement of the longitudinal slide.

Now in the mass production art precaution is taken to estimate the working time required for a piece of work according to the size of shaving to be taken off and according to the number of revolutions and the diameter of the grinding disc employed. The result of this is that the estimated working time differs considerably from the time actually required for the work.

The present invention has for its object to obviate, this disadvantage and to effect the finished treatment of a work piece independently of the arrangement of the machine and the longitudinal movement simply upon the basis of the calculation undertaken.

In the drawings is illustrated an embodiment of the invention by way of example and in which

Fig. 1 is a front view of a machine constructed according to the invention and shows the following arrangement.

Fig. 2 is a side view of the machine seen from the right-hand of Fig. 1.

Figs. 3–7 show the special construction of the controlling of the cross-slide in a larger scale, namely, Fig. 3 is a cross section through the cross-slide of the machine; Fig. 4 is a section through Fig. 3 in the direction of the line 4—4; Fig. 5 is a section through Fig. 3 in the direction of the line 5—5; Fig. 6 is a section through Fig. 3 in the direction of the line 6—6; Fig. 7 is a section through Fig. 4 in the direction of the line 7—7; and

Fig. 8 is a diagrammatic view showing the entire system of connections, the controlling valves and pumps.

In the drawings 1 is either the stationary table of a grinding machine, or, as in the example illustrated in Figs. 1 and 2, the movable longitudinal slide upon the frame A of a grinding machine. On the frame A is also mounted the bearing 77 in which the spindle 78 for holding the work piece is journalled. The cross-slide 6 is located in a horizontal direction upon the part 1. In the slide is mounted a shaft 7 upon which is located a driving pulley 8, which by means of a belt 9 drives a pulley 82 affixed on a shaft 70 mounted in a bearing 71 arranged upon the slide 6. On the shaft 70 the grinding disk or the work piece to be treated is arranged. I prefer, as shown in the drawings, to arrange the grinding disk 72 on said shaft 70. The shaft 7 is driven by means of a belt 73 from a pulley 74 arranged on a shaft 75. The latter has fixed on it a pulley 76 which may be driven in any suitable manner by means of a motor or the like. From the shaft 7 by means of worm gearing 10 and worm and pinion gearing 11 and 12 is driven a shaft 13, which drives two oil pumps 14 and 15 (Figs. 4 and 8). The pressure lead 16 of the pump 14 extends to a throttle valve or throttle cock 17 and to a recess in which a shaft 18 may rotate. This shaft, at the position at which the lead 16 emerges into its recess, as may be seen especially from Figure 2, is constructed in the form of a three-way cock. In the position of this cock illustrated in Fig. 4 the lead 16 is connected to a lead 21 (Fig. 6), by means of the lead 19 and the upwardly directed lead 20, which emerges near to one end of a cylinder 22, in which a piston 23 is slidably mounted backwards and forwards. At the other end of the cylinder 22 emerges a lead 24, which, by means of an upwardly directed lead 25 and a transverse lead 26 branching therefrom, leads to the other side of the shaft 18, wherefrom it extends by means of a lead 27 to an oil collecting chamber 83 from which the pump 14 sucks.

The throttle cock 17 is, as may be observed

from Figure 7 hollow built, and the bore extending therethrough is in communication with an inner hollow region. The hollow region is covered at the top by means of a ball 28, which is pressed against the opening by a spring 29, so that this throttle cock functions simultaneously as a safety valve. The rotation of the cock may take place by means of a hand lever 30.

The second pump 15 feeds, through a lead 31 to which is attached an upwardly directed vertical lead 32, into a cylinder 33, in which moves a valve 34 upon the rod of which are located two pistons 35 and 36. In the position of the valve 34 illustrated in Figure 6 this valve resides with its left side against the appropriate seating. The lead 32 consequently is in communication, by means of the cylinder space, with a lead 37, which leads into a cylindrical chamber 38. A rotary piston turns within the chamber 38. The chamber is divided into two sections by means of the piston and a partition wall 40. From the second section a lead 41 extends towards the other side of the valve 34. The two sides of the valve are furthermore connected to the oil container by means of leads 42 or 43, moreover from the two chambers extend leads 44 and 45 to the cylindrical chamber 38.

The piston 34 is adjusted by means of a gearing, which consists principally of two levers 46 and 47 which are rotatable about pivots 48, 49 and carry at their free ends plungers 50 and 51, which can abut the outer ends of the piston 23. The two other ends of the levers, 46, 47 are connected together by means of a link 52 for simultaneous movement; moreover they abut the outwardly extending piston rods 53, 54 on the pistons 35 and 36.

The shaft 18 (Fig. 3) is connected by means of a link 55 to a disc 56 which resides loosely upon a shaft 57 and carries a pawl 58, the pawl engages in a ratchet wheel 59 situated rigidly upon the shaft 57. The shaft 57 contains further a pinion 60 which meshes with a pinion 61 upon a shaft 62. The latter is mounted in the slide 6, carries at its lower end an eccentrical pivot 63 which has fixed on it a crank arm 64 connected with a toothed rod 66 by means of a pin 65. The toothed rod meshes with a pinion 67 upon a spindle 79 on which is located a worm wheel 68 which is in engagement with a worm 69. By rotating the worm 69, by means of the hand-wheel 80 fixed on the spindle 81 of the said worm 69, the rack rod 66 may be consequently moved and as this rod stands in communication with the shaft 62, this shaft 62, and also the entire slide 6 will be moved in the direction of the rack for being adjusted. If the worm 69 remains at rest and the shaft 62 on the contrary is turned, the excentric pin 63 effects a movement of the slide 6 in Fig. 3 towards the left or the right relatively to the not moved rack 66. This serves for the automatic adjustment.

This automatic adjustment, upon which the invention depends principally, takes place, as proceeds from the foregoing, in the following manner.

By means of the continually running shaft 7 the two pumps 14 and 15 are driven unintermittently. The pump 14 consequently feeds the fluid through the above mentioned leads at the position illustrated in Figure 4 towards the left side of the piston 23. Figure 6 shows the position of the piston, as soon as the feed is ended. The piston in this instance has already assumed its right end position. Consequently it has brought the piston 34 into the position illustrated in Figure 6 by means of the lever 47. As a result of this, oil is now fed by the second pump 15 through the opening 37 upon the right side of the turning piston 39 (Figure 5). The turning piston consequently performs a rotation in an anti-clockwise direction and actually to an extent of about 90°. During this movement the oil located upon the left side of the turning piston can flow through the openings 41 and 44. If the piston has reached its left end position then the opening 44 lies already somewhat at the right side of the piston 39. Both sides of the turning piston 39 are then connected through the cylinder chamber 33 with the outflow lead 42, the pump 15 then runs empty.

The oscillatory movement of the piston 39 has also brought about a corresponding oscillatory movement of the disc 56 and this consequently has occasioned a rotation of the shafts 57 and 62 and therewith a small movement of adjustment. As the piston 39 is rigidly connected to the shaft 18 the rotation of this piston about 90° simultaneously rotates the shaft 18 also about 90° so that the portion of this shaft constructed in the form of a three way cock is now turned through 90° to the position in Figure 4. The result of this is that the left side of the cylinder 22 stands in communication with the outflow opening 27 for the oil, while the oil fed from the pump 14 through the lead 16 and the leads 26, 25, 24 now in communication therewith, flows towards the right side of the cylinder 22, whereby the piston 23 is moved from the position in Figure 4 into its left end position. Hereby by means of the lever 46 it slides the valve 34 so that it arrives into position upon the right seating. The oil of the pump 15 can then enter through the lead 32 over the opening 41 to the left side of the rotary piston 39 and moves this back again through 90° until it liberates the opening 45 and runs to the tank 83 again. This backwards rotation of the piston 39 results in a resetting of the three way cock of the shaft 18, which now again assumes the position shown in Figure 4, and the procedure is re-

peated. At every backwards and forwards movement the pawl 58 performs a working stroke, and rotates the shaft 62 for a certain amount, therefore effects a definite adjustment.

The speed of the adjustment therefore depends simply upon the number of strokes of the shaft 18 and a corresponding number of strokes of the piston 23. The number of strokes of the piston 23 is however again dependent upon what speed the pressure oil flows to one or other side of this piston, since this speed through the throttle valve 17 may be regulated by corresponding adjustment of the hand lever 30, there is reached, by means of the adjustment of the said hand lever 30, a desired number of strokes of the piston 23 and consequently a desired number of strokes of the entire gearing, and also of the pawl 58. In other words the adjustment of the cross-slide, thus the approaching of the work tool to the work piece may be adjusted quite independently from the movement of the longitudinal slide. So long as the lever 30 preserves its position, the speed of adjustment depends upon the number of revolutions of the shaft 7, since this drives the oil pumps. In all cases therefore is there present a regulation of the stroke according to the speed of the slide. The faster the grinding disc rotates, the faster becomes the adjustment. Even then by the adjustment of the hand lever 30 a regulation corresponding to the diameter of the grinding disc, the quality of the grinding disc, the nature of the material to be ground, may be undertaken. In every case by means of the adjustment of the hand lever 30 it may be effected that for a constant number of revolutions of the shaft 7 within a definite time there results a definite adjustment.

Of course the arrangement may be carried out differently from the constructional point of view, thus one may choose, instead of the hydraulic drive illustrated and described in given cases also a mechanical drive, which, issuing from the drive of the grinding disc or the tool, takes up the movement of the cross-slide independently from the movement of the longitudinal slide.

I claim:

1. An adjustment device particularly for the cross-slides of grinding machines comprising in combination with the cross-slide of the machine, a hydraulic piston for feeding the cross-slide, a pump serving for producing a medium under pressure moving said piston, a second hydraulic piston for controlling said first-mentioned piston by leading the medium under pressure to the one or the other side of the piston, a cylinder in which said second piston works, a second pump serving for producing a medium under pressure for moving said second piston, a pipe line leading the driving medium to said cylinder, and a hand-controlled valve inserted into said hydraulic means and adapted to adjust same in accordance with the time allowed for working.

2. An adjustment device particularly for the cross-slides of grinding machines comprising in combination with the cross-slide of the machine, a hydraulic piston for feeding the cross-slide, a pump serving for producing a medium under pressure for moving said piston, a second hydraulic piston for controlling said first-mentioned piston by leading the medium under pressure to the one or the other side of the piston, a cylinder in which said second piston operates, a second pump serving for producing a medium under pressure for moving said second piston, and controlling means controlling the medium driving said second piston.

3. An adjustment device particularly for the cross-slides of grinding machines comprising in combination with the cross-slide and the longitudinal slide of the machine, a hydraulic gearing for feeding the cross-slide, hydraulic means for controlling said gearing, and a hand-controlled valve inserted into said hydraulic means and adapted to adjust same in accordance with the time allowed for working said valve constituting also a safety-valve.

4. An adjustment device for the cross-slide of a grinding machine, comprising in combination with the cross-slide a hydraulic system for feeding the cross-slide; a pump serving for producing a medium under pressure for driving said system; a second hydraulic system for controlling said first-mentioned hydraulic system; a second pump producing a medium under pressure for driving said second system; a grinding disc; means for driving said disc and pumps in dependency of each other; and means inserted into said second hydraulic system adapted to control the speed thereof at will during the operation of the machine.

In testimony whereof I affix my signature.

KARL JUNG.