Aug. 6, 1929. F. S. HAAS 1,723,852

GRINDING MACHINERY

Filed Aug. 5, 1927

Fig. 1

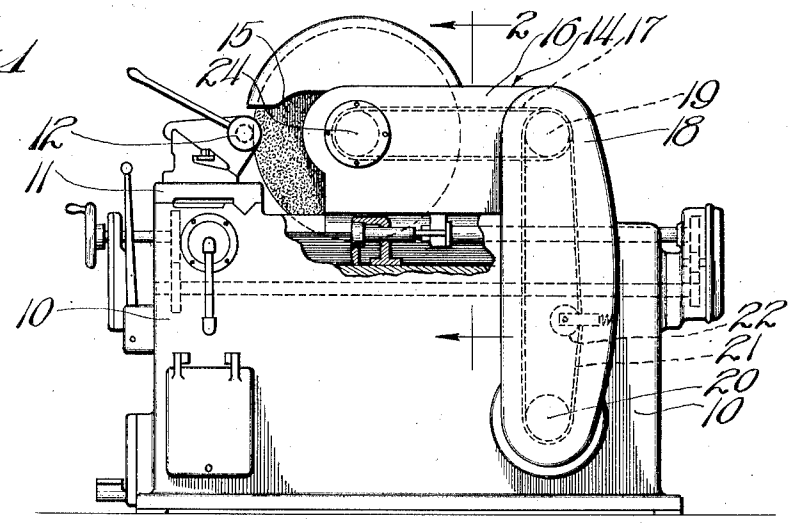



Fig. 2

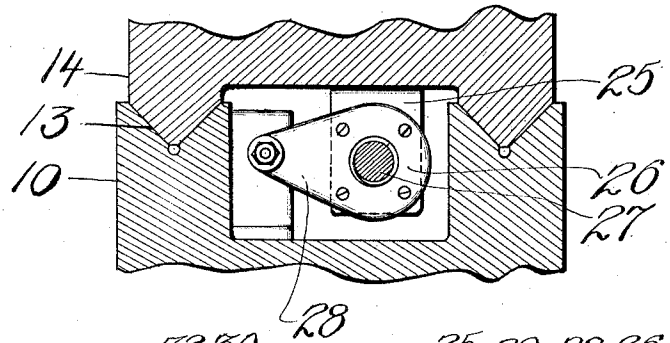
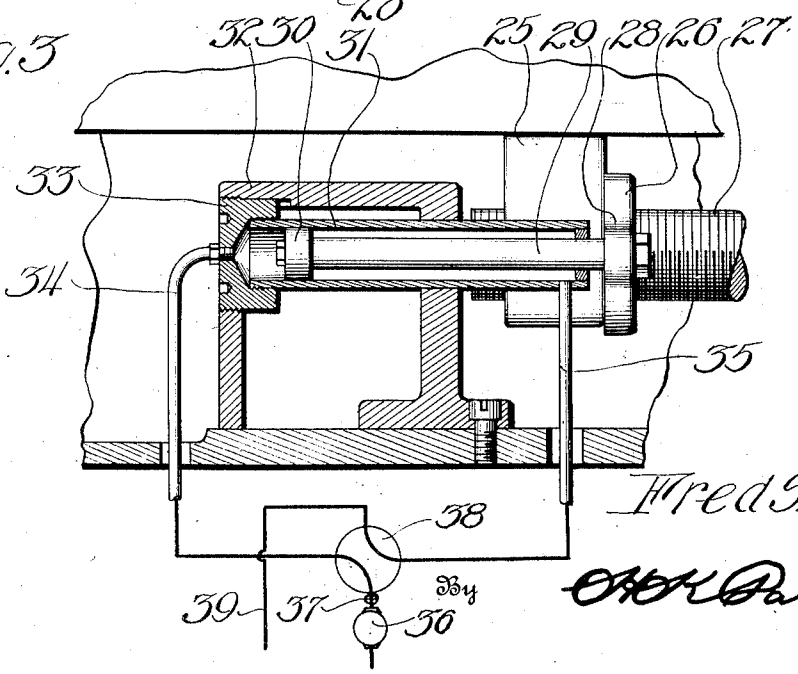



Fig. 3




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Patented Aug. 6, 1929. 1,723,852

# UNITED STATES PATENT OFFICE.

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## GRINDING MACHINERY.

Application filed August 5, 1927. Serial No. 210,835.

This invention relates to improvements in grinding machinery and has particular reference to an improved control for the feed mechanism thereof.

Prior to the present invention it has been customary in performance of grinding operations to make use of a machine in which there is relative movement between the work and the grinding wheel, this movement being normally effected by the use of a screw for obtaining proper relative feeding of the parts either by continuous rotation or intermittent rotation depending on whether the grinding is of the plunge cut or transverse type. Screw mechanisms, however, are subject to the difficulty particularly after they have been in operation for a time that there is wear and consequent play between the nut member and the threads on the feed screw.

It is the object of the present invention to provide an improved mechanism for eliminating back lash and play due to such wear or loose fit between the parts and to insure absolute accurate non-chattering feeding movement and retention of parts in exact position to which they may be adjusted, irrespective of any looseness there may be in fit between the interior threads of the nut or female member and the exterior threads of the male member or screw.

A further object of the present invention is the provision of an improved mechanism which shall have a cushioning non-vibrating effect in this respect as distinguished from the action present when a depending weight or like structure is utilized.

Another object of the present invention is the provision of a mechanism which may be so adjusted as to cause the feed pressure to be produced in a positive mechanical manner by the screw just described or which may be alternatively employed to cause the feed pressure to be of a cushion or hydraulic type in which the screw shall variably limit the approach of the parts and there shall be possibility of slight yield or cushioning in conjunction with the relatively positively controlled feeding action.

Other objects and advantages of the present invention should be readily apparent by reference to the following specification taken in connection with the accompanying drawings, and it will be understood that I may make any modifications in the specific structural details hereinafter disclosed within the scope of the appended claims, without departing from or exceeding the spirit of the invention.

Figure 1 is a side elevation of a machine embodying the present improvement with parts broken away to facilitate understanding of the location thereof.

Figure 2 is a transverse sectional view as on the line 2—2 of Figure 1, and

Figure 3 is a longitudinal sectional view through the control mechanism.

In the drawings the numeral 10 designates the bed of a grinding machine having the customary traversable table 11 adapted to support a work piece as at 12 in the customary manner.

The bed is further provided with ways 13 for the grinding wheel carriage 14 mounted for movement toward and from the work table 11. This carriage bears the grinding wheel 15 having a hood portion 16 enclosing the driving belt 17 therefor. Associated with this casing is a second swivelled casing 18 having its upper end pivoted concentric with or about the intermediate shaft 19 and its lower end pivoted concentric with or on the main drive shaft 20 journalled in the bed 10. A drive belt 21 serves to transmit power from shaft 20 to shaft 19 being kept under tension as by the spring actuated idler 22, while a second drive belt 17 transmits power from shaft 19 to the grinding wheel spindle 24. From this construction it will be noted that as the grinding wheel carriage is moved back and forth intermediate casing 18 will swing in and out constantly enclosing and protecting the belt.

To cause the in and out movement the carriage 14 has depending therefrom a bracket 25 supporting the nut 26 through which is threaded feed screw 27. This screw may be actuated in any suitable manner such as the gearing indicated in dotted lines in Figure 1 for hand or power rotation thereof as is customary in machines of this

type. Extending laterally from bracket 25 either integral with or separate from nut 26 is the arm 28 having secured thereto piston rod 29. This rod bears piston 30 slidable in cylinder 31. The cylinder in turn is rigidly mounted within bracket 32 bolted to the bed 10 and therefore in fixed relation to the machine itself and to the work table 11 and work supported thereby.

As shown what is normally the head of the cylinder is formed by a nut 33 exteriorly threaded for engagement with bracket 32 and interiorly threaded to receive the further end of cylinder 31. Coupled with this nut is pressure pipe 34, while extending into the rear of the cylinder and in communication with the interior thereof is a second pipe 35. In normal operation of the machine pressure is supplied from pump 36 through pipe 34 to the interior of cylinder 31. This pressure builds up this prescribed amount in the further end of the cylinder, rearwardly urging piston 30 and piston rod 29 which in turn exert a rearwardly acting pressure component against bracket 25 and thus against the grinding wheel carriage 14, tending to force the same to the rear and holding the nut firmly engaged with the front faces of the threads on screw 27. This may be any suitable type of fluid pressure either air, hydraulic or otherwise and may be set for proper and desired pressure within the center as by relief or bypass valve 37 in the pressure supply line.

It will thus be seen that there is at all times a yielding or cushion urge of the grinding wheel carriage rearwardly in opposition to the feeding movement of the screw as the wheel is being moved forward or acting in conjunction with the reverse rotation of the screw urging the grinding wheel rearwardly as it is being withdrawn.

As indicated in Figure 3, the lines 34 and 35 may lead into a reversing valve 38 causing the pressure to be introduced through line 35 in place of line 34 and selectively coupling the free line with relief line 39. In ordinary operation the relief line 35—39 serves merely to conduct away any of the actuating fluid which may in the course of use pass by piston 30, but by the presence of these lines is made possible the reversal of the system. On reversal the piston it will be understood acts to urge the carriage inward against the opposite side of the threads. This is advantageous when it is desired there may be a slight cushioning feed in the event undue resistance is met with by the grinding wheel for a moment, rather than causing an absolute unyielding forcing of the wheel into the work by the screw. It also has the additional advantage that either side of the thread may be selectively employed as the controlling side and thus extreme accuracy attained even in those instances where wear on the other side of the screw has tended to slightly interfere with the accurate infeed accomplished thereby. This it will be appreciated is a feature of considerable importance when grinding work to within limits of one or two ten thousandths as is frequently necessary in modern precision grinding.

It will of course be understood that while the mechanism has been particularly illustrated and described as accomplishing the feeding movement of the grinding wheel, that in its present aspect the invention contemplates the utilization of a mechanism of this nature for controlling the relative feeding action of the grinding wheel and work and that a reversal of the stationary and movable parts with employment of the same type of controls for their relative approach and receding movement is within the purview of the invention as hereinafter defined by the claims.

I claim:—

1. In a grinding machine the combination with a work supporting member and a grinding wheel for action on work held thereby, of means for positively producing relative movement between said parts, comprising a feed screw carried by one of said parts; a nut member associated with the other of the parts and fluid pressure mechanism for insuring constant contact between one face of the interengaging threads on the nut and screw.

2. In a grinding machine the combination with a work supporting member and a grinding wheel for action on work held thereby, of means for positively producing relative movement between said parts, comprising a feed screw carried by one of said parts; a nut member associated with the other of the parts and fluid pressure mechanism for insuring constant contact between one face of the interengaging threads on the nut and screw, and means for reversing the effect of the fluid pressure mechanism to render operative the opposite faces of said threads.

3. In a machine of the character described, the combination with a movable tool carriage, of a nut carried thereby, a feed screw for cooperation with the nut positively to shift the tool carriage, and fluid pressure means for yieldingly urging the nut in one direction against the screw to eliminate back lash or play therebetween.

4. In a grinding machine, the combination with a bed, of a grinding wheel carriage movably mounted on the bed, a screw rotatable but non-translatably supported by the bed for effecting the forward movement of the carriage, a nut carried by the carriage and engaging the screw, a cylinder held on the bed against movement relative thereto, a piston associated with the carriage for

movement therewith, and means for introducing fluid under pressure to the cylinder yieldingly to resist movement of the piston therein in opposition to the movement imparted to the carriage by the screw.

5. In a grinding machine, the combination with a bed and a carrier moveable thereon, of a feeding screw carried by one of said parts and a nut carried by the other of said parts whereby rotation of the screw will serve to positively shift the carriage on the bed, a means for eliminating back lash in conjunction with the movement of the carrier as effected by the screw, said means comprising a cylinder carried by one of the two first named parts and a piston moveable within the cylinder and operatively connected with another of said parts, and means for introducing fluid under pressure into the cylinder to urge the piston in opposition to the direction of movement imparted to the carriage by the screw whereby the fluid yieldingly resists movement of the carriage to eliminate back lash between the nut and screw.

6. The combination with a grinding machine comprising a bed, a wheel carriage moveable on the bed, and an interengaged nut and feeding screw for effecting the movement of the carriage on the bed, of a back lash eliminator for application to said parts including a cylinder adapted to be mounted on one of the parts and a piston operatively associated with the other of the parts, and means for introducing fluid under pressure into the cylinder to yieldingly resist the movement of the piston in the cylinder on movement of the carriage as effected by the screw.

In testimony whereof I affix my signature.

FRED S. HAAS.