Dec. 25, 1934. A. TURNER 1,985,433

GRINDING MACHINE

Filed May 6, 1931 2 Sheets-Sheet 1

Fig. 1

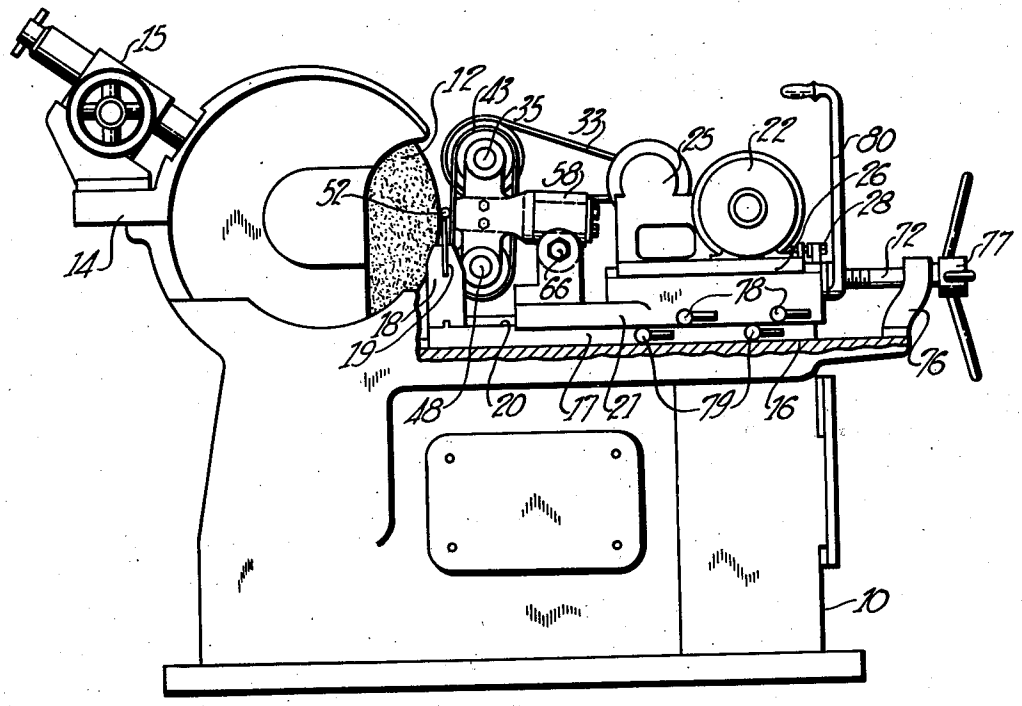
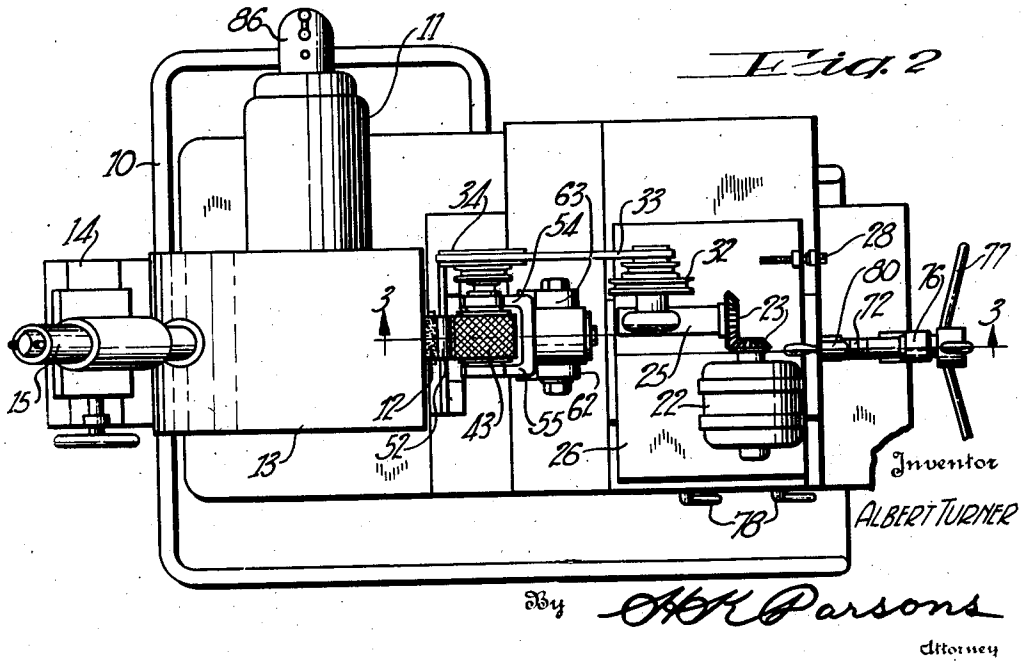


Fig. 2



Inventor
ALBERT TURNER

By A. K. Parsons
Attorney

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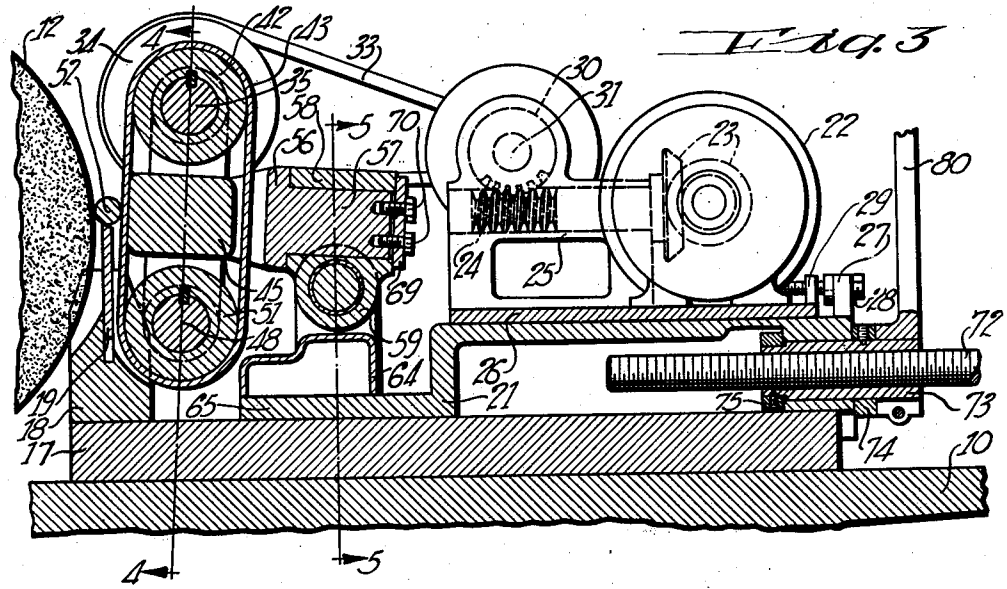


Fig. 3

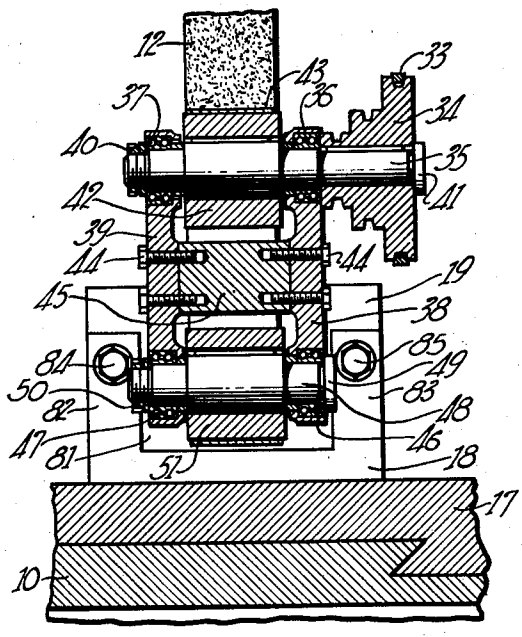


Fig. 4



Fig. 6

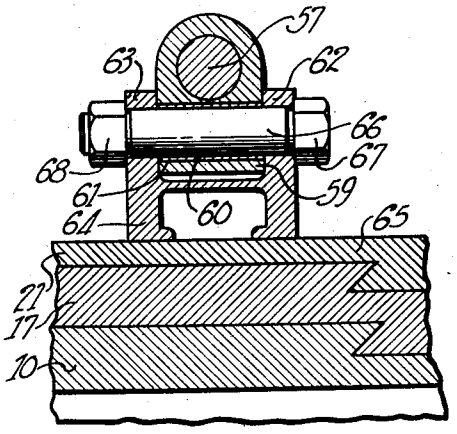


Fig. 5

Inventor

ALBERT TURNER

By H. K. Parsons

Attorney

Patented Dec. 25, 1934 1,985,433

UNITED STATES PATENT OFFICE

1,985,433

GRINDING MACHINE

Albert Turner, Shrewsbury, Mass., assignor to Cincinnati Grinders Incorporated, Cincinnati, Ohio, a corporation of Ohio

Application May 6, 1931, Serial No. 535,440

6 Claims. (Cl. 51—103)

This invention relates to improvements in machine tool structures and especially to improvements in centerless grinders.

An object of the present invention is the provision of improved means for controlling the rotation and feed of a work piece.

Another object of the invention is the provision of a work control mechanism capable of universal adjustment to change the rate of feed of the work and relative position of the surfaces of the throat forming members.

A further object of the invention is the provision of an improved self-contained unit for use with a centerless grinder to effect the proper controlling movement of a work piece being operated upon.

A still further and specific object of the invention is the provision of an improved work control member in the nature of an endless band for controlling the rotation and feed of a work piece through the throat of a centerless grinder.

These and other objects are obtained by the means described herein and disclosed in the accompanying drawings forming a part thereof, and it is to be understood that any modifications may be made in the specific structural details there shown and described without departing from the spirit of the invention as defined by the subtended claims.

In the drawings:

Figure 1 is an elevational view of a centerless grinder embodying the improvements of this invention.

Figure 2 is a plan view of the grinder shown in Figure 1.

Figure 3 is a fragmentary sectional view on line 3—3 of Figure 2.

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

Figure 5 is a sectional view taken on line 5—5 of Figure 3.

Figure 6 is a cross sectional view of the control band or belt.

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

The machine of this invention may comprise a base or bed 10 having formed thereon and extending therefrom a pedestal 11 for supporting the bearings of a spindle to which is secured the grinding wheel 12. The grinding wheel 12 is enclosed within a suitable housing 13 having formed integral therewith a bracket 14 for the truing mechanism 15 utilized for trimming or truing the active face of the grinding wheel.

The bed 10 is further provided with ways 16 for the slide 17 which bears at its front end a work rest block 18 for work rest blade 19. The work rest block 18 is cut away intermediate its lateral sides, as at 81, providing ends 82 and 83 of a width substantially equal to the width of the block 18 through which ends clamp screws 84 and 85 extend for clamping the blade 19 in adjusted positions relative to the block 18. The work rest blade has an inclined or angle top inclining downwardly toward the active face of control belt or band 43 and forming therewith a work receiving trough. The slide 17 is further provided with ways 20 for a second or upper slide 21 which supports the work rotation and controlling mechanism. This mechanism includes a motor 22 driving through a pair of bevel gears 23 a worm 24 journaled in a bracket 25. The motor 22 and bracket 25 are secured to a plate 26 mounted on the slide 21 for movement longitudinally thereof. To effect this movement the slide 21 has extending from it a lug 27 in which is rotatably journaled a screw 28 which has its threaded end threadedly received in a lug 29 extending from the plate 26. The worm 24 meshes with and drives a worm wheel 30 fast on shaft 31 which is journaled in the bracket 25. Secured to the shaft 31 exteriorly of the bracket 25 is a cone pulley 32 having a plurality of different sized individual pulleys each provided with a groove for the reception of a complementary formed belt 33 which is adapted to be trained about a cone pulley 34. The transmission member 33 may be a belt, band, chain, or the like, here shown as a belt having a V shaped cross section. By this construction engagement between the belt and pulleys is insured through the contact of the inclined sides of the belt and the wedge shaped sides of the pulley groove.

The cone pulley 34 is keyed to a shaft 35 journaled in anti-friction bearings 36 and 37 carried by the upper end of yoke arms 38 and 39. A nut 40 on the end of the shaft 35 clamps the parts between itself and a head 41 on the shaft 35. Intermediate the yoke arms 38 and 39 the shaft 35 has keyed to it a drum 42 about which an endless band or belt 43 extends. The yoke arms 38 and 39 are secured by bolts 44 to a block or anvil 45, and the said arms 38 and 39 extend below the anvil 45 and carry anti-friction bearings 46 and 47 at their lower extremities. Journaled in the bearings 46 and 47 is a shaft 48 having a head 49 on one end and a lock nut 50 on the other. Intermediate the lower ends of the yoke arms 38 and 39 and keyed to the shaft 48 is a

drum 51 about which the endless belt 43 is further trained.

From the foregoing it will be noted that motor 22, through the transmission train above described including the pulleys 32 and 34, will drive the shaft 35 at a plurality of speeds, depending upon which of the steps of 32 and 34 are being employed, for correspondingly driving the endless belt or band 43. This belt 43 is driven in a clockwise direction so that its surface adjacent the work rest blade travels in an upwardly direction while in engagement with the work 52 for rotating the work in a counter-clockwise direction. The active face of the grinding wheel 12 travels in a clockwise direction and tends to force the work down against the blade. Therefore, the blade 19 takes the cut thrust of the grinding wheel while the infeed thrust of the wheel is against the anvil 45.

The anvil 45 has extending therefrom arms 54 and 55 which are joined to form flange 56 from which stud or trunnion 57 extends. The stud 57 is journaled in a bracket 58 which has depending from it a bearing 59 provided with a bore 60 for bushing 61. The bearing 59 is received between arms 62 and 63 of a bracket 64 secured on the extension 65 of slide 21. The arms 62 and 63 are provided with bores in axial alignment with the bore of bushing 61 through which a stud or shaft 66 projects. The stud 66 has a head 67 on one end and a nut 68 on the other for clamping the bearing 59 of the bracket 58 therebetween to hold the anvil 45 in adjusted positions about the axis of said clamping stud or bolt 66. This adjustment of the parts is employed to properly enlarge the grinding throat above the actual point of grinding. In order to provide the necessary feeding component on the work to feed same through the grinding throat, as when performing through feed grinding operations, the band or belt 43 and anvil 45 are adjusted about the axis of stud or trunnion 57. The said parts are clamped in this position by a clamp plate 69 engaging the rear face of bearing 58 and forcibly held thereagainst by clamp screws 70 extending through said plate and threadedly received in the trunnion 57.

The adjustment of the parts about the axis of stud 66 will tend to either shorten the distance between the axes of shafts 35 and 31 thereby throwing undue tension on the belt 33 or loosening same beyond its efficient driving tension. For this reason the motor and bracket 25 are mounted on the plate 26 so that through the adjusting screw 28 the said parts may be either advanced or retarded relative to the slide 21 for properly tensioning belt 33.

In order that the proper frictional engagement may be had between the belt 43 and the work 52, the said belt may be serrated as shown at 71 in Figure 6. This serration or roughening 71 may be obtained from the grinding wheel 12 which would be trued to an open condition whereby a multiplicity of relatively deep cutting points are provided each forming a groove in the band or belt 43 between which grooves teeth would appear so that the active face of band 43 would appear similar to the surface of a butcher's knife-sharpening steel. In order to cross the grooves formed by the grinding wheel the spindle thereof is provided with a reciprocating attachment 86.

The slides 17 and 21 are adapted to be actuated relative to the bed 10 for setting up the parts and to provide the proper width of grinding throat between the operative faces of the grinding wheel 12 and band or belt 43. For this purpose an adjusting screw 72 is provided having threaded engagement with a nut 73 oscillatably journaled in the slide 21 but prevented from axial movement relative thereto by the nuts 74 and 75. The outer end of the adjusting screw 72 is journaled in a bracket 76 carried by the bed 10, and the said screw has secured to it exteriorly of the bracket 76 a pilot wheel 77 whereby the said screw may be actuated. In order that the slides 17 and 21 may be moved as a unit, there is provided clamps 78 for securing the slides to one another, while to adjust the slides independently of one another clamps 79 are employed for clamping the lower slide 17 to the bed.

In the performance of centerless grinding operations on shoulder work, which is generally termed infeed grinding, the throat is enlarged to permit the placement of the work on the blade whereupon the throat is contracted to reduce the work to the desired size. For this purpose the oscillatable nut 73 has secured to it a handle or lever 80 for oscillating the same, which oscillation causes the nut to advance or retract relative to the screw 72 and thereby actuate the parts correspondingly. In practice the hand lever 80 is oscillated through an arc of ninety degrees from the position shown in Figures 1 and 2. By previous adjustment of the slides 17 and 21 the oscillation of the lever 80 causes the work control unit to feed the work into the grinding wheel an amount necessary to reduce the work to the desired size.

What is claimed is:

1. In a precision centerless grinder the combination of a bed, a grinding element having a non-yielding operative surface rotatably mounted thereon, a work rest blade adjacent the operative face of the grinding wheel for supporting a work piece while in engagement with the grinding wheel, a slide carried by the bed for supporting the work rest blade, a second slide superimposed on the first slide for movement relative thereto, a bracket mounted on the second slide, a trunnion bearing pivotally secured to the bracket for adjustment in a plane tandem to the plane of rotation of the non-yielding face of the grinding wheel, a drum frame having a trunnion extending therefrom and received in the trunnion bearing for adjustment in a plane transversely to the plane of adjustment of the trunnion bearing, an endless band supported by the drum frame, means integral with the drum frame for backing up the band at a point opposite the grinding point of the grinding wheel and thereby forming a grinding throat between the operative non-yielding portions of the grinding wheel and band, means for actuating the band at a comparatively slow work rotation rate of speed, said band having a serrated operative surface for increasing the frictional contact between itself and the work, means for securing the slides to one another for unitary adjustment, means for securing the first slide to the bed for independent adjustment of the slides, and an adjusting screw for effecting the unitary and independent adjustment of the slides to properly position the work rest blade relative to the active face of the grinding wheel and to vary the final size of the grinding throat between the non-yielding operative portions of the grinding wheel and band.

2. In a precision centerless grinder the combination of a bed, a grinding element having a non-yielding operative surface rotatably mounted thereon, a work rest blade adjacent the oper-

ative face of the grinding wheel for supporting a work piece while in engagement with the grinding wheel, a slide carried by the bed for supporting the work rest blade, a second slide superimposed on the first slide for movement relative thereto, a bracket mounted on the second slide, a trunnion bearing pivotally secured to the bracket for adjustment in a plane tandem to the plane of rotation of the non-yielding face of the grinding wheel, a drum frame having a trunnion extending therefrom and received in the trunnion bearing for adjustment in a plane transversely to the plane of adjustment of the trunnion bearing, an endless band supported by the drum frame, means integral with the drum frame for backing up the band at a point opposite the grinding point of the grinding wheel and thereby forming a grinding throat between the operative non-yielding portions of the grinding wheel and band, means for actuating the band at a comparatively slow work rotation rate of speed, said band having a serrated operative surface for increasing the frictional contact between itself and the work, means for securing the slides to one another for unitary adjustment, means for securing the first slide to the bed for independent adjustment of the slides, an adjusting screw for effecting the unitary and independent adjustment of the slides to properly position the work rest blade relative to the active face of the grinding wheel and to vary the final size of the grinding throat between the non-yielding operative portions of the grinding wheel and band, a prime mover carried by the second slide for adjustment relative thereto for actuating the band, and means between the prime mover and the band for reducing the rate of actuation of the band as respects the prime mover.

3. In a precision centerless grinder of the class described the combination of a bed, a pair of opposed grinding and work rotation controlling elements, one of said elements being in the nature of an endless non-compressible band, said elements being spaced from one another a distance to form a grinding throat, a work rest blade subtending the grinding throat and supporting a work piece thereon in simultaneous engagement with said grinding and work controlling elements, and means associated with the endless band for backing up said band at the point of contact thereof with the work for providing a non-yielding grinding throat.

4. In a precision centerless grinder of the class described the combination of a bed, a grinding wheel rotatably mounted thereon, an opposed work rotation controlling mechanism including an endless band, the grinding wheel and endless band being spaced from one another a distance to form a grinding throat between them, said band being formed of non-compressible material and having a serrated operative surface for frictional engagement with the work, a work rest blade disposed within the grinding throat for peripherally supporting a work piece while in contact with the grinding wheel and band, a bracket member including a pair of drums for supporting the band, and an anvil operatively associated with the supporting bracket for backing up the band at the point of contact thereof with the work for thereby providing a grinding throat of a definite size which is non-yielding during the grinding operation.

5. In a precision centerless grinder of the class described the combination of a bed, a grinding wheel rotatably mounted thereon, an opposed work rotation controlling mechanism including an endless band, the grinding wheel and endless band being spaced from one another a distance to form a grinding throat between them, said band being formed of non-compressible material and having a serrated operative surface for frictional engagement with the work, a work rest blade disposed within the grinding throat for peripherally supporting a work piece while in contact with the grinding wheel and band, a bracket member including a pair of drums for supporting the band, an anvil operatively associated with the supporting bracket for backing up the band at the point of contact thereof with the work for thereby providing a grinding throat of a definite size which is non-yielding during the grinding operation, a slide member mounted on the bed for supporting the work controlling mechanism, and means associated with the bed and slide for adjusting the position of the band with respect to the grinding wheel to vary the size of the grinding throat.

6. In a precision centerless grinder of the class described the combination of a bed, a grinding wheel rotatably mounted thereon, an opposed work rotation controlling mechanism including an endless band, the grinding wheel and endless band being spaced from one another a distance to form a grinding throat between them, said band being formed of non-compressible material and having a serrated operative surface for frictional engagement with the work, a work rest blade disposed within the grinding throat for peripherally supporting a work piece while in contact with the grinding wheel and band, a bracket member including a pair of drums for supporting the band, an anvil operatively associated with the supporting bracket for backing up the band at the point of contact thereof with the work for thereby providing a grinding throat of a definite size which is non-yielding during the grinding operation, a slide member mounted on the bed for supporting the work controlling mechanism, means associated with the bed and slide for adjusting the position of the band with respect to the grinding wheel to vary the size of the grinding throat, and means carried by the slide for driving the band.

ALBERT TURNER.