March 21, 1939. C. G. FLYGARE 2,151,655

GRINDING WHEEL SPINDLE RECIPROCATING APPARATUS

Filed June 1, 1936

FIG. 2

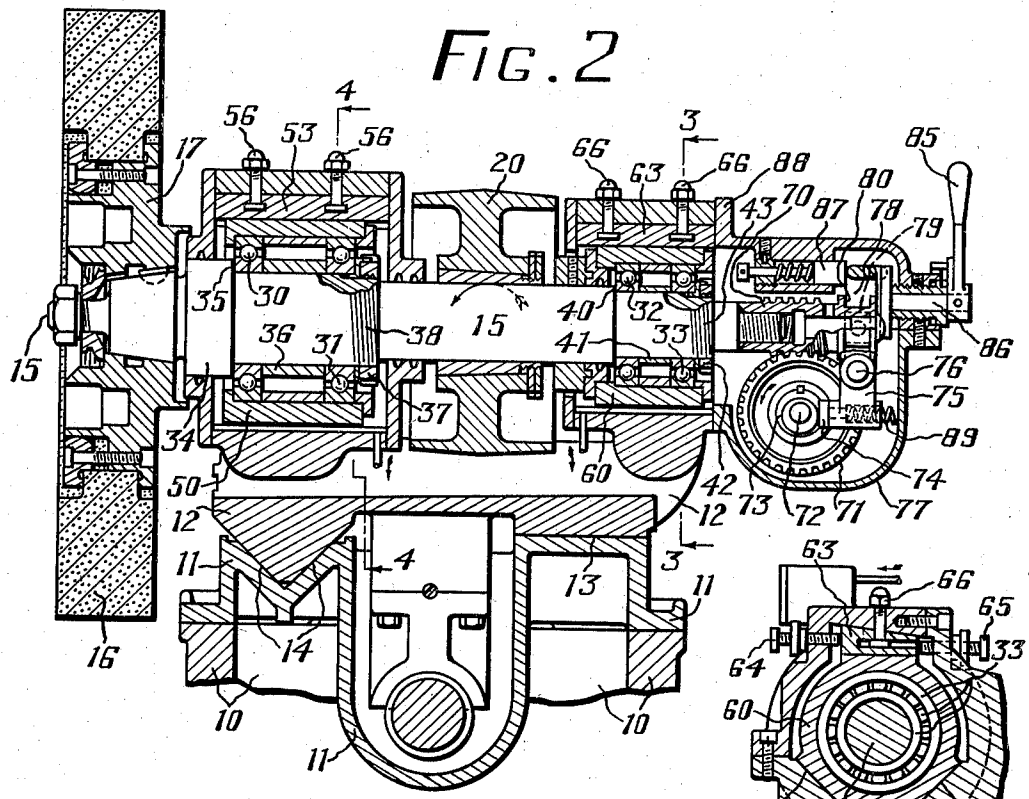
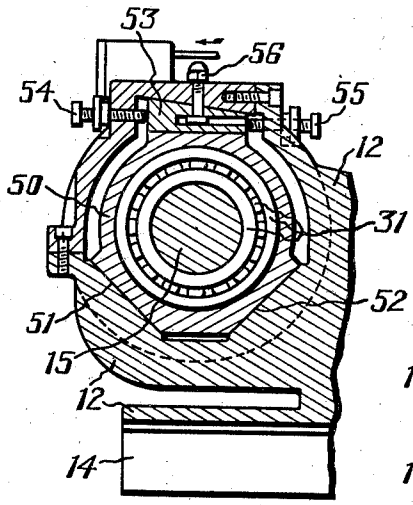


FIG. 3

FIG. 1



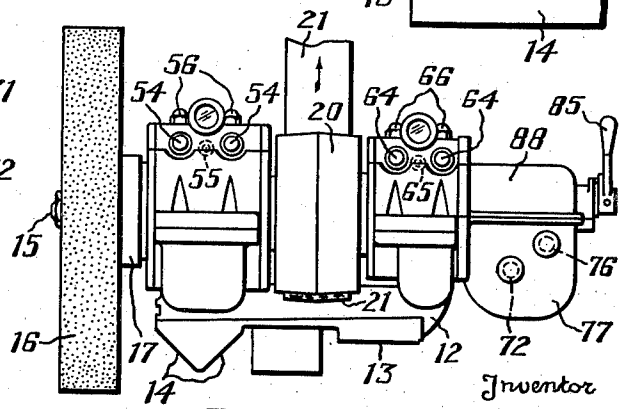


FIG. 4

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Patented Mar. 21, 1939 2,151,655

UNITED STATES PATENT OFFICE

2,151,655

GRINDING WHEEL SPINDLE RECIPROCATING APPARATUS

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Application June 1, 1936, Serial No. 82,764

1 Claim. (Cl. 51—34)

This invention relates to grinding machines, and more particularly to a mechanism for reciprocating the grinding wheel spindle axially during the grinding operation.

One object of this invention is to provide a simple, thoroughly practical wheel spindle reciprocating mechanism for a grinding wheel spindle. Another object of this invention is to provide an anti-friction bearing mount for a grinding wheel spindle in which the spindle may be reciprocated axially during a grinding operation. A further object of this invention is to provide an anti-friction bearing for a wheel spindle in which the spindle and anti-friction bearing may be reciprocated axially during a plunge-cut grinding operation. Other objects will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts, as will be exemplified in the structure to be hereinafter described, and the scope of the application of which will be indicated in the following claim.

In the accompanying drawing in which is shown one of various possible embodiments of the mechanical features of this invention,

Fig. 1 is a front elevation of a grinding wheel slide;

Fig. 2 is a longitudinal sectional view, on an enlarged scale, through the grinding wheel slide, showing the spindle in elevation and the bearings and associated parts in section;

Fig. 3 is a fragmentary cross sectional view, taken approximately on the line 3—3 of Fig. 2; and

Fig. 4 is a fragmentary cross sectional view, taken approximately on the line 4—4 of Fig. 2.

As shown in the drawing, a grinding machine has been illustrated comprising a base 10 having a wheel slide base 11 fixedly mounted thereon. The base 11 supports a transversely movable wheel slide 12 on a flat way 13 and a V-way 14. The grinding wheel slide 12 carries a rotatable grinding wheel spindle 15 which supports a rotatable grinding wheel 16. A wheel supporting center 17 is provided for convenience in mounting the grinding wheel 16 on the spindle 15. The spindle 15 may be rotated by any of the well-known driving mechanisms. As illustrated, the wheel spindle 15 is provided with a driving pulley 20 which is connected by a driving belt 21 with a suitable source of power, such as an overhead drive shaft or a motor on the wheel slide. The spindle 15 is preferably supported by anti-friction bearings, such as ball bearings 30, 31, 32 and 33. The spindle 15 is provided with an enlarged portion 34 which provides a shoulder 35 against which the ball bearing 30 may be located. A spacing collar 36 is interposed between the anti-friction bearings 30 and 31 and a locking collar 37 is screw threaded onto a threaded portion 38 on the spindle 15 to facilitate adjusting the bearings 30 and 31 relative to the spindle.

Similarly, a shoulder 40 is provided on the spindle to locate the anti-friction bearings 32. A spacing collar 41 is interposed between the anti-friction bearings 32 and 33 and a locking collar 42 is screw threaded onto a threaded portion 43 of the spindle 15 to facilitate adjustment of the bearings 32 and 33.

In a plunge-cut grinding operation, that is where the grinding wheel is of a width equal to or slightly greater than the portion of the work to be ground and the wheel is fed directly or straight-in toward the work axis, it is desirable to provide an axial oscillating or reciprocating movement of the grinding wheel during grinding to break up the grain markings on the finished work piece. It is, therefore, desirable to provide a suitable mechanism for reciprocating the spindle 15 axially during the grinding operation. In the preferred construction, the anti-friction bearings are mounted in a slidable supporting member so that the spindle 15, bearings 30, 31, 32 and 33 and supports may be oscillated or reciprocated to transmit a corresponding movement to the grinding wheel 16 during a grinding operation.

As illustrated in the drawing, the anti-friction bearings 31 and 32 are mounted in a slidable supporting member 50 which is provided with sliding surfaces 51 and 52 which mate with correspondingly shaped surfaces on the wheel slide 12. In order to maintain the bearing support 50 in proper relationship with its supporting surfaces 51 and 52, an adjustable member, preferably a wedge shaped member 53, is provided in the upper portion of the bearing housing. This wedge shaped member may be adjusted transversely of the slide 12 by means of opposed adjusting screws 54 and 55 and may be locked in adjusted position by means of clamping screws 56. The wedge 53 is preferably adjusted so as to take up any play between the parts, but adjusted so as to permit the bearing support 50 to be readily reciprocated longitudinally relative to the wheel slide 12 on the surfaces 51 and 52.

Similarly, the anti-friction bearings 32 and 33 are mounted in a supporting member 60 which is provided with sliding surfaces 61 and 62 which

mate with correspondingly shaped surfaces on the wheel slide 12. A wedge block 63 is provided to hold the bearing supporting member 60 in proper relationship with its slide surfaces 61 and 62. The wedge block 63 is adjusted transversely relative to the wheel slide 12 by means of opposed adjusting screws 64 and 65 and may be clamped in adjusted position by means of clamping screws 66. The wedge 63 is adjusted so as to take up any play or lost motion between the bearing supporting member 60 and the wheel slide 12 but not sufficiently tightened to prevent a reciprocating movement of the bearing supporting member 60 relative to the wheel slide 12.

In order to transmit a reciprocatory motion to the grinding wheel 16 and wheel spindle 15, a wheel spindle reciprocating mechanism is provided which is arranged to cause an axial reciprocating movement, when desired, of the spindle 15, the bearings 30, 31, 32 and 33, and the bearing supports 60 and 61 relative to the wheel slide 12. The wheel spindle reciprocating mechanism may comprise a worm 70 mounted on the end of the wheel spindle 15 and meshing with a worm gear 71 which is supported on a rotatable shaft 72. The shaft 72 carries a cam or eccentric 73 which bears against a follower surface 74 on the lower end of a rock arm 75. The rock arm 75 is pivotally supported on a stud 76 within a casing 77, bolted or fixedly mounted on the end of the wheel slide 12. The upper end of the rock arm 75 is formed as a yoked member 78 having spaced, opposed, pivotally mounted shoes 79 which ride in a spool shaped member 80 formed integral with the worm 70. It will be readily apparent from the foregoing disclosure that when the spindle 15 is rotated, this rotary motion is transmitted through the worm 70, the worm gear 71, to rotate the shaft 72 and the eccentric or cam 73 so as to oscillate the rock arm 75 about its supporting stud 76. This movement serves to transmit an oscillating or reciprocating movement to the yoked member 78 which in turn transmits this oscillating or reciprocating motion through shoes 79 and spool shaped member 80 to reciprocate the wheel spindle 15 axially relative to the wheel slide 12, carrying the anti-friction bearings 30, 31, 32 and 33 and their supporting slides 50 and 60 longitudinally during the reciprocatory movement.

A manually operable lever 85 is mounted on the outer end of a shaft 86 and serves to rock the rock arm 75 in a counterclockwise direction in case it is desired to stop the reciprocating movement of the spindle and to hold the grinding wheel, spindle and associated parts against a reciprocatory motion either during a truing operation while the grinding wheel face is being trued or for a grinding operation by the traverse method. A spring pressed plunger 87 is mounted within the top 88 which is mounted on casing 77 and serves to aid in holding the rock arm 75 with the follower 74 in contact with the cam or eccentric 73. Similarly a spring 89 is interposed between the lower end of the rock arm 75 and the casing 77 and this spring also serves to aid in maintaining the follower 74 in operative contact with the eccentric 73. The details of this mechanism have not been fully illustrated and described since the details of the specific reciprocating mechanism are not considered part of this invention. This mechanism is identical with the mechanism shown in the prior patent to Belden and Flygare No. 1,584,717 dated May 18, 1926, to which reference may be had for a more detailed disclosure thereof.

The operation of this mechanism is readily apparent from the foregoing disclosure. The wedge blocks 53 and 63 are adjusted to the desired extent to hold the bearing supporting members 50 and 60 in proper relation with their slide surfaces but are arranged to permit a reciprocation of the supporting members during a plunge-cut grinding operation. The manually operable lever 85 is then turned into the position illustrated in Fig. 2 so that the follower 74 is maintained in operative relation with the eccentric or cam 73, and the rotation of the wheel spindle 15 by belt 21 and pulley 20 serves to transmit the rotary motion of the spindle through the worm 70 and worm gear 71 and the eccentric 73 to oscillate the wheel spindle 15 within the wheel slide 12, carrying its supporting anti-friction bearings and the bearing supporting members longitudinally during the reciprocatory movement.

It will thus be seen that there has been provided by this invention apparatus in which the various objects hereinabove set forth together with many thoroughly practical advantages are successfully achieved. As many possible embodiments may be made of the above invention and as many changes might be made in the embodiment above set forth, it is to be understood that all matter hereinbefore set forth or shown in the accompanying drawing is to be interpreted as illustrative and not in a limiting sense.

I claim:—

A wheel spindle reciprocating apparatus for a grinding machine comprising a transversely movable wheel slide, a rotatable grinding wheel, a rotatable wheel spindle to support said wheel, anti-friction bearings rotatably to support the opposite ends of said spindle, spaced slidably mounted sleeves to support said bearings, slideways on said sleeves, mating slideways on the wheel slide, adjustable means to hold said bearing sleeves in proper relation with said slideways, and means to reciprocate said bearing sleeves longitudinally relative to the wheel slide so as to transmit an axial reciprocating movement to the grinding wheel for a grinding operation.

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