

May 15, 1928.

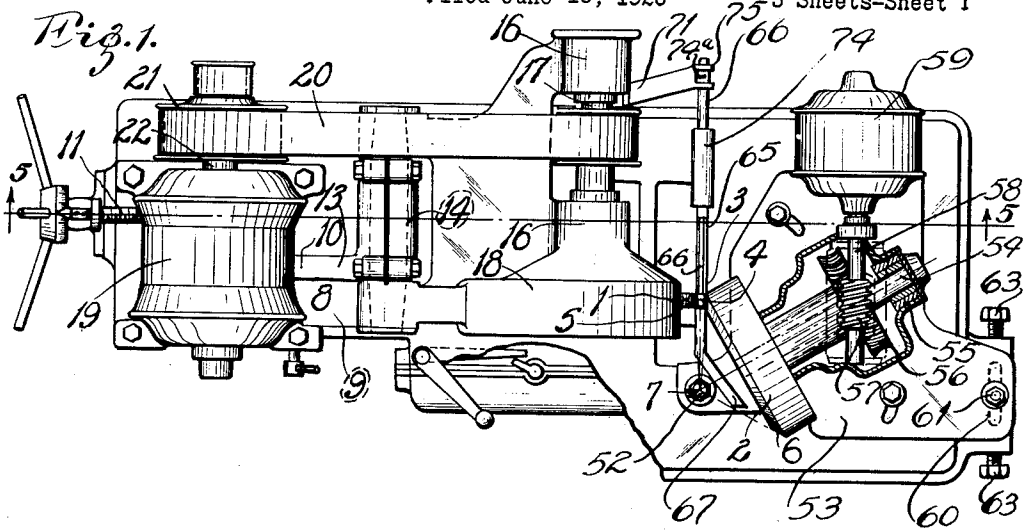
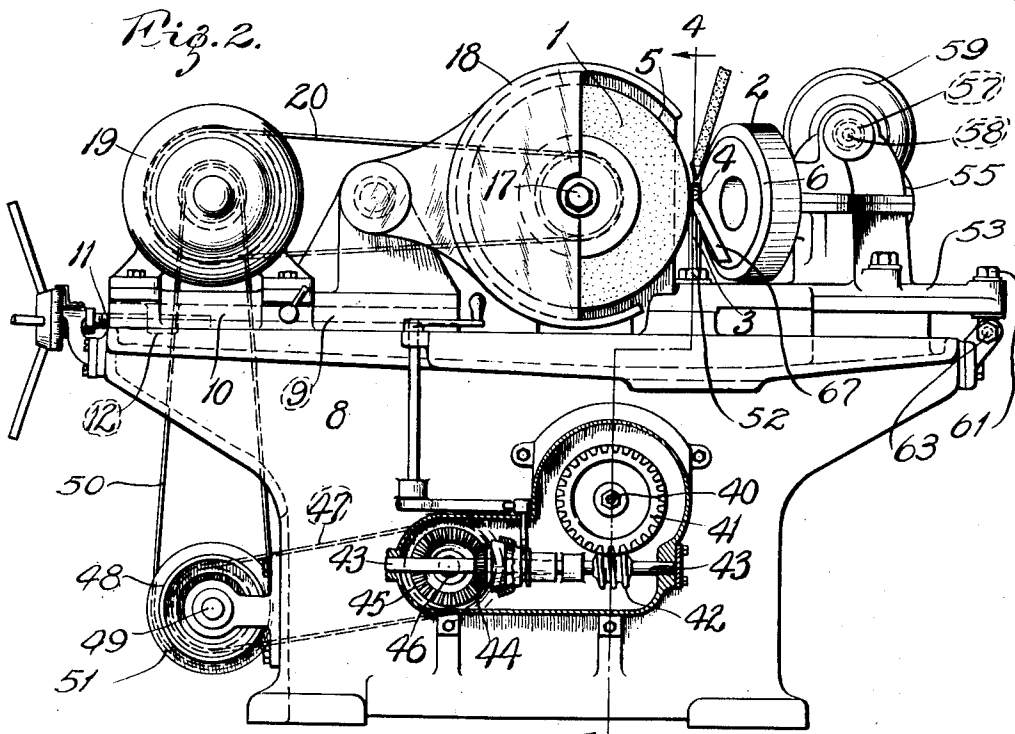
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H. VANDERBEEK

CENTERLESS GRINDING MACHINE

Filed June 15, 1925

- 3 Sheets-Sheet 1



4 INVENTOR:
Herbert Vandenberg,
by 
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May 15, 1928.

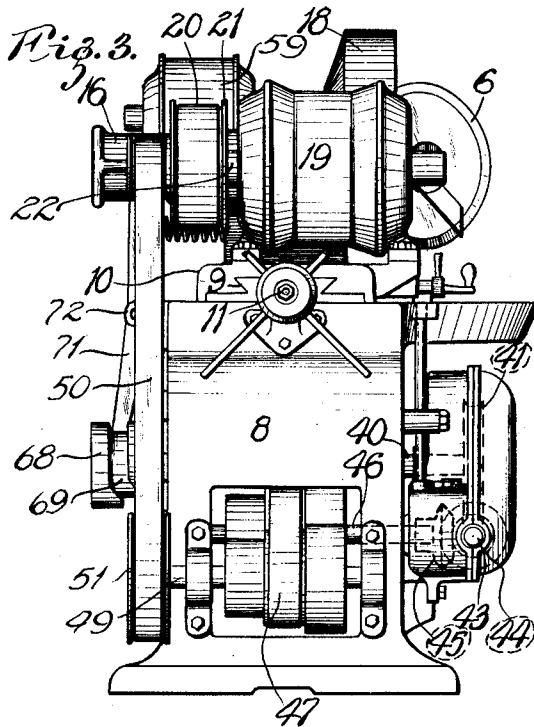
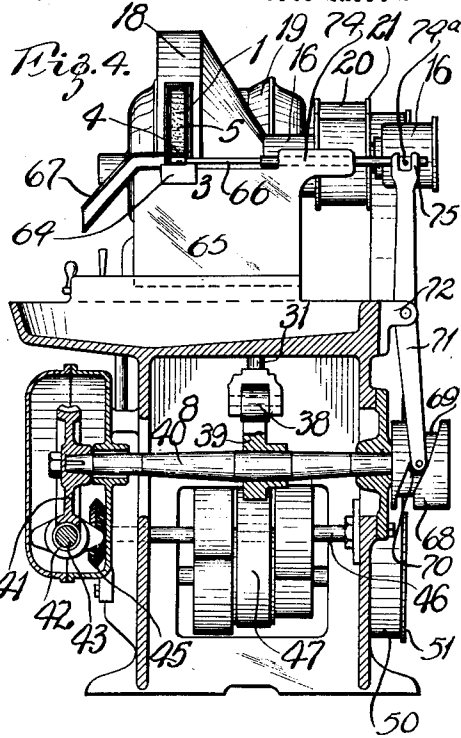
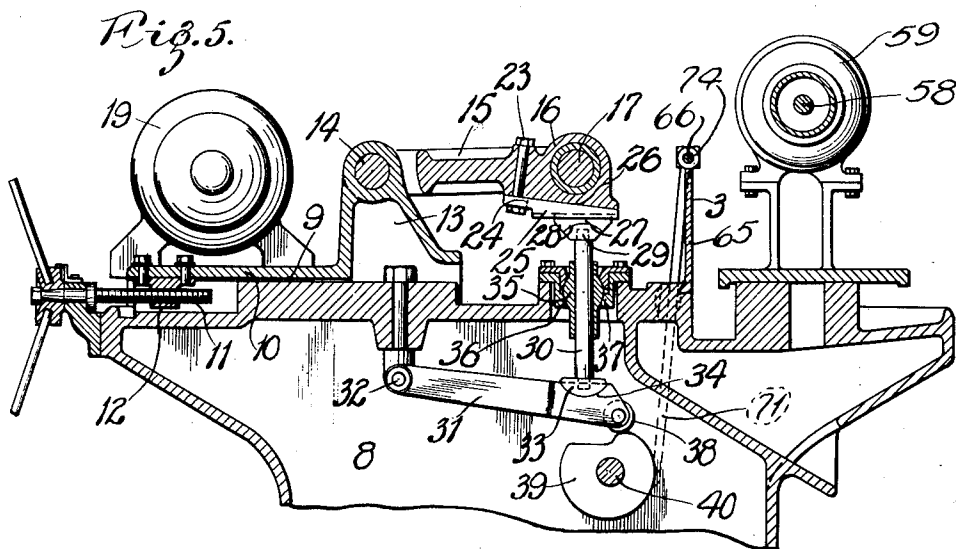
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CENTERLESS GRINDING MACHINE

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3 Sheets-Sheet 2



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May 15, 1928.

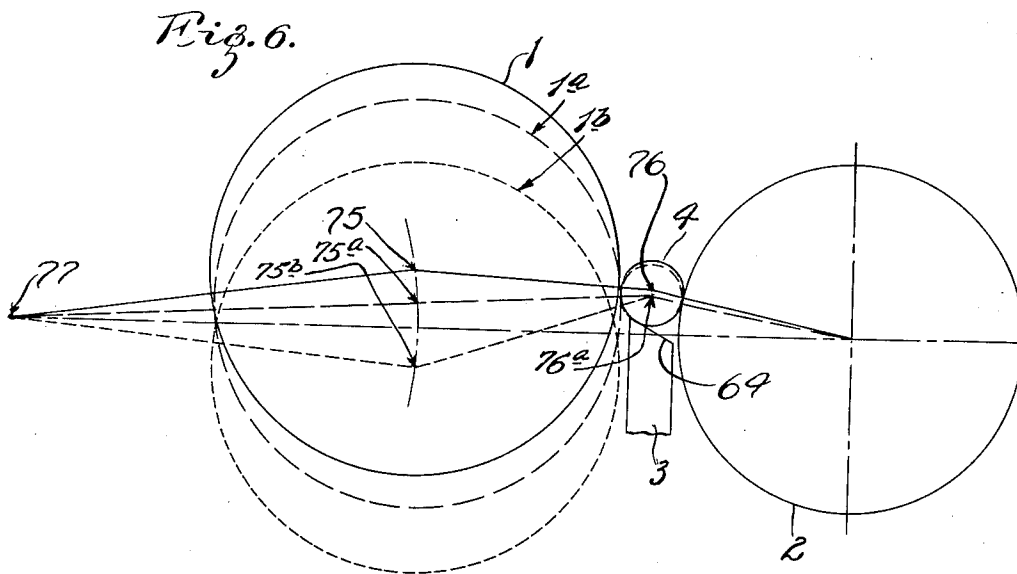
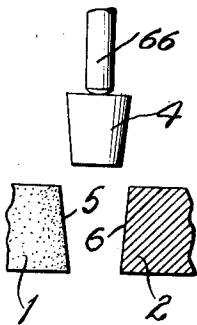
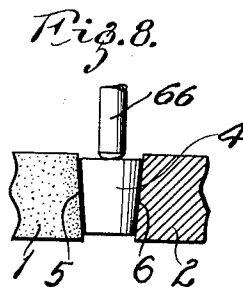
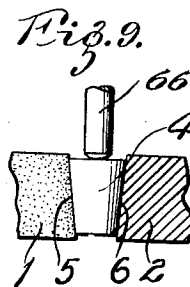
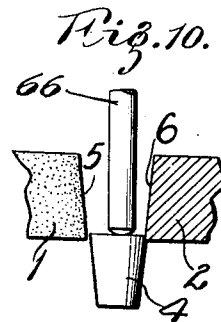
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CENTERLESS GRINDING MACHINE

Filed June 15, 1925

3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE.

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CENTERLESS GRINDING MACHINE.

Application filed June 15, 1925. Serial No. 37,022.

My invention relates to centerless grinding machines, and has for its object a machine that is particularly adapted for grinding conical pieces, such as conical rolls for roller bearings; to centerless grinding machines for grinding conical pieces such as rolls for roller bearings and the like, although it may also be used for grinding cylindrical pieces or pieces of generally conical form but having some endwise curvature.

The invention consists principally in the form and method of mounting the feed wheel and more particularly in providing a feed wheel of a conical form, the apex of said feed wheel and the apex of the conical work lying on the same side of the plane of the grinding wheel and approximating coincidence with each other. The invention further consists in mounting said feed wheel or the grinding wheel so that the feed wheel can be brought into engagement with the grinding wheel to be dressed thereby. The invention further consists in providing such a machine with a grinding wheel that is mounted at the end of a swinging arm. The invention further consists in the means for feeding the work into position to be ground and for ejecting the work after it has been ground. The invention further consists in the centerless grinding machine and in the feeding mechanism and in the parts and combinations and arrangements of parts hereinafter described and claimed.

In the accompanying drawings which form part of the specifications, and wherein like reference numerals indicate like parts in the several views.

Fig. 1 is a top plan view of a grinding machine embodying my invention;

Fig. 2 is a front elevation thereof;

Fig. 3 is an end elevation;

Fig. 4 is a sectional view on the line 4—4 of Fig. 2, showing, particularly, the feed mechanism;

Fig. 5 is a sectional view on the line 5—5 of Fig. 1 showing particularly the means for supporting and operating the grinding wheel;

Fig. 6 is a diagrammatic view in elevation, showing the several positions of the grinding wheel and of a roll being ground; and

Figs. 7-10 are diagrammatic views in plan of the several positions of a roll being ground.

In the drawings is illustrated a centerless grinding machine comprising a rotatably mounted grinding wheel 1, a rotatably mounted feed wheel 2 and a work support 3 between the opposed faces of said grinding wheel 1 and feed wheel 2 for supporting the work 4 to be ground. The work 4 is rotated and ground by the engagement of the grinding wheel 1 therewith. The feed wheel 2 rotates much more slowly than the grinding wheel (and in the opposite direction) and prevents the work from rotating too rapidly. According to the present embodiment of the invention the work comprises conical pieces 4, such as conical rolls for roller bearings; and the working face 5 of the grinding wheel and the working face 6 of the feed wheel are of conical form to cooperate with the conical work. The conical work and conical feed wheel are so arranged that if their conical surfaces were projected, the apexes of the work and of the feed wheel would lie on the same side of the plane of the grinding wheel and would coincide, or approximately coincide, with each other as at 7. In the drawings, the grinding wheel 1 and the feed wheel 2 are both illustrated as having conical, working surfaces, but, of course, the grinding wheel could be cylindrical and the total taper of the work be taken care of by the taper of the conical feed wheel.

A suitable base or frame member 8 is provided with a slideway 9 on which is mounted a slide 10. Rotatably mounted in the frame 8 is a threaded shaft 11 that extends through the threaded bore of a collar 12 depending from said slide 10, so that by rotating said screw threaded shaft 11 said slide 10 may be moved longitudinally. Said slide 10 is provided with upstanding bearing portions 13 in which is mounted a pivot pin 14. Pivotaly mounted thereon is a hanger 15 that is provided with aligned projecting portions 16 in which is journaled a shaft 17. At the end of said shaft 17 is mounted the grinding wheel 1, and the hanger 15 is provided with a suitable overhanging casing 18 for said grinding wheel. Mounted on the slide 10 is a suitable motor 19 that is operatively connected with the grinding wheel shaft 17, as by a belt 20 extending over pulley wheels 21 on the motor shaft 22 and on the grinding wheel shaft.

Adjustably secured to said hanger 15, is

by a bolt 23 extending through a hole in said hanger and a slot 24 in the adjusting block is a wedge-shaped adjusting block 25 that fits against an inclined portion 26 of the hanger 15. The bottom of said adjusting block rests on the flat upper surface of a compensating block 27. Said block 27 has a concave depression 28 in its bottom into which extends the correspondingly convex head 29 of a rod 30 that extends through the top of the frame and rests at its bottom on the end of a swinging arm 31 that is pivotally secured to the frame as indicated at 32. Preferably the lower end of said rod 30 is provided with a convex head 33 that fits in a corresponding concave depression 34 in said arm 31 and said rod extends through a sleeve 35 that has a convexly curved projecting portion 36 that fits in concave depressions in bearing members 37 secured to the frame. Thus the rod is permitted to assume various positions.

Mounted at the end of said swinging operating arm 31 is a roller 38 that cooperates with a cam 39. Thus as said cam 39 rotates, the operating arm 31 and the rod 30 move upwardly and downwardly, causing the hanger 15 and the grinding wheel 1 also to be moved upwardly and downwardly.

The cam 39 is mounted on a shaft 40 that is provided with a suitable gear 41 whereby it may be rotated. The drive means shown in the drawings comprises a worm 42 meshing with said gear 41, said worm 42 being mounted on a shaft 43 that is provided with a gear 44 that meshes with a gear 45 on another shaft 46, said shaft 46 being driven by means of belt 47 passing over pulley wheels 48 on said shaft and on a shaft 49 journaled at the end of the frame and itself driven by a belt 50 that passes over pulleys 51 on said shaft 49 and on the motor shaft 22.

Secured to the frame 8 as by a bolt 52 extending through aligning holes in both parts is a plate 53 that constitutes a support for the feed wheel 2 and its associated mechanism. Said feed wheel 2 is mounted on a rotatable shaft 54 that is journaled in a suitable bearing member 55 on said support and is provided with a gear 56 that meshes with a worm 57 on the shaft 58 of a motor 59 mounted on said support.

Preferably said support 53 is mounted so that it can pivot about said bolt 52. The frame 8 is provided with a slot 60 therein, through which extends a stud 61 that is secured to said support 53. Mounted in a projecting portion 62 of the frame are adjusting screws 63 that bear against opposite sides of said stud 61; so that by turning said screws the support may be moved.

As has been stated, the feed wheel 2 comprises a conical portion 6 adapted to engage the conical work 4. Said work is also en-

gaged by the grinding face 5 of the grinding wheel 1.

The work being ground rests upon a support 3 that is inclined lengthwise so as to maintain the axis of the work in substantially horizontal position. Said work support is also provided with a transversely inclined supporting face 64 so as to force the work against the feed wheel. The work support is mounted on a suitable block 65 which may be slidably mounted on the frame.

Any suitable means may be provided for feeding the rolls into position to be ground. The means shown in the drawing comprises a cam actuated feed rod 66 adapted to first push a roll 4 into position to be ground and then eject the roll into a suitable outlet chute 67 after it has been ground. Mounted on the cam shaft 40 on which the grinding wheel control cam 39 is mounted is a cam 68 that has a cam slot 69 in which rides a cam roller 70 on the end of a rock arm 71 that is pivotally secured to a boss 72 on the frame. Said feed rod is slidably mounted in a suitable guide 74 (which may be a projecting portion of the block 65) and is operatively connected at its end to said rock arm, as by a projection 74^a thereon resting between forks 75 of said rock arm 71.

A roll 4 is placed in front of the end of said rod 66 in any suitable way, in position to be pushed onto the work support 3. The first movement of the feed rod 66 pushes the roll 4 onto said work support 3 where it rests by reason of said support having the transversely inclined surface 64, against the feed roll 2, there being a slight clearance between the roll 4 and the grinding wheel 1, by reason of the grinding wheel being in raised position. After the grinding operation the feed rod 66 is again moved to push the roll 4 off the work support and into an outlet chute; and the feed rod is then retracted into position to feed the next roll onto the work support.

When a roll 4 is fed onto the roll support 3 in position to be ground, the grinding wheel 1 is in its uppermost position (shown in full lines in Fig. 6) and, accordingly, there is a slight clearance between the grinding wheel and the roll. The center 75^a of the grinding wheel is above the center 76 of the work. When the roll is in position, the grinding wheel is lowered. Thus the grinding wheel engages the roll and grinds it as it moves downward through its arcuate path. As the roll is ground, its center position shifts the roll always keeping contact both with the grinding wheel and with the feed wheel. The dash lines in Fig. 6 show the portions of the grinding wheel and of the roll as the grinding is completed. The center of oscillation 77 of the grinding wheel, the center 75^a of the grinding wheel

and the center 76° of the work are substantially in a straight line. The grinding wheel then swings clear of the roll far enough to permit the roll to be moved end-wise and ejected without the corner of the large end of the roll coming in contact with the grinding wheel (as shown in dotted lines in Fig. 6). The grinding wheel is then raised to uppermost position before the next roll is placed in grinding position.

By swinging the feed wheel support 53 about its pivot, the conical feed portion 6 of the feed wheel 2 may be brought into contact with the grinding wheel 1 and the grinding wheel may be thus used to dress said feed wheel. This insures the feed wheel having an accurate surface.

The herein described grinding machine has numerous advantages. By reason of the construction and mounting of the feed wheel and grinding wheel, the feed wheel has true rolling contact throughout its entire line of contact with the work. Thus the work is accurately positioned and there is no tendency for it to jump or be forced out of proper grinding position. The work may be fed into position with a minimum stroke of the feed mechanism and the grinding wheel is quickly moved clear of the work to permit it to be ejected.

Obviously, numerous changes may be made without departing from the invention and I do not wish to be limited to the precise construction shown. For instance, instead of using a swinging hanger and its mechanism, the slide may be used to move the grinding wheel toward and away from the work. Likewise, the slide may be used to move the grinding wheel into engagement with the feed wheel, instead of swinging the feed wheel support.

What I claim is:

1. A machine for grinding conical rolls comprising a grinding wheel, a conical feed wheel and a work support adapted to support a conical roll between said grinding wheel and said feed wheel, the apexes of

said conical roll and said feed wheel being located on the same side of the plane of the grinding wheel.

2. A machine for grinding conical rolls comprising a grinding wheel, a conical feed wheel and a work support adapted to support a conical roll between said grinding wheel and said feed wheel, the apexes of said conical roll and said feed wheel approximating coincidence with each other.

3. A machine for grinding conical rolls comprising a conical grinding wheel, a conical feed wheel and a work support adapted to support a conical roll between said grinding wheel and said feed wheel, the apexes of said roll and said feed wheel being located on the same side of the plane of the grinding wheel.

4. A machine for grinding conical rolls comprising a pivotally mounted hanger, means for raising and lowering said hanger, a grinding wheel pivotally mounted in said hanger, a conical feed wheel and a work support for supporting conical rolls between said feed wheel and said grinding wheel.

5. A grinding machine comprising a frame, a slide thereon, a hanger pivotally mounted on said slide, a grinding wheel carried by said hanger, means for raising and lowering said hanger, means for moving said slide, a conical feed wheel and a support adapted to support a conical roll between said grinding wheel and said feed wheel.

6. A grinding machine comprising a frame, a support thereon, a hanger pivotally mounted on said support, a grinding wheel carried by said hanger, a vertically disposed rod having convex projections at the top and bottom, said hanger being provided with a member having a concave seat for the top of said rod, a swinging arm, said arm having a concave seat for the bottom of said rod, and a cam for moving said arm.

Signed at Canton, Ohio, this 11th day of June, 1925.

HERBERT VANDERBEEK.