Jan. 27, 1931. C. H. NORTON 1,790,245

GRINDING MACHINE

Filed June 13, 1927 2 Sheets-Sheet 1

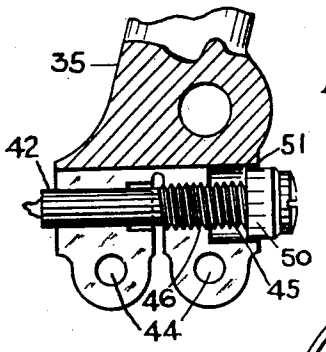


Fig. 3.

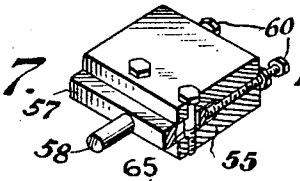


Fig. 7.

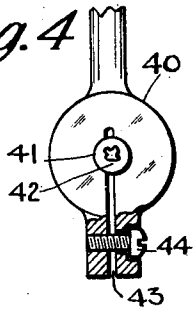


Fig. 4

Fig. 1

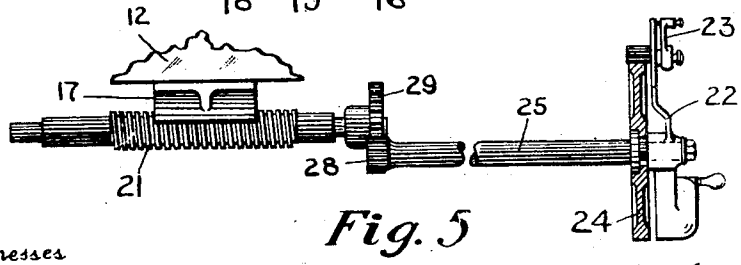


Fig. 5

Witnesses
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Filed June 13, 1927 2 Sheets-Sheet 2

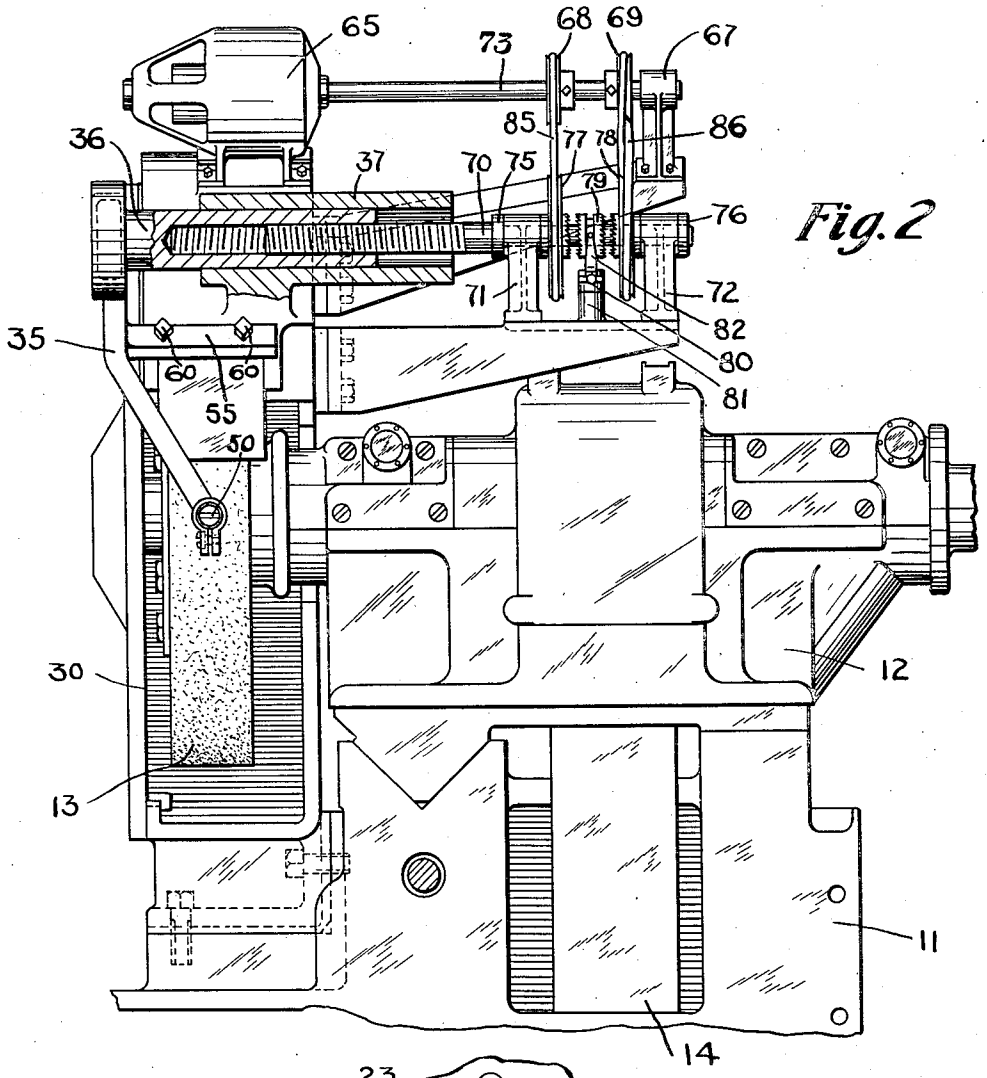


Fig. 2

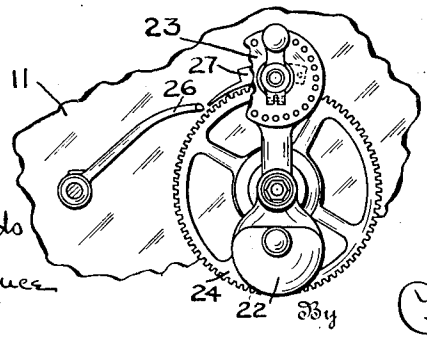


Fig. 6

Witnesses

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UNITED STATES PATENT OFFICE

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GRINDING MACHINE

Application filed June 13, 1927. Serial No. 198,325.

My invention relates to grinding machines and more particularly to a grinding machine having a mechanism for truing the face of the grinding wheel.

The standard type of truing apparatus for a grinding wheel comprises a diamond or truing tool mounted on the work supporting table which is reciprocated past the wheel. Such a truing apparatus does not cooperate with the wheel feeding mechanism, and it has consequently been necessary after each truing operation to readjust the stopping device on the wheel feed mechanism by a cut and try method to compensate for the reduction in size of the grinding wheel and to get the proper work size. To reciprocate the work table manually, for passing the truing tool across the face of the grinding wheel, involves various difficulties and particularly that of obtaining a uniform slow motion tool feed which has been found highly desirable for producing the proper surface on the wheel.

In the truing mechanisms heretofore provided, there has been no provision for adjusting the position of the diamond finely with reference to the face of the grinding wheel or to the surface of the work, and it is not possible with such devices to set the diamond in correct position so that when the truing has been accomplished the wheel face is located exactly where the true line of contact of the wheel with a finished piece of work would be. Yet by locating the point of the diamond in that line of contact, it is possible to grind work to size after the wheel has been trued without resetting the micrometer stopping mechanism on the wheel feed.

The truing device is usually mounted on the hand operated work traversing table, and it is necessary for the operator to use considerable skill to move the table at the right speed and with uniformity of motion when he traverses the diamond across the face of the grinding wheel. For example, if the diamond is traversed too rapidly, it forms a helical groove in the face of the wheel and does not properly true the same. It is therefore desirable that a mechanism be provided which causes the diamond to be traversed at a uniform and proper rate.

It is therefore an object of my invention to overcome such difficulties, and to provide a grinding machine of such a construction that work may be ground repeatedly to a given size as determined by a micrometer wheel feed stopping mechanism and the grinding wheel may be trued as desired without requiring resetting of the stopping mechanism after such truing operation has been accomplished.

It is a further object to provide a simple type of truing device which is permanently mounted on the machine and which may be quickly moved into and out of operative relation with the grinding wheel, and thereby reduce the lost non-productive time involved in operating such a machine.

It is a further object to provide a truing device which may be operated by a power driven mechanism at a desired and uniform rate of feed across the wheel face.

Further objects are to provide a grinding machine with a truing device which may be finely adjusted to a desired position for truing the wheel, and which may be moved at the will of the operator to a non-operative position and then subsequently returned always to the same position so that the wheel face may be trued on a line coinciding with the line of contact of the wheel and the work.

With these and other objects in view as will be apparent to one skilled in the art, my invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

My invention relates primarily to a grinding machine which has a reciprocable work support, a grinding wheel movable towards and from the work for grinding the same and a wheel feeding mechanism including a stopping device and a micrometer adjustment so arranged that the wheel face may be stopped in its forward feed in a desired position to grind the work to a predetermined and duplicatable size. This machine is provided with a truing mechanism which is preferably so located that it will true the wheel on the line of contact between the

wheel face and the surface of the finished piece of work. The truing tool is held in a fixed position so that the wheel may be fed into the diamond, and when its face has been trued the operative face of the wheel will remain in the same position as before and exactly where the surface of the finished piece of work will contact with it. This makes it unnecessary to reset the wheel feed stop after truing the wheel, since the act of resetting the stop during the operation of truing automatically serves this purpose. A suitable support is provided for the diamond so that it may be readily moved to an inoperative position and then returned to exactly the same position as before. The truing device also comprises mechanism for finely adjusting the position of the diamond to make up for its wear or to position a new tool as desired at the correct point for truing, and this mechanism involves means which are preferably power operated to traverse the diamond across the face of the wheel.

Referring to the drawings which illustrate one embodiment of my invention, and in which like reference numerals indicate like parts:

Figure 1 is an end elevation of a grinding machine illustrating my truing device having parts broken away to more clearly illustrate the construction;

Fig. 2 is an enlarged fragmentary view of the rear portion of the machine showing the wheel slide and the truing mechanism having parts broken away and shown in section to more clearly show the construction;

Fig. 3 is an enlarged fragmentary view showing the construction of the diamond mounting;

Fig. 4 is a similar enlarged view of the arm supporting the diamond showing means for clamping the diamond in adjusted position;

Fig. 5 is a side elevation showing a simple form of wheel feed mechanism;

Fig. 6 is a front elevation of the same; and

Fig. 7 is a fragmentary perspective view on an enlarged scale of the adjusting device for varying the path of travel of the diamond.

In the specific embodiment of my invention selected for illustration, I have shown a grinding machine having a base 11, supporting a wheel slide 12 thereon and adapted to slide on suitable slideways. The grinding wheel 13 is rotatably mounted on the slide and is driven by a belt 14 from a pulley 15 mounted on a shaft 16 within the rear base of the machine. A pulley 18 is mounted on the outer end of shaft 16 and is driven by a belt 19 from a motor 20 mounted on the rear base of the grinding machine. For a further illustration and detailed description of this mechanism, reference may be had to my prior Patent No. 1,443,924 of January 30, 1923.

The grinding wheel slide 12 may be fed toward the work or dressing tool by means of a feeding mechanism, which may be of any old and well known construction such as that shown in detail in the prior patent to Wilcox No. 1,261,083. The simplified form of mechanism illustrated comprises a manually operable member 22 having micrometer connections 23 between it and the gear wheel 24. The gear wheel 24 is mounted on the outer end of the shaft 25 which is rotatably supported in suitable bearings in the base 11. The inner end of the shaft 25 carries a pinion 28 meshing with a gear 29 on the end of the feed screw 21. The wheel slide 12 is provided with a depending half nut 17 which is adapted to engage the threads on the feed screw 21. The machine is provided with a stop member 26 which may be swung toward the gear wheel 24 and into the path of the abutment 27 on the member 22 to limit the movement of the grinding wheel when moved in a direction toward the work or truing tool.

To attain one of the objects of my invention, I may mount the truing tool in any suitable manner so that it will be in a fixed position relative to the grinding wheel and so that the grinding wheel may be given a feeding movement toward and from the truing tool. In my preferred construction, I do mount the diamond that it may be moved into and out of an operative position, and while the diamond may be mounted on the slidable table or other part of the machine which is fixed relative to the line of grinding I have shown it as mounted on the wheel guard and the latter as held on a pivotally mounted support 35 which swings from a cylindrical portion 36 rotatably mounted in the sleeve 37 which is secured to the upper portion of the wheel guard 30. The member 35 is provided with an enlarged portion 40 at its lower end having a cylindrical hole 41 adapted to receive the diamond holder 42. As illustrated in Figs. 3 and 4, the portion 40 is provided with a slot 43 to permit the diamond holder 42 to be adjusted and then locked in its adjusted position by the clamping screws 44. This is an old and well known method of clamping a cylindrical member. The diamond holder 42 is provided with a threaded portion 45 which engages a correspondingly threaded opening 46 within the portion 40 so that the diamond may be finely adjusted in position relative to the arm 35. The holder 42 is provided with an enlarged head 50 having graduations on its periphery and a zero mark or indicator point 51 is provided on the arm 35, so that the operator may turn the screw the desired amount by following the graduations. This adjustment is provided so that the diamond may be adjusted as it wears away or so that a new diamond may be correctly positioned, as required to position it for truing the wheel.

To provide a positioning adjustment for

setting up the truing tool for various sizes of work, I provide the member 35 with a projecting arm 55. The arm 55 has a hardened steel guiding shoe 57 adapted to contact with a pin 58 mounted in a fixed position relative to the wheel guard. The position of the shoe 57 may be adjusted relative to the arm 55 and the member 35 by the adjusting screws 60 to vary the location of the member 35 so that the diamond 47 may be adjusted into position to coincide with the line of contact between the grinding wheel and the finished work.

I may reciprocate the diamond across the face of the wheel by suitable mechanism, and in my preferred construction I utilize a motor driven mechanism comprising a motor 65 mounted on the bracket 66 which in turn is secured to the upper surface of the wheel guard 30. The motor has an extending armature shaft 73 supported at its outer end in a bearing 67. This shaft carries a pair of pulleys 68 and 69 which are secured to the shaft by means of set screws. To move the cylindrical portion 36 within the cylinder 37 and reciprocate the diamond across the face of the wheel, I provide a screw 70 mounted so that the threaded portion engages a correspondingly threaded aperture within the cylindrical member 36. As the screw 70 is turned the member 36 will be moved in a direction parallel with the axis of the rotating grinding wheel. The screw 70 is supported in bearings 71 and 72 and it is held against endwise movement by the collars 75 and 76 which are locked onto the cylindrical portion of the screw 70. Between the bearings 71 and 72 I mount the pulleys 77 and 78 loosely on the cylindrical portion of the screw 70 and they are positioned in alignment with the pulleys 68 and 69 respectively. The inner faces of the pulleys 77 and 78 are provided with clutch teeth adapted to be engaged by the clutch member 79 which is keyed by a key (not shown) to the cylindrical portion of the screw 70. A lever 80 is pivotally mounted to a boss 81 on the frame and has yoked member 82 engaging the clutch member 79. By manually moving the lever 80 the clutch member 79 may be brought into engagement to lock either the pulley 77 or pulley 78 to turn the screw 70. The pulleys 68 and 77 are connected by a straight belt 85 and pulleys 69 and 78 are connected by a cross belt 86 so that the screw may be given a forward or a reverse movement to traverse the diamond across the face of the grinding wheel in either direction.

In the operation of my device, the operator when truing the grinding wheel swings the arm 35 downwardly so that the guide shoe 57 contacts with the pin 58 which limits the downward movement of arm 35. The member 35 is made sufficient in weight to insure the guide shoe 57 at all times contacting with the pins 58 and preventing vibration of the diamond during the truing operation. The screws 60 and the diamond holder 50 are adjusted after the first piece of work has been ground so that the diamond, when in its operative position, contacts with the grinding wheel in a line coinciding with the point of contact between the grinding wheel and a finished piece of work. After this setting or adjustment has been made, it is only necessary to make minor adjustments of the diamond to take care of its wear. When it is desired to true the wheel after the preliminary adjustment has been made, the member 35 is swung downwardly to bring the diamond 47 into its operative position relative to the wheel. This brings the diamond automatically into the line of grinding. The feeding wheel is then turned manually to bring the abutment 27 into contact with the stopping member 26. Then the operator turns the micrometer adjusting mechanism to make a minute adjustment of the abutment relative to the feeding wheel to permit feeding the grinding wheel a small fraction of an inch toward the diamond. The operator then moves the lever 80 thereby connecting the clutch member 79 to lock one of the driving pulleys 77 or 78 to rotate the screw 70 and traverse the diamond in one direction across the face of the wheel. After the diamond has traversed across the face of the wheel in one direction, the operator throws the lever 80 into the opposite position to traverse the diamond across the face of the wheel in the opposite direction. This traversing of the diamond may be continued until the surface of the wheel has been trued as desired.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A grinding machine comprising a base, a work support, a slide movable towards and from the support, a grinding wheel rotatably mounted on the slide, a micrometer cross feed mechanism including an adjustable stop to feed and accurately position the wheel relative to a work piece, a diamond, precision mechanism for accurately locating the diamond in the line of contact between the wheel and a finished piece of work, and means for reciprocating the diamond across the face of the wheel, whereby the wheel face may be trued and maintained in the same operative position relative to the work and resetting of the stop thereafter is not required for grinding duplicate pieces of work.

2. A cylindrical grinding machine comprising a reciprocable work table, a slide movable towards and from the table, a grinding wheel thereon, a micrometer cross feed mechanism including an adjustable stop to feed and accurately position the wheel relative to the work table, a diamond for truing the wheel, a support for the diamond independent of said table which is movably

mounted to reciprocate the diamond and true the wheel, and precision mechanism to locate the diamond accurately in the line of grinding contact between the wheel and a work piece on said table.

3. A cylindrical grinding machine comprising a reciprocable work table, a slide movable towards and from the table, a grinding wheel thereon, a micrometer cross feed mechanism including an adjustable stop to feed and accurately position the wheel relative to the work table, a diamond for truing the wheel, a support for the diamond mounted on a stationary portion of the base, means to reciprocate the diamond across the wheel face, and means for accurately positioning the diamond in the line of contact between the wheel and a finished piece of work.

4. A grinding machine comprising a base, a reciprocable work table thereon, a slide movable towards and from the table, a grinding wheel rotatably mounted on the slide, a micrometer cross feed mechanism including an adjustable stop to feed and accurately position the wheel relative to a work piece on the table, a diamond, a grinding wheel guard fixed on the base, a support for the diamond reciprocably mounted on the guard and arranged to traverse the diamond across the wheel face, and means permitting the diamond to be adjusted into contact with the wheel, whereby the wheel face may be maintained in the same operative position relative to the cross feed stop, as it is trued away.

5. A grinding machine comprising a grinding wheel, a work support, means to feed the grinding wheel towards and from the work support, a truing tool, an adjustable support therefor so arranged that the tool may be moved out of operative relation with the grinding wheel or into a predetermined position in the line of contact between the grinding wheel and the finished work surface, and means for traversing said tool along said line of contact to true the wheel face.

6. A grinding machine comprising a base, a support fixed to the base, a truing tool, a swinging frame mounted on said support to hold said tool so that it may be swung into or out of operative relation with the wheel, a fine precision mechanism for adjusting the position of the tool relative to its support and a power traversing mechanism to move the tool laterally relative to the grinding wheel.

7. A grinding machine comprising a base, a work table reciprocably mounted thereon, a grinding wheel slide mounted to move towards and from the work table, a grinding wheel rotatably mounted thereon, a diamond for truing the wheel, a reciprocable support for the diamond mounted on a stationary portion of the base, and precision mechanism for adjusting the diamond towards and from the wheel.

8. A grinding machine comprising a base, a work table reciprocably mounted thereon, a grinding wheel slide movable towards and from the table, a grinding wheel thereon, a diamond for truing the wheel, a support for the diamond movable to position the diamond in the line of contact of the wheel and a work piece, and means for moving the diamond across the face of the wheel which is independent of the table.

9. A grinding machine comprising a base, a work table reciprocably mounted thereon, a slide movable towards and from the table, a grinding wheel rotatably mounted thereon, a diamond for truing the wheel, a support for the diamond mounted on the base, a member carrying the diamond and movably mounted on the support to position the diamond into or out of the grinding zone, and means whereby the diamond may be reciprocated across the wheel face.

10. A grinding machine comprising a base, a work table reciprocably mounted thereon, a slide movable towards and from the table, a grinding wheel rotatably mounted thereon, a diamond for truing the wheel, a reciprocable support mounted on the base, a member carrying the diamond and movably mounted on said support for positioning the diamond near or away from the wheel, means for reciprocating the support to true the wheel, and precision mechanism for adjusting the diamond accurately relative to the wheel.

11. A grinding machine comprising a base, a wheel guard fixed to said base, a grinding wheel therein, a work support, a truing tool holder movably supported on said guard, fine precision means to adjust the position of said support to position the truing tool in with the wheel, a cross feed mechanism to feed the grinding wheel into the tool and power operated means to reciprocate the tool across the face of the grinding wheel.

12. A grinding machine comprising a base, a grinding wheel slide movable thereon, a work support, a grinding wheel on said slide movable towards and from the work support, a wheel guard fixed to the base, a truing tool, a support for said tool on said guard movable to position the truing tool in the line of contact between the grinding wheel and the surface of the finished work or to move the same out of operative relation with the grinding wheel, micrometer mechanism to adjust said tool relative to said support, a motor mounted on the wheel guard and driving connections between the motor and the truing device to reciprocate the latter across the face of the wheel.

13. A grinding machine comprising a base, a grinding wheel, a wheel guard fixed to said base, a diamond, a holder for said diamond, a support for said holder pivoted on said guard, micrometer mechanism to adjust said holder relative to said support, means to ad-

just said support relative to the guard to position the diamond so that it coincides with the line of contact between the grinding wheel and the finished work, power operated mechanism including a motor on said guard to reciprocate the diamond across the face of the grinding wheel and means to feed the grinding wheel toward the diamond to true the face of the wheel.

14. A grinding machine comprising a base, a wheel slide on said base, a grinding wheel on said slide, a wheel guard fixed to the base, a truing tool pivotally mounted on said guard and adapted to be swung into and out of operative position, micrometer mechanism to adjust the position of said tool relative to the wheel face, a feeding mechanism to feed the grinding wheel toward said tool and power operated mechanism to reciprocate the tool across the face of the grinding wheel.

15. The method of grinding cylindrical work pieces in duplicate sizes on a cylindrical grinding machine having a micrometer cross feed mechanism for the wheel, including an adjustable stop, and a reciprocable and adjustable truing diamond, comprising the steps of: (*a*) setting the cross feed stop to stop the infeed of the wheel when the work piece has been ground to a predetermined size, (*b*) setting the diamond in the line of contact of the wheel and the finished work piece, (*c*) feeding the wheel into the diamond after resetting the micrometer stop and thereby truing the wheel, while its operative line of grinding contact remains unchanged as determined by the position of the diamond, and (*d*) subsequently grinding successive pieces of work to the same size by feeding the wheel each time to a final position determined by the fixed location of the stop.

Signed at Plainville, Connecticut, this 10th day of June, 1927.

CHARLES H. NORTON.