

May 18, 1948.

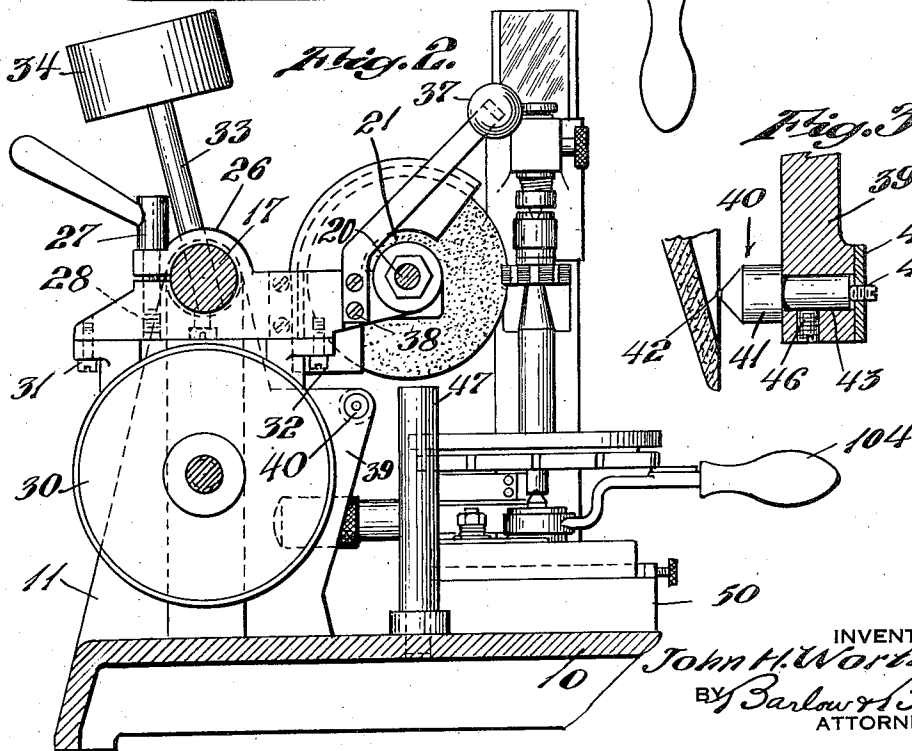
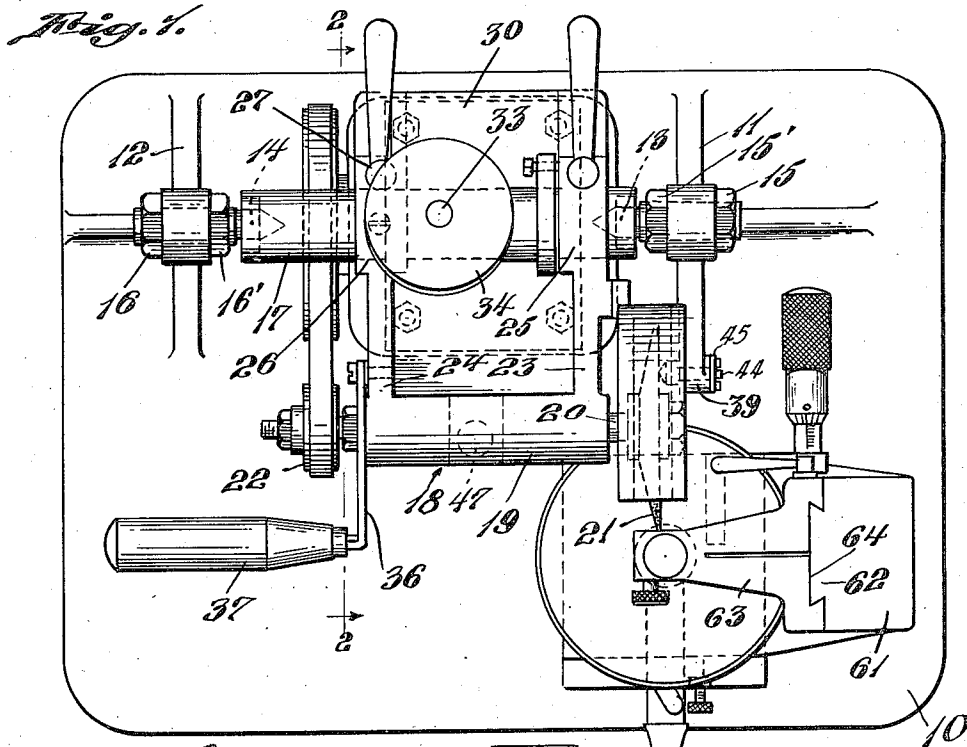
J. H. WORTHEN

2,441,784

GRINDING MACHINE

Filed Nov. 15, 1944

3 Sheets-Sheet 1



INVENTOR
John H. Worthen
BY Barlow & Barlow
ATTORNEYS

May 18, 1948.

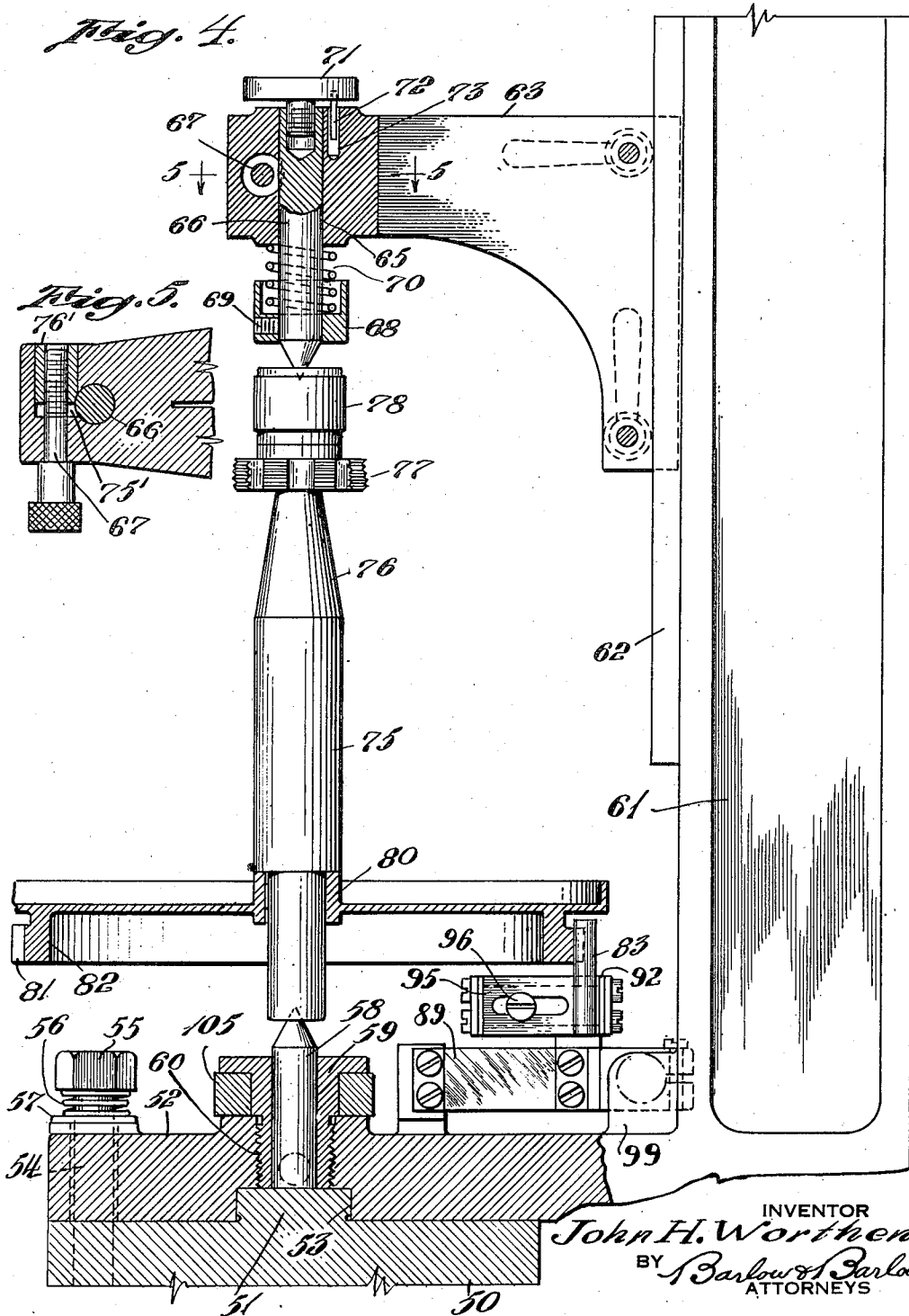
J. H. WORTHEN

2,441,784

GRINDING MACHINE

Filed Nov. 15, 1944

3 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

2,441,784

GRINDING MACHINE

John H. Worthen, Providence, R. I., assignor to
Federal Products Corporation, a corporation of
Rhode Island

Application November 15, 1944, Serial No. 563,467

1 Claim. (Cl. 51—98)

1

This invention relates to a grinding machine for sharpening relatively small cutters such as hobs for instrument gears.

The usual tool room grinders are large and inconvenient for use on small work and are so made that particles of abrasive from the wheel frequently get into the mechanism. On the other hand, some very small machines lack the rigidity and the surface which remains after contact with the grinding wheel is therefore rough.

One of the objects of this invention is to provide a small machine which will present the necessary rigidity and yet one whereby the accuracy of the cut may be very precise.

Another object of the invention is to provide an adjustment for the work so that the depth of cut may be very precise.

A further object of this invention is to provide a mechanism by which the precise adjustment which has been obtained may be preserved after indexing to selectively position the work.

Another object of the invention is to provide an arrangement whereby wheel wear may be readily compensated for by adjustment or surfacing of the wheel.

Another object of the invention is to provide an arrangement whereby the working parts will be free from grinding dust.

With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully described and particularly pointed out in the appended claim.

In the accompanying drawings:

Fig. 1 is a top plan view of the machine;

Fig. 2 is a section on line 2—2 of Fig. 1 but showing in full the handle;

Fig. 3 is a fragmental sectional view indicating a surfacing of the wheel;

Fig. 4 is a sectional view through the work support;

Fig. 5 is a section on line 5—5 of Fig. 4;

Fig. 6 is a sectional view through the upright support looking down on top of the locking mechanism for the indexing plate;

Fig. 7 is a perspective view of the mounting of the locking pin which engages the indexing plate;

Fig. 8 is a fragmental perspective view illustrating the notch in which the locking pin of Fig. 7 engages; and

Fig. 9 is a sectional view showing the lower mounting center for the work arbor.

In proceeding with this invention I provide a work support consisting of an arbor which may be indexed about its axis in equal angular amounts all according to a predetermined series of notches which may be placed in a disc which is carried by the arbor. A locking pin is provided to hold this disc in various positions. This locking pin is mounted to move on substantially a radius toward and from the axis of the arbor

2

while it may be adjusted at right angles to the radius by measured amounts. Thus, the work support may be nicely adjusted in measured increments. To operate upon the work I provide a cradle which carries the grinding wheel and an actuating electric motor. The cradle is counter-balanced and may be rocked toward and from the work by easily operable manual means.

With reference to the drawings, 10 designates a base which has standards 11 and 12 rising therefrom for mounting dead centers 13 and 14 adjustably in the supports whereby they are held by nuts 15, 15' and 16, 16'. A shaft 17 is freely rotatably mounted by means of these dead centers. A U-shaped cradle designated generally 18 comprising a tubular portion 19 and rearwardly extending portions 23 and 24 with split bearings 25 and 26 which are clamped tightly upon the shaft 17 by the handle bolts 27 which are threaded at 28 to engage a threaded socket in the arm while its head engages the opposite side of the split bearing. A shaft 29 is rotatably mounted in the tubular portion 19 on which the grinding wheel 21 is fixed at one end while a pulley 22 is mounted on this shaft at its other end. An electric motor 30 is secured by means of bolt 31 and 32 to the underside of the arms of the cradle such as shown in Figs. 1 and 2. An arm 33 extends upwardly from the shaft 17 and a counter-weight 34 is adjustably mounted along this shaft so as to substantially equally balance the weight of the wheel 21 and motor 30, and the other overhanging parts of the cradle. The arrangement is such that the parts are in balance and an arm 36 having a handle 37 is provided attached to the cradle as at 38 so that by grasping this handle and rocking the cradle about the centers 13 and 14 the grinding wheel 21 may be swung about this pivot toward and from the work.

A boss 39 is provided on the support 11 to carry a facing tool designated generally 40 (see Fig. 3) and which usually consists of a diamond 42 mounted in a holder 41. The holder is mounted in bore 43 and adjusted by means of the set screw 44 extending through the plate 45 of the support boss 39 while it is held by the set screw 46 threaded inwardly to bind the holder in the bore 43. A post 47 mounted on the base at a position below the portion 19 serves to limit the downward movement of the tool. This post may be adjustable as to height by being removable and substituted by a different height post.

A work support is provided on a raised portion 50 which carries a gib 51 (see Fig. 4), and a carriage 52 which is recessed as at 53 so as to receive this gib 51. Slots 54 and 54' (see also Fig. 6) are provided in the carriage for the reception of bolts 55 and 55' which extend through the slots into the base or raised portion 50.

Springs 55 beneath the heads of these bolts engage washers 57 so as to apply a guiding tension upon the carriage as it is moved along the gib 51.

A dead center 58 carried by the bushing 59, is adjustable as to height by the threaded engagement 60 which the bushing has with the carriage 52. An upstanding support 61 of generally I-beam shape extends upwardly from the carriage and has a dove-tail gib 62 for adjustably mounting the bracket 63 which has a dove-tail slot 64, (see Fig. 1), to receive it. This bracket 63 has a bore 65 to receive a dead center 66 which may be tightened in the bore 65 by a plug 76' (see Fig. 5) drawing into the recess 75' by a thumb screw 67 shouldered on one end and threaded into the plug to draw it into the bore snugly against this dead center. A collar 68 is secured by set screw 69 on this dead center while a spring 70 which engages this collar and the underside of the bracket 63 may serve to force the same downwardly. A handle portion 71 is threaded into the upper end of this dead center and is provided with a pin 72 to engage the socket or recess 73. This also serves as a stop to prevent the center 66 from being forced by the spring through its bore 65.

An arbor 75 is mounted between the centers 58 and 66 and is provided with a taper 76 for the reception of the work 77 which is held snugly on this taper by a threaded cap 78 and has a recess to receive the center. A circular plate or disc 80 is mounted upon this arbor in a fixed relation thereto and is provided with a plurality of V-notches 81 in its flange 82, which V-notches flare outwardly. The pin 83 is resiliently mounted to enter the selected one of these notches. This pin is carried by an arrangement so that it will move in a straight line from its notch which will be close to a radial line toward and from the axis of the arbor 75 and also will move at right angle to this line. A block 85 is rigidly mounted upon the carriage 52 by means of bolts 86. A block 87 is connected to the block 85 by parallel resilient springs 88 and 89 of equal lengths thus providing a parallelistic movement whereby the block 87 will always move parallel to the block 85. A block 90 is rigidly mounted upon the block 87 while resilient leaf springs 91 and 92 of equal length and parallel and are secured to the block 90 by bolts 93 serve to carry the block 94. The pin 83 is carried by a slide 95 which is adjustably held by means of the bolts 96 secured to the block 94. This arrangement is so positioned that the pin 83 will have its center on a radius extended from the center of the arbor to the notch engaged. The resilient members 91 and 92 will cause the pin to move always substantially parallel to this radius while the relative arrangement of the two parallelistic movements is such that the spring or resilient members 88 and 89 will cause any movement of the block 87 and consequently the movement of the pin 83 which is carried thereby to be at substantially right angles to this radial line.

A micrometer spindle has an abutment end 98 to engage an abutment 99 at the lower end of the supporting arm 61. The barrel 100 will indicate the amount to which the thimble 101 is operated to move the end 98 against the abutment to move the pin 83 toward and from a position where the springs are relaxed. There is sufficient resiliency in the arms 91 and 92 so that the pin may move out of the notch if the disc 80 is rotated under sufficient pressure to cause the curvature of the pin to wedge the pin out

of the notch. An arrangement by which this may be accomplished is a lever 103 having a handle 104 which is provided with a hub 105 movable about the axis of the dead center 58. This handle is provided with a dog arm 106 provided with a pin 107 and urged by spring 108 to cause the pin to slide into a notch 81. By then urging this lever to the left as shown in Fig. 6 the disc may be rotatively urged with a force sufficient to wedge the pin 83 out of a notch and permit it to ride along the flange 82 until another notch is reached when it will snap into this notch by the resiliency of the springs 91 and 92.

In use work is positioned and then the cutting face of the grinding wheel is brought up against the surface which is to be cut. A reading is noted on the micrometer barrel 100 and then the thimble 101 is turned so as to cause the pin 83 to be moved so as to position the disc the number of thousands which is desired to remove from the work, the wheel of course having first been removed from engagement with the work. This pin moves at right angles to the radius and causes the work to move the amount desired to be removed by the wheel. Then when the handle 37 is grasped and moved to swing the wheel into engagement with the work the predetermined amount of cut is taken on the work and the precise amount is removed. After one tooth of the hob gear or work is cut the handle 104 is moved to rotate the disc so that the next V-notch comes into engagement with the pin 83 which is laid out to similarly position the next tooth of the hob and then the same amount of removal may be had from this tooth and so on until grinding of all of the teeth is performed.

If it is desired to surface the cutting edge of the wheel, post 47 will be either removed or lowered and a lower swinging of the cutter will be had to surface the wheel by reason of the diamond 42 in the holder 49.

I claim:

In a grinding machine, a tool movable into engagement with a piece of work, a work support comprising an arbor for mounting the work, a disk mounted on said arbor and connected to the work to rotate therewith, a disk engaging member, formations provided on said disk and member for selective engagement between them to hold the work in different positions of angular adjustment, parallelistic flexible arms mounting said member for movement by flexing said arms generally radially of said disk toward and from engagement of said disk and member, and a second set of parallelistic flexible arms for movement of said member at right angles to the movement of the first set of arms, and means for adjusting the second set of parallelistic flexible arms to move the member generally tangentially of the disk to adjust the work with reference to said tool.

JOHN H. WORTHEN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,858,869	White	May 17, 1932
1,971,598	Condon	Aug. 28, 1934
1,985,477	Wolf	Dec. 25, 1934
2,096,890	Ferrel	Oct. 26, 1937
2,176,486	Bruestle	Oct. 17, 1939
2,197,538	Dall et al.	Apr. 16, 1940