United States Patent

[11] **3,552,374**

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[54] **GRINDING WHEEL DRESSER**
3 Claims, 11 Drawing Figs.

[52] **U.S. Cl.** **125/11, 51/165**
[51] **Int. Cl.** **B24d 53/00; B24b 51/00**
[50] **Field of Search** 125/11; 51/165

[56] **References Cited**

UNITED STATES PATENTS

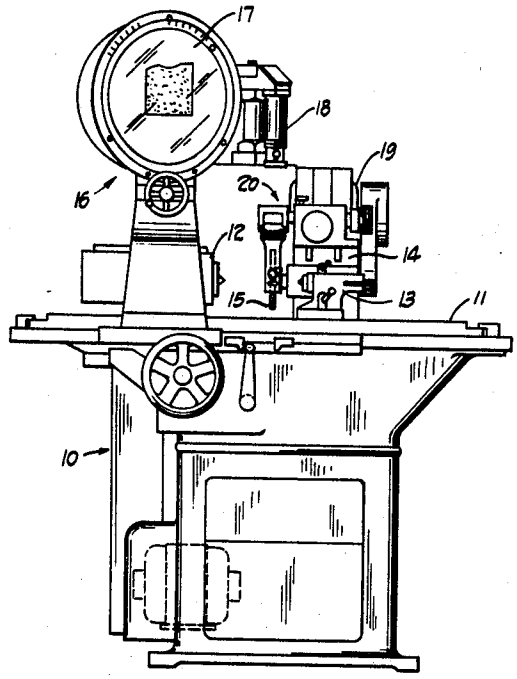
2,581,496	1/1952	Oldham	125/11
1,994,386	3/1935	Dardani	125/11
3,143,831	8/1964	Banko	51/165
2,804,868	9/1957	Coup	125/11

FOREIGN PATENTS

492,549	9/1938	Great Britain	125/11

Primary Examiner—Harold D. Whitehead
Attorney—Sanford Schnurmacher

ABSTRACT: A surface dresser, adapted to shape the surface of the abrasive wheel of a cylindrical grinding machine, having bracket means permanently mounted on the grinding wheel support column. Geometric curve generator means, including cutter means adapted to engage the peripheral surface of the abrasive wheel, removably mounted on the bracket means and translatable thereof in a horizontal plane both normal and parallel to the axis of the abrasive wheel shaft. The axis of rotation of the geometric curve generator means being unobstructed, to permit passage therethrough of the optical axis of optical viewing means, whereby the travel path of the dresser tool can be observed at normal eye level by the operator.



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SHEET 1 OF 6

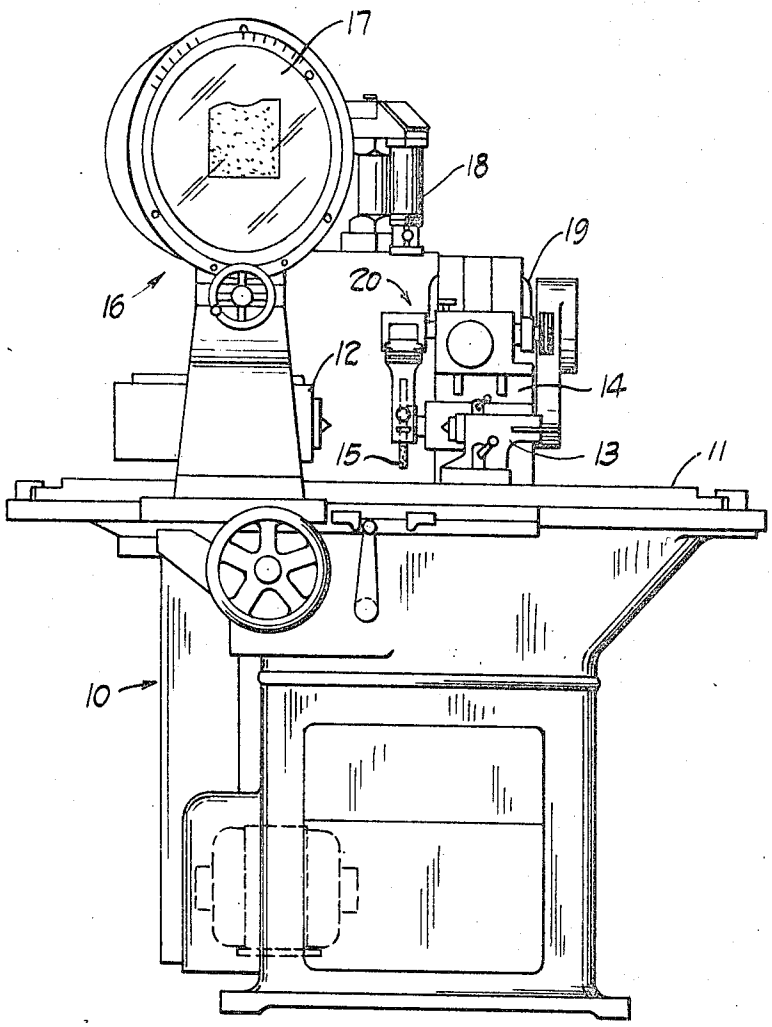


Fig. 1

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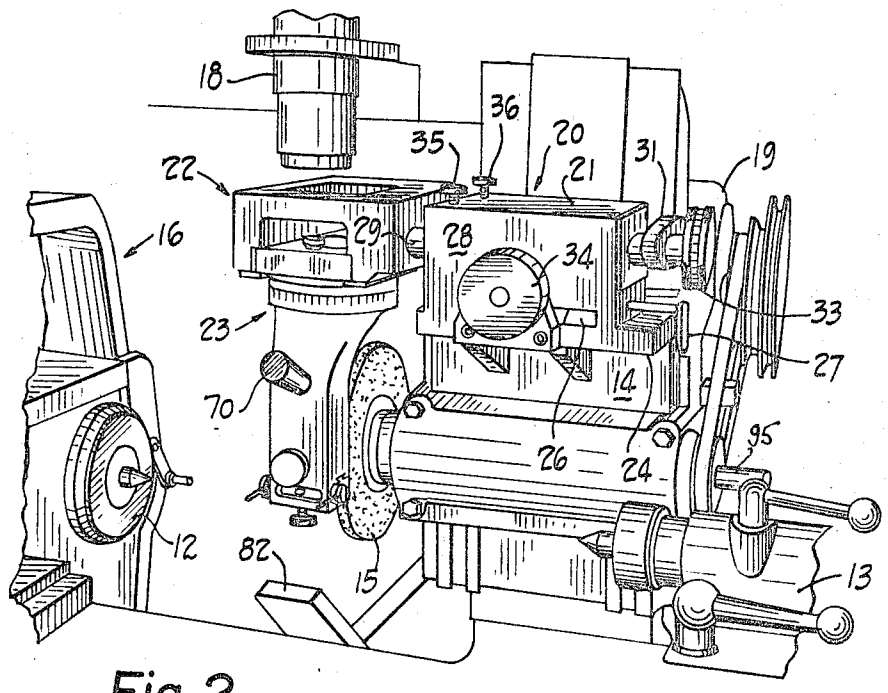


Fig. 2

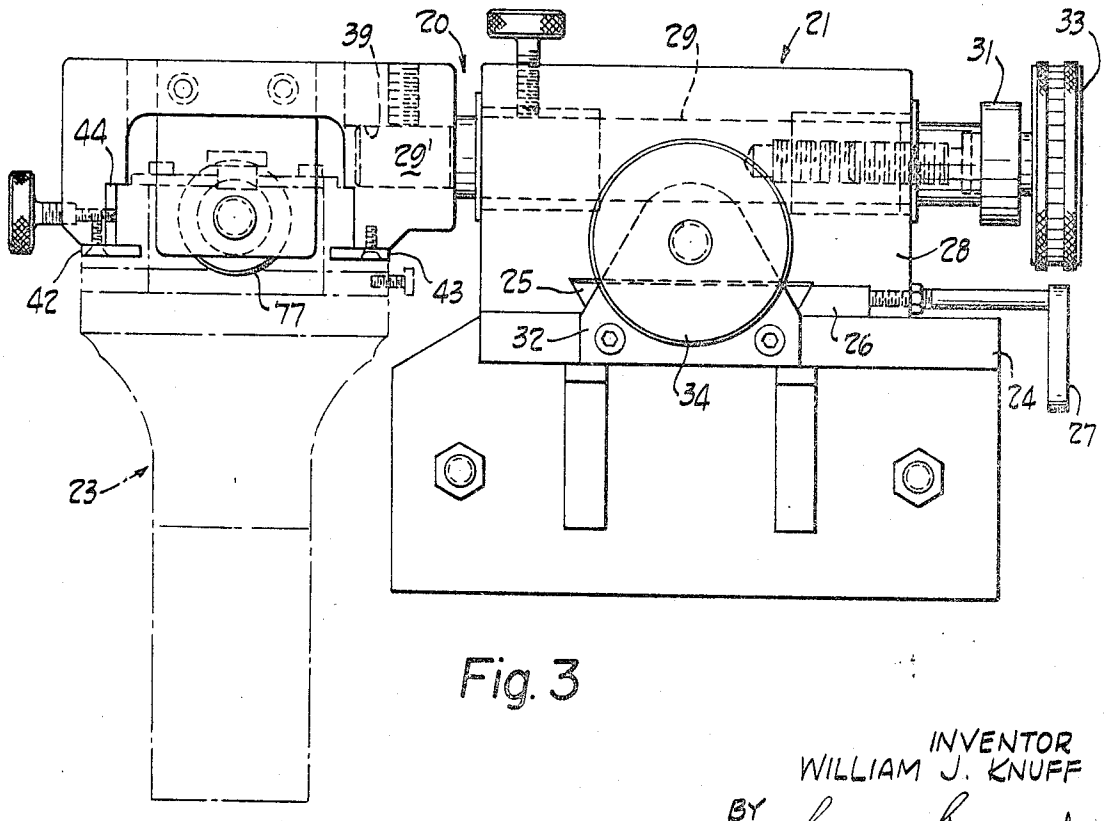


Fig. 3

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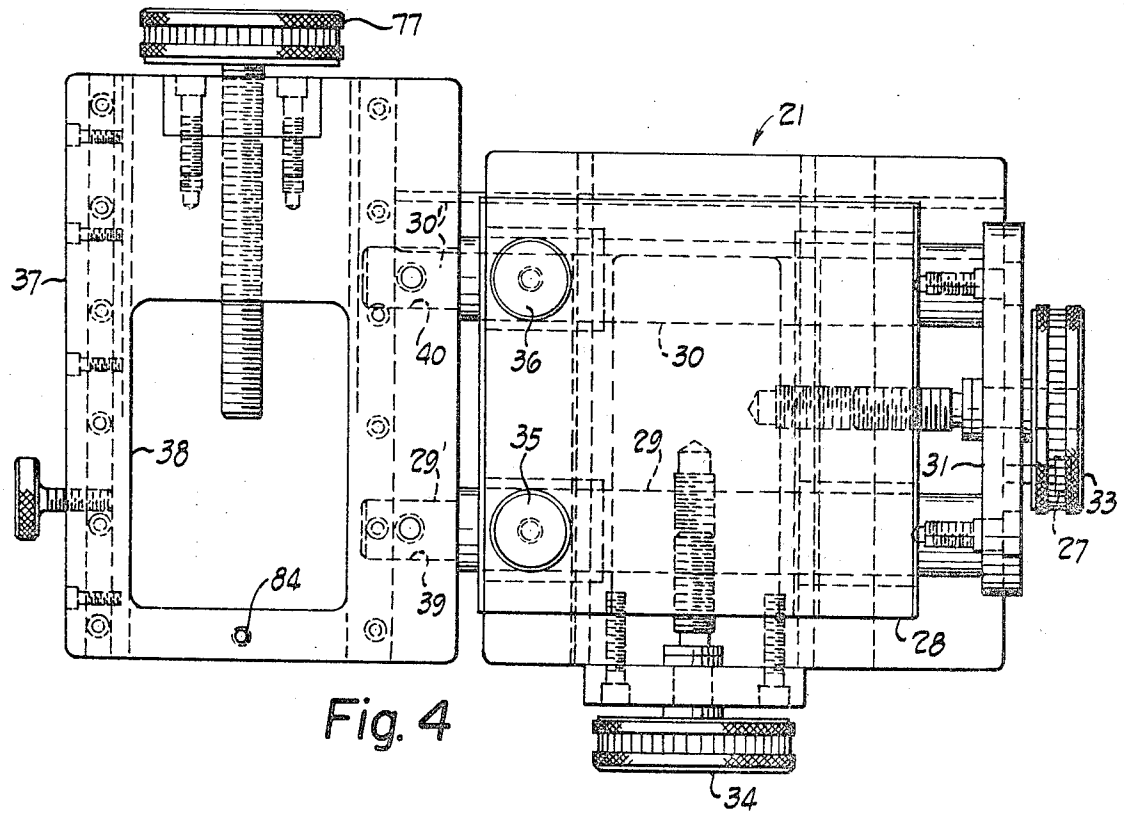


Fig. 4

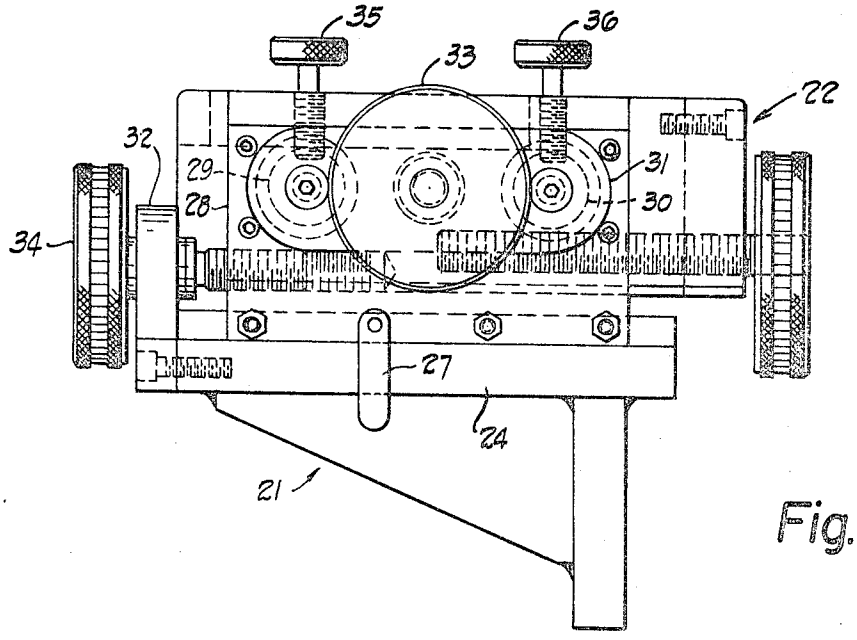


Fig. 5

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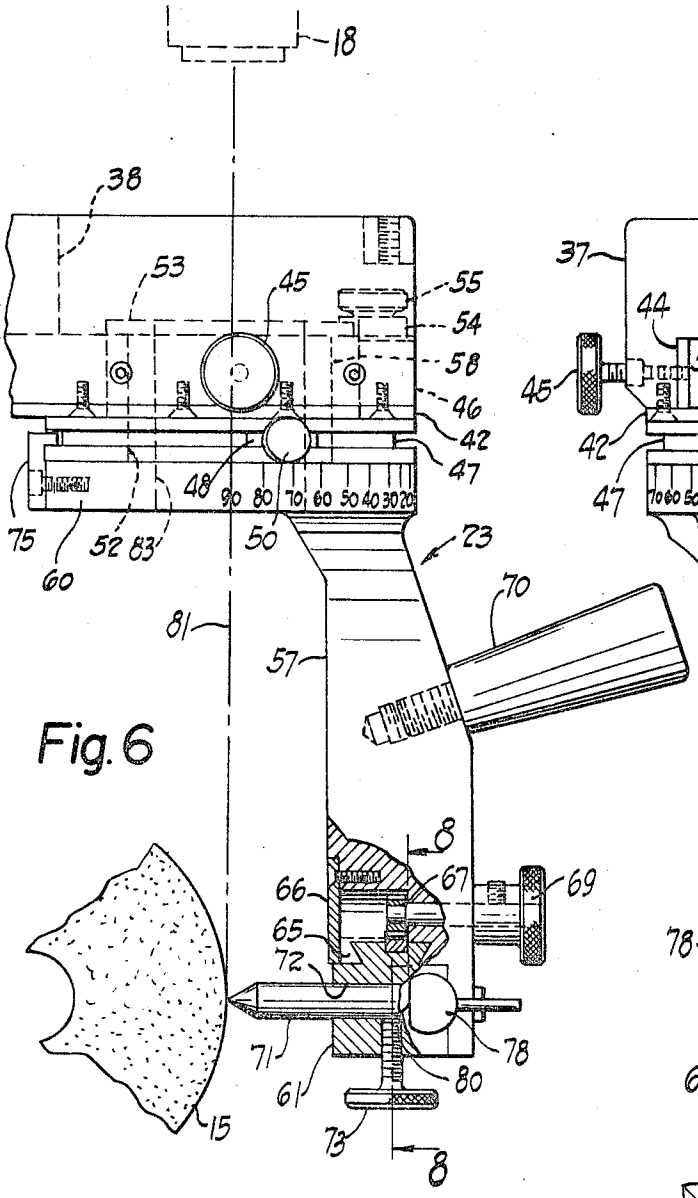


Fig. 6

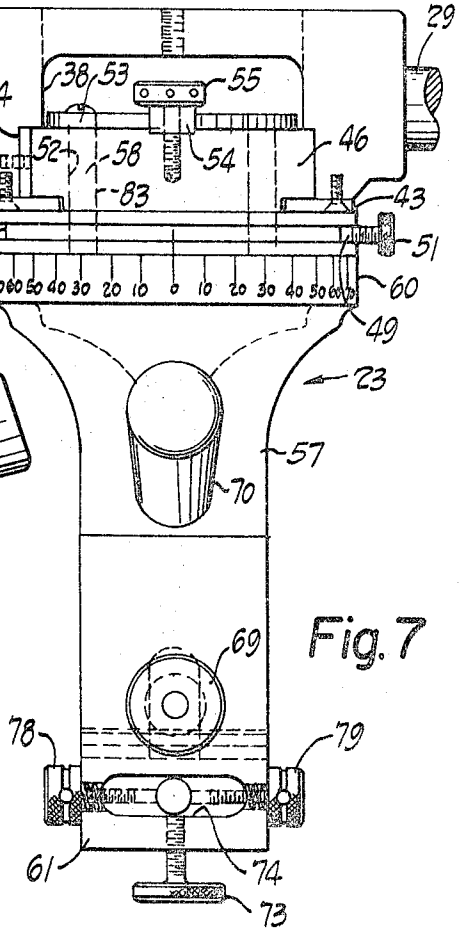


Fig. 7

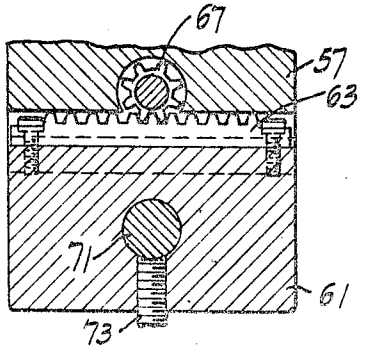


Fig. 8

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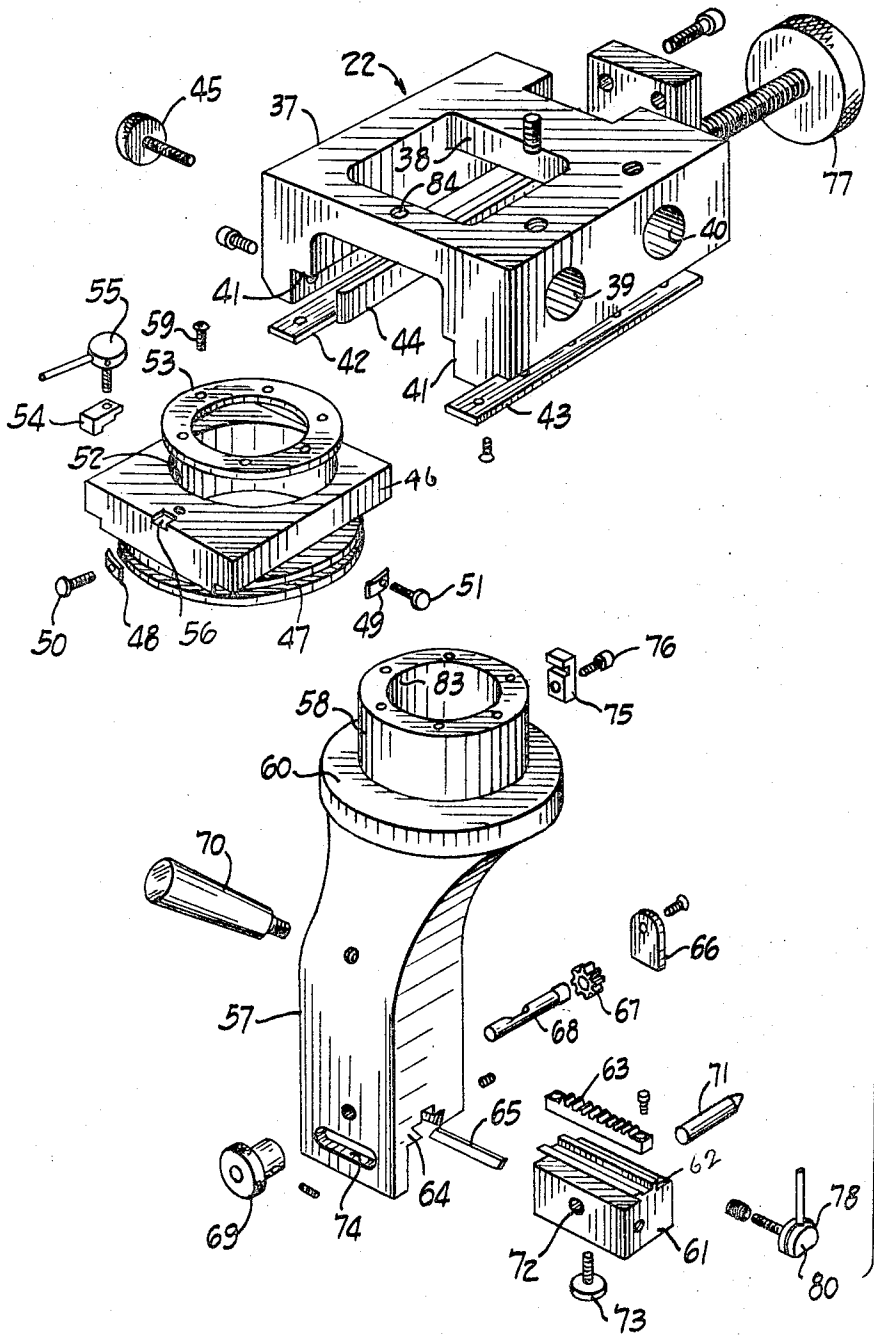


Fig. 9

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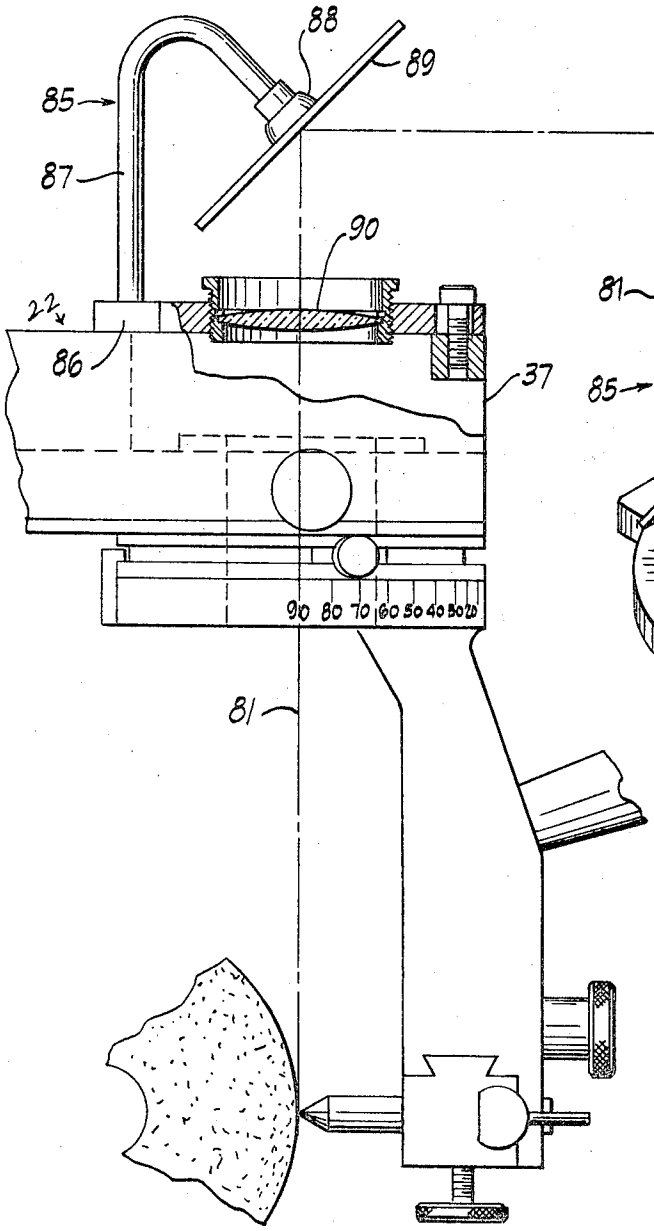


Fig. 11

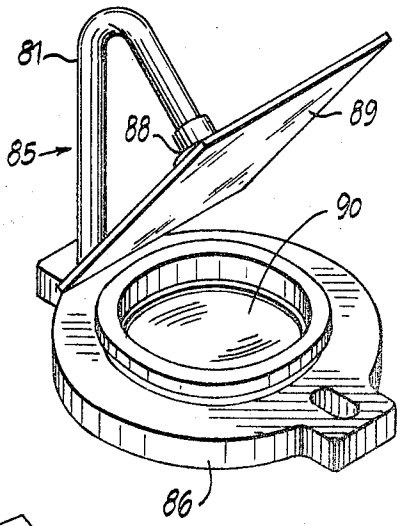


Fig. 10

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GRINDING WHEEL DRESSER

The primary object of the invention is to provide a radius and tangent angle grinding wheel dresser that is adjustable arcuately, longitudinally and laterally of the grinding wheel surface, to provide means for accurately setting coordinate dimensions of forms to be generated in shaping the wheel.

Another object is to provide a device of the type stated, having see-through features that accommodate it for use with an Optical Projection Unit, such as that described in U.S. Pat. No. 3,143,831, to George Banko issued Aug. 11, 1964, or a simple mirror arrangement, such as described hereinafter.

A further object is to provide a dresser of the type stated whose cutting diamond can be set against a magnified image of a layout chart, or scale, projected on the screen of such an optical projection unit.

Still another object is to provide an over-the-wheel mounted dresser whose construction permits inspection of the configuration of the grinding wheel prior to the removal of the geometric curve generator means and cutting tool from its supporting bracket.

Another object is to provide an over-the-wheel mounted dresser that can be easily removed from, and remounted on, its supporting bracket without requiring time consuming realignment with the grinding wheel.

These, and other objects of the invention will become apparent from a reading of the following specification and claims, together with the accompanying drawing, wherein like parts are referred to and indicated by like reference numerals, and wherein:

FIG. 1 is a front elevational view of a cylindrical grinding machine, including an optical projection unit, showing the Grinding Wheel Dresser, that is the subject of the invention, mounted thereon;

FIG. 2 is an enlarged perspective view of the area immediately surrounding the grinding wheel dresser unit, illustrated in FIG. 1;

FIG. 3 is a front elevational view of the grinding wheel dresser unit;

FIG. 4 is a top plan view of the bracket, with the geometric curve generator removed;

FIG. 5 is a right end view of the bracket illustrated in FIG. 4;

FIG. 6 is a side elevational view of the mounted geometric curve generator;

FIG. 7 is a front elevational view of the same;

FIG. 8 is a vertical sectional view, taken along the line and in the direction of the arrows 8–8 of FIG. 6;

FIG. 9 is an exploded view of the bracket head and the geometric curve generator;

FIG. 10 is a perspective view of a portable tool viewing unit adapted to be mounted on the bracket head; and

FIG. 11 is a left end view of the grinding wheel dresser unit showing the viewer illustrated in FIG. 10 mounted thereon in optical alignment with the dresser cutter tool.

Referring more particularly to the drawing, there is seen in FIG. 1 the Grinding Wheel Dresser that is the subject of the invention, broadly indicated by reference numeral 20, mounted on the grinding wheel support column 14 of a conventional cylindrical grinding machine 10. The machine 10, used for the purpose of illustration in FIGS. 1 and 2, has a base with a table 11 mounted for longitudinal and cross wise movement thereon. Reference numerals 12 and 13 indicate head and foot stocks, respectively, mounted on the table 11 and adapted to support the workpiece to be shaped (not shown), therebetween.

The shaft 95 of the grinding wheel 15 is mounted on the column 14, and is driven, through suitably arranged belting, by motor 19.

Reference numeral 16 broadly indicates an optical projection viewer, similar to that described in U.S. Pat. No. 3,143,831, which has the optical axis 81 of its objective lens tube 18 aligned with the point of contact between the grinding wheel 15 and the dresser tool 71, as is seen most clearly in FIG. 6.

Reference numeral 82 indicates a light reflecting mirror, seen in FIG. 2, that reflects light upward from a light source, not shown, through the lens tube 18 to the viewing screen 17, as described in detail in the said U.S. Pat. No. 3,143,831.

As seen most clearly in FIG. 2, the Grinding Wheel Dresser 20 is made up of three major components, namely, a bracket 21, a mounting head, or frame 22, and a geometric curve generator 23, removably mounted in the head 22 in a dependent position.

The bracket 21 had a table 24 that is permanently mounted on the grinding wheel column 14 of the cylindrical grinding machine 10, above and parallel to its grinding wheel shaft 95.

A first slide 28 is mounted on the table 24, through a dovetail 25, for movement crosswise of the table in a horizontal plane, normal to the projected axis of the grinding wheel shaft 95. A headed screw 34 journaled through a pusher plate 32 with fore and aft thrust bearings, and threadedly engaged with the slide 28, acts to move the slide 28 along the dovetail 25, crosswise of the table 24. The head, or knob, of screw 34 has numbered graduation marks around its peripheral surface so that the slide can be repositioned as desired. A gib 26 and lock 27 act to hold the slide immovable at any set position.

A second slide unit is composed of two rods 29 and 30 slidably mounted in spaced and parallel bores extending through the first slide 28, above and at 90° to its dovetail 25. The rods 29—30 are substantially longer than the slide 28 and are connected at one end through a yoke 31, as seen in FIGS. 3 and 4.

A screw 33 having a knob at its outer end is journaled through the yoke 31, with fore and after thrust bearings, with its threaded end engaged in the first slide 28. The screw knob 33 is also graduated around its periphery. Rotation of the knob 33 acts to move the slide rods 29—30, attached to yoke 31, in either direction through the slide 28 in a horizontal plane parallel to the projected axis of the grinding wheel shaft 95.

Lock screws 35 and 36 mounted in the slide 28 and engageable with rods 29 and 30, respectively, act to hold the second slide rods immovable at any set position.

Reference numeral 22 broadly indicates a head mounted on the rod ends 29′ and 30′, through sockets 39 and 40 in the head frame 37, into which the rod ends are fitted and pinned, as seen in FIGS. 3, 4 and 9.

The head frame 37 has a rectangular opening 38 and two spaced and parallel grooves 41, with tracks 42 and 43 secured along the lower edges thereof to define mounting slots for the slide 46 of geometric curve generator 23. A gib 44, together with its pressure screw 45 is mounted in one of the slots. A locator screw 77, for positioning the slide 46, extends through the rear wall of the opening 38, as seen most clearly in FIG. 4.

The slide 46 of the geometric curve generator 23 is square in shape with parallel grooves adapted to permit it to be removably fitted into the head slots, as seen in FIGS. 7 and 9.

The slide 46 has a central bore 52 therethrough, bounded by a circular track 47 into which two degree set stops 48 and 49, having lock screws 50 and 51, respectively, are slidably fitted.

Reference numeral 57 indicates a dependent dresser tool carrying arm having a circular thrust bearing 60 at its upper end and an upstanding hollow collar 58 that is adapted to be journaled in the slide bore 52, with the thrust bearing 60 seated against the underside of the slide 46. A retaining ring 53 of slightly larger diameter than the collar 58, with a central opening whose diameter is the same as that of the collar bore 83, is mounted on the top end of the collar 58, by means of screws 59, with the underside of its periphery seated on the top side of the slide 46. The so-journaled arm 57 is free to rotate 360° in the slide bore 52. The bearing 60 has a degree dial numbered from 0° to 90° to the right and left, around its periphery.

The arm 57 may be locked at any point, in its rotational path, by a clamp 54 mounted in a seat 56 on the top of the slide 46 through a set screw 55. The end of the clamp 54 ex-

tends over the edge of the ring 53, as seen in FIGS. 6 and 9, and is clamped firmly thereon by tightening the screw 55.

Reference numeral 75 indicates a degree stop mounted on the bearing 60, by means of screw 76, diametrically opposite to the 0° mark on the dial, with a finger riding in the groove 47, and engageable by the degree set stops 48 and 49, as explained hereinafter.

As seen in FIG. 6, the so mounted arm 57 is offset outwardly of the centerline 81 of the bores 83 and 52 which also is the optical center of the various viewing means that may be used with this device.

Reference numeral 61 indicates a third operational slide, which carries the dresser tool 71, that is mounted for crosswise travel of the lower end of the arm 57 through a tongue 62 that slidably interfits a groove 64 cut in the arm 57. The tongue 62 has a toothed rack 63 mounted along the top surface thereof.

A gib 65 holds the slide 61 snuggly in place. The rack 63 is engaged by a pinion gear 67 mounted on a shaft 68 journaled in the arm at 90° to the rack. The shaft 68 has a control knob 69 whose rotation effects transitional movement of the slide 61. A plate 66 covers the rear face of the cavity in which the pinion gear 67 is located.

A conventional diamond tipped cutter tool 71 is mounted through a bore 72 in the slide 61 and locked in place by a thumb screw 73. A slot 74, cut in the arm 57 in alignment with the slide bore 72, provides clearance for the shank of tool 71.

Reference numerals 78 and 79 indicate circular stops that are mounted on the end faces of slide 61. Each stop has a flat 80. The two stops cooperate to hold the slide immoveable. However, when either stop is turned so that its flat is aligned with the side edge of the slide, the slide is free to be moved inwardly of its groove, at the end at which said stop is located. In other words, referring to FIG. 7, if stop 79 is in its release position, slide 61 is free to move to the left. If stop 78 is in its release position, the slide may be moved to the right.

Reference numeral 70 indicates a control handle mounted on arm 57, used to swivel same in either direction from its 0° position.

To mount the geometric curve generator 23 on the bracket head 22, the screw 45 is loosened to release the gib 44. The slide 46 is inserted between the head tracks 42 and 43 and slid therealong until it abuts the end of the locating bolt 77. The bolt 77 is adjusted until the center of the collar opening 83 is properly positioned. The slide 46 is then locked in position by tightening the gib screw 45.

It will be evident that, once properly positioned on the head 22, the geometric curve generator 23 can be removed and remounted thereon, by merely loosening, or tightening, the gib screw 45, with assurance that it will always be in the same position; without requiring time-consuming recalibration.

The so-mounted geometric curve generator 23, and the cutter tool 71, is translatable in a horizontal plane, normal to the axis of rotation of the grinding wheel 15, by rotating the knob of slide-translating screw 34; and is translatable parallel to the peripheral face of wheel 15, by rotation of screw knob 33 which causes the head support rods 29 and 30 to travel in a horizontal plane parallel to the axis of the wheel supporting shaft 95.

Upon loosening the clamp screw 55 and grasping handle 70, the arm 57 and the cutter 71 mounted on the lower end thereof, may be rotated to the right or left of its 0° setting.

Rotation of arm 57 translates the cutter 71 in an arc whose length is determined by the location of the degree set stops 48 and 49 relative to the finger 47 of stop 75. The arm 57 may be locked at any angular setting by tightening the clamp screw 55.

The cutter tool 71 may be made to travel at the set angle by rotation of the gear knob 69 of the tool slide 61, after releasing either of the stops 78, 79, or both.

As seen in FIGS. 6 and 7, the aligned openings 38 and 83 provide an unobstructed passage for the images of the grinding wheel 15 and the tip of the cutter tool 71, along the optical axis 81 of an optical projection unit 16, such as illustrated in FIGS. 1 and 2, wherein the light reflected from the light-source mirror 82 travels upward along the optical axis 81 through the objective lens tube 18 and on to the viewing screen 17, where it may be observed by the operator at normal eye level.

The grinding wheel shaping path of the cutter tool 71 can be set by means of a magnified image of a layout chart, or scale, projected on the screen 17.

It will be evident that, by suitable manipulation of the slide positioning knobs 33 and 34, the center of rotation of the geometric curve generator 23, and the cutter tool 71 mounted thereon, can be set anywhere in a horizontal plane running either parallel or normal to the axis of rotation of the grinding wheel 15. The wheel 15 may be given right- or left-hand radii, tangent angles, or any combination thereof, with ease and accuracy. By taking note of the settings of the various scales appearing on the control knobs 33, 34 and bearing seat 60, any cut may be duplicated without time consuming recalculations.

It is again emphasized that the geometric curve generator 23 can be removed from the bracket head 22, during workpiece shaping operations, and remounted thereon with assurance that it will be in the exact position it was, when removed, relative to the grinding wheel periphery, since the bracket 21 is permanently mounted on the machine column 14.

To give the grinding wheel a simple square shape, the arm 57 is locked at its 0° setting, with the tool slide 61 immobilized by its stops 78 and 79, as is seen most clearly in FIG. 7. The slide knob 33 is then slowly rotated to move the cutter 71 across the peripheral face of the grinding wheel, parallel to its axis of rotation.

When the grinding wheel dresser unit 20 is mounted on a grinding machine having no optical projector unit, a simple reflecting mirror viewing unit 85 may be mounted on the bracket head 22, as seen in FIG. 11.

As seen most clearly in FIG. 10, the unit 85 has a base 86 with a lens 90, held in a threaded focusing collar, mounted centrally therethrough. A plane mirror 89 is tiltably mounted, through suitable ball-and-socket means 88, on a curved arm 87.

As again seen in FIG. 11, the lens and mirror are aligned with the optical axis 81, that passes through the openings 38 and 83. The mirror is adjusted so that an enlarged image of the cutter tip and the grinding wheel face thereat, is reflected to the eye 99 of the operator, while the operator is standing in a normal, upright position. At no time does the operator have to bend over the dressing tool to observe, or correct, the dressing operation.

It is to be understood that the mirror viewer 85 may be used without the lens 90, but the use of the lens provides an enlarged image that is easier to follow.

It will now be clear that there is provided a device which accomplishes the objectives heretofore set forth.

While the invention has been disclosed in its preferred form, it is to be understood that the specific embodiment thereof, as described and illustrated herein, is not to be considered in a limited sense, as there may be other forms or modifications of the invention which should also be construed to come within the scope of the appended claims.

I claim:

1. A grinding wheel dresser, adapted to shape the abrasive wheel of a cylindrical grinding machine having an abrasive wheel support column, comprising in combination:

a. a horizontally extending bracket table, permanently mounted on the abrasive wheel support column, spaced upwardly of the abrasive wheel shaft;

b. a first slide, mounted on the table for movement crosswise thereof, in a horizontal plane normal to the axis of the abrasive wheel shaft;

c. control means, for moving the first slide between adjusted positions;

d. a second slide, comprising a head having two laterally extending rods slidably fitted through two parallel bores extending lengthwise of the first slide, for movement therethrough in a horizontal plane parallel to the axis of the abrasive wheel shaft;

e. said head having a vertical opening therethrough, bounded at its lower edge by two parallel tracks extending normal to, and crosswise of, the slide rods;

f. control means, for moving said second slide between adjusted positions;

g. geometric curve generator, having a mounting plate with a vertical bearing bore centered therethrough;

h. a dependent, laterally-offset arm journaled for rotation in said mounting plate bore, through an upstanding hollow collar;

i. control means, for rotating said arm between adjusted positions, actuation of the control means translating the arm in an arc;

j. a third slide, mounted at the lower end of the arm, having an axis of elongation normal to the arm;

k. cutter means, mounted on the third slide, adapted to engage the peripheral surface of the abrasive wheel;

l. The geometric curve generator being removably secured on the second slide head, in a depending position, by interfitting its mounting plate between the head tracks;

m. clamp means, for locking the geometric curve generator in place; and

n. the openings of the hollow collar of the geometric curve generator, and the second slide head, being aligned, to provide an unobstructed passage therethrough for the optical axis of optical viewing means, whereby the travel path of the cutter means can be observed by the operator at normal eye level.

2. A grinding wheel dresser, as in claim 1, wherein the optical viewing means comprises an optical projection unit.

3. A grinding wheel dresser, as in claim 1, wherein the optical viewing means comprises an angularly disposed plane mirror mounted on the second slide head, above the geometric curve generator, and in line with the axis of rotation thereof.