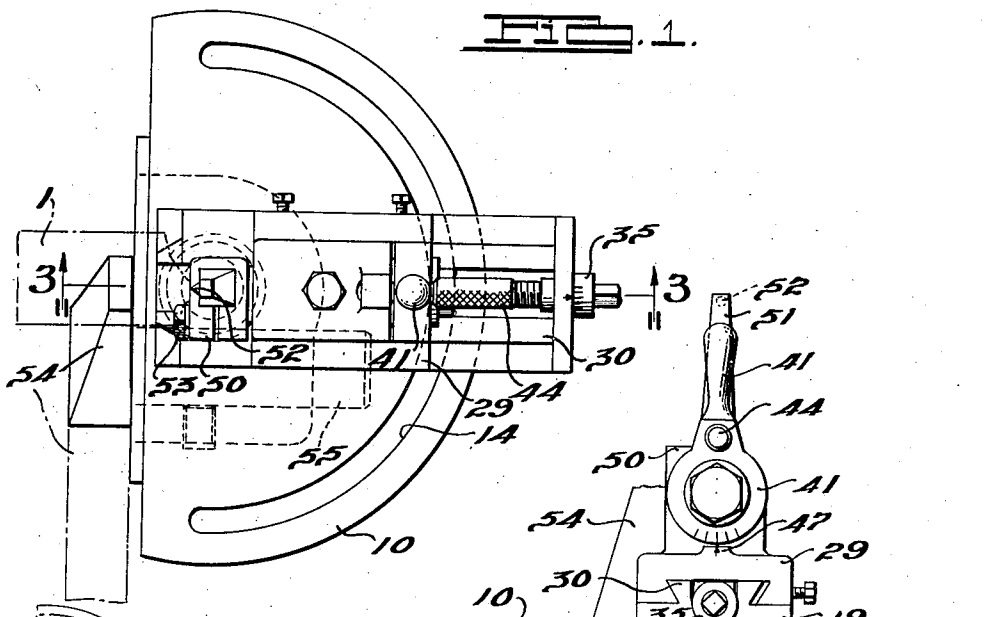
Aug. 23, 1938. J. W. PARKER 2,127,614

GRINDING WHEEL DRESSING UNIT

Filed Dec. 5, 1935

FIG. 1.



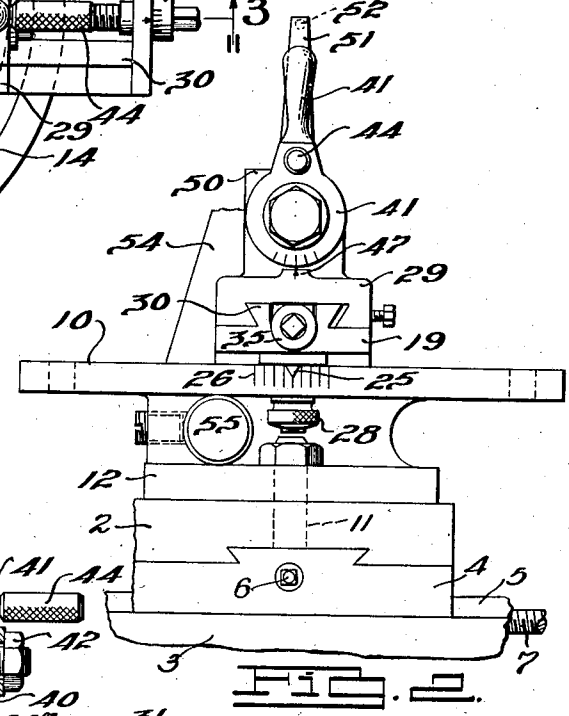


FIG. 2.

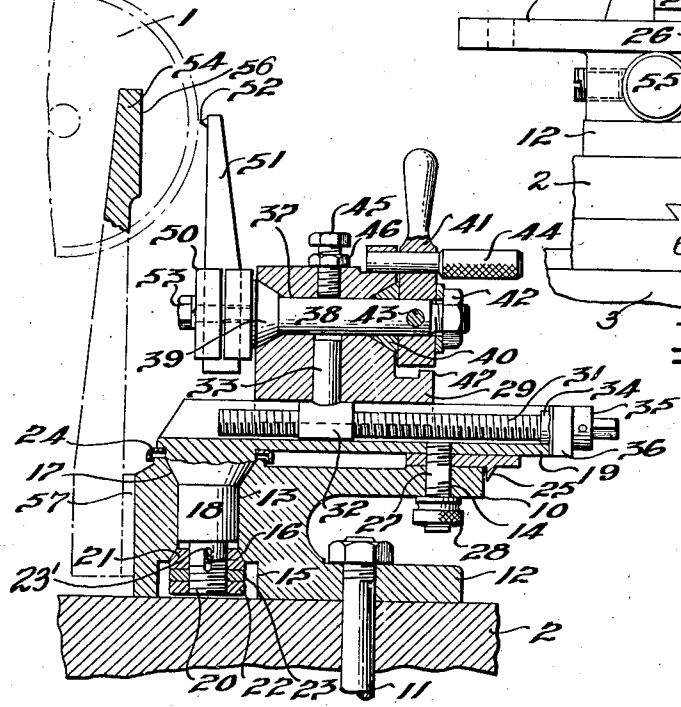


FIG. 3.

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GRINDING WHEEL DRESSING UNIT

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5 Claims. (Cl. 125—11)

The invention relates to a grinding wheel dressing unit adapted to be mounted upon the work-supporting bed of a grinding machine.

The general object of the invention is to provide a dressing unit adapted to dress a grinding wheel to provide a grinding face of complex contour with great accuracy.

Another object of the invention is to provide a dressing unit having sufficient flexibility to dress the grinding face of a wheel on any desired radius or on straight line at any angle to the wheel axis, or any desired combination of arcs and straight lines.

Another object of the invention is to provide a dressing unit of the type mentioned having inherent therein means to locate the diamond dressing tool accurately in any desired plane of reference, in combination with means for establishing the path of the tool from such plane of reference in any direction in order to positively fix the contour of the wheel face independently of the wheel itself.

Referring to the drawing in which a preferred form of the invention is shown and wherein like numerals are applied to like parts in the several views,

Fig. 1 is a plan view of the dressing unit.

Fig. 2 is an elevation, looking from the right of Figure 1.

Fig. 3 is a vertical section, taken on the line 3—3 of Figure 1.

Referring to the drawing, there is shown a portion of a grinding wheel 1 and a work supporting table 2 mounted on the bed 3 of the grinding machine for relative movement in lines parallel and perpendicular to a vertical plane through the wheel axis. The mounting of the grinding wheel and work table on the bed may be effected in any conventional manner to produce the desired relative movement, but, for the purpose of illustration, the work table 2 is shown mounted on a slide 4 which in turn is mounted upon ways 5 on the bed 3 of the machine. By operating a suitable control shaft 6, the table 2 may be reciprocated in a plane perpendicular to the axis of the grinding wheel. Operation of a control shaft 7 reciprocates the slide 4 and the table 2 in a plane parallel to the axis of the grinding wheel. In addition to the above, the grinding wheel shaft is adjustable vertically with respect to the bed 3 in any conventional manner, not shown, in order to position the axis of the wheel in the same horizontal plane as the work.

The dressing unit shown in the drawing comprises a bed 10 fixedly secured to the work-supporting table 2 by means of bolts 11 passing through a base flange 12 of the bed. The top of the bed is semi-circular in form, as shown in Figure 1, and is provided at its center with a vertical bore 13 and a concentric slot 14. The underside of the bed 10 is provided with an enlarged opening 15 coaxial with the bore 13 and the shoulder between the bores 13 and 15 is provided with a conical bearing surface 16. A similar but oppositely disposed conical bearing surface 17 is provided at the upper end of bore 13.

A vertical trunnion 18 of a turntable 19 is journaled within the bore 13 of bed 10. The trunnion 18 is provided with a conical bearing surface at its upper end adapted to cooperate with the conical portion 17 of the upper end of the bore, and is provided at its lower end with an integral cylindrical extension 20 of reduced diameter. An annular bearing member 21 surrounds the reduced extension 20 and has a snug fit therewith, and a pair of lock nuts 22 and 23 are threaded on the end of the extension 20 for the purpose of adjustably fixing the position of the annular bearing member 21. Any suitable means, such as the pin and slot connection 23' shown in Figure 3, may be utilized to prevent relative turning movement between the annular bearing member 21 and trunnion 18 without interfering with relative axial movement of these members. A pressed metal guard 24 surrounds the upper end of trunnion 18 and has a downwardly extending peripheral flange overlying a cooperating boss or raised portion on the top of bed 10 to prevent the entrance of abrasives into the bearing between trunnion 18 and the table. The trunnion mounting just described may be adjusted by nuts 22 and 23 to have a very close fit in the opposed conical portions of bore 13 for the purpose of accurately fixing the axis of rotation of the turntable 19.

The turntable 19 is provided with a downwardly extending finger 25 adapted, during pivotal movements of the turntable, to slide along the outer peripheral arc of the bed 10; and the outer edge of the bed 10 is calibrated, as shown at 26 in Figure 2, to indicate the angle at which the turntable is positioned with respect to a line perpendicular to the axis of the grinding wheel. A stud bolt 27 is threaded into the underside of the turntable 19, passes through the arcuate slot 14 and is provided with a thumb nut 28 by means of which the turntable may be fixed in adjusted position.

A slide member 29 is mounted upon the turn-

table 19 and connected for sliding movement with respect thereto by means of the conventional dovetail slide arrangement shown at 30 in Figure 2. A feed screw 31 rotatably carried by the turntable is threaded into a block 32 having an integral projecting pin 33 journaled in a vertical bore in the slide member 29. The feed screw 31 is fixed against axial movement with respect to the turntable by collars 34 and 35 positioned on opposite sides of an upstanding flange 36 on the turntable with the result that rotation of the feed screw effects longitudinal sliding movement of slide member 29. Collar 35 may be provided with a micrometer scale calibrated in terms of the distance through which member 29 slides for a given rotation of the feed screw.

Slide member 29 is provided with a horizontal bore 37 extending parallel to and directly above the feed screw 31 and intersecting the axis of trunnion 18. The ends of bore 37 are provided with oppositely directed conical bearing surfaces, similar to those described with respect to bore 13 in bed 10; and journaled in bore 37 is a trunnion 38 having a conical bearing enlargement 39 adapted to cooperate with the left hand conical bearing surface in bore 37. An annular bearing member 40, having a conical surface adapted to cooperate with the other conical bearing surface in bore 37, is slidably mounted on trunnion 38 and is held against axial movement by a handle 41 which, in turn, is fixed on trunnion 38 by means of a nut 42 threaded on the reduced end of trunnion 38. The handle 41 is fixed against rotational movement with respect to trunnion 38 by means of a pin 43 extending through the trunnion and handle members. When handle 41 is in the vertical position shown a pin 44 having a knurled end is adapted to be inserted through aligned openings in the handle 41 and the body of slide member 29 to fix trunnion 38 against rotation. A cap screw 45 having a lock nut 46 is threaded into the slide member 29 and may be utilized to engage and lock the trunnion member 38 against rotation when the openings in handle 41 and slide member 29 are not aligned.

Fixed to the left-hand end of trunnion 38, as viewed in Figures 1 and 3, is a split clamping member 50 in which is clamped the lower end of an arm 51 carrying a diamond point cutting element 52. A cap screw 53 passes through one of the bifurcated ends of the clamping member 50 and is threaded to the other for tightening the member about the lower end of arm 51. The parts are so arranged that when the knurled pin 44 is passed through the openings in the handle 41 and the slide member 29, the arm 51 will extend vertically with the diamond point in the plane of the axes of trunnion members 38 and 18. A raised portion 47 on member 29 is provided with a pointer adapted to cooperate with a micrometer scale on the lower end of handle 41 to indicate the extent of movement of the diamond point.

An arm 54 having fixed thereto a horizontally extending trunnion 55 journaled in the bed 10 on an axis in a plane perpendicular to the axis of the grinding wheel is provided for establishing a reference plane for the diamond point with respect to the axis of trunnion member 18. For this purpose the arm 54 is provided with a reference surface 56 which is positioned very accurately at a known distance from the axis of the trunnion 18. The distance between the plane of surface 56 and the axis of trunnion 18 is fixed by means of a collar or washer 57 positioned on the trunnion 55 between the bed 10 and the arm 54.

It will be apparent that if the distance between the face 56 and the axis of trunnion 18 is known, the plane of the diamond point 52 may be accurately positioned either in the plane of the axis of trunnion 18 or on either side thereof by any desired amount merely by the use of gauge blocks between the face 56 and the point 52, or by means of the micrometer adjustment on feed screw 31. Should it be desired to position the diamond point at a greater distance to the left of the axis of trunnion 18 than the normal plane of surface 56, it is only necessary to withdraw trunnion 55 and insert a thicker washer in place of washer 57, or the same thing may be accomplished by feeding the diamond point into contact with the surface 56 when a thin washer 57 is used, then by swinging arm 54 out of the way further movement of diamond point 52 can be effected for a measured distance by means of the micrometer scale.

In operation, the dressing unit is extremely flexible and may be operated in any one of a large number of different methods depending upon the nature of the grinding surface desired and the will of the operator. In grinding arcs, it is necessary first to position the axis of trunnion 18 on the center of the arc by means of the conventional adjustments provided for the grinding wheel and work table 2, thereupon arm 51 carrying the diamond point 52 may be fixed in position by means of pin 44 and the diamond point positioned at the desired radius from the axis of trunnion 18 by means of the reference plane 56, gauge blocks, and the micrometer adjustment on feed screw 31. If the wheel is to be ground with a convex face it is obvious that the diamond point would have to be positioned to the right of axis of trunnion 18, as viewed in Fig. 3, by an amount equal to the radius of curvature, while a concave grinding face may be provided by shifting the diamond point to the opposite or left side of the axis of trunnion 18. Once the proper setting is secured the face is dressed by swinging turntable 19 about trunnion 18.

When it is desired to dress the face on a straight line parallel to the axis of the grinding wheel, and the width of the face is to be substantial, this can be accomplished by fixing arm 51 in the position shown in the drawing and feeding the work table 2 and the wheel axially with respect to each other by means of the conventional feed screws of the grinding machine, not shown. The unit, however, is particularly adapted for dressing straight line faces of small width since these can be dressed by fixing the work table 2 and wheel support and merely swinging the arm 51 by means of handle 41 through the small arc necessary to dress a straight parallel face. The face can be dressed at any angle by merely rotating the turntable to the desired angle as indicated by pointer 25 on the scale at the periphery of the bed 10, fixing it in the adjusted position and then swinging arm 51 by means of handle 41.

The device is of particular value where it is desired to dress the face of a grinding wheel into a profile composed of the combination of one or more radii and one or more straight lines. For example, when dressing a face, the profile of which includes a pair of straight lines intersecting at an angle, the axis of trunnion 18 can be fixed on the point of intersection of the two

straight lines on the grinding face. From that position, after one of the surfaces is dressed by swinging arm 51 back and forth, it is only necessary to rotate the turntable through the desired angle to position the diamond point in a plane wherein it will dress the other straight line by movement of the arm 51 in the opposite direction.

While certain of the outstanding capabilities of the unit are described above, it is believed clear that the device is adapted for use in other ways than those outlined. Moreover, in any case it is possible, by means of the plane of reference established by surface 56 on arm 54, and suitable trigonometric or other mathematical calculations, to determine the settings and amount of adjustment required on the turntable, the micrometer screw 31 or the swinging arm 51 for any given grinding profile. The extent of these adjustments is indicated by suitable micrometer scales.

The dressing unit is of particular value in dressing a very narrow face grinding wheel having a complicated grinding contour such as would be used for grinding small complicated elements, but it is obvious that it may be applied to larger grinding surfaces with advantage.

I claim:

1. In combination, a grinding machine having a bed, a grinding wheel rotatably supported on said bed, a work support carried by said bed, means for adjusting said grinding wheel and work support relatively in lines parallel and perpendicular to a vertical plane through the axis of the wheel, a wheel dressing unit mounted on said work support, said unit comprising a turntable rotatably carried on an axis fixed with respect to the work support and located in a plane perpendicular to the wheel axis, a slide member adjustably carried by said turntable for rectilinear movement perpendicular to the axis of the turntable, an arm pivoted to said slide member on an axis perpendicular to and intersecting the axis of said turntable, and a cutting element carried by said arm eccentrically of said arm pivot.

2. In combination, a grinding machine having a bed, a grinding wheel rotatably supported on said bed, a work support carried by said bed, said grinding wheel and work support being relatively movable in lines parallel and perpendicular to the plane of the wheel axis, a turntable pivotally mounted on said work support, a slideable member movable rectilinearly with respect to said turntable in a plane perpendicular to the turntable axis, an arm pivoted to said slideable member on an axis in a plane perpendicular to said turntable axis, a cutting element carried by said arm eccentrically of said arm pivot, and means for establishing a fixed plane of reference for said cutting element with respect to said work support, said means including an arm pivotally mounted on an axis fixed with respect to said work support and swingable in a plane parallel to the axes of said wheel and said turntable.

3. In combination, a grinding wheel having a bed, a grinding wheel rotatably supported on said bed, a work support carried by said bed, said grinding wheel and work support being relatively movable in lines parallel and perpendicular to the plane of the wheel axis, a cutting element, means for connecting the cutting element to the bed including a pair of trunnions positioned at right angles with respect to each other, said cutting element being mounted on one of said trunnions and the other of said trunnions being mounted on said bed, independent means for adjustably fixing said trunnions against rotation respectively, means for adjusting one of said trunnions axially thereof with respect to the other, and means for establishing a fixed plane of reference for said cutting element with respect to said work support.

4. In a grinding wheel dressing unit, a bed, a trunnion rotatably carried by said bed, an arm pivotally connected to said trunnion on an axis perpendicular to the trunnion axis, a cutting element carried by said arm eccentrically of said pivot, and means for adjusting said arm with respect to said trunnion rectilinearly in a direction parallel to said pivotal axis to selectively position said cutting element on opposite sides of said trunnion axis.

5. In a grinding wheel dressing unit, a bed, a trunnion rotatably carried by said bed, an arm pivotally connected to said trunnion on an axis perpendicular to the trunnion axis, a cutting element carried by said arm eccentrically of said pivot, independent means for adjustably fixing said arm and trunnion against rotation respectively and means for adjusting said arm with respect to said trunnion rectilinearly in a direction parallel to said pivot axis.

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