Feb. 13, 1951 A. S. TITCOMB 2,541,844

ABRASIVE WHEEL

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Fig. 1.

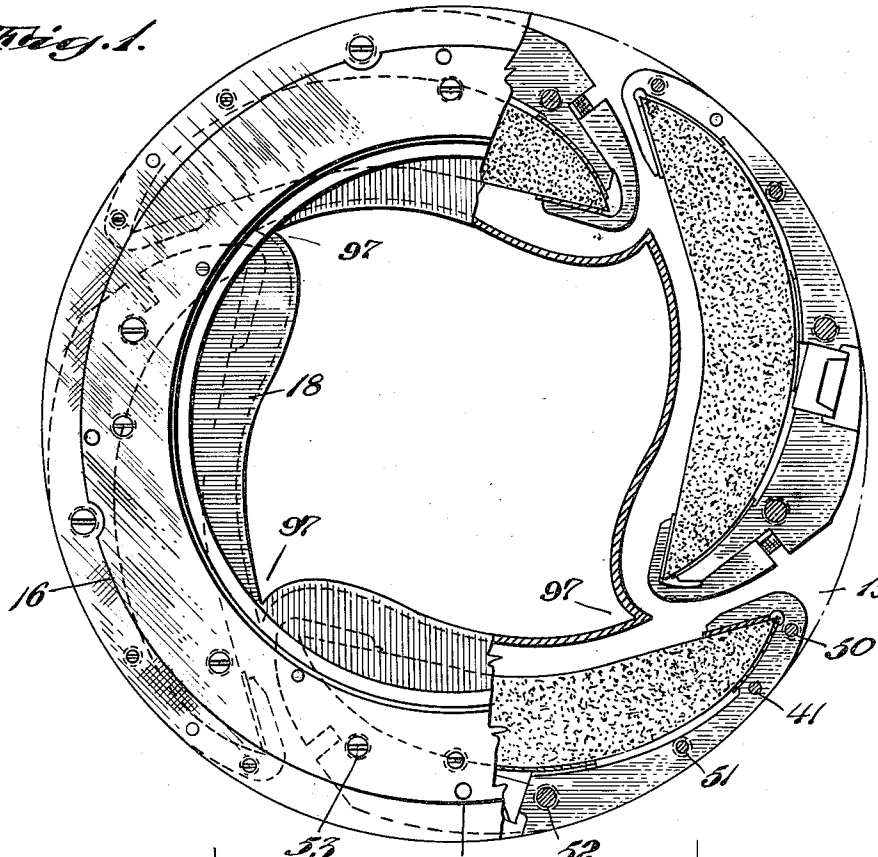
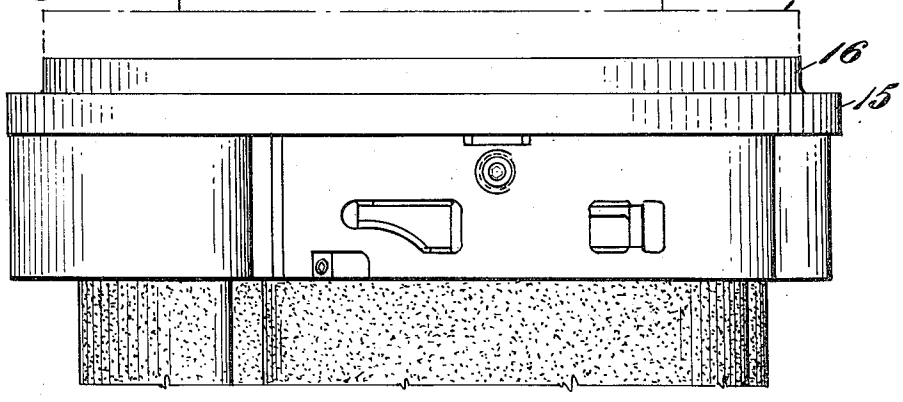


Fig. 2.



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Fig. 3.

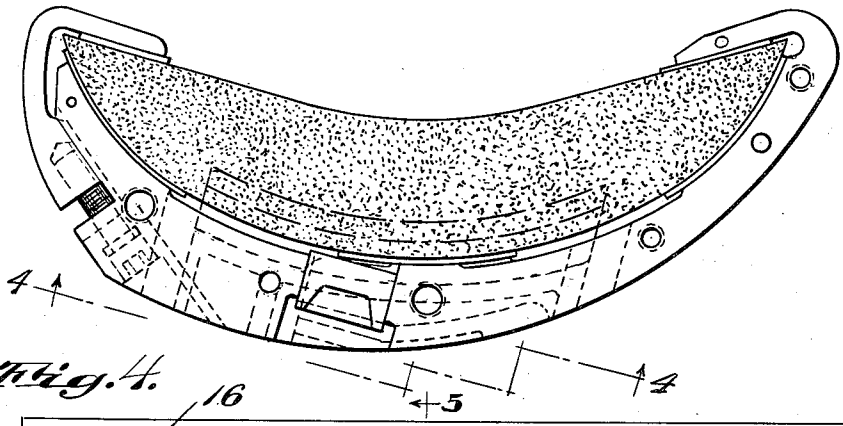


Fig. 4.

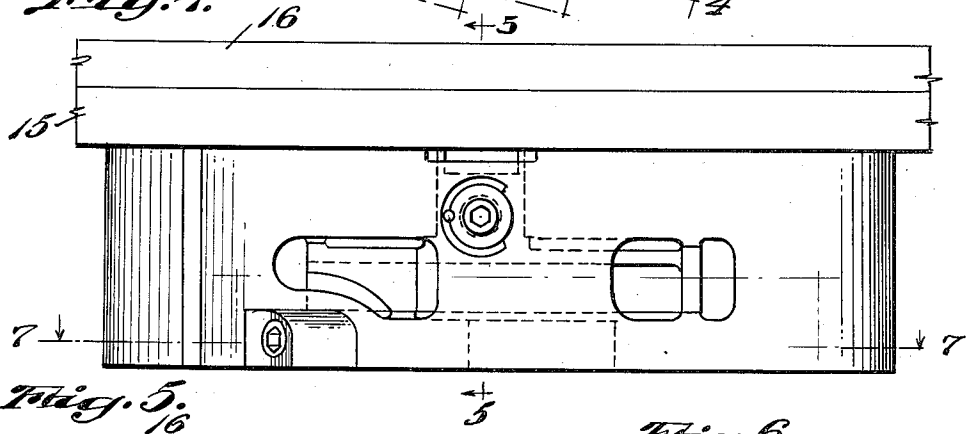


Fig. 5.

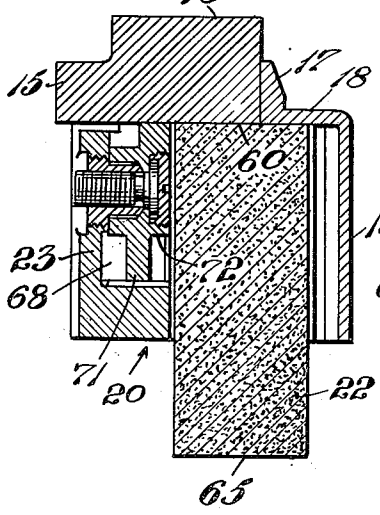


Fig. 6.

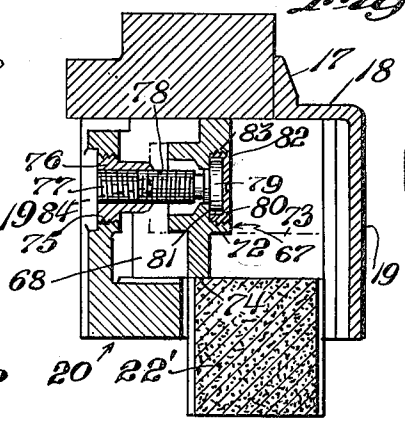
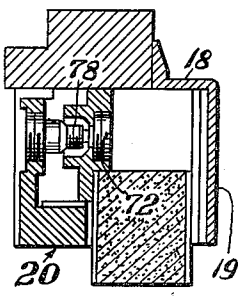


Fig. 6a.



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Fig. 7.

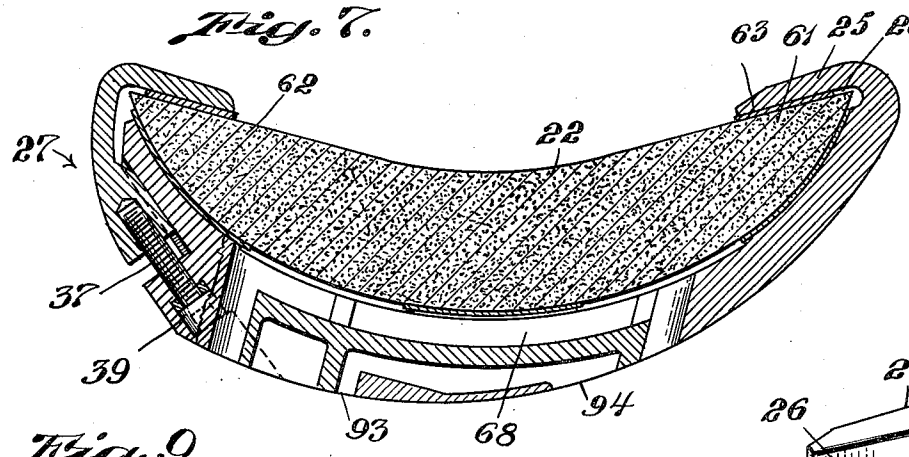


Fig. 9.

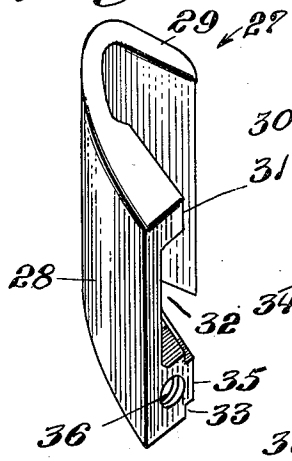


Fig. 8.

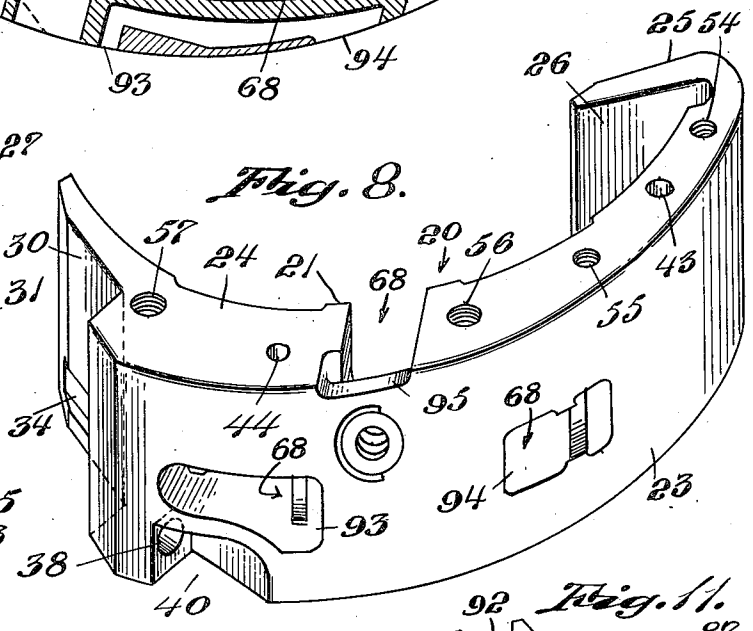


Fig. 10.

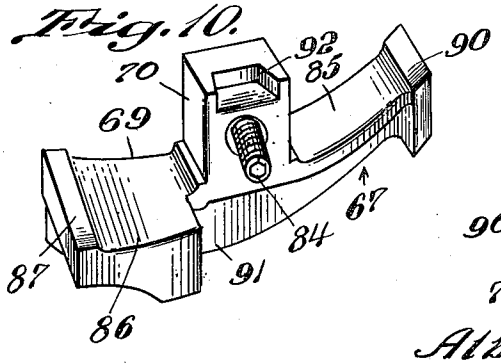
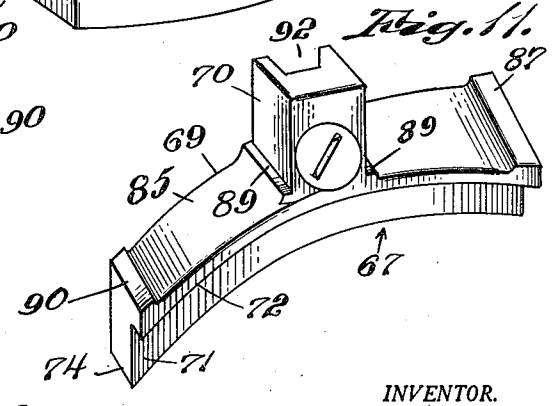


Fig. 11.



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Patented Feb. 13, 1951

2,541,844

UNITED STATES PATENT OFFICE

2,541,844

ABRASIVE WHEEL

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Application July 12, 1949, Serial No. 104,254

10 Claims. (Cl. 51—209)

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This invention relates to an abrasive grinding wheel which is composed of a plurality of spaced abrasive surfaces.

Abrasive grinding wheels of this character have heretofore been constructed of a grinding segment composed of abrasive material shaped like a hollow cylinder, known in the trade as an "inverted cup." The sides of the cup are often made of segments each locking into the next segment or sometimes by segments with spaces in between with locking devices to hold the sides of the cup to the upper base of the grinding wheel by means of what is known in the trade as the chuck. This wheel is intended for operating on a mounting at the bottom of a rotating vertical spindle on work fastened to a movable base (either rotary or reciprocative) and where the revolving segments are pressed downward against the work. It is also intended for apparatus on a mounting at one end of a horizontal spindle on work fastened to a reciprocating table so that the revolving segments are pressed against the work. When the wheel is applied to the work, chips of the work and also of the cutting wheel are formed by removal of the stock of each. This removed stock will load up or interfere with the efficient cutting action of the usual types of wheels, the cutting efficiency of a wheel depending to a substantial extent upon the elimination or removal of this debris. Thus the particular shape of the block and arrangement of the several blocks in the wheel are therefore very important from the standpoint of an efficient cutting wheel. It has been found that if this loose stock is readily removed from the grinding before it becomes imbedded into the cutting surface of the wheel or segment, it is unnecessary to dress the wheel as frequently as otherwise and even more often eliminates such dressing entirely. This is because the loose stock fills in the crevices that is, loads the wheel so that the cutting edges of the rough surface are neutralized and forms a smooth uncutting wheel which causes heating, burning, and warpage of the work being ground. This friction, instead of cutting action, often causes sufficient friction to throw the work off the magnetic chuck, generally used, sometimes with serious results.

One of the objects of this invention is to provide a grinding wheel which will have abrasive blocks of a shape which will be more advantageous than any shapes with which I am familiar for the purpose of a more efficient and freer cutting action in any unit of time.

Another object of this invention is to provide a grinding wheel which, although providing a

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faster cut and making more chips of work while grinding, the abrasive material will not wear away as fast and the debris will not load up and therefore the wheel will maintain its efficiency for a longer time.

Another object of this invention is to provide a shaping of abrasive blocks so that the chips will be self removed efficiently and thus prevent loading of the wheel.

Another object of this invention is to provide abrasive blocks which will cause their leading edge to have an efficient plow action upon the chips which are formed to spread the chips outwardly, and inwardly of the wheel as the cutting surface of the block advances.

Another object of this invention is to provide a grinding wheel which will run cool and free of loading and thus prevent heating and warping of the work.

Another object of this invention is to provide a cutting wheel which will exert a continuous downward pressure on the work at all times, thus preventing the work from being thrown from the magnetic table or fixtures upon which it rests while being ground.

Another object of the invention is to provide a cutting wheel having an arrangement of the abrasive surfaces so that they will present a continuous cutting or grinding surface to the work, while providing passage outwardly for undesired removed material.

Another object of this invention is to provide a cutting wheel having the abrasive blocks so arranged that the leading edge of one will overlap the trailing edge of the other so that some abrasive surface will be continually in engagement with the work, yet provide free way for debris to be self removed.

Another object of the invention is to provide an adjustable built-in plate which may be actuated by a single screw to back up the abrasive blocks and which may be adjusted so that the block will be moved further out axially of the wheel as their wearing surfaces are used up to assure more complete usage of the block.

Another object of this invention is to provide a plurality of different sized wheels by utilizing in the plurality of wheels a unit abrasive block which will be of a uniform size and shape, the arrangement being such, generally, that more blocks will be used in a larger wheel than in a smaller wheel, thus decreasing the number of shapes required to cover different diameters of grinding wheels.

Another object of this invention is to provide a clamping means which may be common in a plu-

rality of wheels and of identical form so that one unit of clamping means may be utilized in a plurality of different sized wheels, thus enabling lower cost of manufacture through standardization and also a greater economy in case there is need of replacement by damage.

Another object of this invention is to provide a simple form of clamping means for holding each of the abrasive blocks in position.

Another object of this invention is to provide a rapid yet dependable clamping means which may be actuated by a single screw for holding each of the abrasive blocks in position.

Another object of this invention is to provide a coolant guide for directing the application of the coolant to a location just in front of or to a proper part of each of the abrasive blocks as it is rotated about the axial center.

Another object of this invention is to provide an abrasive block which is so shaped that it will be prevented from tipping out of line when clamped in position.

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 claims.

In the accompanying drawings:

Figure 1 is a top plan view of the wheel with a portion broken away to show the abrasive blocks and their relation one to the other;

Figure 2 is a side view or edge view of the wheel;

Figure 3 is a top plan view of one of the abrasive block holding units detached from its mounting plate;

Figure 4 is an elevation of this unit alone showing its position relative to its mounting plate;

Figure 5 is a section on line 5—5 of Figure 4;

Figure 6 is a view similar to Figure 5 but showing the parts shown in Figure 5 in a different relative position;

Figure 6a is a view similar to Figures 5 and 6 but showing the block in a position between the positions shown in Figures 5 and 6;

Figure 7 is a sectional view on substantially line 7—7 of Figure 4;

Figure 8 is a perspective view of the body portion of the block clamping unit;

Figure 9 is a perspective view of the second portion or jaw thereof which is movable relative to the body to hold the block in position;

Figure 10 is a perspective view of the inner side of the stop or segment adjustment plate for use in holding the abrasive block or segment so that the cutting surface thereof shall be at a further extended position beyond the clamping shoe in order to consume, or use it up to full advantage; and

Figure 11 is a perspective view similar to Figure 10, but looking at the other inner stepped or contact side thereof.

In proceeding with this invention, I have constructed an abrasive block or segment of an elongated shape which will have pointed ends. The leading pointed end will be so positioned in the wheel that the opposite flaring edges from the leading end will have a plow action upon the chips and debris removed by the preceding segment. These blocks are all of the same size and shape for standardization and for grinding wheels of different diameters, and I usually mount more upon a larger wheel than on a smaller wheel in order to provide the size of grinding wheel desired. The blocks may also be arranged in overlapping circular echelon relation so that a continuous cutting surface is provided on the work thus preventing the opportunity for the stock being ground to rise, and at the same time providing necessary chip clearance between. The overlapping relation will be so spaced that the chips removed from the work may be thrown aside from the wheel by centrifugal force as well as by physical displacement of the plow action referred to above. Coolant is usually delivered at a location just inwardly of the circular cutting annulus of the wheel and flows to the work surface within this annulus. The coolant usually is laden with chips or broken off abrasive particles and settles on any horizontal surface just within the cutting annulus. In order to discharge or direct the flow of the coolant, I have in some cases provided a shelf onto which the coolant is discharged, which shelf will serve somewhat to collect settlings which are carried by the coolant, and I have so shaped this shelf that it will have channels or openings which will lead the coolant to a point just ahead of each of the leading ends of the abrasive blocks which are utilized; thus directing the coolant to the most effective point and a location where it will assist in removing debris which is formed by the cutting edge of the abrasive block.

The wheel comprises an annular mounting plate 15 as shown in Figures 1, 2, 4, 5, and 6 provided with a strengthening or spacing rib 16 also of annular form and of a radius less than the similar dimensions of the plate which extends upwardly from the clamp bodies. A member known as a coolant guide continues as at 17 so as to provide a thin portion 18 extending inwardly and from which there depends a skirt 19. This thinner portion 18 with skirt 19 comprises the coolant guide. These portions are shaded in Figure 1. Although they are of a complex shape, this will be referred to later to show how such complex shape serves to direct the coolant to the location desired.

On the under surface of the annular plate 15 there is rigidly secured a plurality of abrasive block holders such as shown in perspective in the two complemental views Figures 8 and 9. The assembled units for holding the abrasive block are shown in Figures 3 and 7.

Each of these units comprises a shell or body 20 which is generally of arcuate shape providing an inner surface 21 for supporting the abrasive block designated 22. The width of this body or shell which is to extend axially of the rotating axis of the wheel is sufficient to give a good bearing surface for the block. The strip of material 23 which forms this body has a smooth outer surface and the body as a whole is of a graduated thickness as may be seen by its edge 24 so that the required strength may be provided. The body is essentially solid with recesses therein for purposes as will be hereinafter pointed out. One end of the body is turned inwardly in the form of a hook 25 to provide a socket 26 into which one end of the abrasive block 22 may be placed. The other end of this unit has a jaw 27 (see Figure 9) movably mounted upon it so that it may engage the other end of the abrasive block 22. This jaw 27 has a mounting portion 28 and a hook shaped portion 29 which engages the abrasive block to be held.

The body 23 of the unit has one end reduced as at 30 to provide a sliding surface or face for engaging the reduced strip or surface 31 of the portion 28 of the jaw, the part 32 being cut away while leaving another spaced surface 33 to engage this surface 30 along the lower edge por-

tion of the body 23. To assist in guiding the movement of the jaw, a groove 34 is formed in the surface 30 and a tongue 35 enters this groove so that the opposite edges of the tongue will be guided by the side walls of the groove. This maintains the movement of the jaw in a desired direction which it should have, and in order that the jaw may be drawn toward clamping position, there is a threaded bore 36 provided parallel with the tongue (see Fig. 9) to be engaged by a screw 37 (see Fig. 7) passing through opening 38 in the body 23 (see Fig. 8) and actuated by its sunken hexagonal socket head 39 by means of a T Hex. wrench. A recess 40 affords access thereto. The body 20 of the abrasive block unit is fixedly secured to the under side of the plate 15 by means of dowels 41 and 42 (see Fig. 1) entering openings 43 and 44 in the shell or body 23 and is drawn snugly against the under side of the plate by screws 50, 51, 52, and 53 entering the threaded openings 54, 55, 56 and 57 in the edge of the body or shell 23, so as to tightly draw it against the plate and hold it in fixed position thereon.

An abrasive block 22 which has a periphery such as shown in Figure 7 or Figure 3 will be of an original height as shown in Figure 5, so that its upper end will engage the under surface 60 of the plate 15, while one of its ends 61 will fit into the recess 26, as shown in Figures 7 and 8, while its other end 62 will be grasped by the jaw 27 urged through the screw 37 so as to grip it firmly in the holding unit. Suitable pads such as paper, or gasket, or other textile fibrous material 63 will be provided on the blocks along the engaging surfaces of the end portions and center outside of the block so that the pressure will be applied through this cushioning means. The block, as will be observed in Figure 5, projects out beyond the unit 20 so as to provide a quantity of solid abrasive material for grinding purposes; however, as the work is operated upon, the grinding surface will be worn from the surface 65, shown in Figure 5, upwardly toward the edge of the clamping unit, and it is desirable that the abrasive block which has become worn from use and of lesser axial dimension, may be moved outwardly of the unit 20 so as to present for use additional abrasive material.

In order to support the abrasive block 22, at a position outwardly from that shown in Figure 5, I have provided a member 67 as shown in perspective in Figures 10 and 11, to act as a variable abutment shoulder to engage the inner end surface of the abrasive block. The body 23 is recessed as at 68 so as to accommodate this member 67 in a position as shown in Figure 5 wholly within the member 23 so as to in no way interfere with the mounting of the abrasive block 22 when it is to engage the under surface of the plate 15. This member 67 comprises an arcuate portion 69 from which there extends upwardly a strut 70 to engage the under surface of the plate 15. The arcuate portion 69 conforms to the shape of the body 23 and may be completely housed within the recess 68 while the strut 70 engages the under surface of the plate 15, as shown in Figure 5. The inner edge of this arcuate portion 69 is cut away at its lower edge 71 so as to provide an overhanging shoulder 72 which when moved inwardly from the position shown in Figure 5 to the position shown in Figure 6, provides a point of engagement for the upper edge 73 of the abrasive block, as shown in dotted lines in Figure 6, while when the member is moved inwardly a further amount, the end 74 of the member serves as an abutment for the abrasive block now reduced to the size 22′ as shown in Figure 6. A mounting for this member is as follows:

An opening 75 is provided from the outside to the recess 68 which is threaded for the reception of a plug 76 which is fixed in this opening and is provided with a threaded bore 77 for the reception of a threaded stud 78 which is rotatably mounted in the shelf member 67. This rotatable mounting is accomplished by means of a head 79 on the stud 78 located loosely in a socket 80 and held between the surface 81 of the member 67 and a threaded cap 82 secured in a bore 83 through which the stud 78 is passed. This stud may be manipulated by means of a sunken hexagonal socket 84 in its end which is accessible from the outside of the holding unit and by this arrangement and a suitable T wrench tool to turn this stud, the member 67 may be moved inwardly to present either its shoulder 72 or its end 74 as an abutment surface for the inner or upper end or the abrasive block 22 so that it may be moved in two steps outwardly from the holding unit to more fully use the abrasive material in the block, before it is discarded. The surfaces 85 and 86 of the variable abutment member are cut away to leave only bearing portions 87 and 90 so as to provide dirt clearance which might otherwise unduly retard the movement of this shoulder member. Other cutaways are as at 91 (see Fig. 10) and 92. These cutaway surfaces connect with openings 93 and 94 so that the centrifugal force which might tend to force dirt about the member 67 will tend to further force it through the openings 93 and 94 so that it may be discharged from the wheel.

In operation, the rib 16 of the plate 15 will be attached to some rotating means shown in dotted lines in Figure 2 at 96 having known perforations through which coolant will discharge downwardly and outwardly so that it will engage the portions 18 shown in Figure 1. As rotary action occurs, any dirt or grit in the coolant tending to collect along the upper, inner surface of the coolant guide 17 and 18, the coolant by reason of the openings or peculiar formation of the shelf 18 will provide spaces 97 through which the liquid will descend so as to be in a position just ahead of the leading end of the abrasive block 22 so that it will better perform its action.

The abrasive block which I have illustrated may be of different shapes, but fundamentally will have an acutely angled leading end and preferably for reversability will also have the same shaped trailing end, although this is not necessarily so.

I claim:

1. A clamping device to hold an individual bonded abrasive block comprising a body member having an end formed into a hollow V to receive one acutely angled end of the block in a wedging action, a jaw, means to move the jaw with relation to the body member toward and from the body member to bind the block of abrasive into such wedging action, and a single tongue and groove joint between the upper and lower edges of said jaw and body member to guide the jaw in its movement.

2. A clamping device as in claim 1 wherein a single screw in alignment with said tongue serves to move said jaw.

3. A clamping device as in claim 2 wherein said

single screw is rotatable in said body and has threaded engagement with a hole in said jaw.

4. A clamping device as in claim 1 wherein the single tongue is on said jaw and a single groove is in said body member.

5. A clamping device to hold an individual bonded abrasive block comprising a base disposed at right angles to its axis of rotation, a body at right angles thereto, a jaw to hold an abrasive block between the jaw and body and extending away from said base and a member having a step therein to provide an abutment intermediate its top and bottom edges and mounted in said body for movement radially inward at right angles to said axis of rotation to be engaged by said block to space the block from said base.

6. A clamping member as in claim 5 wherein said member provides an end abutment surface and may be selectively held in different positions to variously space said block from the base.

7. A clamping member as in claim 5 wherein said abutment member is provided with threaded means located wholly radially outwardly of the abrasive block for movement of the member at right angles to said axis of rotation.

8. A grinding wheel comprising a plurality of individual bonded abrasive blocks arranged in circular echelon relation each with a wedge shaped leading inner edge extending generally parallel to the axis of rotation and a guard presenting a horizontal lip with vertical channels for the downward movement of the coolant at the locations adjacent each of said leading edges.

9. A grinding wheel as in claim 8 wherein said wheel is annular and said means comprises a horizontal guard to catch the coolant and direct it outwardly and circularly, said guard terminating at intervals for downward vertical movement of the coolant.

10. A grinding wheel comprising a plurality of individual bonded abrasive blocks held in a chuck arranged in circular echelon relation, each with a wedge-shaped leading inner edge extending generally parallel to the axis of rotation and within the inner contours of said abrasive blocks, a coolant guide presenting a horizontal lip extending over the top and a vertical skirt along the upper inner end and upper inner side of said abrasive blocks, said contour of the skirt of said coolant guide providing channels for the downward flow of the coolant to the inner leading edge of said block.

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