

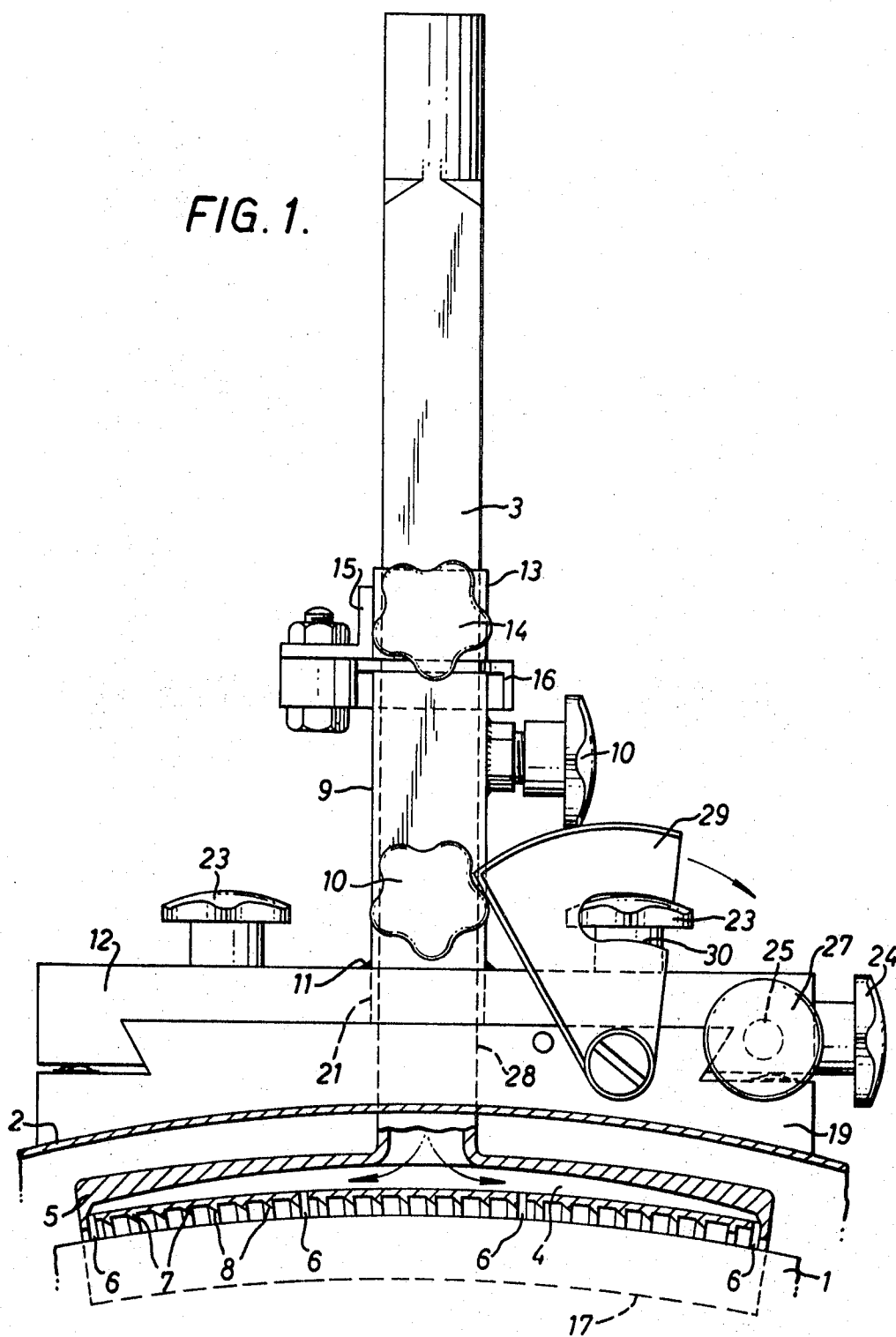
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N. H. HUTTON
GRINDING APPARATUS

3,616,577

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3 Sheets-Sheet 1



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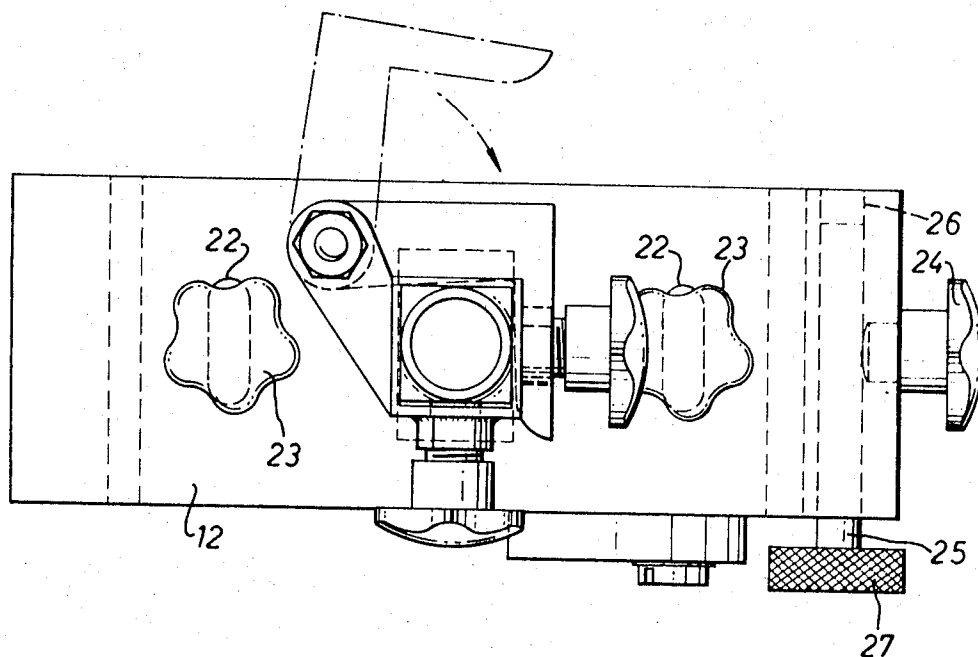
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FIG. 2.



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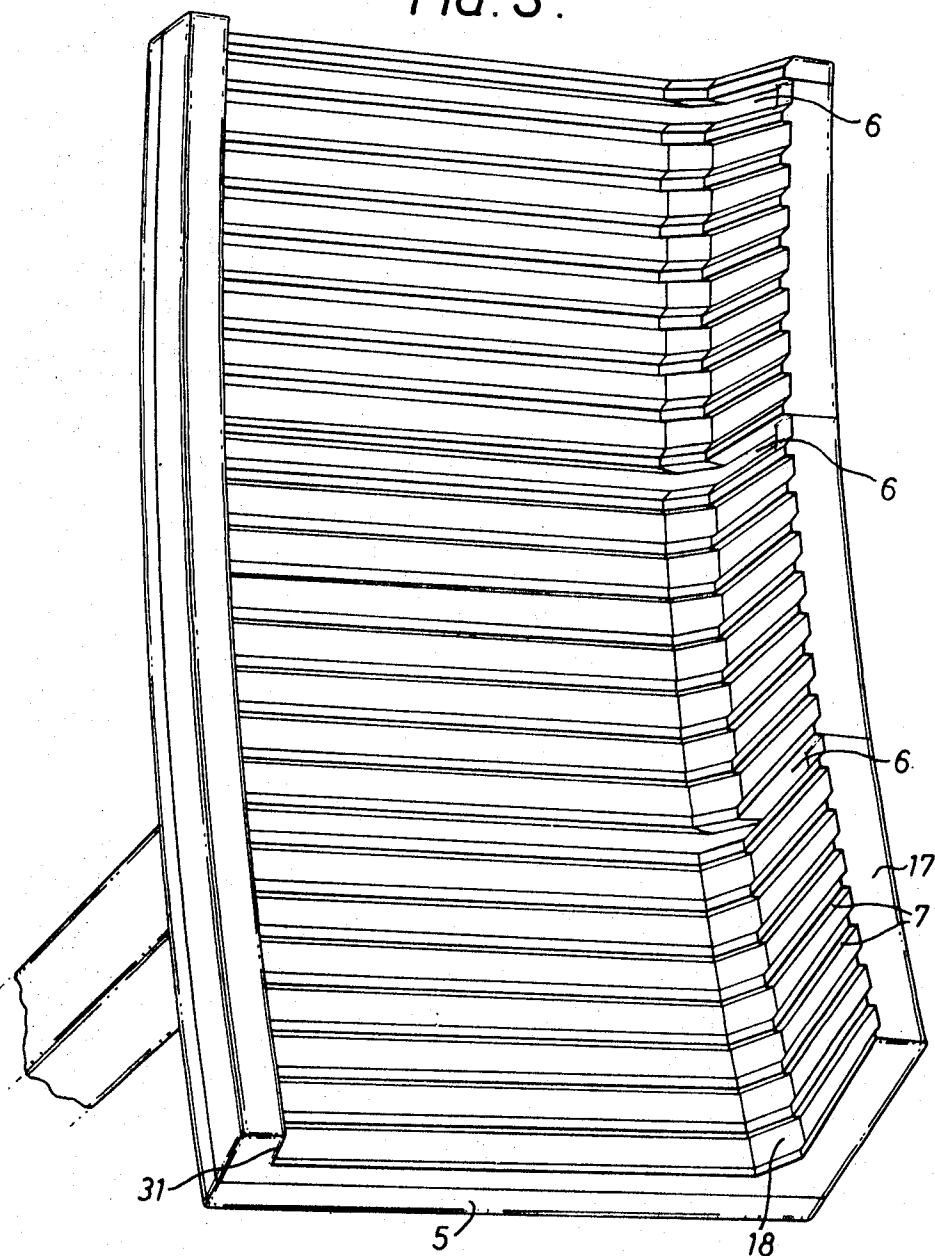
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FIG. 3.



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GRINDING APPARATUS

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8 Claims

ABSTRACT OF THE DISCLOSURE

A grinding machine of the kind described in Pat. No. 3,334,451 is modified for use with a grinding element formed with a peripheral grinding edge, by providing the deflector element with a side wall which extends radially in close proximity to the grinding edge and the adjacent side surface of the grinding element and is formed with outlets for directing liquid coolant onto a grinding edge and side surface of the grinding element in directions substantially at right angles thereto so as to effectively remove grinding debris therefrom and is also formed with ridges forming continuations of the ridges on the curved plate of the deflector element for deflecting coolant back onto the grinding edge and adjacent side surface of the grinding element repeatedly without material loss of imparted velocity. The deflector element is also adjustable in an axial direction relative to the grinding element to maintain a constant clearance between the deflector side wall and grinding elements of different widths.

This invention relates to the grinding of metals, ceramics and other materials and is concerned with an improvement in or modification of the invention forming the subject of my Pat. No. 3,334,451 for use with a grinding element having a grinding surface formed on at least one peripheral edge thereof and to this end, according to the invention, the deflector element is formed with at least one side wall which is adapted to extend in close proximity to the grinding edge and to the adjacent side surface of the grinding element and is formed to direct and force coolant liquid into contact with said edge and side surface in directions substantially at right angles thereto so as to effectively remove grinding debris from the grinding element.

The invention will be described, by way of example, with reference to the accompanying drawings in which:

FIG. 1 is an elevational view, partly in section, of the deflector element and means for adjusting it both radially and axially in relation to a grinding wheel;

FIG. 2 is a plan view of the deflector shown in FIG. 1; and

FIG. 3 is a perspective view of the lower surface of the deflector.

As described and shown in the specification of my Pat. No. 3,334,451 a rotary grinding wheel 1 is disposed within a housing or hood 2 which partially encloses the wheel and means (not shown) are provided external to the hood for bringing a workpiece into contact with the grinding surface and also for directing coolant liquid onto the area of contact between the grinding surface and the workpiece.

The hood 2 is apertured for the passage of a conduit 3 one end of which is connected to a reservoir and pump (not shown) for supplying coolant liquid thereto and the other end of which opens into a chamber 4 formed in a deflector 5 carried by the conduit 3 and curved to substantially conform to the curvature of the wheel 1 and hood 2. The chamber 4 communicates with the circumferential surface of the grinding wheel 1 through slots 6 extending across the inner surface of the deflector in direc-

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tions transverse to the direction of rotation of the grinding wheel. The inner surface of the deflector 5 is also formed or provided with a plurality of closely spaced ridges or blades 7 extending parallel to the slots 6 and each having one surface 8 inclined inwardly in the direction of rotation of the grinding wheel 1 which is clockwise as viewed in FIG. 1. The edges of the ridges 7 are preferably slightly flattened.

The deflector 5 is radially adjustable to compensate for wear of the circumferential grinding surface of the wheel 1, in a manner generally similar to that described in the specification of my Pat. No. 3,334,451. For this purpose the conduit 3 is slidably mounted in a sleeve 9 provided with clamping screws 10, which sleeve, instead of being fixed to the hood 2, is secured at 11 to a plate 12 the purpose of which will be described hereinafter. A collar 13 provided with a clamping screw 14 is slidably mounted on the conduit 3 above the sleeve 9 and carries a bracket 15 on which is pivotally mounted a gauge 16 for determining the clearance between the inner surface of the deflector 5 and the circumferential surface of the grinding wheel 1. To adjust the deflector 5 radially the clamping screw 14 on the collar 13 is loosened, the gauge 16 is swung outward, and the collar is withdrawn clear of the sleeve 9. The clamping screws 10 on the sleeve 9 are then loosened and the deflector 5 is pushed into contact with the circumferential surface of the grinding wheel 1 after which the screws 10 are tightened. The collar 13 is next moved into contact with the outer end of the sleeve 9 and the clamping screw 14 tightened. The clamping screws 10 are next loosened, the conduit 3 is drawn outward from the sleeve 9 and the gauge 16 swung inward between the end of the sleeve and the collar 13. The latter is again moved inward to clamp the gauge 16 firmly between the collar and the sleeve 9 and the clamping screws 10 and 14 tightened. The inner surface of the deflector 5 is thus spaced from the circumferential surface of the grinding wheel 1 by a distance equal to the thickness of the gauge 16, the initial clearance being between one-sixteenth and one-eighth of an inch according to the character of the grinding wheel and the metal or other material to be ground.

In the operation of the arrangement above described during grinding, the coolant liquid issuing from the slots 6 in the deflector 5 impinges on the circumferential surface of the grinding wheel 1 and rebounds therefrom onto the ridges or blades 7 under the influence of the centrifugal force generated by the speed of rotation of the wheel. The form and disposition of the blades 7 causes the coolant liquid to be returned towards the surfaces of the wheel without substantially losing its imparted velocity, being repeatedly forced onto the circumferential surface of the wheel by reaction. The coolant is thus retained between the deflector and the grinding wheel for repeated effective impact on the surface of the wheel until it passes beyond the confines of the hood 2 carrying with it debris loosened by its impacts which would otherwise remain within the interstices of the wheel or become adherent to the inner surface of the hood.

It is the principal object of the present invention to enable coolant liquid issuing from the slots 6 in the deflector to impinge also on at least one peripheral edge and one side of the grinding wheel 1 in the same manner as described above when these portions of the wheel are used for grinding, and to this end the deflector is provided with at least one side wall 17 formed with extensions of the slots 6 and blades 7 on the deflector. At its junction with the deflector, the wall 17 is provided, as shown in FIG. 3, with an inclined surface 18, the form of which is dependent upon the curvature of the associated peripheral edge of the grinding wheel and may be

provided with additional apertures for the discharge of coolant onto said edge in a direction substantially at right angles thereto. A wall similar to the wall 17 may be provided at the other side of the deflector 5 or instead a short rib or flange 31 may be provided as shown in FIG. 3.

It is a further object of the present invention to provide means whereby the deflector can be adjusted in a direction parallel to the axis of the grinding wheel to predetermine the clearance between the side wall 17 and the associated peripheral edge and side of the grinding wheel. To this end, the plate 12 to which the sleeve 9 is secured is slidably mounted on a block 19 secured to the hood 2. The plate 12 is formed with an aperture 21 for the passage of the conduit 3 and elongated slots 22 for the passage of clamping screws 23 for clamping the plate to the block 19. A further clamping screw 24 is arranged to engage a pin 25 passing through a bore 26 in the plate 12 and provided at its outer end with a stop member 27. The block 19 is formed with an elongated aperture 28 for the passage of the conduit 3 and carries a pivotally mounted gauge 29 for determining the clearance between the side wall 17 of the deflector and the associated side of the grinding wheel, said gauge being provided with a slot 30 for the passage of the pin 25.

To adjust the deflector 5 axially the clamping screws 23 and 24 are loosened and the clearance gauge 29 is swung clear of the pin 25. The plate 12 is then slid along the block 19 until the wall 17 of the deflector contacts the side of the wheel, after which the clamping screws 23 are tightened. The pin 25 is then moved inward until the stop 27 contacts the block 19 to withdraw the deflector wall 17 from the side face of the grinding wheel. The gauge 29 is then swung into engagement with the pin 25 and the plate 12 is slid back until the stop 27 contacts the gauge 29 after which the screws 23 are again tightened. The wall 17 of the deflector is thus spaced from the side surface of the grinding wheel by a distance equal to the thickness of the gauge 29.

The inclined surface of the or each side wall of the element and the adjacent arcuate edge surface of the grinding wheel serve to promote and sustain the flow of coolant in a direction substantially at right angles to said surfaces so that these opposed surfaces may be maintained free of embedded waste material as a consequence of the abrading process when used in the grinding of a workpiece.

By this means, in addition to the peripheral surfaces of the grinding wheel, the edges of the wheel and the outer portions of the wheel flanks or sides are freed of grinding debris attached thereto when grinding is performed thereupon and contact grinding temperature is much reduced. The construction is fully effective with a plurality of grinding wheels on a common spindle.

I claim:

1. A grinding apparatus comprising a rotatably mounted grinding element having peripheral and side surfaces and an abrasive grinding edge between said peripheral surface and at least one of said side surfaces, means for conventionally supplying coolant liquid to the grinding area where a workpiece is brought into contact with said grinding edge, a hood partially enclosing said grinding element, additional means for introducing coolant liquid to the interior of said hood at a point remote from said grinding area, and an adjustably mounted deflector element through which coolant is introduced to said grinding edge, said peripheral surface and said one side surface of the grinding element in directions substantially at right angles thereto and having inner surfaces which face and are spaced from said grinding edge, said peripheral

surface and said one side surface respectively of the grinding element, said deflector element being provided with a plurality of ridges extending inwardly from said inner surfaces and being arranged transversely over said peripheral surface and grinding edge and radially over said side surface of the grinding element to deflect coolant back onto the grinding element repeatedly without material loss of imparted velocity and effectively remove grinding debris from the grinding element.

2. A grinding apparatus according to claim 1, wherein the deflector element is carried by the inner end of a coolant supply conduit which is adjustably mounted in the hood for the purpose of moving the deflector element radially and maintaining it in substantially constant relationship with the peripheral surface of the grinding element.

3. A grinding apparatus according to claim 2, wherein the deflector element comprises a hollow curved plate having an inner surface facing and spaced from the peripheral surface of the grinding element and a wall extending in a radial direction from one side of said plate and having an inner surface, portions of which face and are spaced from, said grinding edge and said one side surface respectively of the grinding element, the inner surfaces of said plate and wall being provided with a plurality of outlets for effecting the discharge of coolant onto said grinding edge, said peripheral surface and said one side surface of the grinding element.

4. A grinding apparatus according to claim 3, wherein the inner surface of said wall, at its junction with said plate, extends at an inclination to the rest of said surface and to the inner surface of the plate for effecting the discharge of coolant onto said grinding edge in a direction substantially at right angles thereto.

5. A grinding apparatus according to claim 4, wherein said inclined surface portion is formed with additional outlets for the discharge of coolant onto said grinding edge.

6. A grinding apparatus according to claim 3, wherein a short radial flange is provided on the side of said plate opposite said wall.

7. A grinding apparatus according to claim 3, including means for adjusting the deflector element in an axial direction relative to the grinding element to maintain a constant clearance between the deflector side wall and grinding elements of various widths.

8. A grinding apparatus according to claim 7, wherein said adjusting means comprises a block secured to the outside of said hood and having an axially elongated aperture for the passage of the coolant supply conduit, a plate apertured for the passage of said supply conduit, said plate being axially slidable on and adapted to be clamped to said block, a stop member axially slidable in and adapted to be clamped to said plate and a gauge pivotally mounted on said block for movement between said block and said stop for determining the spacing between the wall of the deflector plate and the grinding wheel.

References Cited

UNITED STATES PATENTS

3,123,951	3/1964	Kuris et al.	51—262 A
3,334,451	8/1967	Hutton	51—267
2,863,265	12/1958	Ault	51—267

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