

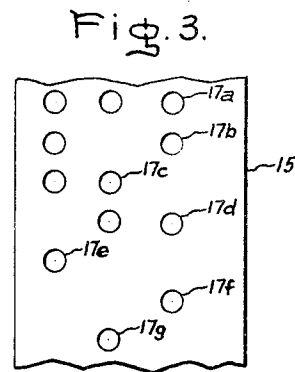
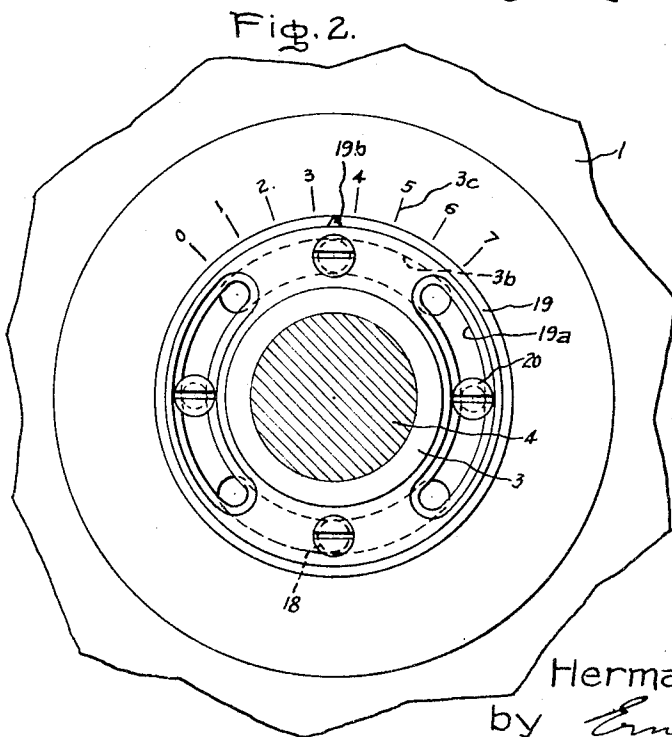
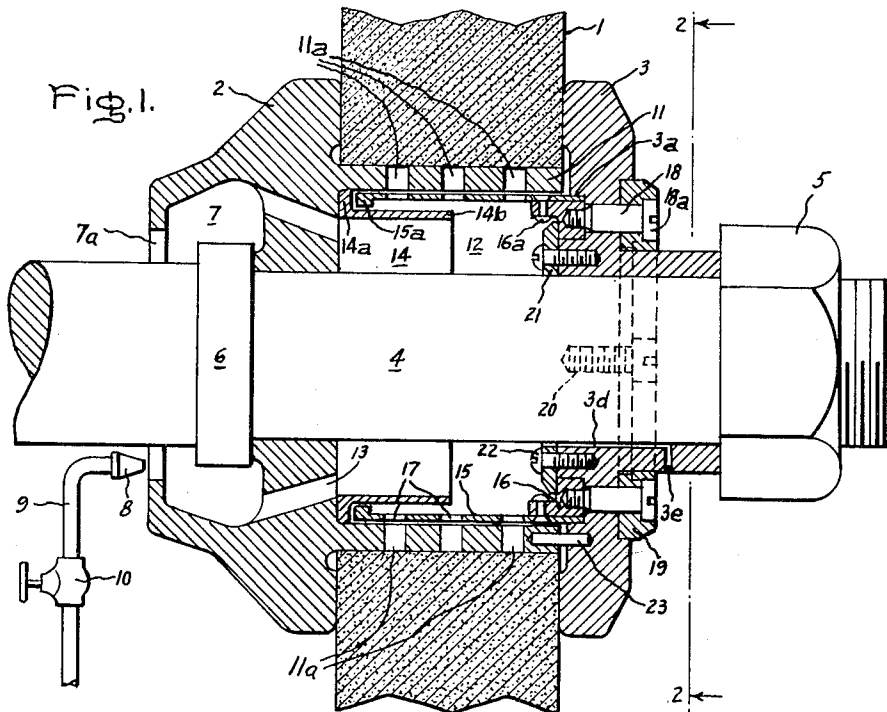
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COOLANT REGULATOR FOR WET GRINDING WHEELS

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COOLANT REGULATOR FOR WET GRINDING
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5 Claims. (Cl. 51-267)

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This invention relates to "wet grinding wheels," in which a coolant such as water is supplied to a central bore in the wheel and caused by centrifugal force to flow radially outward through the interstices in the wheel material to the cutting face. It relates particularly to an arrangement for permitting ready control both of the quantity and distribution of the coolant across the face of the wheel.

The present invention represents an improvement in wet grinding wheels of the general type disclosed in the United States patent to Scheer, 2,380,332, issued July 10, 1945. In practicing the invention of the Scheer patent, it is found that commercially obtainable grinding wheels are of sufficiently uneven porosity as to render objectionably non-uniform the distribution of the coolant liquid discharged across the width of the wheel at the cutting surface thereof. This means that excessive heat is generated, and the permissible rate of cutting is slowed down, with the result that the wheel must be dressed more frequently and the wheel life is thereby shortened.

Accordingly, an object of the present invention is to provide means for so regulating the supply of coolant to the wheel proper that the discharge of coolant at the cutting face is controlled as desired, in order to overcome the above-mentioned difficulties.

Other objects and advantages will become apparent from the following description taken in connection with the accompanying drawings, in which Fig. 1 is a sectional view of a grinding wheel assembly incorporating the invention, Fig. 2 is an end view of the wheel assembly taken on the plane 2-2 in Fig. 1, and Fig. 3 is a developed view of a portion of the circumference of the coolant control member.

Generally, the above-mentioned objects are achieved by deliberately unbalancing the distribution of water to the wheel at its inner circumference, the unbalance being carefully selected so as to compensate for any inequalities present in the structure of the specific wheel being used.

Referring now more particularly to Fig. 1, the grinding wheel 1 is provided with a central bore for mounting the wheel on a special bushing assembly containing the coolant regulating means. This bushing comprises a first bushing member 2 and a second bushing member 3, each having central bores to receive the shaft 4. As will be apparent from Fig. 1, a clamping nut 5 forces the flange 3 against the radial face of the wheel 1 so as to clamp it against the flange 2, end-wise

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movement of which is resisted by a locating collar 6 on shaft 4.

The first flange member 2 defines an annular coolant inlet chamber 7 having an annular inlet 7a to which water is supplied by a nozzle 8 and a supply conduit 9 having a suitable valve 10 for regulating the total quantity of coolant supplied. Extending axially from the main portion of the flange member 2 is a cylindrical portion 11, the outer circumference of which forms the seat for the grinding wheel. This extension 11 is provided with four axially extending rows of radial holes 11a spaced 90° apart, there being three holes in each row. In order to get good distribution of coolant across the face of the wheel, the middle hole is placed exactly at the middle of the grinding wheel width, while the other two holes are half-way between the middle hole and the side of the wheel.

Coolant from the annular supply chamber 7 is delivered to the central chamber 12 by means of two or more equally spaced holes 13. Secured in the axial extension 11 of bushing 2 is a distributing sleeve or cylinder 14 having a radially extending flange portion 14a adapted to be secured in bushing member 2, as by a light press fit or other suitable means. It is to be noted that this distributing cylinder 14 has an edge portion 14b terminating at the middle of the wheel width, for a reason to be noted hereinafter in connection with the operation of the wheel.

Supported within the axial bushing extension 11 and forming a small clearance with the inner circumferential surface thereof is a coolant distributor and regulator member in the form of a cylinder 15 having perforations arranged as described more particularly in connection with Fig. 3 hereinafter and secured at its right-hand circumference to a ring 16, the connecting being made by suitable fastening means, for instance the rivets 16a. It will of course be appreciated by those skilled in the art that this construction is for manufacturing convenience, and the flow regulating cylinder 15 could very well be formed integral with the end ring 16.

The supporting ring 16 is received in an annular recess 3a in the second flange 3. Serving to retain the support ring 16 in place in the recess 3a is an annular plate 21 secured to flange 3 by suitable threaded fastenings 22. Ring 16 is adapted to be adjusted circumferentially relative to flange 3 so as to alter the position of the perforations 17 relative to the ports 11a. This adjustment is effected by means which will be ap-

parent from Figs. 1 and 2, including a pair of diametrically spaced studs 18 threadedly secured at one end to the ring 16, projecting through a pair of arcuate slots 3b in the flange member 3 and having another end portion with a head 18a received in a counterbore in retaining ring 19. Ring 19 is adapted to be clamped in fixed relation to the flange member 3 by a second pair of diametrically opposed locking screws 20 which, as will be apparent from Fig. 2, extend through arcuate slots 19a in adjusting ring 19 and are threaded into the flange 3.

It will be apparent from the above description that the studs 18 and adjusting ring 19 are free to be moved circumferentially relative to flange 3, during which the studs 18 traverse the arcuate slots 3b, so that the flow regulating sleeve 15 can be adjustably positioned relative to the ports 11a in the axial flange extension 11. Regulating sleeve 15 is locked in any desired adjusted position by tightening the locking screws 20. It will also be apparent that this adjustment may be readily made from the exterior of the assembly merely by stopping the grinding wheel, and without any further disassembly required than to loosen the locking screws. The position of the cylindrical flow regulator 15 may be seen from the exterior of the wheel by means of a graduated scale 3c on flange 3 having a number of arcuately spaced numbered positions cooperating with a pointer mark 19b on the adjusting ring 19.

In order to prevent accidental circumferential shifting of the flange 3 relative to the inlet flange 2 during the process of adjusting the flow regulator cylinder 15, the relative position of flange members 2 and 3 may be fixed by means of one or more axially extending dowel pins 23.

The arrangement of the perforations 17 in the flow regulating cylinder 15 is shown in Fig. 3. There are actually four circumferentially spaced sets of holes corresponding to the pattern illustrated in Fig. 3. In other words, Fig. 3 represents the perforations in one 90° segment of the cylinder 15, this pattern being repeated around the circumference of cylinder 15. As will be seen in Fig. 3, the perforations 17 are arranged in seven separate axially extending rows. The first row 17a comprises three holes spaced substantially uniformly across the face of the wheel. The second row 17b has only two holes, the middle one being omitted. In row 17c the right-hand hole is omitted; while in row 17d the left-hand hole is omitted. Row 17e has one perforation only at the left-hand side of the wheel; while row 17f has a single hole at the right-hand side of the wheel. Row 17g consists of a single perforation at the middle of the wheel. It will be seen that this pattern of perforations permits coolant to be supplied equally to all three sets of ports 11a when row 17a is aligned with ports 11a. If the particular grinding wheel used happens to be denser at the sides than at the center portion, then row 17b may be aligned with the ports 11a so that proportionally more water is delivered to the side portions of the wheel. If the operator should find that more water is required at the left-hand side of the wheel face, then the row 17c will be aligned with the ports 11a. If only a very small quantity of water is required at the extreme left-hand edge of the wheel then the row 17e would be selected; and if a small quantity of water is required at the middle of the wheel only, the row 17g would be used. It will be apparent from the pattern

illustrated in Fig. 3 that the distribution of the coolant can thus be increased to either edge or to the center of the wheel, or made uniform across the whole wheel width.

Thus the operator can, by repeatedly adjusting the flow regulating cylinder, either procure completely uniform distribution of coolant across the cutting face of the wheel, to compensate for any non-uniformity of porosity of the particular wheel, or he can deliberately unbalance the distribution of water across the face of the wheel in accordance with any special requirements of the particular grinding job being performed. Furthermore, while the coarse adjustment of ring 19 determines the distribution of water across the wheel face, by aligning the appropriate row of holes 17 with the ports 11a, the quantity of coolant admitted to the grinding wheel may be determined by the fine adjustment of regulator cylinder 15 relative to ports 11a, this fine adjustment being effected by moving the appropriate row of ports 17 slightly out of register with the ports 11a so as to reduce the effective area of the passage for the liquid. As indicated above, the coarse adjustment for the quantity of coolant supplied is provided by the flow regulating valve 10 in a supply conduit 9.

In operation, a suitable coolant liquid such as water is supplied by way of conduit 9 to the inlet chamber 7, whence it flows through the axially extending holes 13 and along the inner circumference of the distributing cylinder 14. Centrifugal force will insure that the coolant will be distributed uniformly circumferentially in the chamber 7, and any discontinuity introduced by the flow through the discrete holes 13 will again be smoothed out by centrifugal force so that the liquid is distributed uniformly on the inner circumferential surface of the cylinder 14. Since cylinder 14 is not perforated, all the coolant is discharged at the extreme edge portion 14b. As noted above, this edge portion 14b is located exactly at the middle of the wheel face width. This insures that liquid supplied to the inner circumference of the regulating cylinder 15 will flow equally to the right and left thereof so as to be distributed uniformly in an axial direction.

As described in the above-mentioned patent to Scheer, the radially extending side surfaces of the wheel may be provided with an impervious coating to prevent the loss of coolant axially from the side surfaces of the wheel, which loss would increase the consumption of the coolant and make for discomfort to the operator by reason of excess water being thrown around where it does no good.

It may also be observed that the flow regulating cylinder 15 is provided with an inwardly extending circumferential lip 15a at the left-hand edge thereof, this lip serving to prevent the overflow of coolant around the left-hand edge of the regulating cylinder 15.

In order to vent any entrained air which may be centrifuged from the coolant, an axial groove 3d is provided in the central bore of flange member 3, communicating with a radial hole 3e. The radial hole will have a centrifugal pumping effect tending to suck out the air which is separated from the coolant.

If the operator should discover that coolant is not being discharged uniformly across the wheel face width, or if he should desire for special reasons to deliberately unbalance the distribution of coolant at the cutting face, he mere-

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ly stops the wheel, loosens the two locking screws 20, shifts the adjusting ring 19 circumferentially to select a different pattern of supply holes 17, each pattern being represented by one of the indicating marks on the scale 3c. After again locking the screws 20, further operation of the wheel will determine whether the coolant distribution is as desired.

Thus it will be apparent that either the axial distribution of water across the face of the wheel or the quantity of coolant supplied can be adjusted accurately and with comparative ease without any complicated disassembly of the grinding wheel.

While a particular embodiment of the invention has been described, it will be obvious to those skilled in the art that many modifications might be made. The general arrangement of the wheel supporting flanges 2, 3 may be varied greatly so long as they are in general accordance with the above-mentioned patent to Scheer 2,380,332. Furthermore, the distributing cylinder 14 might readily be machined integral with the first bushing member 2. There could of course be more than three of the holes 11a in each axial row of a larger number of smaller holes were found to give superior results. Also the mechanism for shifting the regulating cylinder 15 relative to end flange 3 could take many forms.

In some applications where the coolant distribution need not be determined so precisely, the flow distributing cylinder 14 may be omitted and the flow regulating cylinder 15 employed by itself to determine the quantity and distribution of coolant supplied. For optimum results however the distributing cylinder 14 is used to insure best uniformity of distribution of coolant in an axial direction across the inner circumference of the flow regulating cylinder 15.

Many other changes will be obvious to those skilled in the art, and it is desired to cover by the appended claims all such changes and modifications as fall within the true spirit and scope of the invention.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. In a wet grinding wheel assembly of the type having first and second wheel support flange members one of which has an annular coolant inlet chamber with axially extending passages for admitting liquid coolant to a central recess within the grinding wheel, the combination of a wheel support cylinder connected with one bushing member and having a plurality of circumferentially spaced axial rows of ports for supplying coolant to the central recess of the grinding wheel, a flow regulating cylinder member supported from the other bushing member and disposed within and closely adjacent the inner surface of the wheel support cylinder, said flow regulating cylinder having a plurality of axial rows of differently arranged holes in varying numbers, and means for adjusting the regulating cylinder circumferentially to selectively align the rows of holes therein with said rows of ports in the wheel support cylinder whereby the quantity and distribution of water across the width of the wheel may be varied.

2. In a wet grinding wheel assembly of the type having first and second wheel support flanges one of which has an annular coolant inlet chamber with at least one axially extending passage for admitting coolant to a central recess within the grinding wheel, the combination of a first wheel support cylinder extending axially from the inlet

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bushing member and having a plurality of circumferentially spaced axial rows of ports adapted to supply coolant to the inner circumference of the wheel, a second flow regulating cylinder member supported from the other bushing member and disposed within and closely adjacent the wheel support cylinder, the flow regulating cylinder having a plurality of axial rows of differently arranged holes in varying numbers, means for adjusting the regulating cylinder circumferentially to selectively align the rows of holes therein with said rows of ports in the wheel support cylinder, and means for locking said flow regulating cylinder relative to the wheel support cylinder, whereby a desired rate of supply and distribution of coolant to the grinding wheel is effected.

3. In a wet grinding wheel assembly of the type having first and second wheel support flanges one of which has an annular coolant inlet chamber with axially extending passage means for admitting coolant to a central recess within the grinding wheel, the combination of a first wheel support cylinder extending axially from the inlet bushing member and having a plurality of circumferentially spaced axial rows of ports adapted to supply coolant to the central recess of the wheel, a second flow regulating cylinder supported from the other bushing member and disposed within and closely adjacent the wheel support cylinder, the flow regulating cylinder being provided with a plurality of axial rows of differently arranged holes in varying numbers, a third flow distributing cylinder secured to the first bushing member and disposed within and radially spaced from the second regulating cylinder, the inner surface of the distributing cylinder being adapted to receive coolant from said axially extending coolant inlet passages and the circumferential edge of the flow distributing cylinder remote from the first bushing being disposed at the middle of the width of the grinding wheel whereby the coolant is distributed uniformly in an axial direction across the width of the wheel, means for adjustably positioning the regulating cylinder circumferentially to selectively align the holes therein with the ports in the wheel support cylinder, and means for locking the flow regulating cylinder relative to the wheel support cylinder, whereby a desired rate of supply and distribution of coolant to the wheel is effected.

4. In a wet grinding wheel of the type having first and second wheel support flange members one of which has an annular coolant inlet chamber with axially extending passage means for admitting liquid coolant to a central recess within the wheel, the combination of a first wheel support cylinder extending axially from one bushing member and having a plurality of circumferentially spaced axial rows of ports adapted to supply coolant to the inner circumference of the wheel, a second flow regulating cylinder supported from the other bushing member and disposed within and closely adjacent the wheel support cylinder, the flow regulating cylinder having a plurality of axial rows of differently arranged holes in varying numbers, a third flow distributing cylinder secured to the inlet bushing member and disposed within and radially spaced from the second cylinder, the inner circumferential surface of the distributing cylinder being adapted to receive coolant from said inlet passages and the circumferential edge of the distributing cylinder remote from the inlet bushing being disposed substantially at the middle of the width of the

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grinding wheel whereby coolant is delivered to the regulating cylinder uniformly across the wheel width, and adjustable means associated with the other bushing member for retaining the regulating cylinder in a desired circumferential position relative to the wheel support cylinder to align a selected row of holes in the distributing cylinder with the ports in the support cylinder whereby the distribution of coolant across the face width of the wheel may be varied as desired.

5. In a wet grinding wheel assembly of the type having first and second wheel support flange members one of which has an annular coolant inlet chamber with axially extending passage means for admitting liquid coolant to a central recess within the grinding wheel, the combination of a wheel support cylinder connected with one bushing member and having a plurality of circumferentially spaced axial rows of ports for supplying coolant to the inner circumference of the grinding wheel, a flow regulating cylinder member supported from the other bushing member and disposed within and closely adjacent the inner surface of the wheel support cylinder, said flow regulating cylinder having a plurality of axial rows of differently arranged holes in varying numbers, and means for adjusting the regulat-

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ing cylinder circumferentially to selectively align the rows of holes therein with said rows of ports in the wheel support cylinder whereby the quantity and distribution of water across the width of the wheel may be varied, said adjusting means comprising a ring disposed at the exterior side of the second wheel support flange member, at least one connecting stud having a first end portion secured to the adjusting ring, a second end portion secured to the flow regulating cylinder, and an intermediate portion projecting freely through an arcuate slot in the second flange member, whereby the adjusting ring may be shifted circumferentially relative to the wheel flange members to position the flow regulating cylinder relative to the wheel support cylinder, and means for locking the adjusting ring in a selected position comprising at least one locking screw projecting through an arcuate slot in the adjusting ring and threadedly received in the second flange member, whereby the adjusting ring may be clamped in a desired position by tightening the locking screw.

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No references cited.