

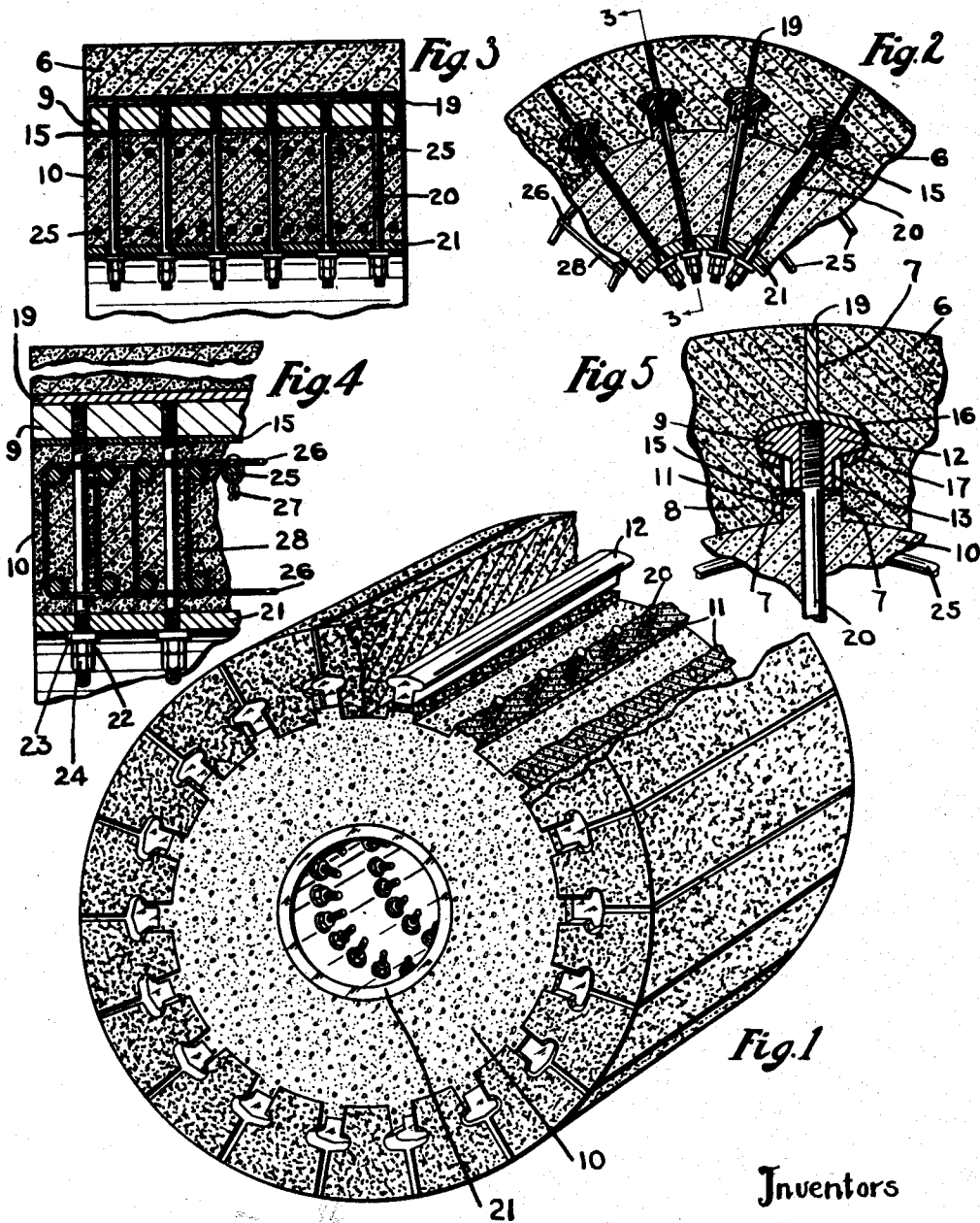
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SEGMENTAL ABRASIVE WHEEL

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SEGMENTAL ABRASIVE WHEEL

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This invention relates to grinding wheels and more particularly to a segmental grinding wheel in which the segments of abrasive grains bonded by vitrified ceramic material are mounted upon a rotary support.

It has been proposed heretofore to make a large sized grinding wheel of abrasive segments mounted on a metal drum for use in grinding wood pulp and the like. Such a segmental wheel is however expensive to manufacture, partly because of the size and weight of the drum but more because of the difficulties involved in mounting the segments on the drum. A wheel used for grinding wood pulp is subjected to enormous forces from without, owing to the fact that the logs of wood are pressed against the wheel under hydraulic pressure, as well as large internal stresses resulting from the centrifugal force set up by rotating the wheel at high speed and because of expansion and contraction of the wheel under the changes of temperature required for grinding the pulp in the presence of hot water. It has heretofore been advisable, in order to mount the segments rigidly and securely on the metal drum, to provide each segment with a metal shoe and to have the surface of the drum carefully ground to a smooth and accurate shape in order that the shoes of the segment may fit correctly thereon.

The primary object of this invention is to avoid the necessity of using a massive iron drum which must be accurately finished and shaped to fit the segments and which must be sufficiently rigid and strong to hold them under the enormous strains of the grinding operation, and particularly to provide a simple, inexpensive type of segmental grinding wheel which may be readily manufactured and assembled and which will serve efficiently for grinding wood pulp as well as various other types of material.

A further object of the invention is to provide a unitary type of grinding wheel made up of abrasive segments mounted rigidly in position on a central support, and particularly one in which the central supporting body is formed as a monolithic structure

which is substantially integral with the segments.

To the accomplishment of these objects and such others as will be apparent to one skilled in the art, we propose to utilize a concrete or other monolithic structure as the supporting body for a plurality of abrasive segments arranged on the surface thereof, and in order that the segments may be safely held in position under the enormous stresses of a grinding operation, we employ clamping blocks suitably secured to the concrete body and engaging the abrasive segments to hold them rigidly in position.

One embodiment of this invention is shown in the accompanying drawing, in which:

Fig. 1 is a perspective of the grinding wheel with several of the wedge-shaped abrasive segments removed to show the supporting concrete body, as well as the adjustable clamping blocks which secure the segments to the body;

Fig. 2 is a fragmentary detail in sectional elevation showing the abrasive segments, clamping blocks and the adjustable bolts embedded in the concrete and securing the segments in position;

Fig. 3 is a sectional elevation on the line 3-3, Fig. 2;

Fig. 4 is an enlarged sectional elevation similar to Fig. 3, but taken on a different line on Fig. 2, showing the reinforcing members which straighten the concrete body; and

Fig. 5 is a fragmentary detail in sectional elevation showing, enlarged, the abrasive segments in their assembled position.

The embodiment of our invention illustrated in the drawing comprises a plurality of segments 6, composed of abrasive grains bonded by suitable material, such as vitrified ceramic material, which are mounted with their side faces 7 spaced apart to form an annular grinding body. The inner portions 8 of the segments are secured in position by means of clamping blocks 9 suitably secured to the inner concrete cylinder 10. In the form illustrated, the segments are secured against lateral, circumferential motion by the ribs 11 on the cylinder located between the inner ends of the segments.

The clamping blocks 12, in the form illustrated comprise wedge shaped heads formed on the outer ends of rectangular webs 13. These webs may rest on strips of elastic material 15, such as rubber or other resilient material, suitably placed between the bottoms of the webs and the ribs 11 to prevent the concrete from flowing around the webs when the central body is cast, and yet provide a pad of sufficient springiness to permit the tightening of the clamping blocks.

Each segment, at the lower portions of the reentrant shoulders 16, is provided with an inner facing shoe 17 of lead cast integrally thereon and bonded intimately with the porous surface of the segment. These shoes 17, which extend the full width of the segments, have a fitting engagement with the lower portions of the blocks 6 (Fig. 5). The interstices between the adjacent faces 7 of the segments are filled with a suitable cementitious filler 19, such as lead, which is poured in a molten state so that the heads 12 become completely covered (Fig. 5).

Each clamping block 12 is connected to a mandrel 21 within the concrete cylinder 10 by a plurality of bolts 20, which are incased in the concrete. The upper ends of the bolts 20 are threaded into the webs 13 while the lower ends of the bolts pass loosely through the mandrel 21. The bolts 20, which may be somewhat elastic under tension, have nuts 22 and washers 23 thereon, serving to secure the bolts to the mandrel 21, a locking nut 24 being used to prevent the parts from becoming loosened.

The concrete cylinder 10 is preferably reinforced. To this end numerous concentric circular hoops 25 are arranged as shown in Figs. 2, 3 and 4. A plurality of cross rods 26 are connected to the peripheries of the hoops 25 by a twisted wire tie 27 which is wrapped around the hoops and rods at each point of contact. The two concentric rows of hoops are also connected by wires 28 which have their respective ends twisted about the hoops.

To construct the grinding wheel, the reinforcing net-work composed of the hoops 25, the rods 26 and wires 28, is formed loosely around the mandrel 21. The clamping blocks are then threaded upon the upper ends of the bolts 20, the lower ends of which are inserted through the holes in the mandrel and then provided with the washer 23, the nut 22 and the nut 24. The nuts 22 and 24 are adjusted to allow the clamping blocks to be withdrawn and positioned from the mandrel the proper distance in which they may be braced by temporary wooden braces or by sleeves of metal or other material surrounding the bolts, and which may form a permanent part of the wheel structure.

After the clamping blocks are braced outwardly from the mandrel, the wedge shaped

abrasive segments are slipped sidewise between the pairs of blocks 12, and they interlock with the reentrant shoulders 16 and engage the lead facing shoes 17. After the various segments have been placed in position, the crevices between the segments are then wedged to hold the grinding surfaces thereon in the proper relative relation. This may necessitate adjustment of the position of the blocks 12 through manipulation of the nuts 22 and 24.

When the segments are all assembled in position and wedged apart to form the proper cylindrical grinding surface they are bound with wire so that they may be up-ended upon a circular form forming a base upon which to pour the concrete. The temporary braces, if they were used, are removed and the bolts 20, between the mandrel and the webs 13 are provided with sleeves of heavy grease. The concrete is now poured into the space between the mandrel and the segments. During this operation the reinforcing net-work may be held in its proper central position without difficulty. The fluid concrete flows into engagement with the bottom faces of the segments and fills the interstices between the packings 15 beneath the clamping blocks and the side faces 7 of the segments, thus forming the ribs 11 on the concrete cylinder 10. The concrete makes an intimate bond with the porous surface of the segments.

After the concrete has set, the wires binding the segments together and the wedges between the adjacent faces of the segment are removed. The nuts 22 are now sufficiently tightened so that the greased bolts 20 pull the heads 12 of the clamping blocks against the facing shoes 17, tightly squeeze the elastic strips 15 between the web bottoms and the ribs 11, and draw the segments down into firm contact with the surface of the concrete cylinder 10. This tightening process places the elastic bolts under longitudinal tension. The bolts thus permit expansion of the wheel upon heat, and contraction of the wheel upon cooling. After this operation the lead filler 19 is poured into the crevices between the adjacent faces of the segments down to the heads of the clamping blocks 12 which are covered by the filler. The end faces of the concrete cylinder are then provided with suitable flanges whereby the grinding wheel may be supported upon a driving spindle.

It will be apparent to those skilled in this art that changes may be made in the details of construction and in the steps of the method, the described and illustrated embodiment of the invention being intended as an exploitation of its underlying essentials, the features whereof will be definitely stated in their true scope in the claims hereto appended. It will also be understood that one may construct

a wheel, by this method, which grinds on one plane end face, and that various other shapes as well as sizes of wheel may be thus made. It will also be understood that we may utilize in place of concrete various types of fluid material capable of being poured or molded in situ and of setting to a hard condition, and forming a support for the abrasive blocks.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. That improvement in the art of making grinding wheels which consists in arranging a plurality of abrasive segments independently of their final support in such a position as to form a grinding surface, then forming the internal supporting structure for all the segments in situ and thereafter adjustably forcing the segments radially inwardly into position on said structure.

2. That improvement in the art of making grinding wheels which consists in connecting loosely a plurality of clamping blocks to a mandrel, arranging a plurality of abrasive segments between and in operative relation to said blocks and spaced from said mandrel to form a grinding surface, filling the interstices between the mandrel and the segments with a fluid material capable of solidifying and forming a support for the segments, causing said material to harden and thereafter adjustably drawing the clamping blocks towards the mandrel and thereby fixing the segments rigidly in position on the support.

3. That improvement in the art of making grinding wheels which consists in building loosely around a mandrel a reinforcing network, connecting loosely a plurality of clamping blocks to the mandrel, arranging a plurality of abrasive segments between said blocks in a position spaced from the network to form a cylindrical grinding surface, and then filling the interstices between the mandrel and the segments with a fluid material capable of solidifying and forming a support for the segments.

4. That improvement in the art of making grinding wheels which consists in arranging a plurality of porous segments of abrasive grains bonded by vitrified ceramic material independently of one another and their final support in such a position as to form a grinding surface, embedding the lower portions of said segments in a fluid material capable of solidifying in an intimate bonded relation with the porous surfaces of all the embedded segments and forming a support therefor, and thereafter forcing the segments radially inwardly into a firm position on said support.

5. That improvement in the art of making grinding wheels which consists in bolting loosely a plurality of clamping blocks to a mandrel, arranging a plurality of abrasive segments between said blocks in a position

spaced from said mandrel to form a cylindrical grinding surface, filling the interstices between the mandrel and the segments with a fluid material capable of solidifying to form a support for the segments and then connecting the blocks to the mandrel with elastic tension.

6. The method of making a grinding wheel comprising the steps of assembling a set of abrasive segments in a spaced annular arrangement independently of their final support so as to form a grinding surface, casting a body of solidifiable material within the annulus and in intimate contact with the bottom faces of the abrasive segments so as to form a supporting seat therefor, then after said body has solidified forcing the segments radially inwardly into firm contact therewith, and filling the crevices between the segments.

7. A grinding wheel comprising a plurality of abrasive segments arranged as an annulus, a rotary support of material molded in situ which contacts with and fits intimately against the adjacent surfaces of the segments, and adjustable means for drawing the segments radially inwardly and securing them rigidly in position on the support.

8. A grinding wheel comprising a plurality of abrasive segments arranged as an annulus, a support therefor having its surface molded against and forming a supporting seat for the inner faces of the segments and means, including adjustable clamping members secured to the support and cooperating shoulders on the segments, for forcing the segments radially inwardly and securing them in firm contact with the support.

9. A grinding wheel comprising a plurality of abrasive segments arranged in spaced relation as an annulus, a body of cement within and forming substantially the sole support for the annulus, the outer surface of which fits intimately against the irregular surface of each abrasive segment, adjustable means for forcing the segments radially inwardly into firm contact with said body, and a filler in the interstices between adjacent faces of the segments.

10. A grinding wheel comprising a plurality of abrasive segments arranged in spaced relation as an abrasive annulus, a supporting body molded in position against and intimately fitting the inner surfaces of said abrasive segments, said body forming substantially the sole support for the segments, adjustable means to force the segments radially inwardly into position on the supporting body, and a filler in the interstices between adjacent faces of the segments.

11. A grinding wheel comprising a cylindrical body having a plurality of channels formed laterally therein, a plurality of abrasive segments seated in said channels, a plurality of clamping blocks, each being located between and engaging the sides of adjacent

segments, said blocks and segments having cooperating interlocking surfaces, and adjustable means for securing each block to said body.

5 12. A grinding wheel comprising a cylindrical body having a plurality of channels formed laterally therein, a plurality of abrasive segments seated in said channels, each segment having reentrant shoulders formed
10 on its opposite side faces and facing shoes thereon, clamping blocks, each engaging the shoes of a pair of adjacent segments, and a filler in the interstices between adjacent faces of the segments.

15 13. A grinding wheel comprising a central mandrel, a concrete cylinder encasing the mandrel, a plurality of abrasive segments embedded in the surface of said cylinder, a plurality of clamping blocks between the seg-
20 ments, said blocks and segments having cooperating, interlocking surfaces and bolts secured to the concrete cylinder and connecting each block and the mandrel.

25 14. A grinding wheel comprising a central mandrel, a reinforced concrete cylinder encasing the mandrel, a plurality of abrasive segments on the surface of said cylinder, a plurality of clamping blocks between the seg-
30 ments, said blocks and segments having cooperating interlocking surfaces, bolts connecting each block with the mandrel which are arranged to move freely through the concrete, and a filler in the interstices between adjacent faces of the segments.

35 15. A grinding wheel comprising a mandrel, a series of abrasive segments surrounding but spaced from the mandrel and forming a grinding surface, clamping blocks adjust-
40 ably secured to the mandrel and the segments to hold the latter against outward movement, and a filling of concrete between the mandrel and the segments which serves as the support for the segments.

45 16. A grinding wheel comprising a mandrel, a series of abrasive segments arranged around but spaced at a considerable distance from the mandrel to form a grinding sur-
50 face, the segments having clamping shoulders thereon, blocks engaging said clamping shoulders, adjustable means for forcing the blocks inwardly towards the mandrel, a cementitious filler between the segments, and a rigid molded body between the mandrel and segments having intimate contact with
55 the segments and serving substantially as the sole support therefor.

60 17. A grinding wheel comprising a series of abrasive segments arranged as an annulus and provided with clamping shoulders, clamping blocks engaging said shoulders, a
65 molded body within the abrasive annulus which contacts directly with and forms a support for the segments and adjustable means including adjustable members embedded in said body to force the segments radially in-

wardly and secure them rigidly on said support.

70 18. A grinding wheel comprising a series of abrasive segments in an annular arrangement which have clamping shoulders thereon, clamping blocks engaging said shoulders, a molded body in the space within the annulus which makes intimate contact with the segments and forms a rigid and substantially
75 the sole support for the same, adjustable members movable within said body and engaging the blocks and means associated therewith permitting said members to be drawn inwardly to clamp the blocks tightly against the body.

80 19. A grinding wheel comprising a body of molded concrete having ribs thereon, a series of abrasive segments mounted on said body and having clamping shoulders and portions between the ribs to prevent circum-
85 ferential displacement, clamping blocks engaging said shoulders, tie rods connected with the blocks and movably embedded in the concrete, and means for adjusting said rods to secure the segments rigidly in position.

90 20. A grinding wheel comprising a massive body of concrete forming a support, abrasive segments mounted on said support and forming a grinding surface, clamping
95 members engaging the segments and adjustable means associated therewith which serve to draw the segments radially inwardly into a rigid relationship to the support.

Signed at Worcester, Massachusetts, this
29th day of March, 1928.

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GEORGE N. JEFFSON.

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