Oct. 26, 1926. 1,604,943

T. LARSSON

SEGMENTAL GRINDING WHEEL

Filed Feb. 9, 1925 2 Sheets-Sheet 1

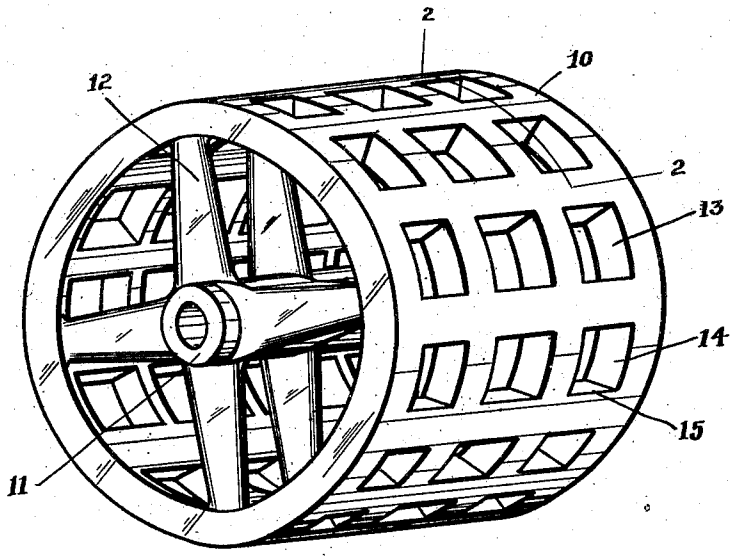


Fig. 1

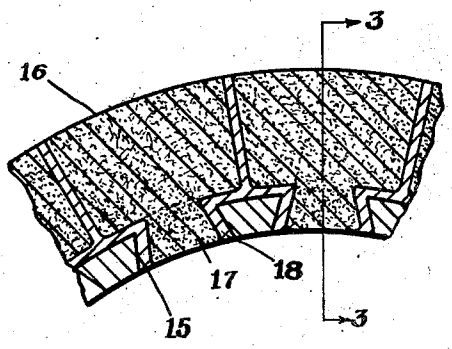


Fig. 2

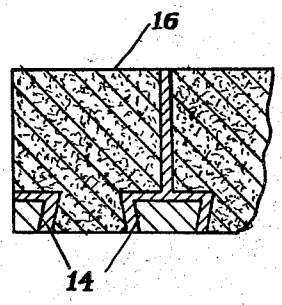


Fig. 3

WITNESSES.

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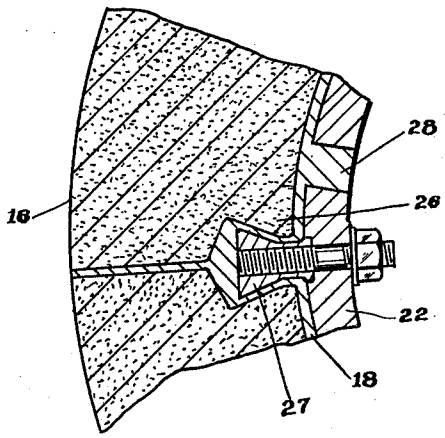
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Fig. 7



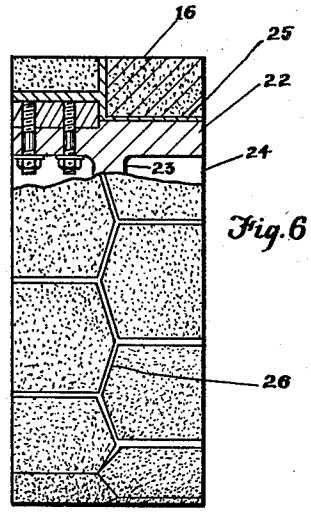


Fig. 6

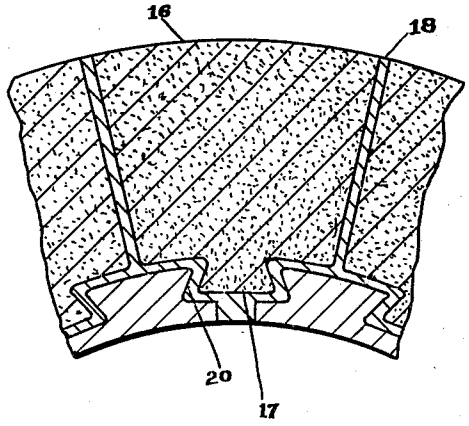


Fig. 5

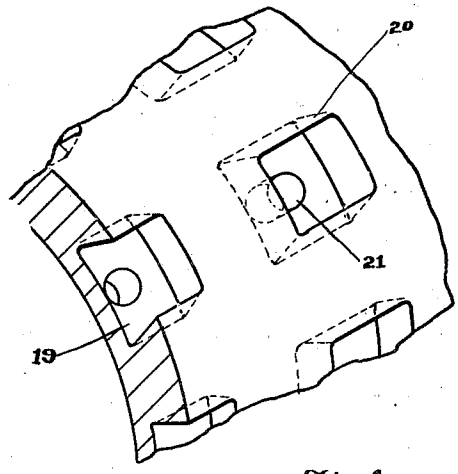


Fig. 4

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UNITED STATES PATENT OFFICE.

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SEGMENTAL GRINDING WHEEL.

Application filed February 9, 1925. Serial No. 7,769.

This invention relates to abrasive wheels and more particularly to a segmental grinding wheel of artificial abrasive bonded with an appropriate binding agent, such for example, as a ceramic material, and which is particularly adapted for grinding wood pulp. The invention has for its object the provision of certain expedients which tend to eliminate many of the difficulties encountered in the manufacture and use of grinding wheels of this type.

In the manufacture of paper from wood it has heretofore been customary to grind logs with an abrasive wheel of natural sandstone, or abrasive granules bonded with cold set cement, as an abrasive element. The cement bonded stones are ordinarily used only in cold grinding processes, whereas the process most generally employed in this country involves grinding with but little cooling water and utilizing the frictional heat evolved to loosen the bond between the pulp fibres. In the practice of this process a temperature as high as 160° to 180° F. is advantageous. The cement bonded stones are detrimentally affected by the combination of heat and water.

In order that sandstone may be used for making pulp containing long fibres, it has been found necessary to provide high ridges on the cutting face. This procedure, which is known to the trade as burring the stone, is wasteful of the expensive stone and consumes valuable time which should be devoted to grinding pulp. Moreover, the ridges on such a soft wheel do not stand up under the severe strain of grinding and must be renewed at frequent intervals; hence the stone is short-lived.

Various efforts have been made to employ a grinding wheel of the type used in the metal industry but heretofore this has not proven successful. A stone as large as is normally required for grinding wood pulp efficiently is difficult to manufacture, and the firing of such a large piece in a commercial kiln is likely to produce a wheel not properly annealed and therefore susceptible to breakage during use. An attempt has been made to use stones made up of disc sections placed side by side, but the differential expansion of such a wheel structure and its metal mounting may introduce strains into the wheel likely to cause breakage.

Heretofore, in the manufacture of segmental pulp grinding wheels it has been customary to assemble the abrasive segments upon a rotatably mounted drum by sliding the abrasive segment in between two wedge blocks or wedge shaped members properly spaced around the periphery of the drum. These wedge shaped members have been positioned in various ways upon the drum surface, such for example, as parallel to the axis of the drum, or circumferential with the drum. The segments were provided with a bottom portion properly shaped to fit against and be secured to the drum by these wedge shaped members. The crevice between adjacent segments was then supplied with an appropriate cementitious material from the exterior of the grinding wheel. It was practically impossible to properly support the segments around the positioning members and the drum surface. These wheels have not been entirely satisfactory because the abrasive segments frequently crack, resulting in the early deterioration of the grinding wheel. Moreover, in general, the heretofore customary method of assembling the segments upon the drum is cumbersome and tedious.

I have discovered that the life of a pulp grinding wheel may be very materially increased by properly supporting the abrasive segments on the drum. This may be accomplished by appropriately supplying a cementitious material around the abrasive segments. I may employ any appropriate cementitious material, such for example, as molten sulphur, Portland cement, metallic lead, or Babbitt metal. Preferably, I employ a cementitious material which will wear away, when hardened, at substantially the same rate as the abrasive segments. I have obtained most satisfactory results with an alloy composed for the most part of tin and containing relatively small amounts of antimony and copper.

The present invention contemplates the provision of certain means whereby the abrasive segments may be assembled on and secured to the drum with comparative ease, and whereby a cementitious material may be appropriately supplied around the segments to properly support the same on the drum. In accordance with the invention, I provide a rotatably mounted drum having openings so shaped and arranged that a bottom or reduced portion of the abrasive segments may

be inserted therein and permit supplying a cementitious material from the interior of the drum to properly support and secure the segments to the drum, the top surface of the segments forming a substantially cylindrical grinding surface.

The drum may have openings of any one of various forms. Thus, the openings may be tapered to the interior of the drum and the bottom or reduced portion of the abrasive segment placed therein, and properly supported and secured by supplying a cementitious material from the interior of the drum.

It is sometimes desirable to provide the drum with openings which have upper or outer parts into which the bottom or reduced portion of the abrasive segment may be placed, and lower or inner parts of reduced section leading to the interior of the drum. In certain instances, it may be feasible to provide the abrasive segment with an irregular bottom or reduced portion and at the same time provide the lower or reduced part of the opening with an irregular or inclined wall. Preferably, the upper part of the opening is provided with an inclined or irregular wall and the bottom or reduced portion of the abrasive segment is provided with an irregular or wedge shaped section. If desired, the corresponding opposite sides of the upper parts of a series of openings may be removed forming a single large upper part with a plurality of lower or reduced parts leading to the interior of the drum.

In either case the bottom or reduced portions may be slightly smaller than the openings so that the segments may be easily dropped or placed within the openings, or if desired, the bottom portion of the segment may fit relatively close within the opening. In all cases the segments are located within the openings in an interfitting or interlocking relation.

In any event, in accordance with the provisions of the invention, the drum is provided with openings which may serve the dual function of affording means for locating or locking the abrasive segments on the drum as well as means to permit supplying an appropriate cementitious material from the interior of the drum for easily and properly supporting the segments on the drum. It is preferable to so construct the opening, and when employing an opening having a reduced lower part, to so construct the upper part of the opening, that the bottom or reduced portion of the abrasive segment will interfit or interlock therewith so as to be securely supported to the drum by an appropriate cementitious material.

The wall of each opening and that of the bottom or reduced portion of each segment may be inclined or have an irregular shape, or the wall of the bottom portion of each segment and the wall of the lower or reduced part of each opening may be inclined or have an irregular shape. By irregular, I mean a surface having indentations or projections, or both.

The upper parts of the openings may be constructed either integral with the drum or may be detachable therefrom and are so shaped and arranged in accordance with the invention to best suit the requirements of the particular pulp stone. In general, the openings form cross bars or positioning members arranged between the segments in an interfitting or interlocking relation.

The invention will be more clearly understood from the following description in conjunction with the accompanying drawings in which:

Figure 1 is a diagrammatic view of a drum construction embodying the invention;

Fig. 2 is a sectional view of a portion of the drum taken along a plane perpendicular to the axis of the drum of Fig. 1 and with the abrasive segments assembled;

Fig. 3 is a similar sectional view taken along a plane through the axis of the drum;

Fig. 4 is an isometric view of a portion of a modified drum construction;

Fig. 5 is a sectional elevational view of a portion of the modified construction of Fig. 4 with the abrasive segments in position;

Fig. 6 is an elevational end view in partial section of a further modification of drum construction; and

Fig. 7 is a sectional elevational side view of a portion of the drum construction of Fig. 6.

In one embodiment of the invention as illustrated in Figs. 1, 2 and 3 of the drawings, a hollow drum 10 is rotatably mounted upon a shaft 11, and supported thereon by means of spokes 12. The drum surface may have a web-like appearance by the provision of a plurality of appropriately spaced openings 13 having faces 14 and 15, which preferably have a plane or inclined surface but which may have an irregular shape or surface. The openings 13 are so spaced along and around the drum that when a properly shaped bottom or reduced portion of an abrasive segment 16 is placed in the openings, a relatively smooth and substantially continuous grinding surface is formed.

The abrasive segments 16 may have downwardly depending bottom portions 17 adapted to be easily inserted in the openings 13 so as to provide sufficient space therebetween to permit supplying an appropriate cementitious material 18 around the abrasive segments. In general, the openings 13 are so shaped and arranged as to serve as locating or positioning members for properly assembling the segments 16 in an interfitting or interlocking relation therewith. The openings thus serve to securely lock

the segments on the drum by cooperation with the supporting cementitious material which may be supplied from the interior of the drum. Preferably, the downwardly depending bottom portion 17 of each abrasive segment has faces inclined so as to be substantially parallel to the inwardly inclined walls 14 and 15 of the openings 13 when the segments are properly positioned on the drum. The faces or walls of the segments, however, may have an irregular surface or shape.

In assembling the abrasive segments on the drum, they may be inverted and placed upon a concave platform and the platform then raised until the reduced or bottom portions of the abrasive segments pass into the openings 13 so as to leave a small space between the segments and the drum surface and the walls 14 and 15 of the openings 13. A cementitious material 18 may be easily inserted from the interior of the drum through the openings 13 into the relatively small spaces between the abrasive segments and the drum so as to properly support the segments thereon. When the cementitious material has solidified or hardened sufficiently, the drum 10 is appropriately turned and another set of segments placed within the openings 13 and properly secured and supported on the drum in the same manner. This procedure is followed until all the abrasive segments have been assembled on the drum.

In Figs. 4 and 5 I have illustrated a modified form of drum construction. In this construction the drum is mounted in any appropriate manner for rotation and is provided with a plurality of properly spaced openings having upper or outer parts 19 into which the bottom or reduced portions of the abrasive segments may be placed or located. Preferably, the upper parts 19 of the openings are provided with inclined walls 20, but it will be understood that these walls may have any desired shape or configuration, such as a plane or irregular surface. The openings have lower parts or holes 21 providing communication between the interior of the drum and the upper parts 19 of the openings to permit supplying an appropriate cementitious material 18 for properly supporting and securing the segments to the drum. The walls or surface of the lower parts 21 of the openings may have any desired configuration which may be plane, inclined or irregular.

The abrasive segments are assembled on this modified form of drum construction in the upper parts 19 of the openings in exactly the same manner as in the drum construction previously described, or in any other appropriate manner. The upper parts 19 of the openings serve as positioning members for locating the abrasive segments in an interfitting or interlocking relation therewith, and as locking members in operative association with the cementitious material and cooperate therewith to lock and properly support the segments on the drum.

In Figs. 6 and 7 of the drawings, I have illustrated a further modification of drum construction embodying the invention, and in which the corresponding opposite sides of the upper parts of a series of openings are removed forming a single large upper part with a plurality of lower or reduced parts leading to the interior of the drum. A drum 22 is suitably mounted for rotation upon a central shaft (not shown) and is supported thereon by means of central webs 23 and radial webs 24. The drum 22 has an outer cylindrical surface 25 which preferably is shaped fairly accurate. The segments 16 are so shaped that when mounted on the drum they fit rather close to the surface 25 and form an outer substantially cylindrical abrasive surface. In order to make a wide wheel, it is preferable to employ more than one row of abrasive segments on the drum and these may be shaped as illustrated to form staggered joint lines 26 which will minimize the tendency for slivers to be carried past in the crevices between the rows of segments.

The bottom portions 17 of the abrasive segments 16 are adapted to be positioned between or in an interlocking relation with positioning or locating members 27, which may be of any desired form but preferably are wedge shaped. The positioning members 27 should be secured rather rigid to the drum 22 and either may be integral therewith or adjustably mounted thereon. It should be noted that in this modification of drum construction the upper parts of the openings are formed between the positioning members 27 and are relatively large and in the nature of slots. These realtively large upper parts of the openings each have a plurality of lower or reduced parts 28 or holes to permit supplying an appropriate cementitious material from the interior of the drum for properly supporting the abrasive segments on the drum.

It should be noted that in each of the modifications hereinbefore described, the segments are so formed, preferably, that the peripheral lines of contact between adjacent rows of segments are staggered. This minimizes the tendency for slivers to be carried past in the crevices between the rows of segments.

In service, pulp wheels are subjected to varied stresses of large magnitude and unless the segments are properly supported and secured upon the drum they crack, and the wheel is soon rendered useless. Heretofore, in the manufacture of plup wheels no provision has been made for properly sup-

porting the segments on the drum; and in fact, it has been practically impossible to properly support the segments on the drum. In accordance with the invention these difficulties are substantially eliminated by the provision of means for appropriately supplying a suitable cementitious material around the abrasive segments. Thus, the invention not only simplifies the manufacture of the wheels for grinding wood pulp but, also, provides a wheel capable of standing up under the severe requirements of the pulp grinding operation, and one which will give long and efficient service.

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

1. A grinding wheel comprising a hollow rotatably mounted drum, abrasive segments thereon, means for locating the abrasive segments on the drum in operative association with openings from the interior of the drum to the abrasive segments, and a cementitious material cooperating with said locating means for supporting the segments on the drum.

2. A grinding wheel comprising a hollow rotatably mounted drum and abrasive segments thereon, the drum having openings each of which have an upper part adapted for positioning the segments thereon and a lower part of reduced cross section permitting supplying an appropriate cementitious material from the interior of the drum for properly supporting the segments thereon.

3. A grinding wheel comprising a rotatably mounted drum, abrasive segments thereon, locking members spaced on the drum between inner reduced portions of adjacent segments and positioned in an interfitting relation therewith for locating the segments on the drum, the drum having holes therethrough between said members through which an appropriate cementitious material may be supplied to properly support the segments on the drum.

4. A grinding wheel comprising a rotatably mounted drum, abrasive segments thereon having bottom portions with inclined walls, the drum having openings therethrough with inclined walls positioned in an interfitting relation with the bottom portions of the segments and permitting supplying an appropriate cementitious material from the interior of the drum for properly supporting the segments thereon.

5. A grinding wheel comprising a rotatably mounted drum, abrasive segments thereon having bottom portions with inclined walls, the drum having openings each of which have an upper part and a lower part of reduced section permitting supplying an appropriate cementitious material from the interior of the drum for properly supporting the segments thereon, the upper parts of the openings having inclined walls and forming positioning members arranged in an interfitting relation with the bottom portions of the segments.

Signed at Worcester, Massachusetts, this 3rd day of February, 1925.

THURE LARSSON.