March 24, 1936. W. H. McGILL 2,035,173

GRINDING STONE

Filed Oct. 9, 1929

Fig. 1

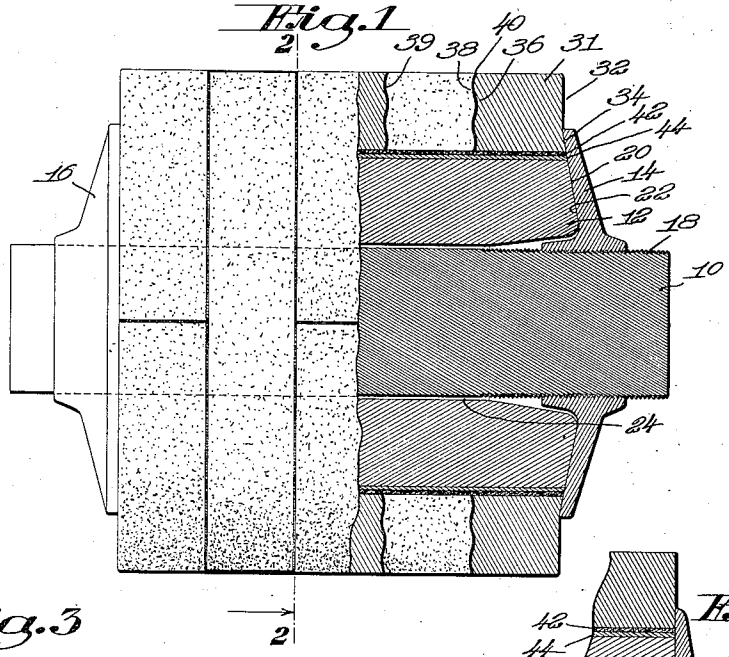


Fig. 3

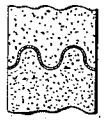


Fig. 2

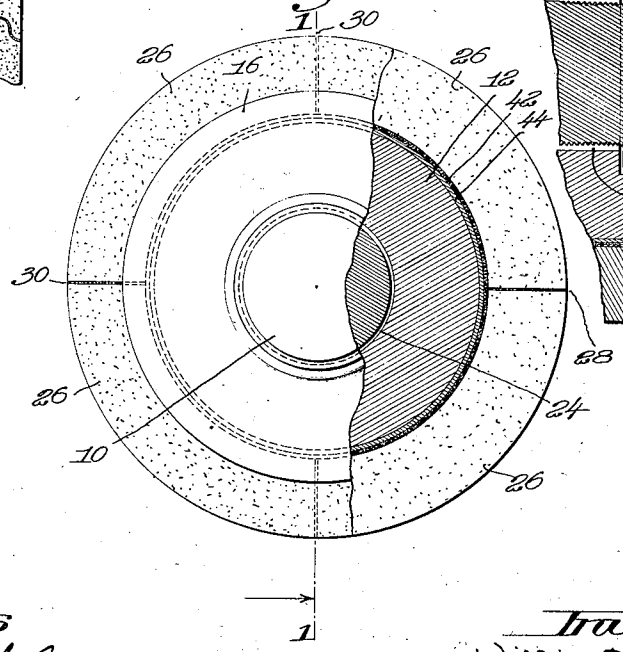
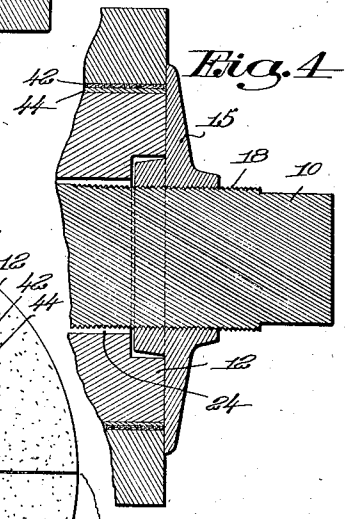


Fig. 4



Witness

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GRINDING STONE

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11 Claims. (Cl. 51—207)

The present invention relates to grinding stones or wheels adapted for various purposes, but more particularly for the grinding of pulp wood.

Pulp grinding has commonly been performed with natural sandstone wheels, although suggestions have been advanced looking toward the use and employment of artificial stones for this purpose, such stones being made of emery, carborundum and other grinding materials commonly employed. The natural sandstones are well adapted for grinding fibrous materials, such as pulp wood, and successfully accomplish the intended purpose, that is, the shredding of the pulp logs, with a minimum disintegration and shortening of the fibre. Suggestions advanced to date for the substitution of artificial stones for this purpose have not achieved any considerable practical value for a variety of reasons, principally because of the structural difficulty in properly mounting the artificial stone, either in the form of segments or rings, in a manner to accomplish the desired function without premature failure, due to breakage or other causes.

The object of the present invention is to provide a grinder particularly adapted for pulp wood which permits the employment of artificial stone with a standard performance comparable to that of natural stone, and with a simplicity and compactness of construction which permits the cost of manufacture to be maintained within reasonable and practical limits.

With this primary object in view, a feature of the invention contemplates the assembling of one or more grinding elements of artificial stone or abrasive material upon a hub or core of natural stone, the individual grinding elements, if more than one are employed, being interlocked and connected in a fashion to resist the relatively great centrifugal forces initiated in the grinding operation, and the plurality of grinding elements being connected to the natural stone core in a manner to cause the combined core and grinding periphery to function as a single unitary structure.

Still further features of the invention consist in certain novel features of structure, combinations and arrangements of parts hereinafter described and claimed, the advantages of which will be obvious to those skilled in the art from the following description.

In the accompanying drawing illustrating the preferred form of the invention,

Fig. 1 represents a side elevation of a pulp grinder embodying the features of the invention, with a portion broken away on the line 1—1, Fig. 2, and shown in section;

Fig. 2 is an end elevation of the stone shown in Fig. 1, with a portion broken away on the line 2—2, Fig. 1;

Fig. 3 is a detail illustrating a modified form of joint between the individual segments of the grinding ring; and

Fig. 4 is a detail illustrating an alternative form of holding collar or flange for locking the stone to the shaft.

The grinding assembly shown in the illustrated embodiment of the invention is conveniently mounted upon a supporting shaft **10**. Surrounding this shaft is a hub or core **12** of natural sandstone, having a bore somewhat greater than that of the shaft to permit the shaft to be loosely received therein. The core is engaged at opposite ends by collars or flanges **14** and **16**, which may be threaded upon the shaft, as indicated at **18**. The retaining collars are provided with axially inclined clamping surfaces **20**, which engage with similarly inclined surfaces **22** formed at opposite ends of the core, and serving to rigidly clamp the core not only against axial displacement, but resisting centrifugal action tending to expand and rupture the core in a radial direction. As indicated, the core is engaged by the clamping and retaining collars throughout the areas formed by the inclined surfaces, the inner axial bore **24** being free of contact with both the supporting shaft **10** and the hub portions of the retaining collars. As an alternative, the core may be engaged by the form of collar illustrated at **15**, which is threaded upon the shaft and is provided with a plane clamping surface which engages the end face of the core and surrounding abrasive rings. It is to be understood that the method of supporting and clamping the grinding wheel to the arbor or shaft may be of standard construction and design, and does not necessarily form a part of the present invention. Surrounding the core and serving as the active grinding element are a series of rings of abrasive material, commonly referred to as artificial grinding materials. Materials presumably suitable for this purpose may be made of silicon carbide, aluminous abrasive, or other suitable abrasives known and recognized in the trade for this purpose.

In the embodiment of the invention illustrated in the drawing, the grinding surface is formed of a series of rings disposed axially of the grinding element, each ring in turn consisting of a plurality of segments rigidly united. As indicated, pairs of semi-circular segments **26**, two in num-

ber, are assembled to form a completed ring having radial joints 28. The segments are preferably bonded to one another at the joints by a cement of phenolic resin, such as Bakelite, indicated at 30. The outer segments, that is to say, segments at opposite ends of the grinding cylinder, have their inner faces provided with concentric ribs and grooves or flutes, which interlock with similarly formed and complementary ribs and grooves or flutes upon the next adjacent ring. This construction is indicated more particularly in Fig. 1, in which an outer ring 31 is provided with a substantially plane outer face 32 terminating in an outwardly flared bottom portion 34 for engagement by the clamping collar, and an inner ribbed or fluted face 36 which complements a similarly fluted face 38 formed upon the next adjacent ring. The intermediate or inner rings are fluted upon opposite faces, as at 38 and 39, the outer ring at the opposite end of the stone being similar to the ring 31.

With this construction the plurality or series of grinding rings disposed axially of the assembly are rigidly interlocked through the action of the clamping collars, and are caused to resist rupturing strains engendered in the operation of the assembly through the provision of the interlocking ribs. The plurality or rings are united into a single unitary whole through the employment of a Bakelite cement joint indicated at 40, which may be similar to the material employed for uniting the individual segments.

The entire grinding assembly, as indicated, surrounds the core of natural stone 12, and is bonded thereto by a joint of cementitious material, such as Bakelite, indicated at 42. Under certain conditions it may be desirable, and in fact, essential, that a cushion be interposed between the outer grinding periphery and the natural stone core, and for this purpose is indicated an inner cushion of rubber compound 44, immediately surrounding the core 12 and bonded both to the core and the layer of phenolic resin which, in turn, bonds the core to the outer ring of abrasive material. By virtue of this cushion a movement of limited extent is permitted between the outer grinding ring and the supporting core. This cushion affords compensation, if necessary, during the use and employment of the assembly and the varying temperatures which it is compelled to assume. In the usual practice, the assembly of the outer grinding elements and inner core, together with the cushion of rubber compound and cementitious layer of phenolic resin, is vulcanized and bonded into a single unitary whole by a common operation. In this connection it is to be understood that the desired cushioning effect between the core and outer periphery of the grinding assembly may be secured through the employment of materials other than rubber or rubber compounds, it being conceivable that certain elastic cements, such as mixtures of Bakelite and fibre, may be satisfactorily employed for this purpose. I have also found it desirable to assemble the construction at temperatures approximately the same or somewhat greater than the temperature to which the assembly is elevated in actual practice. This method of assembly insures against the imposition of strains upon the completed structure, due to differences in expansion and contraction under the influence of temperature when the grinder is in active operation. Inasmuch as the temperature of these grinders in use approximates steam temperatures, it will be evident that otherwise the completed assembly may conceivably be subjected to rupturing strains of considerable moment, due entirely to the unequal expansion of the elements entering into the assembly.

Although I have indicated the joint between individual segments as plane, it may be conceivably scroll-shaped to interlock the ends of the segments, as indicated more particularly in Fig. 3.

I claim:

1. A grinding wheel comprising a natural stone core, a built-up cylinder of abrasive material surrounding the core, a concentric cushion of rubber compound interposed between the core and cylinder, and a phenolic resin or similar cementitious material bonding the ring and core in permanent relation.

2. A grinding wheel comprising a series of concentrically arranged abrasive rings formed of abrasive segments having cylindrical outside and ribbed and grooved lateral surfaces, the ribs and grooves of said lateral surfaces being concentric to the cylindrical surfaces and interfitting with the ribs and grooves of adjacent segments, and the joints between segments of each ring displaced at an angle about the axis of said rings with respect to the corresponding joints between segments of one or more adjacent rings.

3. A grinding wheel comprising a series of concentrically arranged abrasive rings formed with cylindrical outside and ribbed and grooved lateral surfaces, the ribs and grooves of said lateral surfaces being substantially concentric to the cylindrical surfaces and interfitting with the ribs and grooves of one or more adjacent rings, and means for preventing separation of said lateral surfaces.

4. A grinding wheel comprising a plurality of semi-circular abrasive segments assembled in pairs to form a series of abrasive rings, each with a cylindrical grinding surface having radial joints between segments and each pair of segments arranged concentrically in abutting relation with one or more other pairs but with radial joints between segments displaced at an angle of ninety degrees about the axis of the grinding surface with respect to the corresponding joints between segments of an adjacent pair.

5. A grinding wheel comprising a series of concentrically arranged abrasive rings formed of a plurality of abrasive segments having cylindrical outside and ribbed and grooved lateral surfaces, the ribs and grooves of said lateral surfaces being arranged concentric to the cylindrical surfaces and interfitting with the ribs and grooves of one or more adjacent segments, and means for preventing separation of said lateral surfaces.

6. A wood pulp grinding wheel comprising a natural stone core and a built-up cylinder of concentrically arranged abrasive rings surrounding the core to form a continuous axially extending surface, the rings having complementary ribs and grooves formed on opposing radial surfaces which extend transversely to the axis of the wheel and interfitting to lock the rings in assembled relation, means for preventing axial separation of the rings, and means for bonding the rings to the core.

7. A wood pulp grinding wheel comprising a natural stone core and a built-up cylinder of concentrically arranged abrasive rings surrounding the core to form a continuous axially extending surface, the rings having complementary ribs and grooves formed on opposing radial surfaces which extend transversely to the axis of the wheel and interfitting to lock the rings in assembled rela-

tion, means for preventing axial separation of the rings, and a yielding cushion interposed between the rings and the core.

8. A wood pulp grinding wheel comprising a core, a built-up cylinder of concentrically arranged separate abrasive rings bonded rigidly together to form a continuous axially extending surface, a resilient cushion bonded between the core and the cylinder, and means for rigidly clamping the rings against axial separation.

9. A wood pulp grinding wheel comprising a core, an abrasive cylinder, a rubber cushion, and phenolic resin cement interposed between the core and the cylinder and cured simultaneously with the rubber.

10. A method for forming a wood pulp grinding wheel consisting of assembling independent preformed peripheral portions of abrasive material with a central core, filling the spaces between the independent peripheral portions with a phenolic resin and the spaces between the abrasive portions and the core with phenolic resin and rubber, and simultaneously curing the resin and rubber to rigidly bond the abrasive portions together while permitting the connection between the abrasive portions and the core to yield.

11. An abrasive wheel comprising a shaft, a hub connected with the shaft, an abrasive wheel, and a joint connection having concentric layers of rubber and a synthetic resin for connecting the abrasive wheel to the hub and providing a yielding cushion therebetween.

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