

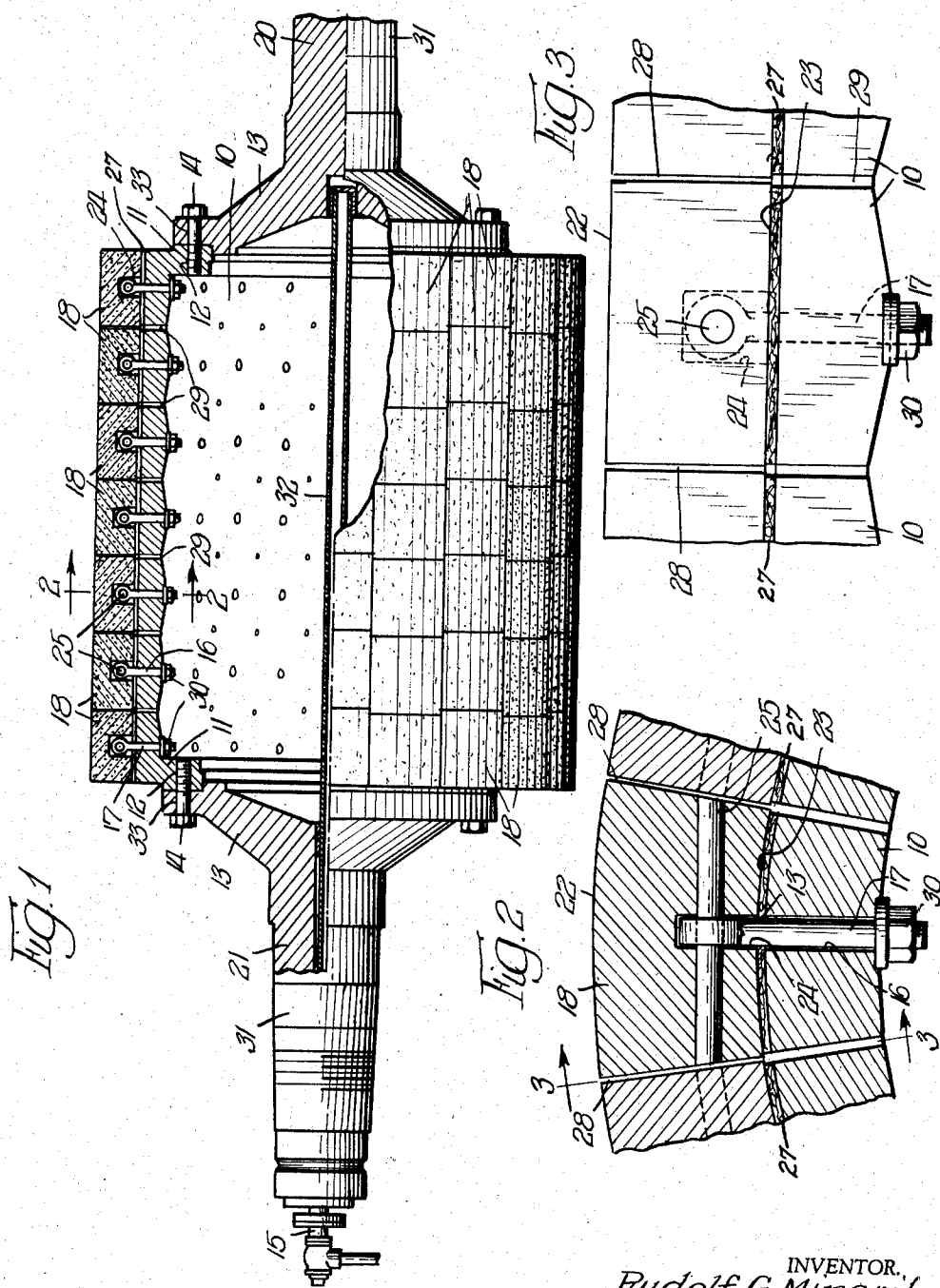
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SHELL TYPE PULPSTONE

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SHELL TYPE PULPSTONE

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This invention relates to machines for grinding wood and more particularly to pulpstones used for producing wood pulp for use in the paper making industry.

The present commercial pulpstones are generally of a construction comprising a plurality of abrasive material grinding blocks secured to a solid concrete core or an imperforate metal drum. Because of this construction the only possible way to flush away the ground material from the grinding interface and control the temperature thereat is by the external application of some suitable fluid such as water. However, this method is usually unsatisfactory because it is generally not possible to apply the fluid directly to the portion of the pulpstone at which the grinding takes place. Consequently a considerable portion of the fluid is lost before it reaches the grinding portion.

If the ground wood is not flushed away promptly from between the grinder-pulpwood interface, some of it will be reground and portions of it will tend to fill and glaze the grinding surface, thereby reducing the efficiency of the pulpstone. Furthermore, regrounding degrades the pulp to some extent and produces a poor quality of paper. Due to the solid construction of the prior art pulpstones, it is difficult to flush the ground material from the pulpstone with the present external type showers to prevent it from being reground.

The fluid also serves to lubricate the pulpstone at its grinding interface. By lubrication the undesirable frictional aspect of grinding is substantially eliminated while the cutting ability of the stone is retained. In grinding wood, lubrication is particularly important because it not only decreases the amount of energy required to rotate the pulpstone but it also results in improved ground wood quality. Thus it is apparent that as the amount of lubricant applied to the grinding interface is increased, the efficiency of the grinding operation will tend to increase.

In order to provide means for rotation of a solid stone, it is necessary to insert a shaft or axle through the stone. Such a shaft is difficult to nonrotatably secure to the stone and at the same time must bear its entire weight plus the major load exerted by the pressure of the pulpwood against the stone. Thus the shaft must be of considerable size in order to withstand these loads and generally is very expensive because it must of necessity be a nearly perfect forging.

It is an object to provide a grinding stone comprised of a plurality of arcuate abrasive grinding blocks mounted on a hollow cylindrical drum. By this means the possibility of faulty construction is reduced, a more precise construction is obtained, and at the same time a much more efficient structure is provided. Such a drum may be supported at its ends by unitary flanges and shafts that may be fabricated with considerably less difficulty than heretofore possible.

Another object is to provide a hollow grinding stone provided with radial passages through which fluid will flow to lubricate the interface between the pulpwood

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and grinding surface and control the temperature of the grinding blocks.

A still further object is to provide a grinding stone in which the individual grinding blocks are secured in such a manner that they may be easily repaired or replaced.

A still further object is to provide a grinding stone whose temperature may be effectively controlled and which has means for keeping the grinding surface at the pulpwood-grinding interface relatively clean by introduction of fluid into the center of the stone. Briefly the invention may be described as a pulpstone comprised of a hollow metal cylindrical drum to which are secured a plurality of arcuately shaped grinding blocks. The individual grinding blocks are spaced from each other and the spaces are aligned with radial passages in the drum through which a lubricating fluid may flow. Other objects of the invention will be apparent upon development of the specification with reference to the drawings.

In the drawings:

Figure 1 is a partially sectioned view of the pulpstone embodying the invention.

Figure 2 is a section taken along the line 2—2 in Figure 1.

Figure 3 is a section taken along the line 3—3 in Figure 2.

Referring now to Figure 1, there is shown a metal cylinder generally denoted by the numeral 10. The cylinder may be fabricated from any one of numerous metals that have sufficient strength for this type of construction. One such metal is cast iron of the type called nodular iron. There is shown at each end of the cylinder an inwardly directed flange 11 provided with a plurality of circumferentially spaced holes 12. Secured to the flanges 11 are the stub shaft members 20 and 21 comprising the integrated shaft 31 and flange 13, the latter being of the same diameter as the flange 11 on the cylinder 10. The stub shaft flanges 13 are provided with a like number of circumferentially spaced holes 33 which are aligned with the flange holes 12 to receive the bolts 14.

The stub shaft 21 is axially bored to permit the ingress of fluid from a suitable source of supply (not shown). Affixed to the outer end of the stub shaft 21 is a non-rotating conduit 15 through which the fluid is supplied from a suitable source of supply to an adjustable shower pipe 32 located axially within the pulpstone. The shower pipe 32 may be rotatably indexed so that the fluid may be directed in any desired radial direction.

Secured to the outer periphery of the cylinder 10 are a plurality of abrasive material grinding blocks 18. One way of securing the blocks 18 is by the eye-bolts 17 which extend through the radial passages 16 in the cylinder 10 and hold the blocks under tension by means of a wrist pin connection with crossrod 25. The radial passages are regularly spaced about the cylinder 10 so that the blocks form a regular pattern as best shown in Figure 1. The cylinder is also provided with a series of regularly spaced radial ducts 29 through which the surface lubricating fluid flows as will be apparent later on. The abrasive material grinding blocks 18 in their preferred embodiment are rectangular in shape and are provided with the concentric arcuate faces 22 and 23 as is best shown in Figure 2. The arcuate face 23 having the shortest radius is provided with a recess 24 which accommodates the eye-bolt 17. Aligned with the eye in the eye-bolt 17 is the hole 19 for receiving the crossrod 25. Thus, the eye-bolt 17 is held within the block 18 by the wrist pin connection between it and the crossrod 25. Obviously there are numerous other means for securing the bolt 17 to the block 18 or for that matter for securing the block 18 to the cylinder 10. In the preferred embodiment the blocks are of such a size that they may

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be secured to the cylinder by a single bolt. This construction is preferred in order to eliminate mounting difficulties such as uneven stresses that usually are imparted to the individual blocks if more than one bolt is used. It has also been found desirable to preload the bolts, the amount of the preload depending upon the velocity at which the stone is to be operated.

It has been found desirable to coat the face 23 with a uniform layer 27 of self-hardening cement of some suitable type, one particularly adapted for this use being a catalytic type resin such as an epoxy resin called "Floor-Nu" manufactured by the Steelcote Mfg. Co. of St. Louis, Missouri. The purpose of the layer 27 of cement is to provide firm contact between the block 18 and the cylinder 10 and to eliminate any unevenness between block and cylinder which occurs in the manufacture of these elements. The cement need not adhere to the cylinder.

As shown in the drawings, the individual blocks 18 are mounted in a regular pattern with a space 28 between each of the blocks. The space 28 is open to the radial passages 29 in the cylinder 10. These passages permit the flow of fluid from the interior of the cylinder to the surface of the blocks 18. The fluid, as it enters the stub shaft 21, will flow to the rim due to the centrifugal force, and will be forced out through the passages 29 into the spaces 28 between the blocks. In the preferred embodiment the spaces 28 are completely free of any grouting material; however, it is conceivable that the spaces 28 may be partially filled with such a material but with ample passageway for the flow of fluid.

The fluid serves to control the temperature of the blocks 18 and prevent undesirable degrading of the pulp by excessive temperature. Moreover, the fluid lubricates the blocks 18 and serves to flush away the ground material from the interface between the pulpwood and the grinding surface. This is particularly important for the reason that if the pulp is reground, its quality will be lessened. By feeding the fluid through the spaces between the stone segments, all portions of the grinding surface are lubricated. Furthermore, the temperature of the fluid can be controlled to effect additional gains in pulp quality. It has been noted that grinding at higher temperature usually results in groundwood pulp of improved quality. However, under higher temperature operation there is more danger of charring or burning if the grinding surface is not adequately lubricated in the grinding zone. Steam may also be passed into the cylinder and out through the radial passages 29 onto the blocks 18.

In the preferred embodiment the blocks 18 are mounted in alternating rows as is usual in pulpstone construction. The purpose of the alternating rows is to prevent the grooving of the pulpwood that would occur if the spaces were continuous about the circumference of the pulpstone.

The assembly of a pulpstone shown hereinbefore will now be briefly described. The self-hardening cement is first applied to the inner surface of the grinding blocks and then the blocks are set in place. The bolts are tightened just enough to bed down the blocks securely in the cement. After the cement has completely hardened, the bolts are preloaded to approximately 4,000 pounds. The pulpstone is then balanced on a lathe and is run for several hours with a reduced grinding load to bring it up to temperature.

If one of the blocks 18 should become damaged, it may be readily replaced by removing the nut 30 from the bolt 17 to release the block from the cylinder 10. A new block may then be secured into position, and if necessary, the pulpstone may be balanced on a lathe. If the entire pulpstone should become worn to a point that it is no longer effective, all of the blocks 18 may be removed and new blocks substituted therefor. The cylinder 10 may be re-used, thus resulting in a substantial savings in cost.

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By the construction just described, a pulpstone is provided that may be effectively lubricated and have its operating temperature effectively controlled by a fluid introduced into the interior of the stone. This construction is economical to build and maintain, and at the same time results in a much higher quality of pulp than heretofore obtainable by using other types of pulpstones.

It is obvious that certain modifications may be made within the scope of the claims without departing from the spirit of the invention.

I claim:

1. A pulpstone comprising a hollow metal cylinder, the inside of which is adapted to be connected to a source of water, a plurality of spaced substantially radial passages in said cylinder, a plurality of spaced abrasive material grinding blocks secured to the outer periphery of said cylinder in which said radial passages are substantially aligned with the spaces between said grinding blocks, and means for securing said grinding blocks to said cylinder, said means being positioned so that the water can flow relatively freely through said radial passages and said spaces.

2. A pulpstone comprising a hollow metal cylinder, the inside of which is adapted to be connected to a source of water, shaft means for rotatably supporting said cylinder, a plurality of spaced substantially radial passages in said cylinder, a plurality of spaced abrasive material grinding blocks secured to the outer periphery of said cylinder in which said radial passages are aligned with the spaces between said grinding blocks, and means for securing said grinding blocks to said cylinder, said means being positioned so that the water can flow relatively freely through said radial passages and said spaces.

3. A pulpstone comprising a hollow metal cylinder, the inside of which is adapted to be connected to a source of water, a coaxial stub shaft secured to each end of said hollow cylinder for rotatably supporting the same, at least one of said shafts being bored to permit water to be induced into said hollow cylinder, a plurality of spaced substantially radial passages in said cylinder, a plurality of spaced abrasive material grinding blocks secured to the outer periphery of said cylinder in which said radial passages are aligned with the spaces between said grinding blocks, and means for securing said grinding blocks to said cylinder, said means being positioned so that the water can flow relatively freely through said radial passages and said spaces.

4. A pulpstone comprising a hollow metal cylinder, the inside of which is adapted to be connected to a source of water, a coaxial stub shaft secured to each end of said hollow cylinder for rotatably supporting the same, at least one of said shafts being bored to permit water to be induced into said hollow cylinder, a plurality of spaced substantially radial passages in said cylinder, a plurality of spaced abrasive material grinding blocks secured to the outer periphery of said cylinder in which said radial passages are aligned with the spaces between said grinding blocks, and mechanical means for securing said grinding blocks to said hollow cylinder, said means being positioned so that the water can flow relatively freely through said radial passages and said spaces.

5. A pulpstone comprising a hollow metal cylinder, the inside of which is adapted to be connected to a source of water, a coaxial stub shaft secured to each end of said hollow cylinder for rotatably supporting the same, at least one of said shafts being bored to permit water to be induced into said hollow cylinder, a plurality of spaced substantially radial passages in said cylinder, a plurality of regularly spaced arcuate abrasive material grinding blocks secured to the outer periphery of said cylinder in which said radial passages are substantially aligned with the spaces between said grinding blocks to form a pulpstone of substantially cylindrical shape, and mechanical means for securing said grinding blocks to said hollow cylinder,

said means being positioned so that the water can flow relatively freely through said radial passages and said spaces.

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