Jan. 1, 1929. 1,697,505

E. R. HYDE

SECTIONAL GRINDING WHEEL

Filed March 6, 1925

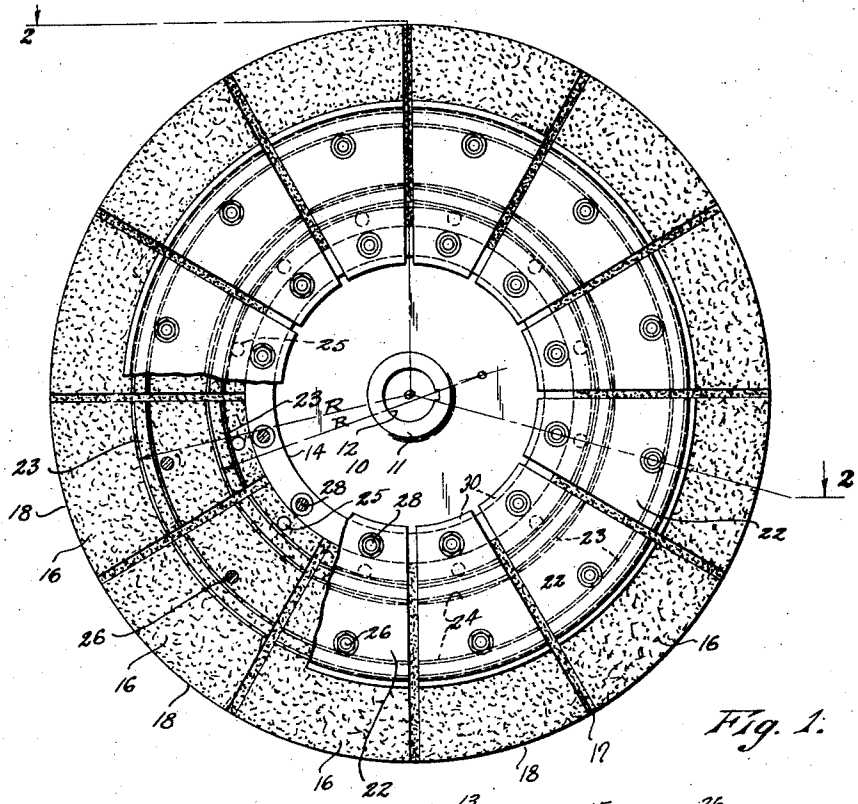


Fig. 1.

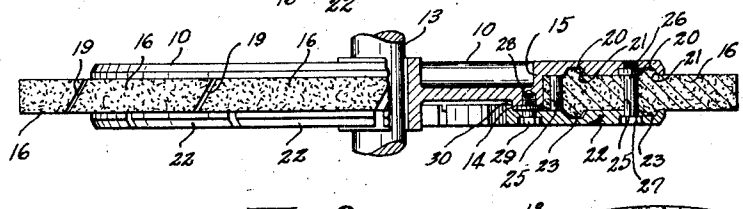


Fig. 2.

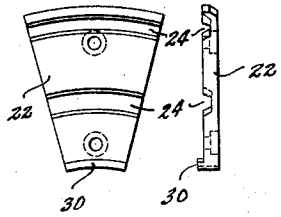


Fig. 4.

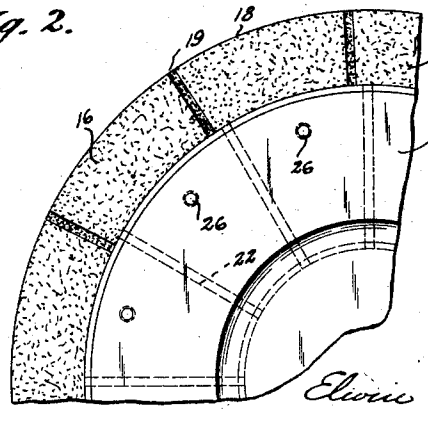


Fig. 3.

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SECTIONAL GRINDING WHEEL.

Application filed March 6, 1925. Serial No. 13,428.

This invention relates to grinding wheels, and has for an object to provide a grinding wheel, especially of the type where the periphery is used as the grinding surface, in which the proper surface speed may be maintained as the wheel wears down without increasing the speed of rotation of the wheel.

It is also an object of the invention to provide a wheel of this type in which the diameter of the wheel may be maintained substantially constant.

It is a further object of the invention to provide a wheel which may be renewed without removing the wheel from the shaft or removing the shaft from the machine, doing away with the necessity of realigning the shaft after a new wheel has been mounted. Thus the wheel may be renewed and placed in grinding condition in a much shorter time and with less expense.

It is a still further object of the invention to provide a wheel in which there is a minimum of waste of the grinding material, and in which the cost of renewal is reduced to a minimum.

With the foregoing and other objects in view, I have devised the construction illustrated in the accompanying drawing forming a part of this specification, similar reference characters being employed throughout the various figures to indicate corresponding elements. In this drawing,

Fig. 1 is a side elevation of the wheel with a portion thereof broken away to more clearly show the construction.

Fig. 2 is a partial edge view and a partial section of the wheel substantially on line 2—2 of Fig. 1.

Fig. 3 is a side elevation of a portion of the wheel looking toward the opposite side from Fig. 1, and

Fig. 4 is a plan and edge view of one of the securing plates for the grinding blocks.

This application relates to the type of construction shown in my prior applications Serial Nos. 709,446 and 709,447 filed April 28, 1924.

Where grinding wheels are made in one piece a certain portion only may be used for grinding purposes, because after it is worn down the proper surface speed may be maintained only by increasing the speed of rotation of the wheel, and this can be done practically only to a certain limit. It is then necessary to discard the wheel, which comprises a large block at the center of the original wheel, and mount a new wheel in the machine. This obviously involves the wasting of a large amount of grinding material, and furthermore, in large wheels it is difficult to make them sufficiently strong to resist the centrifugal forces involved in the rapid rotation, and in artificial grinding wheels as there is a large mass involved in a wheel made in one piece it is difficult to secure a wheel of uniform hardness because of the difficulty of uniformly heating the wheel throughout in the burning operation. Furthermore, due to this nonuniform heating there is a large percentage of the wheels broken during the burning operation and are thus entirely useless.

Still further, in renewing a solid wheel the entire shaft must be removed from the machine, the old wheel removed from the shaft and a new wheel mounted thereon and then the shaft must be remounted in the machine. The aligning of this shaft and wheel is a delicate operation which requires considerable time especially where ball or roller bearings are employed as is now common practice.

To obviate these difficulties I construct the wheel of a plurality of independent blocks of grinding material, the mass of any individual block being relatively small and each block is independently mounted on the support so that if necessary, as where a block is broken or proves to be softer than the remaining blocks, it may be removed from the wheel and a new block mounted in its place without in any way disturbing the remainder of the wheel. Furthermore these blocks are so mounted that they may be securely clamped at different distances from the center of the wheel, so that after the wheel is worn down the blocks may be shifted outwardly and clamped in this position to maintain the diameter of the wheel substantially constant.

In the form shown in the drawing the wheel comprises a metal support 10 having a hub 11 with an opening 12 for mounting the support on a shaft 13, which is mounted in the bearings in the machine in the usual

manner and driven by any suitable means. At a suitable distance from the center this support is provided with a shoulder 14 on one side thereof, preferably an annular shoulder as shown, and beyond this shoulder the support is offset in the opposite direction as shown at 15 to form an annular recess to receive the plurality of blocks 16 of grinding material. These blocks are preferably of the shape shown, that is, they are tapered with their sides 17 extending substantially radially of the wheel and with their outer ends 18 convex to form the periphery of the wheel. They are also preferably of a width so that when mounted in the wheel the sides 17 of two adjacent blocks are spaced from each other to form clearance spaces 19 which assist in clearing the wheel of the particles of metal removed by the grinding operation and thus the wheel works faster. The sides 17 are, however, preferably inclined to the plane of the wheel as shown in Fig. 2 so that these clearance spaces do not extend at right angles across the wheel.

For the purpose of securing these blocks on the support, the support and blocks are provided with coacting lugs and recesses to hold the blocks against radial movement. In the present construction the lugs are in the form of ribs 20 and the recesses are in the form of grooves 21. The grooves and recesses may be formed either on the block or on the support. In the present instance the grooves are formed in the side of the support and are continuous circular grooves in the support while the ribs are formed on the sides of the block. In order that the blocks may be securely held in position at different radial distances from the center of the wheel a plurality of these ribs and grooves are provided which are spaced different distances from the center of the wheel and the two ribs are made of the same width and the same radius as shown at R in Fig. 1, which is the radius of the outer groove, so that either rib will snugly fit in this groove. The inner groove may be made of the same radius but is preferably made somewhat wider than the rib so that the rib may project into it even though it is not formed on the same radius.

In order to clamp these blocks in the annular recess formed by the offset 15 a plurality of separate clamping plates are provided. I preferably provide one of these plates for each block so that each block may be mounted on or removed from the wheel independently of every other block, and therefore without disturbing any of them, although a single plate, if desired, may be used for two or more blocks. The blocks and plates are formed with coacting lugs and recesses the same as the support and the blocks, and these lugs comprise ribs 23 and grooves 24. These ribs and grooves are on the opposite sides of the block and are preferably the same as the ribs and grooves 20 and 21, that is, a plurality of these ribs formed on the same radius spaced different distances from the center of the wheel adapted to seat in the outer groove in the plate. In order to clamp the blocks on the support these blocks are provided with transverse openings 25 for clamping bolts 26, the openings being spaced different distances from the center of the wheel to receive the bolts in different adjusted positions of the blocks. The bolts are preferably threaded into the support 10 and extend through openings in the plates 22 where they receive a nut 27 seated in a countersink in the plate so that these nuts will not project above the surface of the plate. The plates are also clamped directly to the support 10 by studs 28 threaded in the side of the support and extending through an opening in the plate which is also countersunk to receive the nuts 29. To provide a further securing means for the plates they are each provided with a rib 30 at their inner ends forming a shoulder to engage the shoulder 14 of the support which will hold the plate against movement radially of the support because of centrifugal action, and will also take the lateral strain off the bolts.

It will be obvious that in the construction shown each individual grinding block 16 is securely clamped on the support independently of all the other blocks, and that any one of them may be removed if they become broken, or for any other reason, without in any way disturbing the remainder of the blocks. Also that the wheel may be entirely renewed without removing it from the shaft or from the machine, and that the act of renewal is a very simple one as but one block and plate is required to be manipulated at a time. In mounting a block on the support it is placed against the support with the ribs 20 seated in the grooves 21 and the bolt 26 extending through the proper opening 25. A plate 22 is then placed on the opposite side of the block with the ribs 23 in the groove 24, and the plate is securely clamped in position by the nuts on the bolts 26 and studs 28. This operation securely clamps the block on the support and there is no chance of its moving out of position because it will be securely held by the coaction of the ribs and groove and the bolts. After the blocks have worn down to adjacent the periphery of the support 10 the plates may be removed and the blocks moved outwardly one at a time to their outer position and then again clamped to the support. Thus the wheel may be maintained of substantially uniform diameter to maintain the proper surface speed without increasing the rate of rotation, but

the amount of grinding material which must be thrown away is reduced to a minimum. Also as the blocks are relatively small they are easily handled, may be easily molded and may be made of substantially uniform hardness because as the mass is relatively small it may be uniformly heated during the burning operation. Furthermore, there is a minimum breakage during the burning operation because of the relatively small mass of the blocks, which allows substantially uniform heating.

Having thus set forth the nature of my invention, what I claim is:

1. A grinding wheel comprising a support, a plurality of grinding blocks having convex outer ends forming the periphery of the wheel, and means for clamping the blocks against one side of the support comprising a plurality of separate plates all arranged in a common plane to directly engage one side of the blocks and means for clamping the blocks between the support and the plates in a direction axially of the wheel, there being independent clamping means for the individual plates so that a plate and a block held thereby may be removed independently of the other plates and blocks, and coacting means carried by the blocks and their mounting means to prevent radial displacement of the blocks.

2. A grinding wheel comprising a support, a plurality of grinding blocks having convex outer ends forming the periphery of the wheel, said support and blocks being provided on one side with coacting lugs and recesses to prevent radial displacement of the blocks, a plurality of separate plates in substantially the same plane directly engaging the opposite side of the blocks, and bolts extending through the blocks to clamp the in blocks between the support and plates in a direction axially of the wheel.

3. A grinding wheel comprising a support, a plurality of grinding blocks having convex outer ends forming the periphery of the wheel, said support and blocks being provided on one side with coacting lugs and recesses, a plate for each block on the opposite side thereof, and bolts extending through the blocks for clamping each block between the support and a plate.

4. A grinding wheel comprising a support, a plurality of grinding blocks having convex outer ends forming the periphery of the wheel, said support and blocks being provided on one side with coacting lugs and recesses, a plurality of separate plates on the opposite sides of the blocks, said plates and blocks being provided with coacting lugs and recesses, said support and plates being also provided with coacting shoulders to prevent radial movement of the plates, and means for clamping the blocks between the support and plates.

5. A grinding wheel comprising a support, a plurality of grinding blocks having convex outer ends forming the periphery of the wheel, said support and blocks being provided on one side with coacting lugs and recesses, a plate for each block on the opposite side thereof, said plate and block being provided with coacting lugs and recesses, said support being provided with a shoulder and said plates being each provided with a shoulder to engage the shoulder on the support to prevent radial movement of the plate, and bolts extending through the blocks to clamp the blocks between the plates and the supports.

6. A grinding wheel comprising a support, a plurality of grinding blocks having convex outer ends forming the periphery of the wheel, said support and blocks being provided with a plurality of coacting lugs and recesses on one side thereof spaced different radial distances from the center of the wheel to hold the blocks in different radial positions, a separate plate for each block on the opposite side thereof, and means for clamping the blocks between the support and plates in said different radial positions.

7. A grinding wheel comprising a support, a plurality of grinding blocks having convex outer ends forming the periphery of the wheel, said support and blocks being provided on one side with a plurality of coacting ribs and grooves spaced different radial distances from the center of the wheel, all the ribs and the outer groove being of the same radius, a plurality of separate plates on the opposite sides of the blocks, and bolts extending through the blocks and plates for clamping them against the side of the support at different radial distances from the center of the wheel.

8. A grinding wheel comprising a support, a plurality of grinding blocks having convex outer ends forming the periphery of the wheel, said support and blocks being provided on one side with a plurality of coacting ribs and grooves spaced different radial distances from the center of the wheel, all the ribs and the outer groove being of the same radius, a plurality of separate plates on the opposite sides of the blocks, said plates and blocks being also provided with a plurality of coacting ribs and grooves spaced different distances from the center of the wheel and with the ribs and outer groove of the same radius, said support being also provided with a shoulder, said plates being each provided with a shoulder to engage the shoulder on the support to secure the plates against radial movement, and bolts extending through the blocks and plates to clamp them against the side of the support at different radial distances from the center of the wheel.

9. A grinding wheel comprising spaced

side plates one of which is composed of a plurality of separate segments, a plurality of grinding blocks mounted between said plates, one of said plates and the grinding blocks being provided with a plurality of circular grooves spaced from each other radially of the wheel and a plurality of laterally projecting flanges spaced radially of the wheel and adapted to extend into said grooves to allow adjustment of the blocks radially of the wheel, and means for clamping the plates on opposite sides of the blocks to clamp them in adjusted positions comprising bolts extending through the blocks and the plates adjacent the peripheries of the plates, the blocks being provided with a plurality of transverse openings therethrough for said bolts spaced from each other radially of the block with the outer opening in a section of the block which is eventually worn off in use.

10. A grinding wheel comprising a side plate provided with a circular groove in one side thereof, a plurality of grinding blocks each provided with a plurality of ribs on a side wall thereof spaced from each other radially of the wheel and each of which is adapted to enter said groove to determine the position of the block relative to the axis of rotation of the wheel and allow adjustment of the blocks radially of the wheel, the side walls of the ribs being inclined to make the ribs thicker adjacent the bodies of the blocks, and means for clamping the blocks to the side of the plate to secure them in adjusted positions comprising bolts extending through the blocks and secured to the plate adjacent the periphery thereof, the blocks being provided with a plurality of transverse openings therethrough for said bolts spaced from each other radially of the block with the outer opening in a section of the block which is eventually worn off in use.

11. A grinding wheel comprising spaced side plates having circular grooves in the opposed side walls thereof spaced from each other radially of the wheel, one of said plates being composed of a plurality of separate segments, a plurality of grinding blocks mounted between said plates and provided with spaced ribs on the side walls thereof to enter said grooves to determine the position of the blocks relative to the axis of rotation of the wheel and allow adjustment of the blocks radially of the wheel, and means for clamping the plates against the sides of the blocks to secure them in adjusted positions comprising bolts extending through the blocks and secured to the plates adjacent the peripheries thereof, the blocks being provided with a plurality of transverse openings therethrough for said bolts spaced from each other radially of the block with the outer opening in a section of the block which is eventually worn off in use.

12. A grinding wheel comprising a side plate having a circular groove in one of the side walls thereof, the side walls of the groove being inclined so that the groove is widest at its open side, a plurality of grinding blocks having a plurality of ribs extending substantially the width of the block and outwardly from a side wall thereof and spaced from each other radially of the wheel so that they are separated by portions of the bodies of the blocks, said ribs being of substantially the same radius as said groove and having side walls inclined similarly to those of the groove so as to fit snugly in the groove, and means for clamping said blocks against the side walls of the plate with one of said ribs in said groove.

13. A grinding wheel comprising spaced side plates having circular grooves in the opposed side walls thereof, one of said plates being composed of a plurality of separate segments, a plurality of grinding blocks mounted between said plates and provided with a plurality of ribs extending laterally from the side walls thereof and spaced radially of the wheel, said ribs being of substantially the same radius as the grooves, said blocks being also provided with a plurality of holes extending laterally therethrough and spaced radially of the wheel, and bolts extending through some of said holes in the plates to clamp the plates against the sides of the block.

14. A grinding wheel comprising spaced side plates having a circular groove in the inner side walls thereof and one of said plates being composed of a plurality of segments, a plurality of grinding blocks mounted between said plates and provided with a plurality of ribs extending laterally from the opposite side walls thereof spaced radially of the wheel and of substantially the same radius as said grooves, the outer ends of the blocks being convex and forming the periphery of the wheel, the opposite edge walls of the blocks being inclined to the plane of the wheel, and means for securing the plates together and clamping them against the side walls of the blocks with certain of the ribs in said grooves.

15. A grinding wheel comprising a side plate, a plurality of grinding blocks, each block being provided with a plurality of transverse ribs projecting laterally from a side wall thereof spaced from each other radially of the wheel so that they are separated by a portion of the body of the block, said ribs having inclined side walls making the ribs thickest adjacent the body of the block, said plate being provided with a groove in the side wall thereof adapted to receive any one of said ribs to position the blocks different distances from the axis of rotation of the wheel, and means for clamping the blocks to the plate with any rib de-

sired in said groove to clamp them in adjusted positions comprising bolts extending through the blocks and secured to the plate adjacent the periphery thereof, the blocks being provided with a plurality of transverse openings therethrough for said bolts spaced from each other radially of the block with the outer opening in a section of the block which is eventually worn off in use.

16. A grinding block forming a section only of a circular wheel, whose outer end is a convex curve and which is provided with a plurality of tapered transverse ribs projecting laterally from a side wall thereof and integral therewith and spaced from each other radially of said curve so that they are separated by portions of the body of the block, said block being provided with a plurality of transverse bolt openings therethrough spaced from each other radially of the curve and with the outer opening in a section of the block which is eventually worn off in use.

17. A grinding block whose outer end is a convex curve and which is provided with a plurality of tapered curved ribs extending laterally from a side wall thereof spaced from each other radially of said curve so that they are separated by portions of the body of the block, and which ribs have substantially the same radius and extend substantially the width of the block.

18. A grinding block whose outer end wall is a convex curve, whose edge walls extend substantially radially of said curve, and whose side walls are provided with a plurality of transverse ribs integral with the block extending laterally therefrom and spaced from each other radially of said curve so that they are separated by portions of the body of the block, said ribs being thicker adjacent the body of the block than at their free edges, said block being provided with a plurality of transverse bolt openings therethrough spaced from each other radially of the curve and with the outer opening in a section of the block which is eventually worn off in use.

19. A grinding wheel comprising spaced side plates one of which is composed of a plurality of separate segments, a plurality of grinding blocks mounted between said plates, said plates and said blocks being provided on their opposed faces with circular grooves and a plurality of laterally projecting transverse ribs spaced from each other radially of the blocks, said ribs being adapted to enter the grooves to position the blocks different distances from the axis of rotation of the wheel, said blocks being each provided with a plurality of transverse openings therethrough spaced from each other radially of the block, and a bolt extending through an opening in each block for clamping the plates on opposite sides of the block.

In testimony whereof I affix my signature.

ELWIN R. HYDE.