June 24, 1930. H. F. SKILLINGS 1,767,321

ABRASIVE WHEEL

Filed April 16, 1928

Fig. 1.

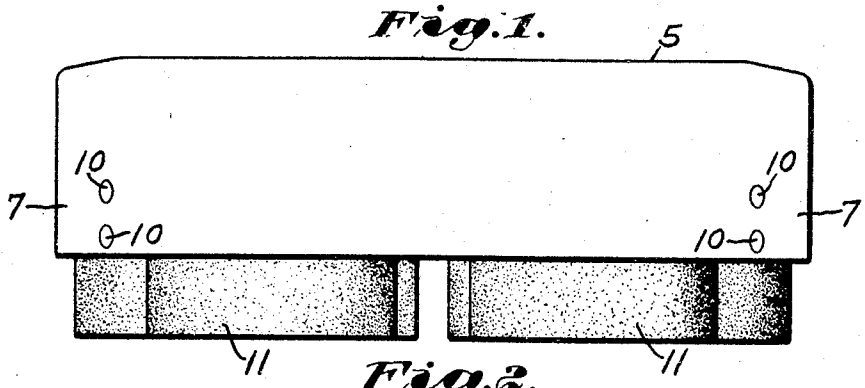


Fig. 2.

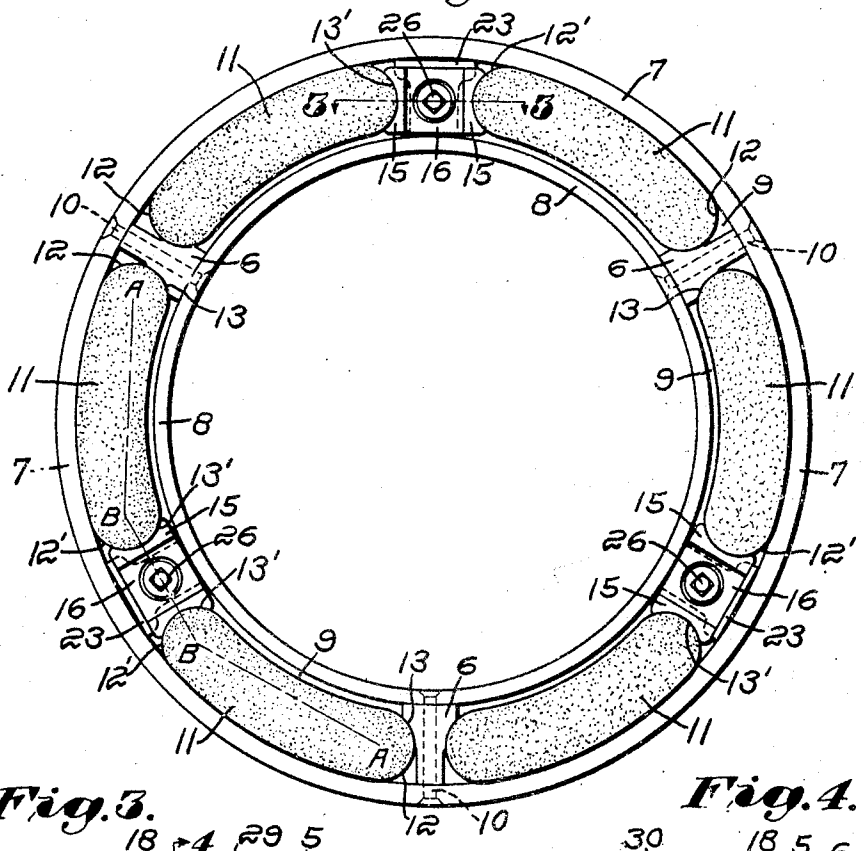


Fig. 3.

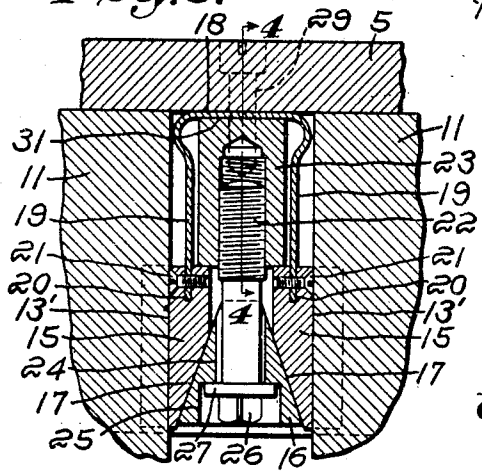
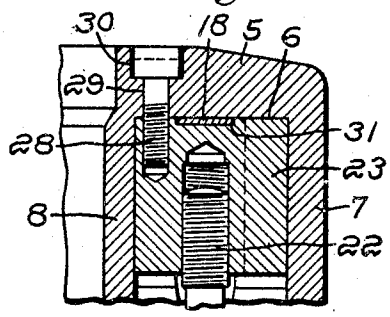


Fig. 4.



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Atty's.

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UNITED STATES PATENT OFFICE

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ABRASIVE WHEEL

Application filed April 16, 1928. Serial No. 270,461.

This invention relates to a novel and improved abrasive wheel, of the class in which several blocks or segments of abrasive material are adjustably and removably mounted in the chuck or holder, in which they may be adjusted from time to time as they wear away, and may finally be removed and replaced by new ones.

The invention will be best understood by reference to the following description, when taken in connection with the accompanying drawings of one specific embodiment thereof, while its scope will be more particularly pointed out in the appended claims.

In the drawings:

Fig. 1 is an elevation of an abrasive wheel exemplifying the invention;

Fig. 2 is a plan of the same as viewed from below;

Fig. 3 is a sectional view, on an enlarged scale, on line 3—3 of Fig. 2; and

Fig. 4 is a sectional view on line 4—4 of Fig. 3.

Referring to the drawings, and to the embodiment of the invention which is selected for illustrative purposes, there is shown an abrasive wheel comprising a body 5, which in practice is a steel forging, herein annular in form, intended to be mounted on a face plate to be secured to the spindle of a grinding machine, such as a vertical spindle surface grinder.

The body presents a plurality of abutments 6, herein three, equally spaced partitions, and an outer wall 7, herein annular, disposed about said abutments. In the present example, the body presents also an inner wall 8, herein annular, and separated from the outer wall by an annular groove 9. The inner wall or shell of the body serves two purposes:—first, it strengthens the body, and second, it serves as a shell to carry water, which is discharged inside the wheel near the top, down to the bottom of the body before the water flies outwardly. This helps to keep dirt out of the chuck, and to bring the water nearer to the wheel face. Herein, the abutments or partitions 6 are formed as separate pieces, inserted between the inner and outer walls, and suitably secured in place, as by rivets 10 extending through both walls and through the partitions. The partitions divide the annular groove 9 into a series of arcuate chambers for the abrasive blocks now to be described.

Each of the chambers receives a pair of abrasive blocks or segments 11, which, in the present example, are arcuate,—that is to say, they are convexly curved on their faces to fit the inner circumferential surface of the outer annular wall 7, and they are concave on their inner sides, but herein are spaced apart from the inner annular wall 8. The blocks are elongated circumferentially (see Fig. 2), and only six are required. This reduces the cost of manufacture of the wheel, and increases the strength of the blocks against lateral stress or inward thrust of the work as the latter is passed across the face of the wheel.

In the present example, the ends of each block are rounded as at 12, thereby to give them a fair bearing, and to make them self-aligning, as will presently appear. Each of the partitions 6 has two curved seats or bearing surfaces 13 for the adjacent ends of the blocks. These seats and the ends of the blocks are formed on arcs struck from centers A. Each seat 13, therefore, constitutes a fulcrum, on which the block may be rocked about an axis represented by the point A in Fig. 2.

In like manner, the other end of each block is rounded as at 12′, on an arc struck from the point B. Between the adjacent ends 12′ of each pair of blocks, there is provided expansive means to urge such blocks, respectively, in opposite directions against the abutments 6, and outwardly against the outer annular wall 7. This expansible means will now be described, reference being had at first to Fig. 2. Each of the rounded ends 12′ contacts with a shoe 15, having an arc-shaped seat 13′, which fits the end of the block, and is formed on an arc struck from the point B as a center.

Referring now to Fig. 3, there is provided suitable means for forcing the shoes 15 apart, the same in the present example comprising a wedge 16, having upwardly converging faces 17, which engage corresponding converging faces on the shoes. Engagement of

the shoes with the wedge is conveniently maintained by a U-shaped spring 18, having arms 19 suitably secured to the shoes, as by providing the latter with slots 20, in which the arms are secured by screws 21.

The shoes are forced apart in opposition to the spring by appropriate means, herein a screw 22, threaded into a block 23, and extending loosely through a much larger opening 24 provided in the wedge 16, which is also chambered out as at 25, to receive a head 26 and an annular shoulder or collar 27 on the screw. The inner end of this chamber thus provides a seat against which the thrust of the collar 27 may be exerted to cause the wedge to be moved in an upward direction, and to force the shoes apart when the screw is rotated in the proper direction by the application of a socket wrench to the head 26.

The described operating mechanism is held in place, and is prevented from dropping out by securing the block 23 to the body 5. This is conveniently accomplished in the present example by the provision of a screw 28 (see Fig. 4) extending loosely through a hole 29 provided in the body, and threaded into the block 23, the head of the screw being received in a chamber 30 counterbored into the body. The block also constitutes a convenient means for holding the spring 18 in place, said block for this purpose being provided in its upper end with a shallow groove 31, which receives the base of the spring. The shoes and the wedge constitute a floating assembly capable of movement radially and circumferentially, considered with reference to the axis of the body.

Referring now to Fig. 2, the blocks of each pair may be likened to two links constituting a toggle, and the expansible assembly may be considered as a toggle-actuating mechanism, capable of swinging the adjacent ends of the blocks in an outward direction against the stop or limiting means presented by the outer annular wall 7. In Fig. 2, the points A and B, representing the pivotal axes at the ends of one block, have been connected to each other by a line A—B, while the points B have been connected to each other by a line B—B. In expanding the operating mechanism, the line B—B naturally lengthens, as a consequence of which the links represented by the lines A—B, A—B, swing outwardly about the points A. At the same time, the expansible mechanism urges the blocks against the seats presented by the abutments 6. While the movement of the shoe 15 actually is tangential, the large angle subtended by each block is such that there is an outward component of the force tending to press the outer surface of the block firmly into contact with the inner circumferential surface of the surrounding wall. Naturally, this is augmented by the action of centrifugal force when the wheel is rotating.

The structure is characterized by a symmetrical form and arrangement of the several segments or blocks, and corresponding forces. Inasmuch as the ends of the blocks are rounded, there is no tendency to chip or break away, as there would be if they were angular. Moreover, this form of the blocks is advantageous because, as already stated, they are self-aligning. One factor in this is the employment of the shoes between the blocks and the wedge which forces them apart. The rubbing action of the wedge against the shoes introduces very little frictional resistance, while the rubbing of the ends of the blocks against the arc-shaped seats 13 and 13′ is so slight as to be negligible.

The blocks are held so firmly that no positive stop is required behind them to keep them from being pushed back into the wheel body, after they have been worn away to such an extent as to require adjustment in an outward direction, it being understood, of course, that new blocks extend the full depth of the annular groove in the body. While it is possible to introduce spacers, such as blocks of wood or metal, behind the segments, this is found to be unnecessary in practice. As the clamping and centrifugal forces are considerable, it is quite probable that there is distortion of the outer wall 7 sufficient to make its curvature agree with the curvature of the segments, provided there should be any slight difference initially.

Having thus described one embodiment of my invention, but without limiting myself thereto, what I claim and dsire by Letters Patent to secure is:

1. In an abrasive wheel, the combination of a body having inner and outer, annular walls and an intermediate, annular groove; a plurality of partitions connecting said walls to each other at intervals and dividing said groove into a plurality of arcuate chambers, each partition presenting on each side thereof an arc-shaped abutment; a plurality of arcuate, abrasive segments arranged in pairs, one pair in each chamber, each segment having two arc-shaped ends, each resting against one of said arc-shaped abutments; each segment having an arc-shaped surface engaging said outer annular wall; and expansible means between the two adjacent ends of the segments of each pair, each expansible means including two shoes, each presenting an arc-shaped abutment which engages the adjacent, arc-shaped end of one of said segments; a wedge between and engaging said shoes, a U-shaped spring secured to said body and having two arms secured to said shoes, respectively, and tending to move them toward each other, and a screw for moving said wedge relatively to said shoes to force them apart.

2. In an abrasive wheel, the combination of a body having inner and outer annular

walls and an intermediate annular groove; a plurality of partitions connecting said walls to each other at intervals and dividing said groove into a plurality of arcuate chambers; a plurality of arcuate abrasive blocks arranged in pairs, one pair in each chamber, each block having one end resting against one of said partitions; and expansible means between the two adjacent ends of the blocks of each pair, each expansible means including two shoes engaging such adjacent ends, a wedge between and engaging said shoes, a screw for moving said wedge relatively to said shoes to force them apart and to urge the other ends of said blocks against said partitions, and to urge said blocks against said outer wall, and spring means tending to maintain engagement of said shoes with the intervening wedge.

3. In an abrasive wheel, the combination of a body having inner and outer, annular walls and an intermediate, annular groove; a plurality of partitions connecting said walls to each other at intervals and dividing said groove into a plurality of arcuate chambers, each partition presenting two oppositely facing fulcrums; a plurality of arcuate, abrasive segments arranged in pairs, one pair in each chamber, each segment having an end mounted to rock on one of said fulcrums and an arc-shaped surface engaging the inner circumferential surface of said outer, annular wall; and expansible means between two adjacent ends of the segments of each pair to rock said segments on their fulcrums outwardly toward said outer wall.

4. In an abrasive wheel, the combination of a body having an annular wall and a plurality of fulcrums within the circle of said wall; a plurality of abrasive segments, each having rocking contact with one of said fulcrums and adapted to engage the inner circumferential surface of said wall; a plurality of shoes, each having rocking contact with one of said segments; a plurality of wedges each contacting with one of said shoes; and a plurality of wedge-actuating screws for causing said wedges to act through said shoes to rock said segments on their fulcrums outwardly against said wall and to urge said segments circumferentially against said fulcrums.

5. In an abrasive wheel, the combination of a body presenting a plurality of fulcrums; a plurality of abrasive blocks arranged in pairs, each pair being between two fulcrums; and expansible means between two adjacent surfaces of the blocks of each pair to rock such blocks on their fulcrums and to urge such blocks, respectively, in opposite directions toward said fulcrums.

6. In an abrasive wheel, the combination of a body presenting a plurality of fulcrums and a wall about said fulcrums; a plurality of abrasive blocks arranged in pairs, each pair being between and contacting with two fulcrums and with said wall; and expansible means between and having pivotal connection with two adjacent portions of the blocks of each pair to rock such blocks on their fulcrums and to urge such blocks, respectively, in opposite directions against said two fulcrums and outwardly against said wall.

7. In an abrasive wheel, the combination of a body presenting a plurality of fulcrums; a plurality of abrasive blocks arranged in pairs, each pair being between two fulcrums; and expansible means between two adjacent portions of the blocks of each pair to rock such blocks on their fulcrums and to urge such blocks, respectively, in opposite directions toward said fulcrums, said expansible means including two shoes having pivotal connection with said portions, respectively, and a wedge between said shoes.

8. In an abrasive wheel, the combination of a body presenting a plurality of abutments; a plurality of abrasive blocks arranged in pairs, each pair being between two abutments; two shoes contacting, respectively, with two adjacent surfaces of the blocks of each pair, yielding means tending to move said shoes together; and means to move said shoes apart.

9. In an abrasive wheel, the combination of a body presenting a plurality of abutments; a plurality of abrasive blocks arranged in pairs, each pair being between two abutments; two shoes contacting, respectively, with two adjacent surfaces of the blocks of each pair, yielding means tending to move said shoes together; and a wedge and wedge-operating screw to move said shoes apart.

10. In an abrasive wheel, the combination of a rotatable body presenting a plurality of abutments; a plurality of abrasive blocks arranged in pairs, each pair being between two abutments; and expansive means between two adjacent surfaces of the blocks of each pair to urge them apart, said means including shoes contacting with said surfaces, yielding means tending to move said shoes together, wedges between the shoes of each pair and movable lengthwise of the axis of rotation of said body, and wedge-actuating screws extending lengthwise of said axis.

11. In an abrasive wheel, the combination of a rotatable body presenting a plurality of abutments; a plurality of abrasive blocks arranged in pairs, each pair being between two abutments; and expansive means between two adjacent surfaces of the blocks of each pair to urge them apart, said means including shoes contacting with said surfaces, a U-shaped spring having two arms connected to said shoes and tending to move said shoes together, wedges between the shoes of each pair and movable lengthwise of the axis of rotation of said body, blocks between the arms of each spring, means securing said

blocks and said springs to said body, and wedge-actuating screws extending lengthwise of said axis and having screw-threaded engagement with said blocks, respectively.

12. In an abrasive wheel, the combination of a body presenting a plurality of abutments constituting fulcrums, a plurality of abrasive blocks arranged in pairs, each pair being between two abutments and constituting a toggle; means to swing the blocks of each pair in an outward direction about their fulcrums; and means to limit such swinging.

13. In an abrasive wheel, the combination of a body presenting a plurality of abutments constituting fulcrums, a plurality of abrasive blocks arranged in pairs, each pair being between two abutments and constituting a toggle; means between two adjacent ends of the blocks of each pair to swing the blocks of each pair in an outward direction about their fulcrums; and means to limit such swinging.

14. In an abrasive wheel, the combination of a body presenting a plurality of abutments constituting fulcrums; a plurality of abrasive blocks arranged in pairs, each pair being between and contacting with two abutments and constituting a toggle; expansible means between two adjacent ends of the blocks of each pair to urge said blocks, respectively, in opposite directions against said abutments and to swing said blocks in an outward direction about their fulcrums; and means to limit the outward swinging of said blocks.

15. In an abrasive wheel, the combination of a body presenting a plurality of abutments constituting fulcrums; a plurality of abrasive blocks arranged in pairs, each pair being between and contacting with two abutments and constituting a toggle; expansible means between two adjacent ends of the blocks of each pair to urge said blocks, respectively, in opposite directions against said abutments and to swing said blocks in an outward direction about their fulcrums; and a wall about said blocks to limit their outward swinging movement.

16. In an abrasive wheel, the combination of a body presenting a plurality of abutments constituting fulcrums; a plurality of abrasive blocks arranged in pairs, each pair being between and contacting with two abutments and constituting a toggle; and expansible means between two adjacent ends of the blocks of each pair to exert a pressure against said ends and to operate said toggle.

17. In an abrasive wheel, the combination of a body presenting a plurality of abutments each having an arc-shaped seat constituting a fulcrum; a plurality of abrasive blocks arranged in pairs, each pair being between two seats and each block having an arc-shaped end seated in one of said arc-shaped seats; and expansible means between two adjacent ends of the blocks of each pair to exert a pressure against such ends.

18. In an abrasive wheel, the combination of a body presenting a plurality of abutments each having an arc-shaped seat constituting a fulcrum; a plurality of abrasive blocks arranged in pairs, each pair being between two seats and each block having an arc-shaped end seated in one of said arc-shaped seats, the remaining pairs of ends of said blocks being arc-shaped; and operating means between the remaining pairs of ends, said operating means including shoes having arc-shaped seats in which such remaining ends are seated.

19. In an abrasive wheel, the combination of a body presenting a plurality of abutments each having an arc-shaped seat constituting a fulcrum; a plurality of abrasive blocks arranged in pairs, each pair being between two seats and each block having an arc-shaped end seated in one of said arc-shaped seats, the remaining pairs of ends of said blocks being arc-shaped; shoes having arc-shaped seats in which such remaining ends are seated, and means between said shoes to urge them apart.

20. In an abrasive wheel, the combination of a body presenting a plurality of abutments each having an arc-shaped seat constituting a fulcrum; a plurality of abrasive blocks arranged in pairs, each pair being between two seats and each block having an arc-shaped end seated in one of said arc-shaped seats; the remaining pairs of ends of said blocks being arc-shaped; shoes having arc-shaped seats in which such remaining ends are seated, and a wedge and wedge-operating screw between the shoes of each pair to urge them apart.

21. An abrasive element for use in a chuck of the class described comprising a block of abrasive material having two parallel flat faces either of which constitutes a grinding face, two parallel cylindric surfaces whose common axis of generation is perpendicular to said flat faces, and two non-parallel cylindric surfaces whose axes of generation are parallel with each other and perpendicular to said flat faces, said non-parallel cylindric surfaces being each tangent to both of said parallel cylindric surfaces.

22. An abrasive element for use in a chuck of the class described comprising a block of abrasive material having two parallel flat faces either of which constitutes a grinding face, two parallel cylindric surfaces whose common axis of generation is perpendicular to said flat faces, and two non-parallel cylindric surfaces whose axes of generation are between such surfaces and are parallel with each other and perpendicular to said flat faces, said non-parallel cylindric surfaces be-

ing each tangent to both of said parallel cylindric surfaces.

23. An abrasive element for use in a chuck of the class described comprising an arcuate block of abrasive material having a flat face which constitutes a grinding face, and two cylindric surfaces whose axes of generation are parallel with each other and perpendicular to said flat face.

24. In an abrasive wheel, the combination of a body presenting a plurality of abutments constituting fulcrums; a plurality of abrasive blocks arranged in pairs, each pair being between two abutments and constituting a toggle; means to swing the blocks of each pair about their fulcrums; and means to limit such swinging.

In testimony whereof, I have signed my name to this specification.

HAROLD F. SKILLINGS.