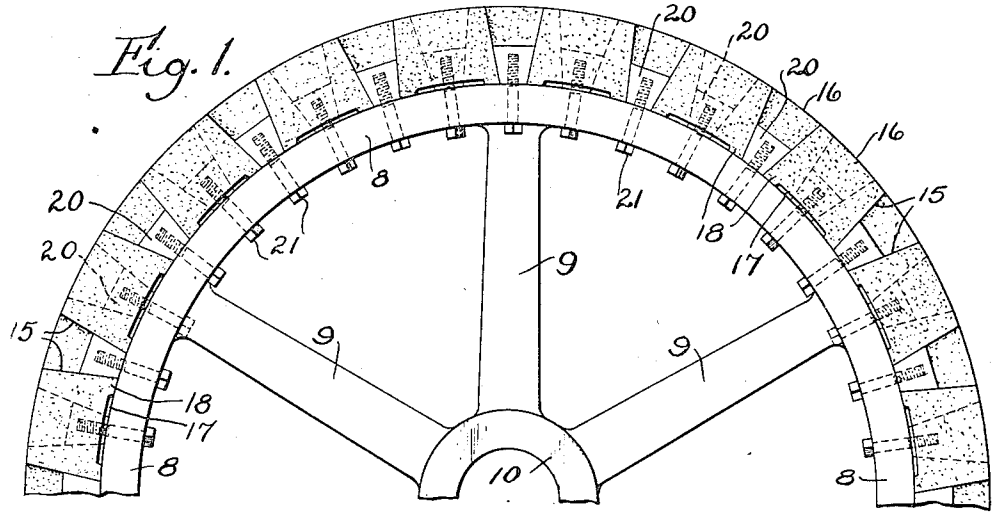
Aug. 10, 1937. J. GREENWOOD 2,089,847

GRINDING WHEEL

Filed June 20, 1936

Fig. 1.



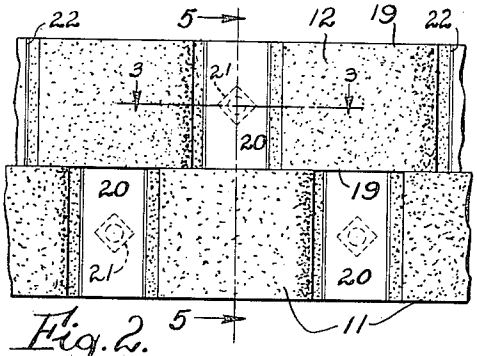


Fig. 2.

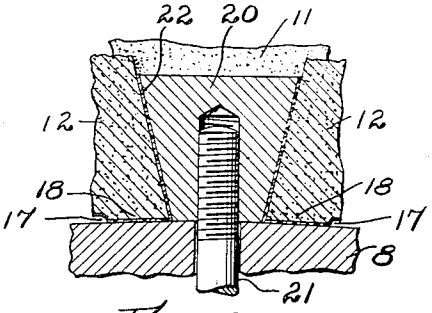


Fig. 3.

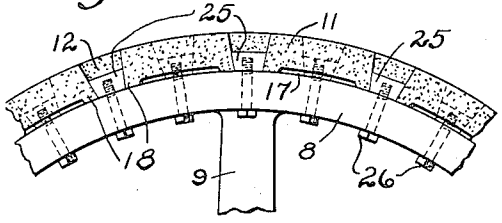


Fig. 4.

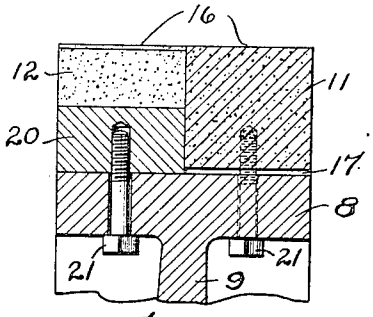


Fig. 5.

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GRINDING WHEEL

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4 Claims. (Cl. 51—207)

This invention relates to improvements in grinding wheels of the type in which the grinding surface of the wheel is formed of a plurality of grinding or abrasive parts or segments.

One object of this invention is to provide a grinding wheel of this kind in which the grinding blocks or segments are arranged on a rotary supporting member in an improved manner with relation to each other. Another object is to provide a grinding wheel in which the grinding or abrasive blocks or segments are mounted on the cylindrical periphery of a rotary support in spaced relation to each other circumferentially of the wheel, and in which the grinding blocks or segments are arranged in circumferential rows with the blocks of one row arranged in staggered relation to blocks of an adjacent row. Another object of this invention is to provide a grinding wheel of this kind which is particularly suitable for use in connection with the grinding of metal and in which spaces or pockets between adjacent grinding segments cooperate with the cooling liquid to provide for the proper cooling of the metal which is being ground. It is also an object of this invention to so arrange the grinding segments of the grinding wheel that while pockets or spaces are provided between adjacent segments, the surface of the wheel will, nevertheless, be in continuous contact with the work which is being ground. Another object of this invention is to provide a grinding wheel of this kind with means of improved construction for securing the grinding segments in place on the cylindrical periphery of the rotary support. Other objects of the invention will appear from the following description and claims.

In the accompanying drawing:

Fig. 1 is a fragmentary side elevation of a grinding wheel embodying my invention.

Fig. 2 is a fragmentary face view thereof on an enlarged scale.

Fig. 3 is a fragmentary section thereof on a still larger scale, on line 3—3, Fig. 2.

Fig. 4 is a fragmentary side elevation of a grinding wheel after the grinding segments have been partly worn away or reduced in height by the use of the wheel.

Fig. 5 is a transverse sectional view thereof, on line 5—5, Fig. 2.

In the grinding wheel illustrated, which forms one embodiment of this invention, a rotary support is employed on which the grinding blocks or segments are mounted. This support may be in the form of a metal wheel, which may be made of steel or other suitable material and which includes a peripheral or rim portion 8, spokes 9 and a hub 10 which may be mounted on a suitable shaft (not shown), the outer peripheral portion of the rim 8 being preferably cylindrical and the various grinding elements of the wheel are mounted on this cylindrical periphery of the wheel. A rotary support of any other construction may, of course, be employed, if desired.

In connection with the grinding of large machine knives, such for example as are used on paper and veneer cutting machines, it has been found that it is very necessary for efficient grinding of such metals to provide a grinding surface on the wheel which is interrupted, and consequently, when natural grindstones are used, it is customary to cut in the grinding surface of the stone, transverse grooves or recesses at short intervals. As soon as the surface of the stone is worn down to nearly the depth of the grooves or recesses thus formed, additional grooves or recesses must be cut in the stone. Consequently, a considerable portion of such stones is wasted, and furthermore, considerable labor is required to cut such grooves or recesses in the stone, and the work of grinding must, of course, be interrupted while such grooves are cut.

In accordance with my invention, the grinding surface of the stone is built up of a plurality of segments or blocks which are arranged in rows about the circumference of the wheel and the segments of each row spaced from each other. In order to provide for a continuous pressure exerted by the grinding wheel upon the work, I provide two or more rows of grinding segments, each of which is preferably of approximately hexahedral shape except that the upper and lower faces are curved. I arrange the rows of grinding segments to extend circumferentially around the wheel, the grinding segments of one row being arranged in staggered and overlapping relation to the grinding segments of an adjacent row. Consequently, the space or gap between adjacent grinding blocks of one row will be closed and bridged at one end by a grinding block or segment of an adjacent row. In the construction illustrated, grinding segments or blocks 11 of one row are consequently, arranged in staggered relation to the grinding segments or blocks 12 of the next row. Consequently, when the stone is being rotated in contact with the work, a grinding segment of either one or another row will always be operating upon the work and during short intervals, segments or blocks of both rows will be operating on the work. This prevents hammering or vibrations which

would result if the segments were not staggered to provide continuous contact with the work.

The grinding segments or blocks 11 and 12 may be secured to the grinding wheel in any suitable or desired manner. Preferably, however, I provide the grinding segments with tapering or inclined end faces or walls 15, which converge outwardly with reference to the wheel. The outer faces 16 of these segments or blocks are of the curvature of the outer periphery of the wheel, and the inner faces are formed to fit against the outer periphery of the rotatable support wheel rim 8. For example, the inner surfaces of the blocks or grinding segments may be recessed at 17, thus providing near opposite ends thereof legs or feet 18 which rest on the outer cylindrical face of the rim 8 of the rotary support, to enable the segments to more readily seat upon the periphery of the rotary support. The opposite side faces 19 of the grinding blocks or segments are preferably parallel to each other and are arranged in planes approximately perpendicular to the axis of the wheel.

This makes it possible to place the overlapping portions of segments of adjacent rows in contact to form a grinding surface free from circumferential grooves or recesses. When these abrasive segments are positioned on the periphery of the rotary support, the adjacent ends of two segments form between them recesses or pockets of wedge shape, the end walls of the recesses converging toward the axis of the rotary support.

In order to secure the grinding segments in correct relation to the wheel, I provide a plurality of wedges or holding members 20, which are preferably approximately of the same width as the width of the grinding segments and which have inclined faces of the same taper or bevel as the opposite faces of two adjacent grinding segments or blocks when positioned on the wheel. These wedges 20 may be secured in position in any suitable or desired manner, a bolt 21 being shown in the construction illustrated for each wedge, the bolt extending through a radially extending hole in the rim of the wheel and into a threaded hole in the wedge 20 as clearly shown in Fig. 3. By tightening the bolts 21, the wedges will be driven toward the periphery of the wheel in such a manner as to grip the grinding blocks or segments at opposite ends thereof. Preferably the wedges and the abrasive segments are so proportioned that when the wedges are in their gripping positions, the faces of the wedges nearest to the rotary support will bear against the cylindrical face of the support, as shown in the drawing. If, however, the abrasive segments are too large to permit this to be done, then every other wedge is first drawn tightly into engagement with the cylindrical surface of the rotary support and the remaining wedges are then drawn by their bolts 21 toward the periphery of the rotary support. In this manner, an accurate and firm positioning and holding of the abrasive blocks on the rotary support is assured.

In order to secure a tight fit and a firm grip on the grinding blocks or segments, and to avoid damage to the segments and wearing or abrading of the surfaces of the rotary support and wedges which engage the surfaces of the segments, these blocks may be provided at their legs 18 and on their inclined end faces with covers 22 of suitable yielding material which act as a protective cushion between the segments or blocks of grinding material and the metal supporting parts therefor.

The grinding segments or blocks may, of course, be made of any desired height radially of the wheel and in order to properly support the same, the wedges 20 are preferably about half of the height of the abrasive blocks. When the abrasive blocks become worn down to near the outer ends of the wedges 20, these wedges may be removed and replaced by shorter wedges 25, as shown in Fig. 4, which are held in place by means of shorter bolts 26. If a number of these grinding wheels are in use, some of these wheels may operate with larger grinding blocks or segments and larger wedges as shown in Fig. 1, and when these blocks or segments are worn down approximately to the height of the wedge blocks 20, they can be removed and placed on another wheel or rotary support equipped with smaller wedges 25. When this is done, it will be noted that in order to remove or replace the abrasive blocks or segments, it is only necessary to loosen alternate wedges around the periphery of the wheel sufficiently so that the blocks may be slid lengthwise of the axis of the shaft into or out of their operative positions between adjacent wedges. The grinding segments can then be further used until their surfaces are worn away approximately to the level of the outer surfaces of the wedges 25. When the abrasive blocks or segments are worn away, they can be readily replaced by new segments. Because of the fact that the difference in diameter between the grinding wheel with new abrasive segments and the grinding wheel with the segments ground down to a point at which they have to be replaced is comparatively slight, the grinding wheel can be operated at a constant rate of speed, no change speed mechanism being necessary to increase the rate of rotation of the wheel as the grinding wheel becomes of smaller diameter.

The grinding wheel described has the advantage that the construction thereof is simple and inexpensive and makes possible the use of blocks or segments of abrasive material of simple form. The wedges described form a very secure and effective means for clamping the abrasive blocks or segments in their operative positions, and furthermore, the wedges reinforce or support the end faces of all of the blocks, so that breaking of the blocks due to excessive pressure against the work is resisted. The entire set of abrasive segments can be very quickly removed from a wheel and replaced by another set, and if it should at any time become necessary to remove and replace a single segment, this can be done by loosening a single wedge, thus leaving all but two of the abrasive segments undisturbed.

Because of the spaces between adjacent abrasive blocks or elements, water or other cooling liquid is held in the pockets or recesses between abrasive blocks and thus permits adequate cooling of the work, and a consequent faster grinding of the same. By staggering the abrasive blocks in adjacent rows, the grinding wheel, nevertheless, has continuous contact with the work which is being ground. It has also been found that by using a grinding wheel as described with recesses or spaces between adjacent abrasive blocks or segments, there is seldom any cause to dress the wheel for the purpose of opening the grinding surface of the segments. With proper care, a grinding wheel according to my invention may be used throughout the life of a set of segments or blocks without dressing the surface thereof.

This is probably due to the fact that the grinding surface of each segment is comparatively short and because of the spacing apart of the segments as described, the metal does not become sufficiently heated by any segment to produce glaze on the grinding surface thereof or to fill the pores of the grinding surface with particles of metal. By avoiding the necessity for dressing the segments, the time usually required for such dressing of the same is saved, and furthermore, the stone described has been found to cut faster and more efficiently, due probably to the fact that with the stone described, the grinding surfaces of the abrasive blocks remain open.

Because of the fast cutting and efficiency of the grinding wheel described, burning of the work is avoided. The particular manner of holding the abrasive segments in place also has the advantage that it makes possible a very efficient use of the grinding segments, about ¾ths of which may be used in grinding.

I claim as my invention:

1. A grinding wheel having a rotary support provided with a substantially cylindrical surface, a plurality of grinding segments having substantially flat parallel sides and arranged in rows extending circumferentially of said cylindrical surface, the segments of each row being spaced apart at their ends to form open pockets between adjacent segments and being arranged in staggered and overlapping relation to and in contact with adjacent segments of the other row, and means for securing said segments to said support and arranged in the inner ends of said pockets, the outer portions of said pockets being open.

2. A grinding wheel for use in grinding large machine knives, and including a metal supporting wheel having a substantially cylindrical rim portion, a plurality of abrasive segments in block form removably secured to and extending substantially radially outwardly from said rim portion, said segments being arranged in circumferential rows with the segments of each row being spaced from each other lengthwise of said rows to provide recesses between said segments, wedges in the spaces between segments of a row and engaging opposite end walls of adjacent segments for securing said segments to said rim portion, the spaces between adjacent segments radially beyond said wedges being open to receive a cooling fluid, the grinding segments of one row being arranged in staggered and overlapping relation to adjacent segments of another row.

3. A grinding wheel including a rotatable support having a cylindrical surface, a plurality of abrasive segments arranged on and extending radially outwardly from said surface in a row extending circumferentially of said cylindrical surface, holders for said segments arranged between adjacent segments of a row and secured to said rotatable support and each engaging two adjacent segments at distances from their outer faces, the portions of the segments beyond said holders being spaced apart to form recesses in the periphery of said grinding wheel, and a similar row of grinding segments arranged adjacent to said first mentioned row and having the segments thereof arranged oppositely to the spaces between the segments of said first row, whereby a continuous substantially cylindrical grinding surface is provided with staggered spaces between segments for cooling the work.

4. A grinding wheel having a rotary support provided with a substantially cylindrical surface, a plurality of grinding segments having substantially parallel sides arranged in planes normal to the axis of said wheel and arranged in rows extending circumferentially of said cylindrical surface, the segments of each row being spaced apart at their ends and being arranged in staggered and overlapping relation to and in contact with adjacent segments of the other row, and means arranged in the inner portions of the spaces between the ends of said segments for securing said segments to said rotary support, whereby every portion of an object contacting with the periphery of said wheel while rotating will be exposed alternately to a grinding segment and a space.

JOHN GREENWOOD.