This invention relates to improvements in grinding wheels, and more particularly to such wheels as are utilized for grinding and polishing marble slabs. The grinding and polishing of slabs of stone, such as marble, as practiced, heretofore, has involved the use of grinding wheels with diamond cutters mounted on the bottom face of the wheel to operate on the top face of the stone slab. Relative motion between the slab and the wheel, to effect the grinding and polishing of the surface, often has resulted in breakage of the arris, which is the surface of the slab at the edge thereof. This breakage is occasioned by chipping off of fragments at the edge, causing an unsightly appearance and frequently ruining the entire piece for the desired result.

To obviate this objection, it is desirable to provide diamond segments not only on the bottom surface of the wheel, but also around the periphery thereof, so that during the operation of the wheel, there will be a gradual cutting or polishing action during the relative recilinear motion of the stone and wheel. Thus, the segments above the bottom surface will effect the initial removal of the surface portion of the stone and thereafter the segments at the bottom face will complete the polishing action of the surface.

It has been proposed heretofore to provide these several diamond cutting segments on a single block, secured to the bottom face of the grinding wheel. A multiplicity of blocks, each with its own segments, are spaced circumferentially of the wheel throughout a substantial portion thereof. These segments and blocks are not readily interchangeable, nor are the diamond segments replaceable on the blocks. When some of the cutting segments wear out, replacement is necessary, even though other segments on the same block have not completed their useful lives.

One object of this invention is to overcome the objections noted and to improve the construction of the diamond cutting segments. Another object of the invention is to provide for the ready interchangeability of the cutting segments in the field, without the necessity for purchasing a new wheel or block.

Still another object of the invention is to provide for use of a single set of cutting segments in making a cutter head or wheel of any desired diameter and for disposition of the cutting segments in any desired relation to each other.

These objects may be accomplished, according to certain embodiments of the invention, by providing a series of cutting segments wherein each segment is mounted in a support or holder and so formed as to provide for both a bottom polishing surface and a curved or angular upturned surface to effect removal of portions of the slab above the top face during the relative recilinear movement between the wheel and slab. Provision is made for securing the segments to the bottom face of a head or wheel by detachable mounting means, so that the segments can be easily and readily interchanged in the field and may be adjusted to different desired angles with respect to the radius, either directly radial or turned to either side of a radius plane or turned to circumferential direction, as found desirable.

I have found that a material such as an epoxy resin or other plastic, that has substantially the holding power of steel, may be molded or formed about the cutting segment to provide a holder or block for supporting the segment. One or more bolts or suitable devices may be connected with the holding means, such as being imbedded in the plastic material for positioning the holding device in the desired relation to the wheel or head and for detachably securing the same thereto.

These embodiments are illustrated in the accompanying drawings, in which:

FIG. 1 is a cross section through a grinding wheel, showing the invention applied thereto;

FIG. 2 is an enlarged detail view through an edge portion of the wheel;

FIG. 3 is a bottom plan view thereof;

FIG. 4 is a similar view, showing a plurality of cutting segments mounted in a single holder;

FIG. 5 is a detached perspective view, showing one of the segments and holder adapted for radial mounting; and

FIG. 6 is a similar view, showing segments and holder adapted for circumferential mounting.

Referring to FIGS. 1 and 2, a conventional rotary grinding wheel or head is illustrated as a means for supporting a plurality of diamond cutting segments. The wheel or head illustrated in this embodiment includes a mounting plate 1 supported by a spindle or shaft 2 having an adapter 3 secured to the lower end of the shaft 2. The adapter 3 is held in place on the shaft by a nut 4 and is keyed or otherwise fixed thereto. The adapter 3 is also secured to the plate 1 by bolts 5.

Secured to the upper surface of the mounting plate 1 is a ring member 6, with an inturned water collar 7 secured thereto by mounting bolts 8 that extend into the plate 1 and connect these several parts together. A coolant pipe 9 extends into the water collar 7 for supplying water thereto, which is fed through passageways 10 in the plate 1 to the surface on which the wheel or head is operating.

Diamond cutting segments are provided at the bottom face of the wheel or head, spaced apart circumferentially about the periphery thereof. These diamond cutting segments are indicated at 11, being formed of usual abrasive material, such as that which has diamonds distributed therethrough to effect the desired abrasive action. Each segment 11 has a polishing surface including a bottom surface 12 and an angular surface 13. The bottom surface is disposed so as to lie in a plane either normal to the axis of the wheel or head or somewhat inclined with respect thereto, as shown, to effect the polishing action on the top surface of the slab 5. By having the bottom surface initially inclined toward the center axis of the wheel, the maximum usage and degree of wear of the segments may be obtained. Extending upwardly from the bottom surface 12 of the segment is an angular surface 13, which may be curved, if desired, but in any event it acts to cut away or remove the portion of the slab of stone above the plane of the top surface on which the portion 12 acts.

In the form of the invention shown in FIGS. 3 and 5 with an elongated bar segment 11, each cutting segment is mounted in a holder, generally indicated at 14 to form a cutting element for detachable mounting on a rotary head. The holder 14 may be formed of a suitable material.
which will embrace or secure the segment in place. The holder may extend in overlapping relation on opposite sides, but the bottom surface 12 and the angular surface 13 are spaced from holder, as shown in FIGS. 2 and 5. I have found a plastic material, such as an epoxy resin, having secure holding properties approaching those of steel, very effective for this purpose. It may be molded or formed about the segment, or the latter secured to the holder by a suitable solder or cement, or other adhesive means. When the life of the diamond segment material has been substantially used up, the holder material can be stripped off and the abrasive thus recovered.

If desired, only the exposed portion of the abrasive segment need be formed of diamond material, while the portion of the segment that is imbedded or enclosed by the plastic or holder may be of a different material, so as to effect a substantial saving in cost.

Each holder 14 is shown as provided with two bolts 15 secured effectively to the back face of the holder and projecting outwardly therefrom, so as extend through openings in the plate 1 and be anchored by nuts 16. This forms a detachable mounting for each segment on the bottom face of the head or wheel.

By providing a series of orifices, generally indicated at 17 in FIG. 3, through the plate 1 of the wheel of the head, the segments can be turned to different positions with respect thereto, generally as indicated in FIG. 3. Thus, the segments may be disposed radially of the wheel or turned to either side of a radial plane, as also illustrated therein. Generally, however, all of the segments will be turned in the same direction, rather than the different positions illustrated in this drawing.

If desired, however, a plurality of segments 11 may be mounted on a single holder, as illustrated in FIG. 4. In this instance, an arcuate holder is shown at 18, having a plurality of segments mounted thereon in radial positions. Each of the segments is fixed securely to the holder, either by being soldered or adhesively applied to the surface thereof, or imbedded therein in the manner illustrated in FIGS. 1, 2 and 5.

In this form, each segment 11 has a bottom surface with an upturned guiding surface corresponding with those indicated at 13 and 15 in FIG. 5. The holder 18 may be made of plastic material, as described above with respect to the holder 14.

Still another modification is shown in FIG. 6, wherein a holder is illustrated at 19 having bolts or other detachable fasteners 20 projecting from the back face thereof adapted to be inserted through orifices in the plate 1 for detachable fastening of the holder on the bottom face of the plate. In this form, however, segments 21 are imbedded in or secured to the material forming the holder in the manner described above. The bottom surfaces of the pair of segments 21 are spaced from the holder 19.

These segments are shown as slightly arcuate, to permit disposition of the holder of the segment in a circumferential direction relative to the wheel or head. A multiplicity of such holders may be used, thus extending about the underface of the wheel or head, to effect the desired polishing of the surface.

If the holders are formed of plastic material, as described, and the diamond segments have the abrasive material extending into the plastic material, the latter will wear down during operation of the wheel or head and thus expose additional diamonds until the abrasive material is substantially entirely used up. Thus, no abrasive salvage would be required, but the unused portion can readily be salvaged, if desired, by stripping off the plastic material.

Such segments can be made of standard size and characteristics, so that one group of segments can be used to provide a head or wheel of any desired diameter, without being specially formed or shaped for each respective size of wheel or head. Moreover, these can be interchanged in the field, without requiring the purchase of a new head or the return of an old one for replacement of the segments.

While the invention has been illustrated and described in certain embodiments, it is recognized that variations and changes may be made therein, without departing from the invention as claimed.

I claim:

1. A grinding wheel comprising a rotary head having a plurality of elongated abrasive segments spaced circumferentially about the under surface of the head, the longitudinal axis of said segments extending substantially radially of said head, each of said segments having a plane bottom surface turned upward in sloping relation at the periphery of the head and forming a continuation of the bottom surface.

2. A grinding segment comprising an elongated bar of abrasive material, a holder having opposite sides and opposite ends, means securing the bar in one opposite side of the holder, and means in the other opposite side for fastening said holder to a grinding head, said bar having an exposed grinding surface extending along said one side of the holder, said grinding surface sloping toward said holder at opposite ends of said holder, the slope of said grinding surface being substantially greater at one end of the holder, than at the opposite end.

3. A holder for circulating a head having a radial face and peripheral edge, a plurality of holders, means for securing the holders individually to the radial face of the head, a plurality of elongated abrasive segments, each of said segments being secured in a holder and having a grinding surface extending from a portion of the holder adjacent the center of the head to a portion of said holder adjacent the peripheral edge, said grinding surface being spaced a greater distance from said radial face at the end adjacent the center of the head than at the end adjacent the peripheral edge.

4. A grinding wheel comprising a head having a center, a radial face and a peripheral edge, a plurality of holders, means for securing the holders individually to the radial face of the head, a plurality of segments, each of the segments containing abrasives throughout, said segments having a greater width than thickness and having opposite longitudinal edges, opposite sides and opposite ends, each of said holders being formed of a plastic material embracing the opposite sides of a segment, said segments being mounted in the holders with one of said edges and one end thereof exposed, said exposed end being on the side of the segment opposite the center of the head and sloping outwardly, said holders extending radially of the head, each of said holders being secured to the head at an equal distance from the center of the head whereby the sloping ends of the segments are spaced from the center and upon rotation of the workpieces are ground against the sloping end and the exposed longitudinal edge of each segment as the head advances radially.

5. A grinding element comprising an elongated bar having abrasive material throughout and having a polishing surface, a holder, said holder overlapping said bar on opposite sides of the bar and exposing said polishing surface, and means on the holder for fastening said holder to a grinding head, said exposed polishing surface including a bottom surface and an angular surface, said holder being formed of a softer material than said bar, whereby the holder wears away to expose the bar during grinding.

6. A grinding element comprising a pair of elongated bars having abrasive material throughout and each having a polishing surface, a holder, said holder overlapping said bars on opposite sides of each bar and exposing said polishing surfaces, and means on the holder for fastening said holder to a grinding head, said exposed polishing surface of each bar being curved toward the holder, said holder being formed of a softer material than said bars,
whereby the holder wears away to expose the bar during grinding.

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