May 28, 1968 L. H. VORCE ET AL 3,385,010

ABRASIVE DISC

Filed March 25, 1966

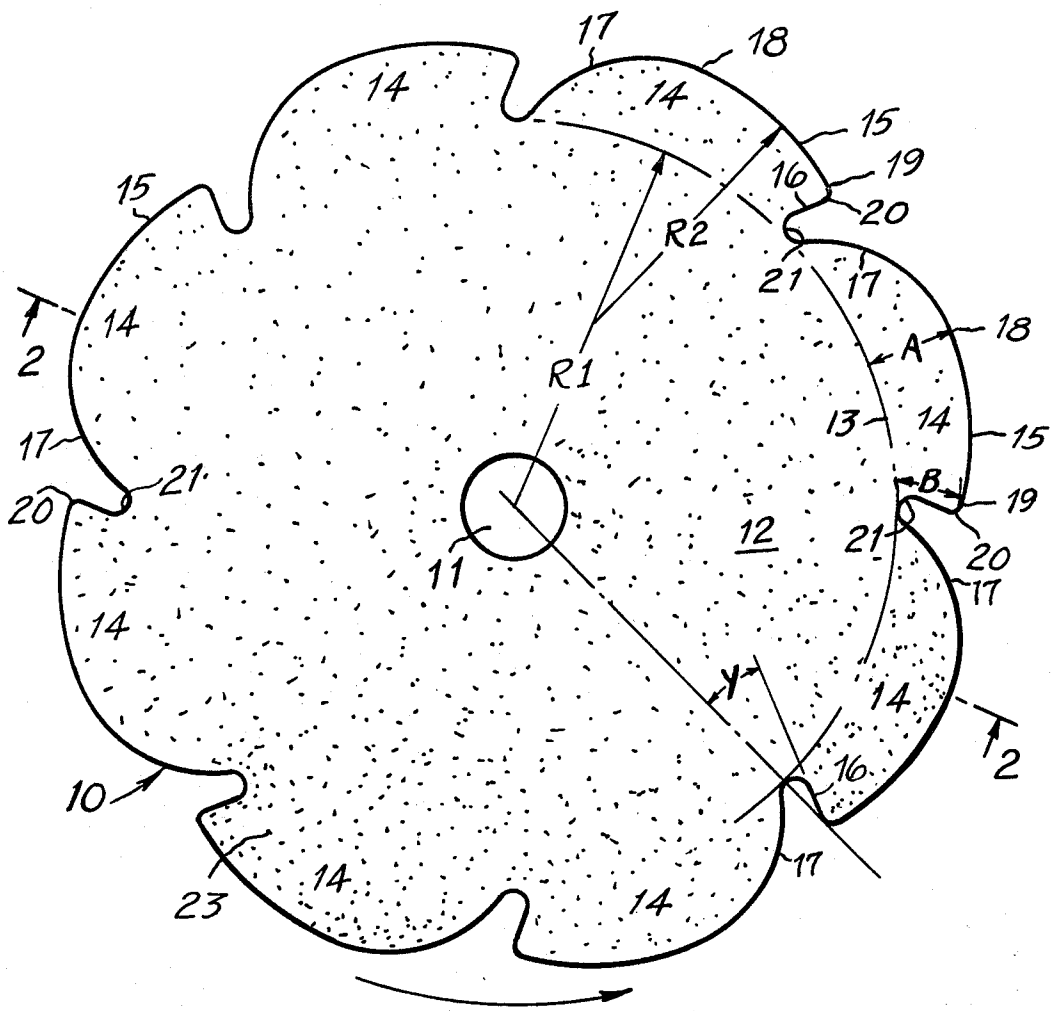

Fig. 1

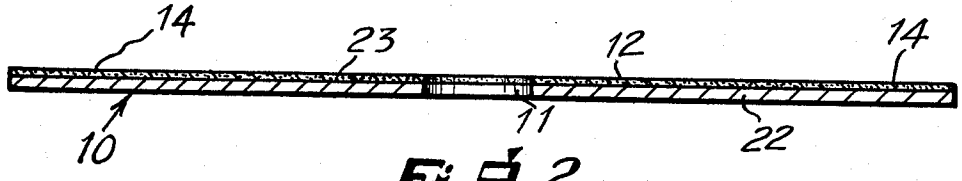

Fig. 2

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United States Patent Office 3,385,010 Patented May 28, 1968

3,385,010

ABRASIVE DISC

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Filed Mar. 25, 1966, Ser. No. 537,363
6 Claims. (Cl. 51—395)

The present invention relates in general to coated abrasives and more specifically to coated abrasives in the configuration referred to in the art as an abrasive disc.

The normal abrasive disc is circular in form and is cut from a larger sheet or web of a coated abrasive material. The coated abrasive material is usually on either a cloth, fiber or paper backing suitably treated as is well known in the art. The abrasive grains, e.g. aluminum oxide, silicon carbide or various natural abrasive materials are bonded to the backing by glue or resin adhesives or combinations thereof.

Variations from the normal circular configuration of abrasive discs have heretofore been proposed and a variety of these have found use in the art. Such shapes as hexagonal, octagonal and pentagonal are common—some with sharp intersecting points or corners and others with the intersections between the polygonal sides rounded to eliminate sharp junctures. A further non-circular periphery shape which has been found useful is the so-called rosette disc disclosed in U.S. 3,186,135.

However, all of these discs have possessed one disadvantage which has required that operators possess substantial skill. When grinding as on a metal surface such as a fender, unless extreme care is taken the discs of the prior art will all "edge cut." That is, they will tend to bite deeper into the metal or other surface being sanded or ground at the point of contact between such surface and the peripheral edge of the disc. This will produce a variation in the surface which may be undetectable at the time of grinding but when the surface is finished it will show up as a wave or undulation of the surface under the finish coat of paint, primer, varnish or the like. Particularly in production line operations as in the manufacture of automobile bodies, this tendency to edge cut causes serious problems of delays, reworking and expense.

Accordingly, it is an object of the present invention to provide a coated abrasive disc which overcomes this defect of prior art discs.

Another object of this invention is the provision of a coated abrasive disc which will not edge cut even when used by unskilled operators.

A further object of this invention is to provide a coated abrasive disc which has extreme flexibility in its peripheral portions and which will not hook or engage with the workpiece being ground so as to cause damage to either the disc or the workpiece.

Additional objects, if not specifically set forth herein, will be readily apparent to one skilled in the art from the following detailed description of the invention.

In the drawings:

FIGURE 1 is a plan view of one embodiment of the coated abrasive disc of the present invention.

FIGURE 2 is a sectional view taken along the line 2—2 of FIGURE 1.

Generally, the present invention comprises forming a coated abrasive disc into a configuration having an interrupted non-circular periphery. The disc shape can be described as a circular central portion with a plurality of interrupted peripheral segments formed integrally with such central portion and uniformly spaced therearound. Each peripheral segment is separated from the next by a non-radial slot inclined from the periphery towards the interior of the disc in the direction in which the disc will be rotated in use. In the preferred construction, the boundary of the peripheral segment may be considered

to be essentially defined by four boundary lines; the innermost being the arc of the circular central portion of the disc; the central outermost portion being formed by an arc having a radius less than the radius of the circular central portion but greater than 50% of such radius of such circular central portion; the trailing edge of such arc (i.e., the end of the segment which would be the last to pass a given point when the disc is rotated in use) being connected to the innermost boundary line (the arc of the circular central portion) by a straight line substantially normal to the arc of said outermost central portion and hence at an angle to the continuation of any radius of the arc forming the central circular portion; and a last segment connecting the leading edge of the outermost central portion of the segment boundary with the innermost boundary and with the straight line section of the next adjacent segment. This latter boundary line may be arcuate or straight but either the straight line or a tangent to the arc if an arcuate boundary line is used will form an obtuse angle with the arc forming the central outermost portion. The exact point of contact between this line and the arc forming the outermost portion of the segment as well as the exact configuration of such line is not critical except that the point of contact which may be referred to as the leading edge of the segment should be further out from the circular central portion of the disc than the corresponding trailing edge of such segment. Variation in the location of the leading edge of the segment will cause variation in the area of the segment and hence it is generally maintained at only very slightly greater distance from the circular central portion than the trailing edge in order to maximize the cutting surface, i.e., the area of the peripheral segment.

More specifically and referring now to the drawings, FIGURES 1 and 2 show the preferred embodiment of the present invention. While the various boundary lines forming the peripheral segments may intersect at sharp points, it is preferred that each intersection be blended smoothly to avoid developing points of weakness which could result in failure of the disc in use and to help insure smooth cutting or grinding operations without snagging of the workpiece. Here reference numeral **10** refers to the coated abrasive disc with the abrasive surface **23** up or towards one on the drawing. This is important since the disc of this invention can rotate only in one direction in use. The direction of rotation is shown by the arrow on the drawing of FIGURE 1. The disc **10** may or may not have a central hole portion **11** for use in securing the disc to the back-up plate of a conventional grinder. Obviously, where it is desired to adhere the disc with adhesive, center hole **11** is not required. The disc **10** has a central circular portion **12** defined by the arc **13** shown in dotted lines. Extending outwardly from this central portion **12** are a plurality of spaced peripheral segments **14**. These may be as few as five or six in number and as many as 16 to 20 as desired, so long as they are equi-spaced about the central circular portion **12**. For most purposes eight segments have been found to be optimum as illustrated in FIGURE 1.

Each peripheral segment **14** is defined by the arc **13** of the central circular portion **12** of disc **10** having a radius R_1; by an arc **15** having a radius R_2; by a straight line section **16** and by a connecting line section **17** from the leading edge **18** of arc **15** to the arc **13**. As indicated above, while these defining lines could meet at sharp points, it is preferred to utilize short arcs or curves to interconnect each to avoid weak spots and to enhance performance. As shown, the trailing edge **19** of peripheral segment **14** is connected through a short arc **20** to straight line **16** while leading edge **18** is connected with an arc **17** blended into arc **15** at the leading edge thereof. A short arc **21** then interconnects respectively arc **17** to the straight line section **16** of the next adjacent leading

segment and straight line section **16** to arc **17** of the next adjacent trailing segment. Since each of these interconnecting arcs **21** are tangent to the arc of the central circular portion **12**, they likewise interconnect the identified ends of each segment to said central portion. As previously pointed out, these peripheral segments **14** are actually integral with the central portion **12** of disc **10**. Leading edge **18** is at a distance A from the arc **13** of the central circular portion **12** while trailing edge **19** is at a lesser distance B from the same arc **13**. Although variations may be made within the general limits defined above, for illustrative purposes it may be pointed out that in the disc shown in FIGURES 1 and 2, the angle Y between the straight line section **16** and the extension of the radius R_1 of the central circular portion **12** is 22½° and the ratio of R_1 to R_2 is approximately 1:1.3, i.e., R_2 is about 75% as long as R_1. FIGURE 2 illustrates that in other respects the disc of the present invention is similar to conventional coated abrasive discs, i.e., the disc **10** is formed of a backing member **22** which, as described above, may be paper, fiber, cloth or combinations thereof, and a uniform layer or layers of abrasive grain forming the abrasive surface **23** adhesively bonded to the upper surface of member **22**. As clearly shown in FIGURE 2, the central portion **12** of disc **10** and peripheral segments **14** are integral and lie in substantially the same plane.

In operation, the disc **10** is mounted, abrasive surface out, on the back-up plate of a conventional grinder and rotated in the direction of the arrow. The peripheral segments are, of course, not supported by the back-up pad, although usually and preferably such back-up pad will conform to and support the central circular portion **12** of the disc. The leading edge of each segment will first engage the work being abraded and will lead the segment per se smoothly into the work. The segment has flexibility to conform to the surface of the workpiece but is strengthened by the support derived from the straight line configuration at the trailing edge so as to effectively abrade. The lower relationship of the trailing edge to the leading edge of the segment in combination with the other features of the disc have been found to make it virtually impossible to edge cut with the disc of this invention. A secondary advantage of the claimed configuration is the ability to view the area being ground by virtue of the interruptions between segments similar to the effect achieved by looking through the blades of an electric fan.

Obviously, many modifications and variations may be made without departing from the spirit and scope of the invention described above and, therefore, only such limitations should be imposed as are contained in the appended claims.

We claim:

1. A coated abrasive disc comprising a continuous, substantially planar, abrasive coated base member having a circular central portion and a plurality of interrupted segments integral with said circular central portion, uniformly spaced therearound, and extending outwardly therefrom in the same plane as said central portion; each of said segments being separated from the next adjacent segment by a non-radial slot inclined from the periphery towards the interior of the disc in the direction in which said disc is to be rotated in use; and each of said segments having its outermost periphery formed by an arc of lesser radius than the radius of said circular central portion; the leading edge, with reference to the direction in which said disc is rotated in use, of said outermost periphery of said segments being at a greater distance from said circular central portion than the trailing edge of said outermost periphery of said segments.

2. A disc as in claim **1** wherein the radius of the arc forming the outermost periphery of each segment is at least fifty percent of the lentgh of the radius of said circular central portion.

3. A disc as in claim **1** wherein at least a portion of the periphery of each such segment has a straight line edge.

4. A disc as in claim **3** wherein said straight line edge forms at least the leading edge, with respect to the direction in which said disc is rotated in use, of said non-radial slot.

5. A disc as in claim **4** wherein said straight line edge is substantially normal to the arc forming the outermost periphery of said segment.

6. A disc as in claim **4** wherein all intersecting edges of said segment, said circular central portion, and said non-radial slot are blended into each other with a smooth curve.

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