ABSTRACT OF THE DISCLOSURE

A rotary-type grinding wheel for lenses has an abrasive material sintered around the annular tip portion of the wheel to form an arcuate edge extending on the outside and inside of the wheel for a height greater than the amount of the stock that is to be removed from the lens blank. The abrasive material may be sintered to a metal ring, which is secured to the annular, open end of the wheel.

The present invention relates to grinding wheels, and more particularly to cup type wheels for surface grinding in a generating process toric and spherical lenses. In a still more specific aspect, the invention relates to diamond-impregnated cup wheels for grinding toric and sperical glasses in a generating process.

Cup-type wheels for grinding toric and spherical lenses in a generating process are shown in the U.S. patent of Fowler No. 2,589,488, granted Mar. 18, 1952. These wheels have arcuate working surfaces on their annular tip edges.

Because of the high cost diamond wheels it is customary to make only the tip of the wheel of a diamond abrasive material and to make the body and shank of the wheel of metal. Usually the diamond abrasive material is sintered to a metallic ring which is, in turn, soldered to a steel body.

Diamond wheels for grinding toric and spherical lenses in a generating process, have heretofore, however, had a very limited life. The lenses are made of glass, of course, and lens glass has itself a high abrasive characteristic. The lenses themselves tend to undercut the ring which carries the abrasive; and the wheel has to be discarded before the diamond tip is actually worn away.

The prime object of the present invention is to provide a diamond wheel for the purpose described which will have a longer life than such diamond wheels as heretofore made.

Another object of the invention is to provide not only a diamond wheel for the purpose described which will have a longer life but which will be no more costly than present diamond wheels.

Other objects of the invention will appear hereinafter from the specification and from the recital of the appended claim.

In the drawing:

FIG. 1 is a fragmentary view showing the known form of grinding wheel in use in grinding a convex toric lens, part of the wheel being broken away to show how the lens undercuts the ring;

FIG. 2 is a similar view illustrating the generation of a convex lens with the known form of wheel, part of the wheel again being broken away to show how the lens undercuts the ring limiting the wheel life;

FIG. 3 is a fragmentary view on an enlarged scale showing a wheel made according to one embodiment of the present invention in use grinding a concave lens, part of the wheel being broken away;

FIG. 4 is a fragmentary view illustrating somewhat diagrammatically the use of this wheel in the surface grinding of a convex lens.

Referring now to the drawing by numerals of reference, 10 denotes a conventional cup-shaped diamond grinding wheel for grinding lenses. The wheel is here shown only fragmentarily. Its axis is at 11; and its body portion 12 and integral shank 14 are made of steel or other suitable metal. Silver-soldered to the tip of the wheel is an iron, or brass, or ferric bronze ring 13. The wheel body has an internally-facing, radial, cylindrical shoulder 18 formed on it against which a correspondingly-shaped, externally-facing radial shoulder 19 formed on the ring 13 seats to prevent lateral movement of the ring 13 relative to the steel adaptor or body portion 12. The tip surface 15 of the wheel is made in conventional manner of an abrasive material impregnated with diamonds or diamond dust and adhered to the rounded tip 16 of the ring 13 by sintering, or in any other suitable manner. The tip 17 of the abrasive surface is also rounded to form an arcuate working surface on the annular edge of the wheel, as required for a lens generating operation.

In the conventional wheel the thickness of the diamond abrasive material on the tip of the wheel is approximately one eighth inch; and this thickness is maintained substantially uniform around the arcuately curved tip 16 of the ring to blend in with the sides of the ring.

The entire amount of glass to be ground off the lens blank may be removed in a single pass, but where a considerable amount of glass is to be moved it is preferable to make a number of passes taking off about 1 mm, per pass. In the grinding operation the wheel rotates on its axis and the lens is swung in the direction of the arrow 21. As will readily be seen from FIG. 1, whether the stock is to be removed in a single pass or in a number of passes, the top surface 22 of the lens blank will in the generating operation extend above the abrasive diamond tip 15, and dig into the ring 13, undercutting the ring above the diamond tip, as denoted at 24.

This undercut will occur whether the wheel is grinding a convex lens or a concave lens. FIG. 1 shows the grinding of a concave lens and FIG. 2 the grinding of a convex lens. The only difference is that in the grinding of the convex lens 25 the undercut 26 will occur at the outside of the ring 13; whereas in the grinding of a concave lens, the undercut 24 will be on the inside surface of the ring.

It will readily be apparent from FIGS. 1 and 2 that the undercut limits materially the life of the wheel. If the same wheel is used for grinding both convex and concave lenses, it will be apparent that even less undercut than shown in FIGS. 1 and 2 will undermine the strength of the wheel adjacent the diamond tip to such an extent that it will break much sooner than where a wheel is used for grinding only convex or only concave lenses.

In FIGS. 3 and 4 there is illustrated the improved diamond grinding wheel of the present invention. Here the wheel, which is denoted generally at 30, again has a steel or other metallic body portion 31 and integral shank 34. Again, the steel body portion of the wheel has an iron, or brass, or ferric bronze ring 35 silver-soldered to its tip; and the wheel body has an internally-facing, radial, cylindrical shoulder 36 formed on it against which a correspondingly shaped externally-facing radial shoulder 38 formed on the ring portion 35 seats to prevent lateral movement of the ring portion 35 relative to the steel adaptor or body portion 31.

The shoulder 36 serves for centering the tip portion 35 on the wheel so that it will run almost dead true.

The ring portion 35 is formed with a rounded tip 39 which here, however, is recessed or offset radically inwardly from the base portion 40 of the ring so as to form shoulders 41 and 42 at the outside and inside, respectively, of the ring.

The diamond impregnated abrading material 45 is
coated over the tip of the ring 35, around the sides of the tip to the shoulders 41 and 42, and sintered to the ring. The full depth of the coating is in practice approximately 3/16 of an inch.

In making the wheel, the ring portion 35 can be forced into the abrasive mixture under pressure; and then the abrasive mixture may be sintered to the ring portion.

As a result, in the grinding operation, the lens, whether a concave lens 20, or a convex lens 25, will not extend above the abrasive grinding surface of the wheel; and the lens blank will engage only that grinding surface. The ring portion 35 of the wheel will not be undercut. The life of the wheel, therefore, will be much longer than the life of the conventional wheel.

While the invention has been described in connection with one embodiment thereof, it will be understood that it is capable of further modification; and this application is intended to cover any variations, uses, or adaptations of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice in the art to which the invention pertains and as may be applied to the essential features hereinafore set forth, and as fall within the scope of the invention or the limits of the appended claim.

Having thus described my invention, what I claim is:

1. A rotary cup type grinding wheel for grinding lenses comprising

   (a) a metallic, generally cup-shaped body portion,
   (b) a metallic ring having a base portion secured to the tip of said body portion coaxially thereof and abutting against said body portion, said body portion having an internally-facing circular shoulder formed on it and said base portion of said ring having an externally-facing circular shoulder formed on it which abuts and seats against said internally-facing shoulder, said ring having a rounded arcuate-shaped tip and being recessed circumferentially on opposite sides to provide plane shoulders at the junctures of said opposite sides and the base portion of said ring, and
   (c) an abrasive material coated on the tip portion of said ring and its opposite sides to a thickness equal to the width of the shoulders on said ring, said abrasive material being shaped to an arcuate tip shape.

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