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COMPOSITE GRINDING WHEEL

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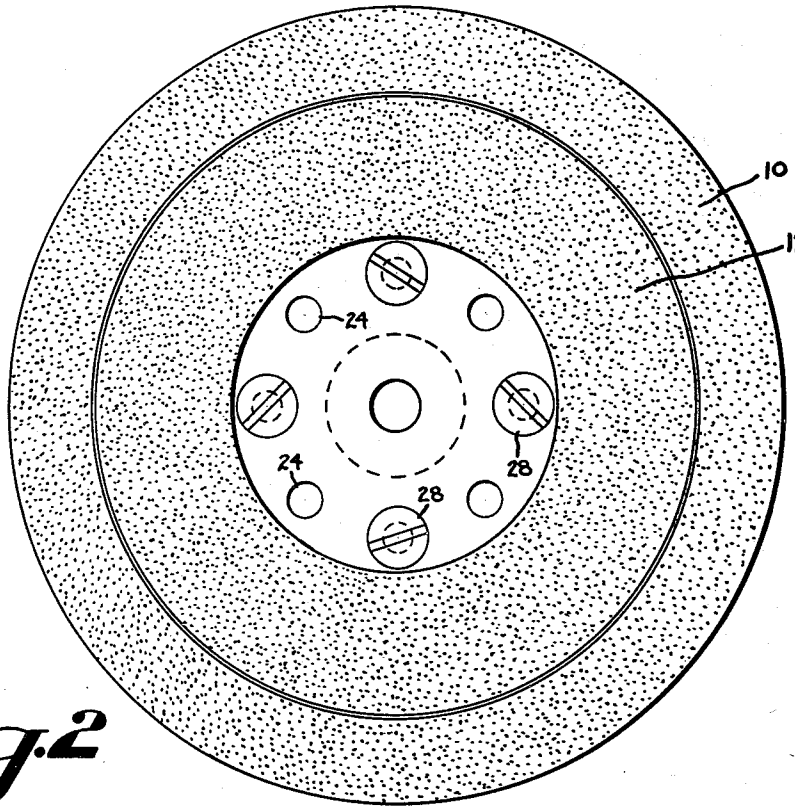


Fig. 2

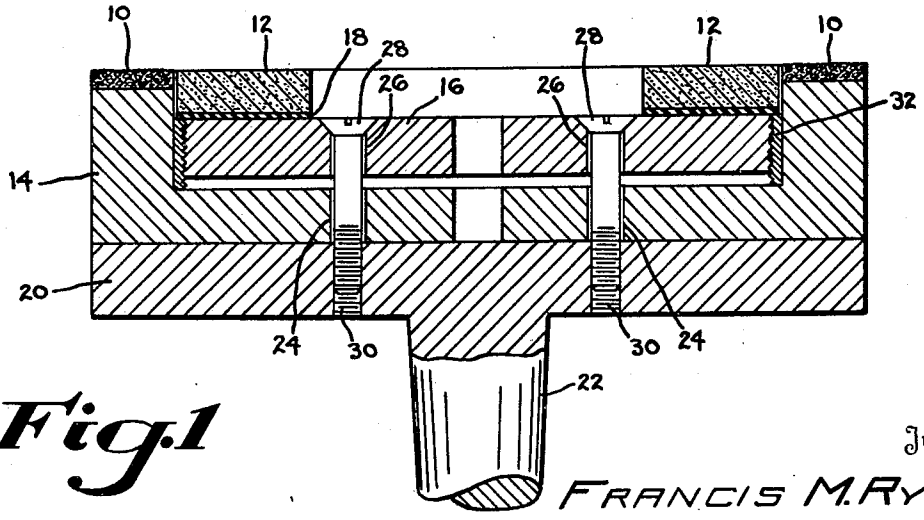


Fig. 1

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COMPOSITE GRINDING WHEEL

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3 Claims. (Cl. 51—181)

This invention relates to abrasive wheels and more particularly to wheels adapted for grinding tools which have hard, cutting tips mounted on a metal shank.

A standard cutting tool comprises a steel shank having brazed thereon a tip of tungsten or other carbide cemented with cobalt or other suitable metal bond. Grinding wheels made of diamond grains bonded with resinoid or metal have been well adapted for grinding the cemented carbide tip, but the use of the expensive diamond wheel for grinding the steel shank is not ordinarily recommended. If it is attempted to grind both the carbide tip and the steel shank at the same time, it is found that the steel slows down the cutting action to an appreciable extent and thus interferes with the operation of resharpening or shaping the carbide tip. Hence, the standard practice has been to grind the steel shank initially by means of a grinding wheel or vitrified bonded crystalline alumina or silicon carbide abrasive for the purpose of cutting away or backing off the steel shank at an angle of 10 or 15° relative to the adjacent tip surface so that the shank will not interfere with the subsequent step of sharpening the carbide tip. The carbide tip is then ground by means of a bonded diamond grinding wheel. This double operation requires the use of two wheels and a considerable waste of time.

The primary object of this invention is to provide a grinding wheel which may be employed for grinding simultaneously two different types and zones of material, such as a cemented carbide tip and a supporting steel shank.

In accordance with my invention, I propose to make a multiple zone grinding wheel having two zones of bonded abrasive of different grinding characteristics which are adapted for grinding simultaneously two materials of different degrees of hardness or which require different abrading treatments. One type of wheel may comprise a multiple zone wheel having a zone of bonded diamond or other abrasive grains suitable for grinding a hard part of a composite work piece associated with a second zone of other abrasive, such as bonded silicon carbide or crystalline alumina which is best adapted for grinding another and dissimilar portion of the work.

A further object of the invention is to make such a multiple zone wheel and to provide constructional features which permit adjustment of one zone relative to the other to compensate for the uneven rates of wear thereof. Further objects will be apparent or particularly pointed out in the following specification.

Referring to the drawing which illustrates one embodiment of this invention:

Fig. 1 is a transverse diametrical section through a composite grinding wheel embodying this invention; and

Fig. 2 is a top plan view thereof.

One form of composite grinding wheel embodying this invention may comprise two separate abrasive bodies which are mounted on a single rotatable support for simultaneously grinding a composite work piece made of two different materials. This wheel may comprise an outer annular zone 10 of bonded diamonds or other abrasive material and a second inner zone 12 of suitably bonded abrasive material, such as crystalline alumina or silicon carbide. One construction for the outer zone may comprise an annular support 14 made of suitable material, such as metal, rubber or resinoid, which carries an annular zone 10 of diamond grains bonded by metal, rubber, resinoid or other bond. The inner abrasive zone 12 may be made of abrasive material, such as crystalline alumina or silicon carbide grains bonded by vitrified ceramic material, rubber, resinoid or other suitable bond. This second zone body may be shaped to fit within the outer cup and the two parts are secured together rigidly but arranged for relative adjustment, so that the two zones may be maintained in working order and their surfaces positioned as required in spite of dissimilarity of rate of wear.

The outer wheel comprising abrasive rim 10 and back 14 may be made in accordance with the patent to Webster No. 1,832,515 of November 17, 1931 and as more particularly described in the patent to Sanford No. 2,073,590 of March 9, 1937. The support 14 may be made of a resinoid mixture and particularly one containing a large percentage of metal particles, such as disclosed in Van der Pyl Patent No. 2,150,886 of March 14, 1939. This may comprise a mixture of a finely divided, partially converted phenol-formaldehyde resin powder and aluminum metal granules. One suitable proportion for the back 14 comprises one part by weight of resin powder to 10 parts by weight of aluminum. The diamond grinding zone may comprise a mixture of diamond grains of suitable size and a similar phenol-formaldehyde resin powder. These may be suitably proportioned in accordance with the desired grinding action, such as 25% by volume of diamonds and 75% of bond. The back 14

is preferably molded first, but only partially cured, and then placed in the mold and the mixture of diamonds and resinoid is then added and then the mold is placed in a hot press which is heated to a temperature of about 160°. The mold may be kept in the hot press for 5 to 25 minutes under a pressure sufficient to consolidate the mass and form an integral body in which the two layers are rigidly united. Other suitable types of resin and methods of procedure may be adopted as desired.

On the other hand the abrasive rim 10 may be metal bonded diamonds in accordance, for example, with either of Van der Pyl patents Reissue No. 21,165 of July 25, 1939 or No. 2,238,351 of April 15, 1941. One preferred embodiment according to the above reissue patent involves a mixture of twenty five volume per cent of diamonds, the remainder metal bond being made from 81.4 per cent by weight of copper powder, and 18.6 per cent by weight of tin powder. The back 14 may be made from the above metal powders and is preferably pre-pressed. The molding technique of the Sanford Patent No. 2,073,590 is preferably used, but the mass is consolidated in a cold press—later the entire pressed article should be sintered for example at around 650° C. and preferably in an inert atmosphere.

One preferred method of making the inner abrading zone 12 is to form initially a vitrified grinding wheel containing the required abrasive, such as silicon carbide or crystalline alumina, and this is made in accordance with standard practice of such grit sizes, volume percentage structure and types of abrasive grains as are required for the particular type of grinding operation to be performed. For example, for undercutting the steel shank on which a cemented tungsten carbide cutting tool is mounted, I may employ crystalline alumina abrasive of 36 grit size bonded by vitrified ceramic material to a medium grade and structure. The vitrified bonded abrasive material may be cemented to a steel plate 16, as by means of a vulcanized rubber layer 18. This cementing layer may be made in accordance with standard practice of a vulcanizable rubber and sulfur composition which is placed between the abrasive 12 and the steel backing 16, and the parts are heated to a suitable temperature to vulcanize the rubber and cause it to adhere to both bodies. If desired, the inner abrasive unit may be used without any metal backing and made solely as an integral body of bonded abrasive grains bonded by a vitrified ceramic material, rubber, resinoid or other bond.

Various expedients may be adopted for securing the two abrading bodies in proper relationship so that the two abrading surfaces of the zones 10 and 12 may lie in the same plane or at any desired angle relative to each other, which may be determined by suitably shaping or truing the two zones prior to their assembly or after they have been put together. The plane surfaced compound wheel shown in the drawing may be mounted on a steel backing plate 20 carried by a spindle 22. One suitable manner of securing the parts together involves providing the disk shaped central plate of the cup body 14 with a plurality of holes 24 concentric with the wheel axis, and the upper steel plate 16 is likewise provided with a similar set of concentric holes 26 located to be aligned with the holes 24 when the parts are mounted together. Screws 28 passing freely through the aligned holes are adjustably secured in the threaded portion 30 of the backing plate 20 and thus serve to hold the backing supports 14 and 16 together and mounted on the backing plate.

In order to provide for proper adjustment of the two abrasive zones and particularly to permit moving the inner zone outwardly from time to time as required by its wearing more rapidly than does the outer annular diamond abrasive zone, the plate 16 may be mounted concentrically within the outer annulus by means of concentric screw threads on the inner wall of the annular body 14 and on the outside periphery of the inner abrasive body. While the two concentric parts 14 and 12 or 16 may be directly threaded together, I preferably employ a brass ring 32 which is suitably secured to the annular wall of the metal or resinoid cup 14, such as by having the cup body molded and heat cured in position against that ring. The inner peripheral surface of the brass ring and the metal plate 16 are threaded by suitable operations so that the parts may be adjusted relative to each other. If desired, the brass ring 32 may be put into position after the cup 14 has been fully fashioned, since the screws will tend to hold that ring in place and to prevent relative rotation therebetween. Also, if the inner abrasive zone is made as a unitary body of bonded abrasive grains, an outer annulus of Babbitt metal may be cast thereon and threaded to fit the threads on the brass ring 32 or on the support 14. Numerous other structural arrangements may be provided for the purpose.

The inner abrasive zone may be moved outwardly by turning it on its threads to a new position after the cap screws 28 have been removed. The inner zone may be adjusted through the angle between two of the holes 24 or multiples thereof, after which the screws may be returned to position and again employed to lock the inner plate 16 against the side wall of the outer supporting cup 14. The two abrading zones are located in a close relationship, so that by proper care the steel shank and the tungsten carbide cutting bit may be ground simultaneously in order to sharpen the cutting tool, and it will not be necessary to undercut the steel bit as heretofore required. It, however, is entirely feasible to initially shape and true the surface of the central zone 12 so that it may lie at any required angle relative to the outer abrading zone. In that case the two abrasive zones may be used simultaneously to grind two surfaces located at an angle to each other. Also, the top surface of the inner zone 12 may be located either above or below that of the diamond abrading zone in order to obtain desired effects.

Many other embodiments of this invention may be made to obtain desired grinding effects and the parts may be suitably made of the many standard materials and methods known in the abrasive industry. Hence, it will be appreciated that the above disclosure is to be interpreted as giving the general principles of this invention and a preferred embodiment thereof and not as limitations on the claims appended hereto.

I claim:

1. A composite grinding wheel comprising a rotatable supporting plate, a cup shaped body having an annular abrasive rim providing a grinding surface lying in a plane, a second abrasive body mounted within the cup and having its grinding surface lying in said plane, a plate secured to said second body which is periph-

erally threaded onto the inner wall of the cup and mounted for adjustment parallel with said axis, the support cup and plates having aligned holes concentric with their axis, and means associated with said aligned holes for rigidly securing the two abrading bodies together in any position of adjustment provided by the holes and threads.

2. A composite grinding wheel comprising a rotatable support, an annulus thereon having a flat abrasive surface, a substantially cylindrical body located within the annulus and having a flat abrasive surface, the inner periphery of said annulus and the outer periphery of said body having cooperating threads whereby the body may be moved for relative adjustment of said abrasive surfaces, and a separate means for securing the body and annulus rigidly together for any adjusted position thereof.

3. A composite grinding wheel comprising a rotatable cup having an abrasive annulus providing a flat grinding surface, a substantially cylindrical body having a flat abrasive surface, the inner wall of the cup and the outer wall of the body having cooperating threads whereby the body is adjustably mounted within the cup in axial alignment, said body and cup having aligned holes, and fastening means associated with said holes for securing the body in an adjusted position within the cup.

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