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2,268,663

ABRASIVE TOOL

Filed Sept. 19, 1939

Fig. 1.

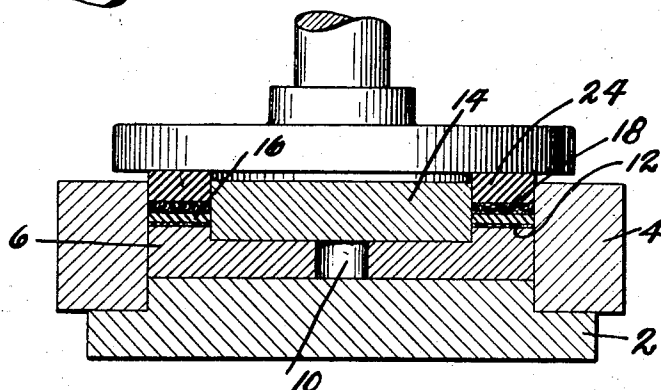


Fig. 2.

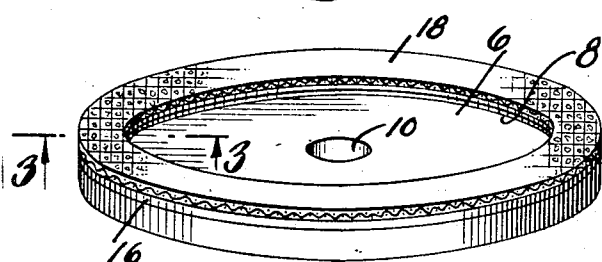


Fig. 3.

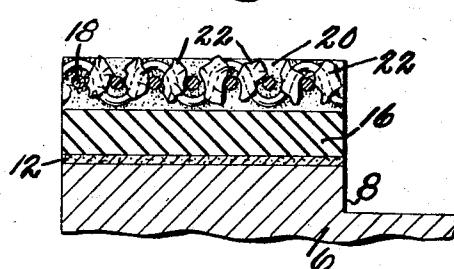


Fig. 4.

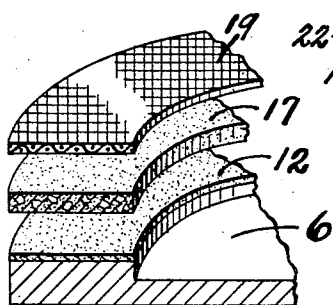


Fig. 5.

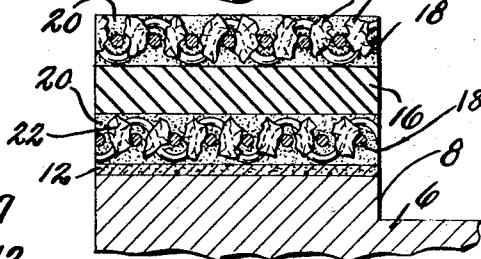
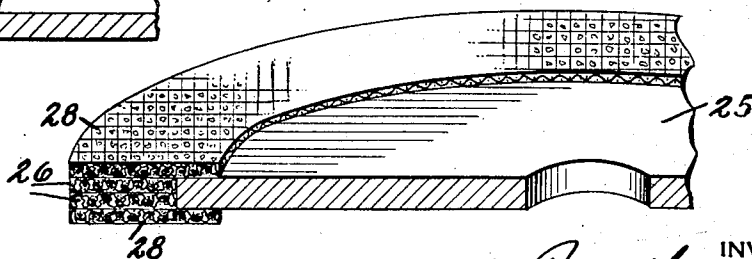


Fig. 6.



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ABRASIVE TOOL

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Application September 19, 1939, Serial No. 295,558

9 Claims. (Cl. 51—206)

This invention relates to improvements in abrasive tools and is particularly directed to improvements in tools known in the trade as diamond grinding wheels, diamond cut-off wheels and diamond laps.

Tools of the character indicated are commonly made at present by forcing or rolling diamond particles into metallic discs or by bonding the particles with some cementitious material or other binder such as Bakelite, resin or the like and mineral fillers. Tools made by these prior methods have certain disadvantages, particularly in that the abrasive particles are not held in place until they are completely consumed.

An object of the present invention is to produce a tool of the character indicated which will overcome the disadvantages of tools as at present constructed and which will have superior qualities and longer life.

Another object of the present invention is the provision of a novel anchoring of the diamond particles wherein each diamond particle is anchored on all sides in its respective setting, and wherein the size of the diamonds employed is controlled so that all of the particles will be of substantially uniform size.

Other objects of the present invention reside in the provision of a tool of the character indicated having the following advantages over previously known tools: (1) the diamond particles are protected on all sides and yet are free to perform their function; (2) heat is conducted away from the diamonds to the support; (3) the diamond particles are so set as to be spaced from each other thus eliminating the danger of fracture; (4) the bond is of uniform consistency; (5) the rate of wear of abrasive controlled.

Other objects of the present invention and advantages over prior methods and prior tools will be manifest from the following description and the accompanying drawing.

More specifically my invention is directed to abrasive tools of the character indicated suitable for grinding, lapping, polishing and finishing metals. In the improved tool the abrasive diamond particles are held in place by means of an articulated element such as wire mesh, the size of the mesh being selected depending upon the size of the diamond particles, whereby the particles will be held on all sides by the mesh and project through the interstices of the mesh to provide an abrasive or working surface. Various types of bonding materials may be employed for anchoring the diamond particles and the mesh.

In the accompanying drawing:

Fig. 1 is a sectional elevation showing my improved tool in place in a mold;

Fig. 2 is a perspective view of a diamond grinding wheel made in accordance with my invention;

Fig. 3 is a section through Fig. 2 taken on the line 3—3, and for the sake of clarity very much enlarged;

Fig. 4 is a fragmentary sectional exploded view of a modified embodiment of my invention;

Fig. 5 is a fragmentary sectional view of a further modification; and

Fig. 6 shows in fragmentary part section a cut-off wheel embodying my invention.

Referring to the drawing in detail and first to Figs. 1, 2 and 3: 2 designates the bottom plate of a mold, and 4 the mold ring.

Disposed on the mold plate 2 is a backing 6 for the tool. This backing plate or support may be aluminum, brass, copper or other suitable material. The backing plate is countersunk as shown at 8 and provided with a central bore 10 to fit the spindle of a grinding machine.

The face of the backing plate 6 is first prepared for the reception of the abrasive material by spreading thereon a layer of cementitious material 12 such, for example, as a cement made of equal parts of denatured alcohol and resin well dissolved. After the cement has dried, the backing plate is placed in the mold and the center plug 14 of the mold placed in position.

I then distribute on the cement a layer of suitable bonding material 16. A satisfactory bonding material is provided by well mixing dry resin and short fiber asbestos in the proportion of 3 parts of resin to 1½ parts of asbestos.

On this bonding material I place a ring 18 of articulated material such as a copper, aluminum or brass wire mesh. This ring is died out to the proper size and coated with a thin cement 20 of denatured alcohol and resin, for example. While the cement is still wet the ring is loaded with diamond particles 22 pressed into the openings of the screen by hand. After the alcohol has evaporated out of the cement, the diamond loaded ring is placed in position upon the bonding material 16, the follower ring 24 is placed in the mold and the assembly subjected to pressure and heat. The pressure employed in the majority of cases is low, from 1000 to 1500 pounds per square inch, and the curing cycle is short, say five minutes at 320° F., where a resinoid type of bond is employed. If desired an insulating layer of Cellophane may be placed be-

tween the follower ring 24 and the abrasive ring, prior to pressing.

The mesh size of the screen depends upon the size of the diamond particles to be employed. For example, should the diamond particles be 240 mesh, a screen slightly larger in mesh size is employed such, for example, as 200 mesh, woven of a relatively fine wire, thus permitting the cutting edges of the diamond particles to project through the screen, the larger portion or waist of the diamond particles being held between the adjacent wires of the screen. Where fairly coarse diamond particles are to be employed, such, for example, as 80 mesh, a screen such as 60 mesh would be employed.

The procedure above described may be varied, if desired, by proceeding as follows: A backing 6 is given a coating 12, as before, of a suitable cement. After this cement has dried I place upon it a ring of bonding material such as above described and which has been designated 16, mixed with abrasive particles. This ring has been designated 17. Instead of using a pre-formed ring I may of course simply distribute a layer of this mixture upon the cement 12. Upon the layer 17 I place a mesh ring 19 which has been given a coating of cement. In other words, the ring 19 is the same as the rings 18 above referred to but is not loaded with abrasive particles. In the pressing and curing operation which this assembly is finally subjected to, it will be appreciated that the mass 17 will be compressed and flow to carry the abrasive particles into the mesh ring. I find this procedure is of some advantage when using very fine abrasive particles.

While I have mentioned only a single screen ring 18, good results are obtained where a plurality of such rings are employed as I have illustrated in Fig. 5 on a greatly enlarged scale. In employing a plurality of rings a layer of cementitious material 12 is spread first upon the face of the backing plate 6. After the cement has dried a loaded ring 18 is placed in position, then bonding material is distributed on the top of this ring, then another loaded ring 18 is superimposed, this procedure being followed until the desired thickness is built up. The interposition of the bonding material between the loaded rings insures a free flowing of the bonding material during the curing operation as will be appreciated.

Referring now to the cut-off wheel shown in Fig. 6: This wheel comprises a disc support 25 of any suitable material, such as aluminum, copper, brass, etc.

About the periphery of this disc are a series of articulated abrasive-loaded annular members 26 similar to the mesh or screen rings above described.

These rings, with intermediate layers of bonding material such as the bonding material 16, are built up to the thickness of the copper disc support 25 and are provided on either side with additional abrasive-loaded screen rings 28 of slightly larger width so as to overlap the faces of the support 25, as illustrated.

It will be understood that this wheel is subjected to a curing operation in a mold the same as the other embodiments of my invention already described.

In the structures herein illustrated and described, it will be appreciated that each diamond particle is not only held in its own setting by the bonding material 20 but is anchored on four

sides by the wire or the wires of the mesh ring or rings 18. The ring or rings serve the additional valuable function of conducting the heat generated when using the tool from the vicinity of the diamonds to the metallic support.

It will be appreciated also that my invention provides a faster cutting tool than in prior structures, the ring or rings providing good chip clearance and facilitating the employment of a larger volume of coolant than in previous structures.

It will be appreciated, furthermore, that my invention provides a very much improved tool in that the setting of the abrasive particles is controlled by reason of the use of the screen rings so that the particles are properly spaced.

Furthermore, as compared with previous tools wherein the diamond particles are set in metal, the structure of the present invention has the added advantage of less metal. In a screen ring such as described, for example, the interstices constitute approximately 50% of the ring area, or, in other words, in one square inch of screen area approximately one-half only is metal.

While I have described the rings of my improved tool as loaded with abrasive particles, it is to be understood that if desired the screen rings may be loaded with mixtures of powdered metals, abrasive particles and resin, such as disclosed in my copending application Serial No. 287,003, filed July 28, 1939.

It will be understood also that the rate of wear of the abrading surface may be controlled by the use of softer or harder or more ductile or less ductile metals for the screen rings.

It is to be further understood that various changes may be made in the structures illustrated without departing from the spirit and scope of my invention.

What I claim is:

1. An abrasive tool comprising a rigid support provided with a peripheral metal mesh ring having its interstices filled with abrasive particles and a non-metallic heat settable binding material, and a similar ring at each side of the first mentioned ring, the last mentioned rings extending inwardly toward the center of the support so as to overlies each face of the support, said binding material bonding the rings to each other and to the periphery and face of the support.

2. An abrasive tool comprising in combination a rigid support to which is bonded an abrasive member, said member comprising metal mesh having its interstices filled with a mixture of diamond particles and a non-metallic bonding agent the mixture lying substantially flush with the plane of the face of the mesh remote from the rigid support.

3. An abrasive tool comprising a rigid support and a laminated facing therefor, each lamination of the facing comprising a metal mesh ring having its interstices filled with a mixture of abrasive particles and a heat settable non-metallic bond, the mixture lying substantially flush with the faces of the ring, the said non-metallic bond bonding the laminae to each other and to the support.

4. An abrasive tool comprising in combination an abrasive member, a rigid support therefor to which the abrasive member is bonded, said abrasive member comprising metal mesh, the interstices of which are filled with a mixture of abrasive particles and a non-metallic bonding agent lying substantially flush with the mesh.

5. An abrasive tool comprising in combination an abrasive member, a rigid metal support there-

for to which the abrasive member is bonded, said abrasive member comprising metal mesh having its interstices filled with a mixture of diamond particles and a heat settable non-metallic bonding agent lying substantially flush with the mesh.

6. An abrasive tool comprising in combination a rigid support to which is bonded an abrasive layer, this abrasive layer comprising a metal mesh having its interstices filled with a mixture of abrasive particles and a resin bond lying substantially flush with the mesh.

7. An abrasive tool comprising in combination a preformed rigid support and an abrasive member bonded thereto, said abrasive member comprising a metal mesh having its interstices filled with a mixture of abrasive particles, powdered

metal and a resin bond, this mixture lying substantially flush with the mesh.

8. An abrasive tool comprising a rigid disc, an abrasive annulus bonded to the periphery thereof and comprising a metal mesh filled with a mixture of abrasive particles and a non-metallic bonding agent, this mixture lying substantially flush with the face of the mesh.

9. An abrasive tool comprising a rigid support faced with metal mesh, the interstices of which are filled with a mixture of abrasive particles and a heat settable non-metallic bond, this mixture lying substantially flush with the face of the mesh remote from the face of the support.

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