United States Patent [19]

Lindenbeck

[11] **3,802,130**

[45] **Apr. 9, 1974**

[54] **DIAMOND AND LIKE GRINDING WHEELS**

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[21] Appl. No.: **248,972**

[30] **Foreign Application Priority Data**

May 12, 1971 South Africa..... 71/3105

[52] **U.S. Cl.** **51/207**

[51] **Int. Cl.**..... **B24d 5/14**

[58] **Field of Search**..... 51/207, 204, 206 R, 206.4, 51/209 R

[56] **References Cited**

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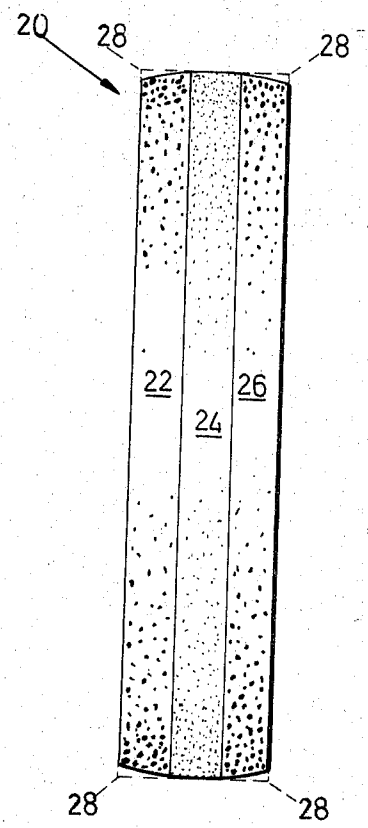
[57] **ABSTRACT**

A peripheral grinding wheel wherein the peripheral grinding portion contains diamond or cubic boron nitride abrasive particles and is characterised in that it consists of two co-axial sections, the one section being a coarse section and containing coarse particles of between 60/80 mesh and 100/120 mesh and the other being a fine section containing fine particles of between 170/200 and 300/350 mesh, or in that it consists of a fine section sandwiched between two coarse sections, in each case the concentration of abrasive particle in the fine section preferably being greater than the concentration of abrasive particle in the coarse section.

7 Claims, 2 Drawing Figures



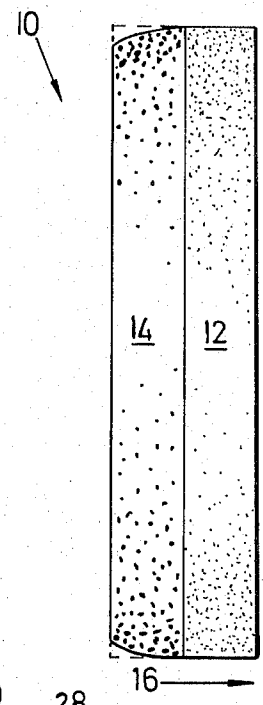


Fig. 1

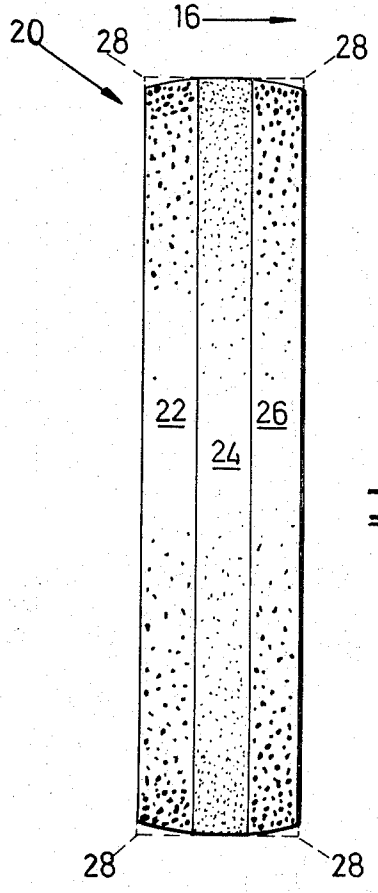


Fig. 2

DIAMOND AND LIKE GRINDING WHEELS

This invention relates to peripheral grinding wheels incorporating as abrasive particles diamond or cubic boron nitride.

Peripheral grinding wheels include a hub portion having a central bore therein adapting the hub portion to be mounted on a shaft or spindle. The hub portion is itself formed from some suitable support material commonly used in the art such as steel, bakelite or a light metal. Carried on the periphery of the hub portion in a position to make effective contact with a workpiece, is the effective grinding portion. This portion commonly has a thickness of the order of either one-fourth inch or one-eighth inch (approximately 6 mm and 3 mm respectively). This peripheral portion has abrasive particles such as diamond embedded in a cured synthetic resin or metal matrix.

Peripheral grinding wheels which incorporate abrasive particles such as aluminum oxide or silicon carbide can be suitably dressed both for good grinding efficiency, i.e. high stock removal, and for relatively low grinding efficiency, i.e. good surface finishing or polishing. When good grinding efficiency is first required then good polishing for a given workpiece, it is possible to dress the same wheel to achieve both effects. However, dressing a peripheral grinding wheel incorporating diamond or cubic boron nitride is not easily achieved and hence different wheels have in the past generally been required to achieve both high stock removal and good surface finish.

It is an object of the present invention to provide a peripheral grinding wheel incorporating diamond or cubic boron nitride abrasive particles which minimises the abovementioned shortcomings of similar wheels of the prior art.

According to the invention, there is provided a peripheral grinding wheel having an effective grinding portion containing diamond or cubic boron nitride abrasive particles, characterised in that the effective grinding portion comprises two co-axial sections, the one section having coarse particles and providing, in use, a high stock removal (hereinafter referred to as the "coarse section") and the other section having fine particles and providing, in use, a good surface finish (hereinafter referred to as the "fine section").

In one form of the invention, the effective grinding portion consists of two such co-axial sections.

In another form of the invention, the effective grinding portion consists of a central fine section sandwiched between two outer coarse sections.

The coarse section is preferably wider than the fine section the width in any given case being influenced by the amount of crossfeed during grinding. The widths of the sections will preferably be 20 percent or more greater than the amount of crossfeed.

It has been found that particularly good results are achieved if the concentration of abrasive particle in the fine section or sections is greater than, preferably three times greater than, the concentration of abrasive particle in the coarse section or sections. As is known, concentration is determined by taking the weight of abrasive particle per unit volume of the finished grinding element. The grinding element in this case is the effective grinding portion. The concentration is expressed relative to a standard of 100 where the weight of abrasive particle is 72 carats per cubic inch.

The preferred concentrations of abrasive particle in the fine section will vary with matrix being used. In the case of a cured synthetic resin matrix, the preferred concentration of abrasive particle in the fine section or sections is 100 to 150. In the case of a metal matrix, the preferred concentration of the abrasive particle in the fine section or sections is 100 to 300.

The preferred concentration of abrasive particle in the coarse section or sections is 50 to 100, irrespective of the matrix material.

The fine abrasive particles preferably have a size between 170/200 mesh and 300/350 mesh and the size of the coarse particles is preferably between 60/80 mesh and 100/120 mesh.

To ensure good retention of the abrasive particles in the matrix of the wheel it is preferred that the particles are metal coated.

Two embodiments of the invention are described with reference to the accompanying diagrammatic drawing which show, in end view, the effective grinding portions of two peripheral grinding wheels according to the invention.

Referring now to FIG. **1**, there is shown the effective grinding portion **10** of a peripheral grinding wheel which consists of two co-axial sections **12** and **14.** Section **12** is the fine section and contains fine diamond grit of size 170/200 mesh while the section **14** is the coarse section and contains coarse diamond grit of size 60/70 mesh. The grit concentration of the fine section is 150 (i.e. 108 carats per cubic inch) while the grit concentration of the coarse section is **50.** The matrix material for both sections is cured synthetic resin and the diamond grit is metal coated grit known as DX DA – MC.

In the wheel **20** of FIG. **2,** there are three sections, **22, 24** and **26.** The sections **22** and **26** are the coarse sections with grit size and concentration as for the section **14.** The section **24** is the fine section, with grit size and concentration as for the section **12.** The matrix material is again synthetic resin and the grit is DX DA – MC.

In use, the wheels are used for grinding workpieces such as metal workpieces. Considering first the wheel according to FIG. **2,** a grinding process can be carried out with cross-feeds from opposite directions. As the grinding progresses, so the sharp edges **28** (shown in dotted lines) of the effective grinding portion will be worn away and become rounded, as indicated in solid lines in the drawing. The outer sections **22, 26** will remove most of the material being ground whereas the central section **24** will polish the surface left by the outer sections.

Because of the curved profile of the wheel **20,** a waviness may be left on the workpiece surface. In order to reduce this waviness, the grinding wheel **10** of FIG. **1** may be used for grinding with the crossfeed being applied in only one direction i.e. the crossfeed of the workpiece in the direction of the arrow **16.** The profile of this wheel, in use, will have less curvature than that shown in FIG. **2,** the curvature being indicated by solid lines in FIG. **1.** This will have the effect of considerably reducing the waviness. Furthermore, such a grinding process is more efficient as a greater amount of the diamonds are used during grinding. Therefore, lower wheel costs and better surface finish are obtained when an abrasive wheel, as shown in FIG. **1** is used with crossfeed in only one direction.

The illustrated embodiments have been described using metal coated diamond grit, but cubic boron nitride abrasive particles may also be used.

I claim:

1. A peripheral grinding wheel having an effective grinding portion containing abrasive particles selected from diamond and cubic boron nitride abrasive particles, characterised in that the effective grinding portion comprises two co-axial sections, the one section containing coarse particles, from 60/80 mesh to 100/120 mesh in size, and the other section containing fine particles, from 170/200 mesh to 300/350 mesh in size, and the concentration of abrasive particle in the section containing the fine particles being greater than the concentration of abrasive particle in the section containing the coarse particles.

2. A wheel according to claim **1** wherein the effective grinding portion consists of two and only two sections.

3. A wheel according to claim **1** wherein the effective grinding portion consists of a central section containing fine particles sandwiched between two outer sections containing coarse particles.

4. A wheel according to claim **1** wherein the ratio of the concentration of abrasive particle in the section containing the fine particles to the concentration of abrasive particle in the section containing the coarse particles is 3:1.

5. A wheel according to claim **1** wherein the matrix of the effective grinding portion is a cured synthetic resin and the concentration of the abrasive particle in the section containing the fine particles is 100 to 150 and the concentration of the abrasive particle in the section containing the coarse particles is 50 to 100.

6. A wheel according to claim **1** wherein the matrix of the effective grinding portion is a matrix metal and the concentration of abrasive particle in the section containing the fine particles is 100 to 300 and the concentration of abrasive particle in the section containing the coarse particles is 50 to 100.

7. A wheel according to claim **1** wherein the abrasive particles are metal coated.

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