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(54) **Rotary abrasive cutting disc**

(57) A method of making a rotary cutting disc comprises forming a metal support member (1), shaping at least one compacted body (4) of powdered material containing abrasive particles so as to enclose at least a portion of the periphery of the support member, and heating the body or bodies to sinter the powdered material and bond the or each body to the periphery of the support member, and then locally applying heat to at least a portion of the external junction between the or each body and the support member to form a weld (6).

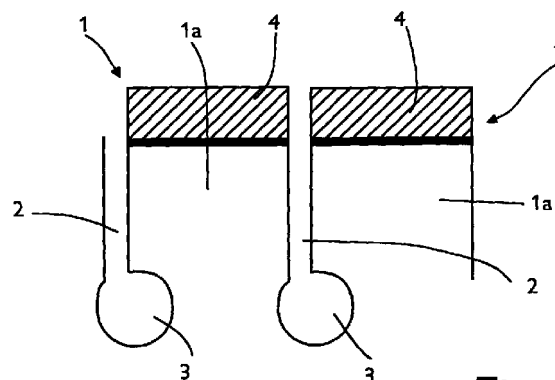


Fig 1

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Description

Field of the Invention

[0001] This invention relates to a rotary abrasive cutting disc and to a method of manufacturing such a disc.

Background to the Invention

[0002] Rotary abrasive cutting discs, particularly diamond cutting discs, are conventionally manufactured in one of several ways. Where the disc periphery is slotted, individual segments of diamond-bearing material may be soldered or braised onto a supporting metal disc. Alternatively, the segments may be welded onto the supporting disc by friction welding, argon arc welding or laser welding. However, because the carrier for the diamond or other abrasive particles is desirably of a relatively soft material, to allow for wearing of the carrier to expose fresh abrasive particles, in use, direct welding may not be possible, and it then becomes necessary to provide each segment with a layer of weldable material such as steel. The working life of such discs is good, but the cost of manufacture is high, since inadequate welding can dramatically reduce strength.

[0003] The abrasive particles can be applied to the supporting disc as a surface layer by electro-chemical deposition, but such discs are of lower durability, since the abrasive particles are only on the surface. Another way of forming on the rim of the disc a body of material containing the abrasive particles is to compact a mixture of a powdered sinterable material and abrasive particles around the rim of the disc and then to sinter it to bond it to the disc. The disc is suitably formed with tabs or keys on the periphery to increase the area of bonding of the sintered material to the disc. The increased bonding area, as compared with welding, coupled with the fact that bonding is even over the area of contact, ensures that a uniform bond of adequate strength is achieved. A continuous cutting surface can be made by this method, if desired. However, unlike the welded materials, the shock resistance of the sintered material is poor, and it can be weakened by heating; if the sintering temperature is exceeded the material will soften and break up.

Summary of the Invention

[0004] The invention provides a rotary cutting disc, comprising a metal support member, at least one body of a sintered powdered material containing abrasive particles formed on the periphery of the support member, and a weld formed along the junction between the or each body and the support member.

[0005] The invention also provides a method of making a rotary cutting disc, comprising forming a metal support member, shaping at least one compacted body of Powdered material containing abrasive particles so

as to enclose at least a portion of the periphery of the support member, and heating the body or bodies to sinter the powdered material and bond the or each body to the periphery of the support member, and then locally applying heat to at least a portion of the external junction between the or each body and the support member to form a weld.

[0006] Preferably, the abrasive particles are diamond, while the sintered material is preferably a metal, for example copper or an alloy thereof, for example, bronze or brass.

[0007] The welding is suitably carried out by laser welding, and preferably the weld penetrates the support member, which is suitably in the general form of a disc, to a significant proportion of the thickness thereof, for example of the order of a quarter of the thickness.

[0008] The rim of the disc may be continuous or it may be segmented in the manner known for conventional cutting discs, with the shape of the slots between the segments being of any suitable form, for example as used in conventional cutting discs.

[0009] The cutting discs of the invention are at least comparable with conventional welded discs in terms of strength and durability, whilst being considerably less costly to manufacture. It is also possible to form a continuous body of material giving a performance equivalent to conventional welded discs, which is not heretofore been possible.

[0010] It is believed that the sintered bond will constitute approximately 60% of the strength of the bond of the cutting edge to the disc, with the laser weld contributing the remainder. It is thus possible to use bronze materials for which laser welding would not, on its own, be considered sufficient.

Brief Description of the Drawings

[0011] In the drawings, which illustrate exemplary embodiments of the invention:

Figure 1 is an enlarged view of a portion of the periphery of a cutting disc according to one embodiment;

Figure 2 is a sectional view on line A-A in Figure 1; and

Figure 3 is a view of a disc according to another embodiment of the invention.

Detailed Description of the Illustrated Embodiment

[0012] Referring first to Figures 1 and 2, a segmented cutting disc has a plurality of separate cutting segments 1 around its periphery, defined by shaped inwardly directed slots 2. While the slots may take any of a wide range of different shapes, the illustrated slots 2 each terminate in an offset circular aperture 3.

[0013] The view shown in Figure 1 represents just two segments on the periphery of a circular disc, and it

will therefore be understood that a segmented cutting disc may have a large number of segments, for example sixteen for a 230mm diameter disc. However, the cutting disc may have a smaller number of segments, and these may be separated by narrow slots or by slots substantially equal in width to the segments.

[0014] The bodies 4 are formed by preparing a mixture of the abrasive particles and the softer material in powdered form, shaping the mixture around a peripheral part of each segment portion 1a, as may be seen from Figure 2, and then heating the body to sinter the powdered material together on the disc segment. The disc segment has a tab or key 5 extending from the outermost edge thereof to increase the surface area for bonding of the sintered material, in conventional manner. Laser welding is then carried out on opposed sides of the body 4 along the junction 6 between the lowermost edge of the body 4 and the segment portion 1a, to a depth which, for example, may be approximately equal to a third of the thickness of the disc support.

[0015] In the embodiment illustrated in Figure 3, the disc 30 is not segmented but instead has a continuous body 31 of abrasive material and carrier formed on its periphery in the same manner as set out hereinbefore with reference to Figures 1 and 2. Again, a weld 32 is formed along the innermost edge of the body 31 on each side of the disc, using laser welding techniques conventional in the field of diamond cutting disc manufacture. This provides the strength advantages of welding not previously obtainable for a continuous cutting edge, for which welding would be impossible.

Claims

1. A rotary cutting disc comprising a metal support member, at least one body of a sintered powdered material containing abrasive particles formed on the periphery of the support member, and a weld formed along the junction between the or each body and the support member.
2. A rotary cutting disc according to Claim 1, wherein the abrasive particles are diamond.
3. A rotary cutting disc according to Claim 1 or 2, wherein the sintered material is a metal or a metal alloy.
4. A rotary cutting disc according to Claim 3, wherein the sintered material is copper, bronze or brass.
5. A rotary cutting disc according to any preceding claim, wherein the periphery of the disc is segmented or slotted.
6. A rotary cutting disc according to any of Claims 1 to 4, wherein the periphery of the disc is continuous.
7. A method of making a rotary cutting disc, comprising forming a metal support member, shaping at least one compacted body of powdered material containing abrasive particles so as to enclose at least a portion of the periphery of the support member, and heating the body or bodies to sinter the powdered material and bond the or each body to the periphery of the support member, and then locally applying heat to at least a portion of the external junction between the or each body and the support member to form a weld.
8. A method according to Claim 7, wherein each weld is formed by laser welding.
9. A method according to Claim 7 or 8, wherein each weld penetrates the support member to a significant proportion of the thickness thereof.
10. A method according to Claim 9, wherein each weld penetrates the support member to a quarter of the thickness thereof.
11. A method according to any of Claims 7 to 10, wherein the powdered material is a metal or a metal alloy.
12. A method according to Claim 11, wherein the powdered material is copper, bronze or brass.
13. A method according to any of Claims 7 to 12, wherein the abrasive particles are diamond.
14. A method according to any of Claims 7 to 13, wherein the body is continuous around the rim of the support member.

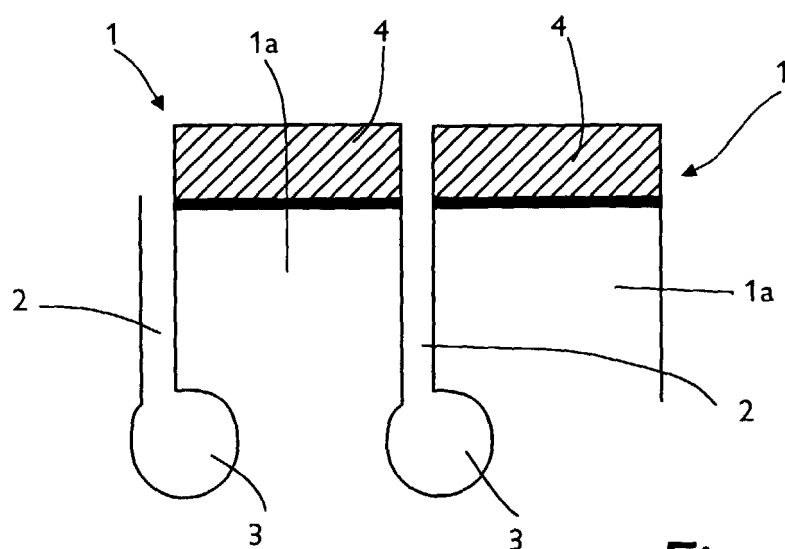


Fig 1

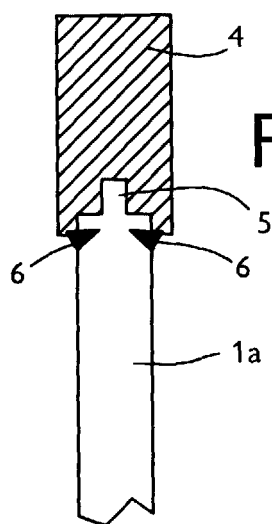


Fig 2

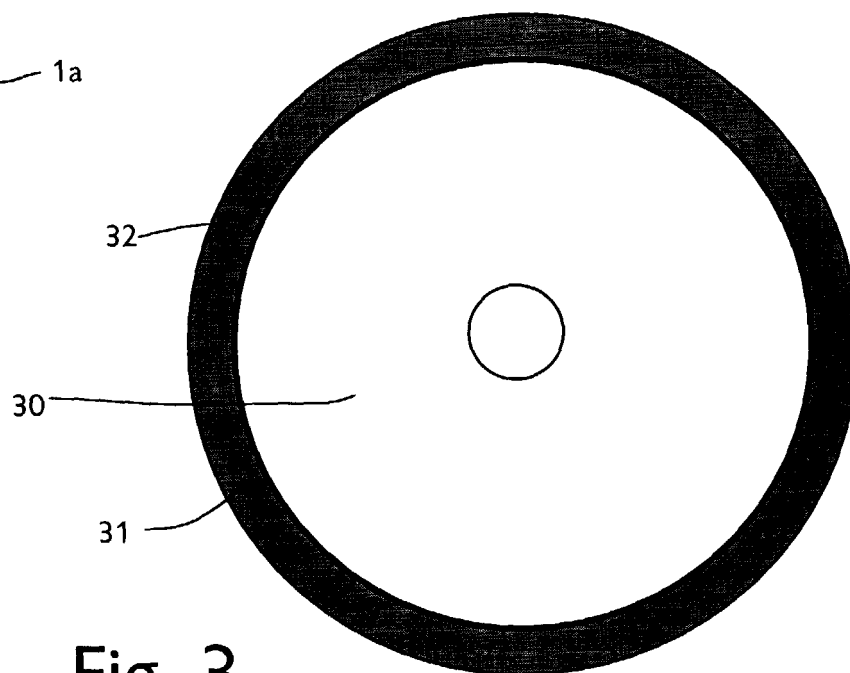


Fig 3