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(54) **A tool for working stone surfaces with a cutting insert having polycrystalline diamond sandwiched between two hard metal layers**

(57) A tool for surface working stone materials, such as granite, marble and the like, wherein a body (1) of substantially cylindrical shape adapted to be mounted on the spindle of a milling machine is provided, the body being equipped with a cutting insert (3), characterised in that said cutting insert (3) is obtained by means of an element (5) of polycrystalline diamond (PCD) sandwiched between two hard metal layers (7).

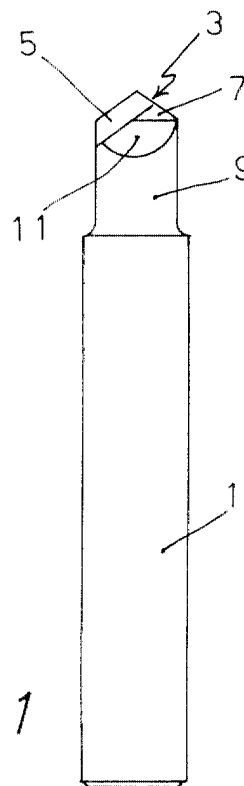


FIG. 1

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Description

[0001] The invention concerns a tool for surface working stone materials, such as granite, marble and the like.

[0002] It is known that in order to engrave signs such as inscriptions and ornaments in general on stone materials, there are employed, among others, rotary tools known as burins, controlled by numerically controlled milling machines.

[0003] Said known tools are generally obtained through inserts with a single cutting edge made of hard metal or ceramic material, depending on the hardness and workability of the stone material to be worked.

[0004] The major drawback of said tools is the rapid wear of the material used for the inserts, what makes a frequent replacement of the tools themselves necessary.

[0005] The need for frequent replacement of said inserts of said tools reduces moreover the advantages inherent in the use of numerically controlled milling machines.

[0006] Actually, tool replacement in a milling machine of that kind is to be manually effected and therefore it requires frequent intervention of an operator, thereby making void the advantages of the automatic working.

[0007] Thus, it is an object of the present invention to provide a tool for working materials in general, an in particular stone materials such as granite, marble and the like, which tool has a longer life.

[0008] Another object of the invention is to provide a tool of the type mentioned above, which maintains its cutting properties for a longer time.

[0009] The above and other objects are attained by the tool as claimed in the appended claims.

[0010] Advantageously, thanks to the use of diamond in an insert according to the invention, an increase in wear resistance is obtained along with a significant increase in the rotation and advancing speeds due to the greater amount of material removed in the time unit.

[0011] The invention will now be disclosed with reference to the accompanying drawings, concerning a preferred but non-limiting embodiment of the invention. In the drawings:

- Fig. 1 is a front view of a tool equipped in its upper part with a cutting plate according to the invention, the rear view being a replica of said Figure;
- Fig. 2 is a side view of the tool shown in Fig. 1;
- Fig. 3 is a detailed front view of the cutting plate according to the invention, the rear view being a replica of said Figure;
- Fig. 4 is a side view of the plate shown in Fig. 3;
- Fig. 5 is an end view of the tool.

[0012] Referring to the drawings, the tool according to the invention comprises a cylindrical body 1 shaped for mounting on the spindle of a milling machine for surface working stone materials such as granite and mar-

ble.

[0013] The tool body 1 is equipped with a plate insert 3, brazed onto the tool tip and consisting of an element 5 of polycrystalline diamond (PCD) sandwiched between two elements 7 of hard metal.

[0014] Said insert 3, obtained by means of electrical discharge machining, has a central portion 5, in PCD diamond, protruding upwards and laterally from the hard metal elements 7.

[0015] The upper part 9 of said body 1 is cylindrical, with lower diameter than body 1, and ends in a portion 11 inclined in upward direction into a wedge shape and arranged to receive insert 3.

[0016] Also the tip of insert 3 is suitably inclined, depending on the material being worked, the inclination ranging from 30° to 60° with respect to the axis of tool 1.

[0017] The portions of PCD element 5 projecting from hard metal elements 7 are of particular importance.

[0018] Actually, the projecting portions of PCD element 5 form a double and symmetrical cutting edge arranged along chords B-B' and C-C' of the insert, and not along diameter A-A', as would be the case for the single cutting edge.

[0019] The provision of the double symmetrical cutting edge allows obtaining a considerable advantage in terms of working rate over the insert with single cutting edge of the prior art.

[0020] Moreover, the arrangement of the two symmetrical cutting edges along chords B-B' and C-C' allows obtaining a negative apparent front rake, such that the cutting edges are substantially submitted to a compressive stress in place of a bending stress. Consequently, as compressive stress is better borne by fragile materials such as diamond, a longer life of the insert will be obtained.

[0021] Moreover, the PCD projections of element 5 must be sufficiently long to carry out a valuable abrasion work, but they must be at the same time sufficiently short to avoid breakage due to bending stresses during working of the stone material.

[0022] The amount of upward projection of PCD elements 5 with respect to the two hard metal elements 7 is of the order of 1 mm, while the amount of diagonal projection of said element 5 with respect to the two elements 7 is of the order of 2 mm.

[0023] Moreover, the maximum amount of projection of hard metal elements 7 with respect to the upper base of portion 11 holding the insert 3 is of the order of 1.5 - 2 mm.

Claims

1. A tool for surface working stone materials, such as granite, marble and the like, including a body (1) of substantially cylindrical shape adapted to be mounted on the spindle of a milling machine, the body being equipped with a cutting insert (3), char-

acterised in that said cutting insert (3) is obtained by means of an element (5) of polycrystalline diamond (PCD) sandwiched between two layers (7) of hard metal.

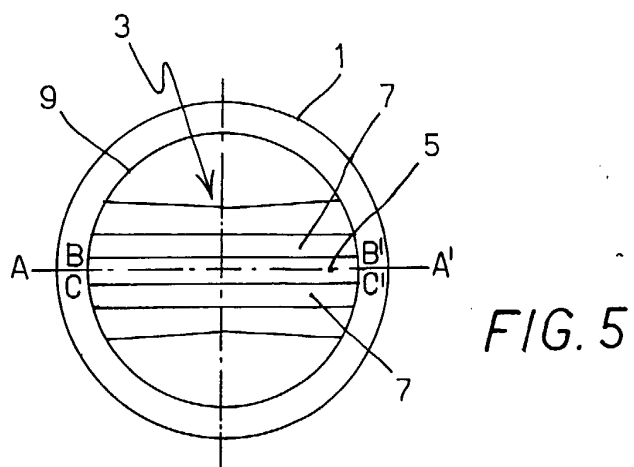
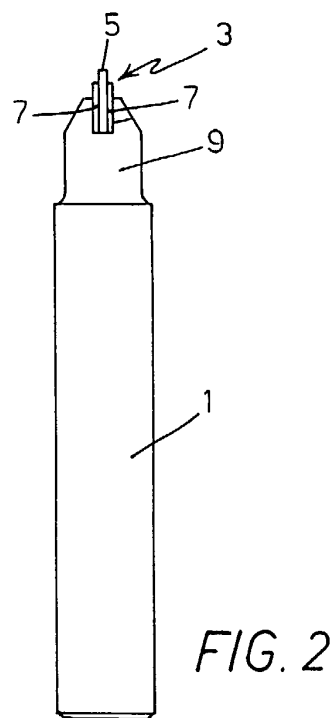
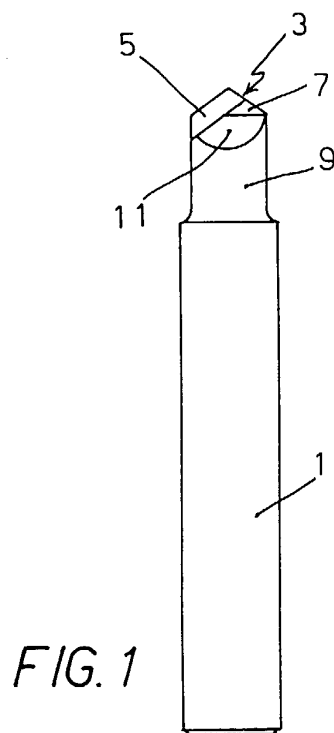
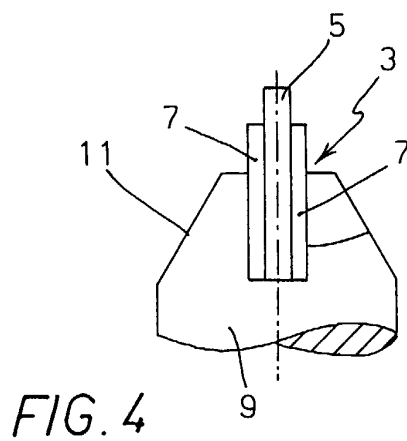
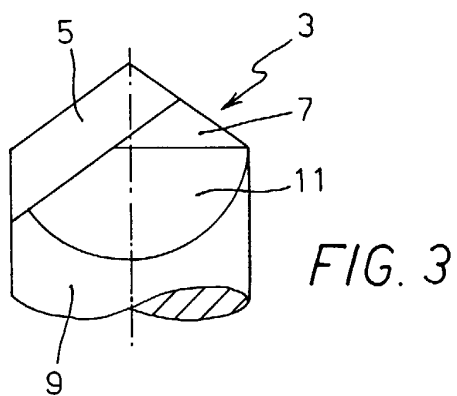
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2. A tool according to claim 1, wherein said insert defines two symmetrical cutting edges.
3. A tool according to claim 2, wherein said body (1) comprises an end portion (9) of smaller cross section than the remaining portion of the body (1). 10
4. A tool according to claim 3, wherein the upper part (11) of said end portion (9), receiving said cutting insert (3), has two tapered opposite plane faces. 15
5. A tool according to claim 4, wherein said insert (3) is fastened by brazing within a radial slot provided on the base of said upper part (11) of said end portion (9) parallel with said plane faces. 20
6. A tool according to claim 5, wherein said two symmetrical cutting edges are arranged along two parallel chords of the base of said upper part (11) of said end portion (9) of the cylindrical tool body (1). 25
7. A tool according to claim 6, wherein said insert (3) has its free end, projecting out of the radial slot, of substantially triangular shape with sharp outer sides. 30
8. A tool according to claim 7, wherein said free end of the PCD element (5) vertically projects of about 1 mm with respect to both hard metal elements (7) and diagonally projects of about 2 mm with respect to said two elements (7). 35
9. A tool according to claim 8, wherein the maximum amount of vertical projection of the hard metal elements (7) with respect to the upper base of the portion (11) holding the insert (3) is of the order of 1.5 to 2 mm. 40

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EUROPEAN SEARCH REPORT

Application Number
EP 00 83 0030

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 5 443 337 A (KATAYAMA ICHIRO) 22 August 1995 (1995-08-22) * column 6, line 4 - line 44 * * figures 1-3 *	1,2	B28D1/18 B23B27/14
Y	---	3-7	
Y	PATENT ABSTRACTS OF JAPAN vol. 009, no. 286 (M-429), 13 November 1985 (1985-11-13) & JP 60 127912 A (ASAHI DIAMOND KOGYO KK), 8 July 1985 (1985-07-08) * abstract *	3-7	
A	US 4 627 503 A (HORTON M DUANE) 9 December 1986 (1986-12-09) * column 9, line 37 - line 40 * * figure 2 *	4	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		20 June 2000	Moet, H
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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