(19) Europäisches Patentamt
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(11) **EP 2 067 573 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
10.06.2009 Bulletin 2009/24

(51) Int Cl.:
B24C 11/00 *(2006.01)*

(21) Application number: **08380328.8**

(22) Date of filing: **01.12.2008**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA MK RS

(30) Priority: **04.12.2007 ES 200703227**

(71) Applicant: **Tico S.A.**
28004 Madrid (ES)

(72) Inventor: **Miranda Rojas, Antonio**
28004 Madrid (ES)

(74) Representative: **Díaz de Bustamante y Terminel, Isidro**
Arcade & Asociados
C/ Isabel Colbrand, 6-5th floor
28050 Madrid (ES)

(54) **Abrasive for cutting by water jet**

(57) Especially devised for the cutting of pieces of great hardness, such as, for example, pieces of steel, aluminium and metals in general, plastics, glasses, rocks and other; it consists of a high-density glass, with a density equal to or greater than 3.5 T/m^3 and a granulometry less than 55% of the interior diameter of the nozzle of the water jet. With this new abrasive, practical results are achieved which are very similar to those of the classic abrasive used in this field, ground granite, but at considerably lower costs.

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Description

OBJECT OF THE INVENTION

[0001] The present invention relates to a new abrasive especially devised to be used as an additive in a water jet cutting machine.

[0002] The object of the invention is to achieve a product which, correctly complying with its function as said abrasive, determines a substantial lowering of costs with respect to the abrasives conventionally used.

[0003] The invention is situated thus in the field of abrasive products, and more specifically in the industrial area of the raw materials used in cutting machines of different types of material such as steels and others.

BACKGROUND OF THE INVENTION

[0004] As is known, the water jet cutting machines, which can use simply water when soft materials are cut, such as, for example, rubber seals or other, require an abrasive when hard pieces are cut, such as, for example, pieces of steel.

[0005] The abrasives are selected in accordance with their hardness, durability, resistance to impact, granulometric distribution and, of course, price.

[0006] At present, and for these applications, granite, which is a natural mineral which is conveniently treated to obtain a suitable granulometry in this use as abrasive, is used, in practically exclusive form.

[0007] This mineral satisfactorily complies with its function, but nevertheless, has as fundamental problem a very high cost, so that this abrasive constitutes the element of greatest cost in the cutting operation.

DESCRIPTION OF THE INVENTION

[0008] The abrasive for cutting by water jet that the invention proposes resolves the aforementioned problem in a fully satisfactorily manner, so that maintaining very similar functional features to those of granite, it entails a substantial lowering of costs, which means that said abrasive can reach the consumer at a price which is a great deal lower.

[0009] This lowering of costs is due to the fact that the abrasive that the invention proposes consists of a high-density glass.

[0010] More specifically, the following components participate in said high-density glass:

- Silicon oxide (SiO_2) ..... between 18 and 32%
- Iron oxide (Fe_2O_3) ..... between 20 and 50%
- Zinc oxide (ZnO) ..... between 1 and 15%
- Aluminium oxide (Al_2O_3)... between 4 and 16%
- Calcium oxide (CaO)..... between 1 and 6%
- Chromium (Cr), Tin (Sn), Lead (PB), Copper (Cu), Vanadium (V) and Sodium (Na)..... between 1 and 11 %

[0011] This mixture of oxides, with a density equal to or greater than 3.5 tons/m^3 and with a granulometry, in turn, less than 55% of the interior diameter of the nozzle of the water jet, permits cutting materials that are normally cut by granite with a water jet, at a more economic price.

EXAMPLE OF PRACTICAL EMBODIMENT OF THE INVENTION

[0012] Using an "Injersoll Rand@" water jet, a high-density glass with the following composition was used as coadjuvant abrasive with the water:

- SiO_2..... 30%
- Fe_2O_3..... 45%
- ZnO 7%
- Al_2O_3..... 10%
- CaO 3%
- Mixture of equal parts of Cr, Sn, Pb, Cu, V and Na..... 5%

[0013] This mixture, with a density of 3.9 and with a granulometry, in this case, less than 600 microns, gave the following comparative results compared with the use of classic granite, with a pressure of 3,100 kg for the machine, with a width of 1.3 mm in the loading nozzle, with a distance of 1.5 mm between the nozzle and the stainless steel, type 316 L thickness 12 mm:

- Penetration time 25.47/22.53 sec.; similar.
- Slightly inferior cutting quality.
- Cost of the abrasive in the order of 70%.

[0014] It is gathered from the results obtained that, except in those cases where an extraordinary cutting quality is required, in all others the new abrasive is much more interesting for the consumer than the conventional abrasive based on ground granite.

Claims

1. Abrasive for cutting by water jet, of the type used for the cutting of pieces of considerable hardness, such as, for example, steels, aluminium and metals in general, plastics, glasses, rocks and other; **characterized in that** it consists of a high-density glass, duly ground.

2. Abrasive for cutting by water jet, according to the preceding claims, **characterized in that** the high-density glass has the following components:

   - Silicon oxide (SiO_2)..... between 18 and 32%
   - Iron oxide (Fe_2O_3) ..... between 20 and 50%
   - Zinc oxide (ZnO) ..... between 1 and 15%
   - Aluminium oxide (Al_2O_3) . between 4 and 16%
   - Calcium oxide (CaO) ..... between 1 and 6%

- Chromium (Cr), Tin (Sn), Lead (PB), Copper (Cu), Vanadium (V) and Sodium (Na)..... between 1 and 11%

3. Abrasive for cutting by water jet, according to the preceding claims, **characterized in that** the high-density glass has a density equal to or greater than 3.5 T/m^3.

4. Abrasive for cutting by water jet, according to the preceding claims, **characterized in that** the high-density glass has a granulometry less than 55% of the interior diameter of the nozzle of the water jet.

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PARTIAL EUROPEAN SEARCH REPORT

Application Number EP 08 38 0328

which under Rule 63 of the European Patent Convention shall be considered, for the purposes of subsequent proceedings, as the European search report

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 803 532 A (SEIKO EPSON CORP [JP]) 4 July 2007 (2007-07-04) * paragraphs [0142], [0143] * * figure 3b * * table 2 *	1,3	INV. B24C11/00
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X	US 5 035 090 A (SZUECS JOHAN [DE]) 30 July 1991 (1991-07-30) * column 4, lines 25-28 * * column 7, lines 26-29 *	1	
X	GB 2 321 344 A (CINIGLIO A J [GB]; HALL LARRY [US]) 22 July 1998 (1998-07-22) * page 6, paragraph 2 *	1	TECHNICAL FIELDS SEARCHED (IPC)
X	US 2 993 309 A (BARNES KENNETH H ET AL) 25 July 1961 (1961-07-25) * column 2, lines 49-52 *	1	B24C

INCOMPLETE SEARCH

The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC to such an extent that a meaningful search into the state of the art cannot be carried out, or can only be carried out partially, for these claims.

Claims searched completely :

Claims searched incompletely :

Claims not searched :

Reason for the limitation of the search:

see sheet C

Place of search	Date of completion of the search	Examiner
Munich	26 March 2009	Eder, Raimund

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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EPO FORM 1503 03.82 (P04E07)

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INCOMPLETE SEARCH
SHEET C

Application Number
EP 08 38 0328

Claim(s) searched completely:
1,3

Claim(s) not searched:
2,4

Reason for the limitation of the search:

Claim 2 refers to percentages of glass components without defining the kind of percentage (weight-, volume-, mol-, etc. %). A comparison to the state of the art is therefore not possible.

Claim 4 refers to a diameter of a nozzle which is no part of the claimed entity and therefore not defined.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 38 0328

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82