



(43) International Publication Date
30 December 2015 (30.12.2015)

- (51) International Patent Classification:
B28D 1/08 (2006.01) *B23D 57/00* (2006.01)
- (21) International Application Number:
PCT/PT2015/000031
- (22) International Filing Date:
25 June 2015 (25.06.2015)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
107741 25 June 2014 (25.06.2014) PT
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- (81) Designated States (*unless otherwise indicated, for every
kind of national protection available*): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,

BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR,
KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG,
MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM,
PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC,
SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN,
TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

- (84) Designated States (*unless otherwise indicated, for every
kind of regional protection available*): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ,
TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU,
TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE,
DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU,
LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK,
SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, KM, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the
claims and to be republished in the event of receipt of
amendments (Rule 48.2(h))

(54) Title: SELF-PROPELLED MACHINE FOR SLICING ROCKS BY MEANS OF DIAMOND WIRE FOR THE TRANS-
FORMATION OF HEWN SLABS INTO BLOCKS

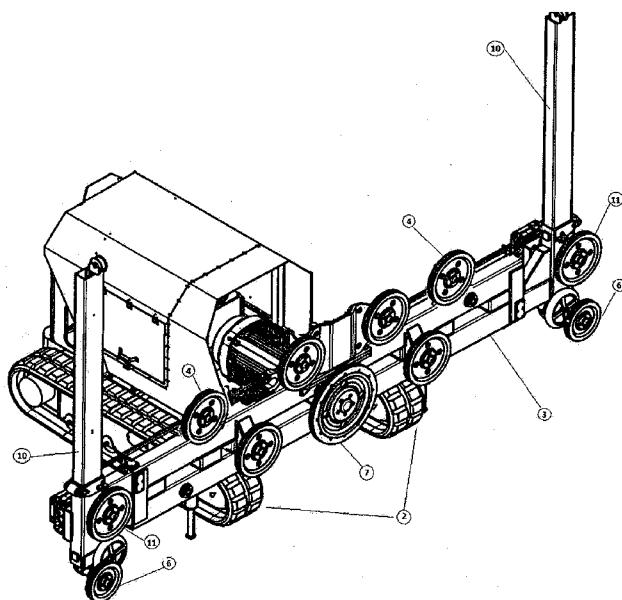


Figure 2

(57) Abstract: Self-Propelled Machine for Slicing Rocks by means of Diamond Wire for the Transformation of hewn slabs into blocks This invention relates to a self-propelled machine for slicing rocks by means of diamond wire (5) for the transformation of hewn slabs into blocks, which allows consecutive cutting, given that it is placed above the rock mass to be cut, whereby after cutting, all that is required is to move the machine rearwards by means of its tracks to begin another cut. Once the hewn slabs, or large masses of rock, have been removed from the front of the cut, they are formed into individual blocks of a size suitable for transport by means of stationary diamond wire cutting machines or stationary pneumatic or hydraulic drilling machines. The objective of this invention is to develop a new solution in one aspect of quarrying operations that enables current needs to be satisfied using appropriate technology and greater productivity.

DESCRIPTION

Self-Propelled Machine for Slicing Rocks by means of
Diamond Wire for the Transformation of hewn slabs into
blocks

Brief introduction to the invention

In recent years, there has been considerable development and adaptation of new technologies in quarries, which has contributed to cost reductions, mitigation of environmental impacts and improved safety. Nevertheless, various functions and phases of the process lack innovations that enable safety requirements, the mitigation of environmental impacts and the competitiveness of the industry to be reconciled.

Quarrying operations involve:

- a) Drilling: This consists of making horizontal and vertical holes to delimit the mass to be quarried and through which the diamond wire will pass (in the case of diamond wire cutting machines). This phase may not be executed where phase b) is directly executed, in the case of a cutting machine equipped with a mechanical saw.
- b) Cutting: Execution of longitudinal, cross-sectional, horizontal and vertical cuts, turning the rock masses into individual slabs (blocks) with diamond wire or mechanical saw cutting machines;
- c) Toppling: Once the rock masses have been cut into individual pieces, they are toppled in slabs;
- d) Cutting: Once the hewn slabs, or large masses of rock, have been removed from the front of the cut, they are

formed into individual blocks of a size suitable for transport by means of stationary diamond wire cutting machines or stationary pneumatic or hydraulic drilling machines.

The objective of this invention is to develop a new solution in one aspect of quarrying operations that enables current needs to be satisfied using appropriate technology and greater productivity, i.e. in operation d) above.

State of the art of the invention

During research into the state of the art of the invention, which was undertaken with the goal of determining whether it had already been conceived or executed by other inventors, the following patent documents were identified, from which we may conclude that this invention is distinct:

- EP 1142680 A2 - describes a piece of equipment that sections the rock mass with diamond wire, but which moves along the rock mass by means of tracks. Adjusting the level of the cut is difficult using this system due to the uneven ground surface and position of the rock mass in relation to the machine. The present invention eliminates this problem, as the machine operates over the rock mass (1), with the cutting structure being easily levelled with the cut by means of the device (9);
- WO 2008/092840 A2 - describes a system for adjusting the diamond wire in which a traction wheel moves on the same plane as two free mobile wheels, which move away from the traction wheel. The inconvenience of this system lies in having to move the motor that

powers the traction wheel along the same plane, which creates constructive problems. Furthermore, in order to make large cuts and maximise production, the movement between these wheels would have to be considerable. In the present invention, the adjustment and tensioning wheels (4) move away from the fixed wheel (12), with the advantage of increased safety, as the wheel are enclosed inside a protective cover;

- IT 1180793 - describes a piece of diamond wire cutting equipment for making vertical cuts in faces by sectioning where holes have been previously opened (6 - IT1180793) for the guide wheels to pass through (8 - IT1180793). Given that these guide wheels normally have a diameter of 400mm, this causes a great waste of raw material. It also depends on another machine for positioning. The present invention is self-propelling by means of tracks, which allows it to move over the rock mass without causing waste of the rock mass, as the wheels (6) guide the cut made by the diamond wire laterally to the rock mass.

Description of the invention

This invention relates to a self-propelled machine for slicing rocks by means of diamond wire for the transformation of hewn slabs into blocks, which allows consecutive cutting, given that it is placed above the rock mass (1) to be cut, whereby after cutting, all that is required is to move the machine rearwards by means of its tracks to begin another cut.

The present invention has a structure (2) with tracks, which serve as support for the remaining components

thereof. Within this same structure (2), there is a power unit for activating and controlling the machine. Locomotion via tracks enables the machine to be moved along the rock mass, thereby facilitating its positioning for cutting. Another structure (3) is appended to the structure (2), which forms the base for the cutting mechanism. The extendable structure (3) enables the angle to be adjusted perpendicular to the rock mass by means of a mechanical or hydraulic device (9).

The extendable structure (3) may consist of one or more parts, a horizontally extendable boom (13) and a depth extendable boom (10) by means of a motor/reducer with linear guidance, an endless spindle or similar, thereby enabling its adaptation tailored to the rock mass to be cut by means of a motor/reducer with linear guidance, an endless spindle or similar.

The wheels (4) of the extendable structure (3), which move away from the fixed wheels (12) (14), are responsible for tensioning and adjusting the diamond wire. The diamond wire (5) is activated by the central traction wheel (7), which is in turn activated directly by the electric motor. Thereafter, the diamond wire (5) is guided by the remaining guide wheels (6) (11). The guide wheels (11) are joined to the structure (13). The guide wheels (6) are joined to the extendable boom (10), which moves downwards or upwards during the cut in relation to the structure (13).

The extendable boom (10) also includes a support wheel (15) to delimit how far it can bend and to support the boom on the rock mass (1) during the cut, if necessary.

The machine can be controlled by the operator directly on the machine, via an electrical, hydraulic or pneumatic system, a combination thereof, by cabled remote control or even by wireless remote control. It may be operated in manual or automatic mode. In manual mode, the operator controls all the machine's movements. In automatic mode, cutting is performed during the entire cut. This position control is performed by means of mechanical, inductive or other sensors.

Additionally, the present invention has a levelling system (8), which enables the machine to be levelled vertically on the rock mass, as well as fixing it against the rock mass to prevent slippage.

Industrial application

This invention refers to an autonomous machine for application in phase d) above. Normally, great quantities of rock are cut at quarries (1). These great quantities have to be sectioned (several times) in order to be optimised and transported.

The conventional method consists of using diamond wire cutting machines placed on the zero point. This method is inconvenient as the machine has to work perpendicularly to the block to be cut, which implies having to move and align the machine between each separate cut.

This new machine allows consecutive cutting, as it is placed above the rock mass to be cut, whereby after cutting, all that is required is to move the machine

rearwards by means of its hydraulically controlled tracks to begin another cut.

Leiria, 23 June 2014

CLAIMS

1. Self-propelled machine for slicing rocks by means of diamond wire for the transformation of hewn slabs into blocks characterised by presenting:
 - a) structure (2) with tracks, in which there is a power unit for activating and controlling the machine;
 - b) extendable structure (3), appended to the structure (2), which presents:
 - a. at least one horizontally extendable boom (13) and at least one depth extendable boom (10) controlled by means of a motor/reducer with linear guidance, which also includes the support wheel (15);
 - b. wheels (4) and a fixed wheel (12), responsible for tensioning and adjusting the diamond wire (5);
 - c) diamond wire (5) activated by the central traction wheel (7) and guided by the guide wheels (6) (11), affixed to the structure (3), whereby the guide wheels (11) are joined to the structure (13) and the guide wheels (6) are joined to the extendable boom (10);
 - d) electric motor;
 - e) levelling system (8).
2. Machine in accordance with claim 1 characterised by consisting of one or more parts.
3. Machine in accordance with claim 1 characterised by the motor/reducer with linear guidance having an endless spindle or similar.

4. Machine in accordance with claim 1 characterised by being controlled by the operator directly on the machine, via an electrical, hydraulic or pneumatic system, a combination thereof, by cabled remote control or even by wireless remote control.
5. Machine in accordance with claim 1 characterised by being operated in manual or automatic mode.
6. Machine in accordance with claim 1 characterised by having position control performed by means of mechanical, inductive or other sensors.

Leiria, 23 June 2014

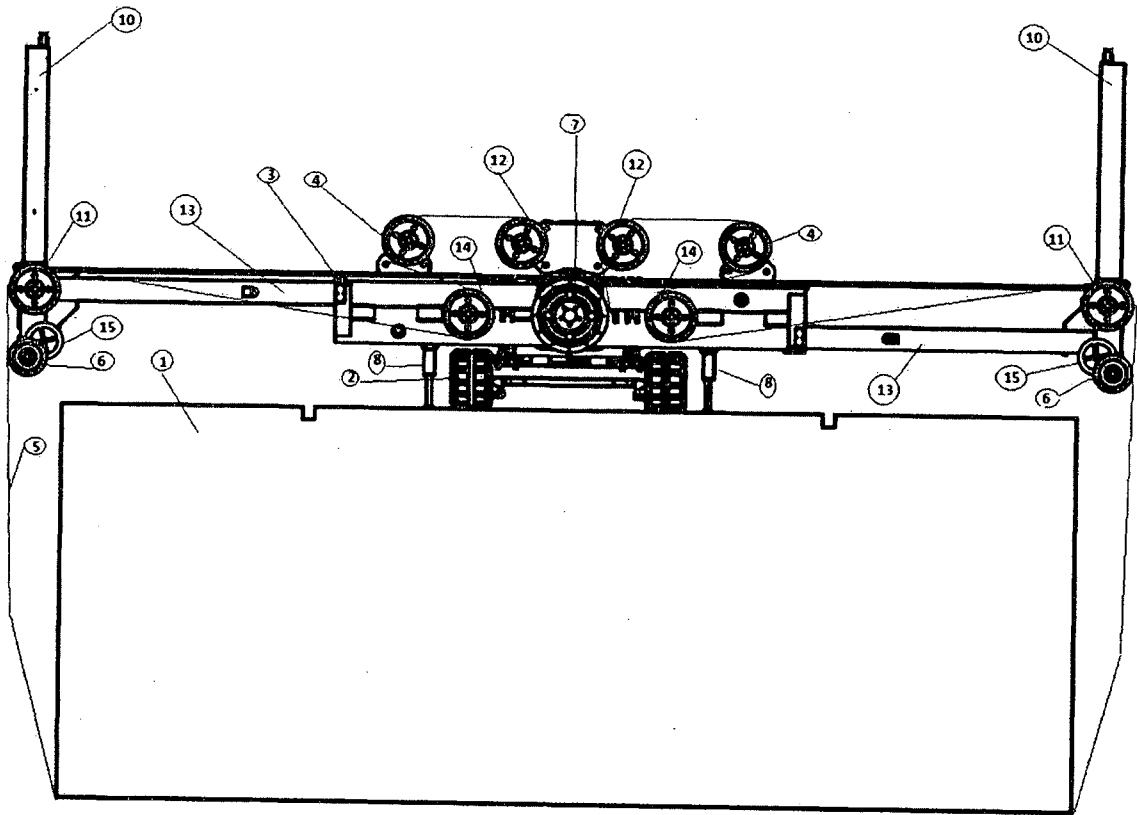


Figure 1

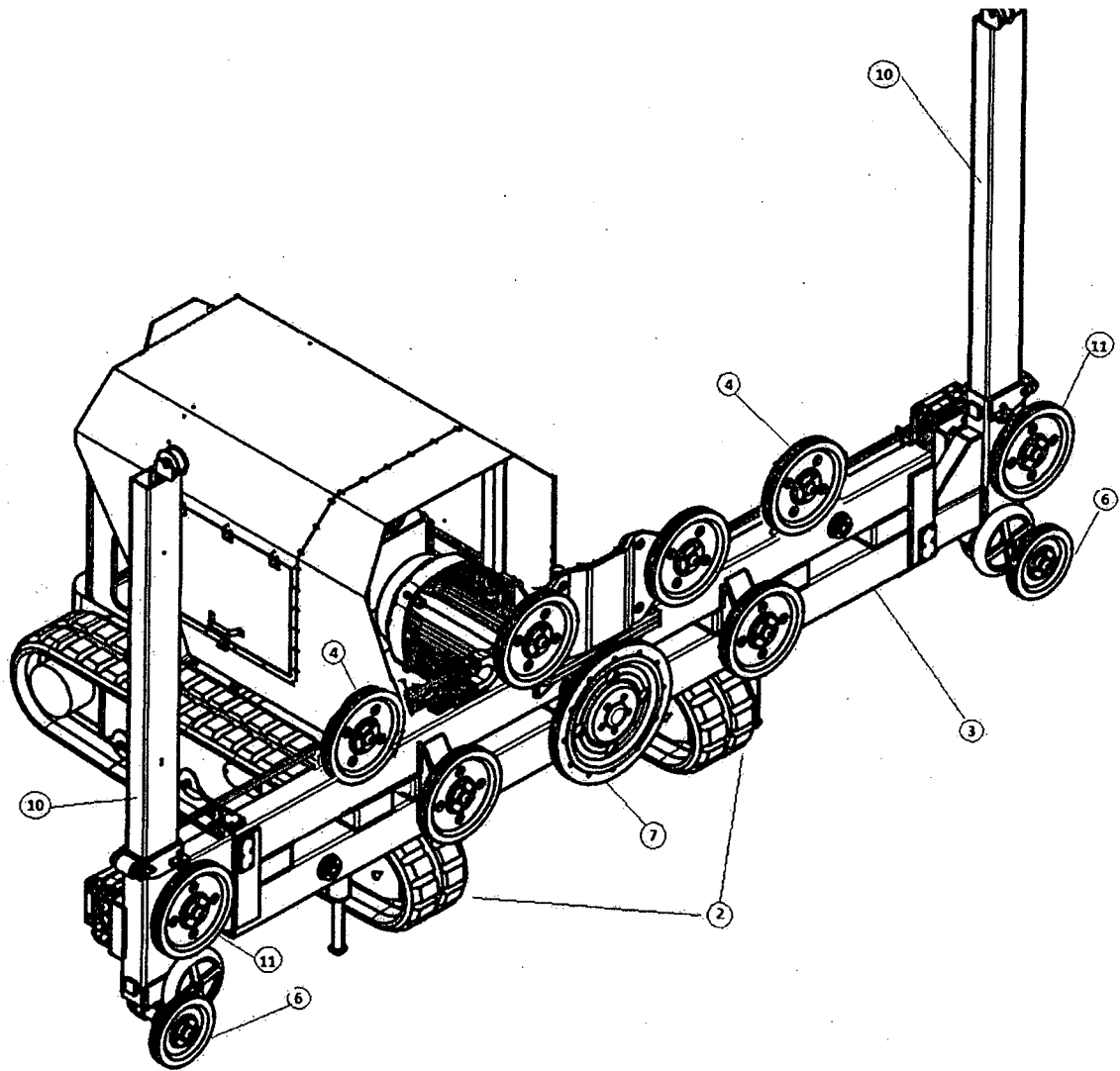


Figure 2

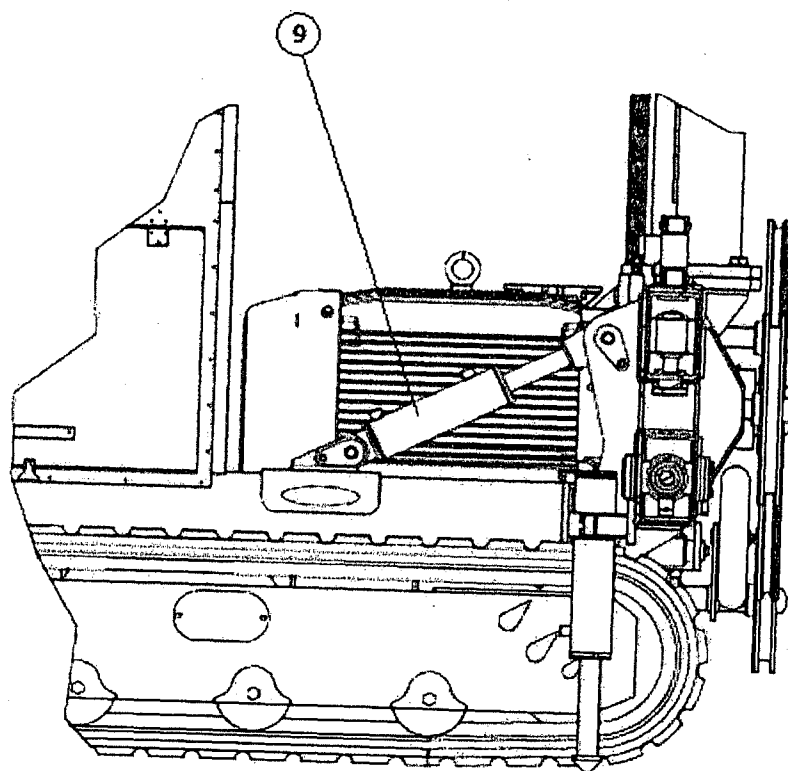


Figure 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/PT2015/000031

A. CLASSIFICATION OF SUBJECT MATTER
INV. B28D1/08 B23D57/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B28D B23D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2014/000003 A1 (HATZER MARKUS [AT]) 3 January 2014 (2014-01-03) the whole document	1-6
A	----- ES 1 023 254 U (LOS BOLILLAS S L [ES]) 16 June 1993 (1993-06-16) the whole document -----	1-6



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

6 October 2015

Date of mailing of the international search report

16/10/2015

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/PT2015/000031

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2014000003	A1	03-01-2014	AT 513118 A1 15-01-2014
			EP 2866992 A1 06-05-2015
			WO 2014000003 A1 03-01-2014
ES 1023254	U	16-06-1993	NONE