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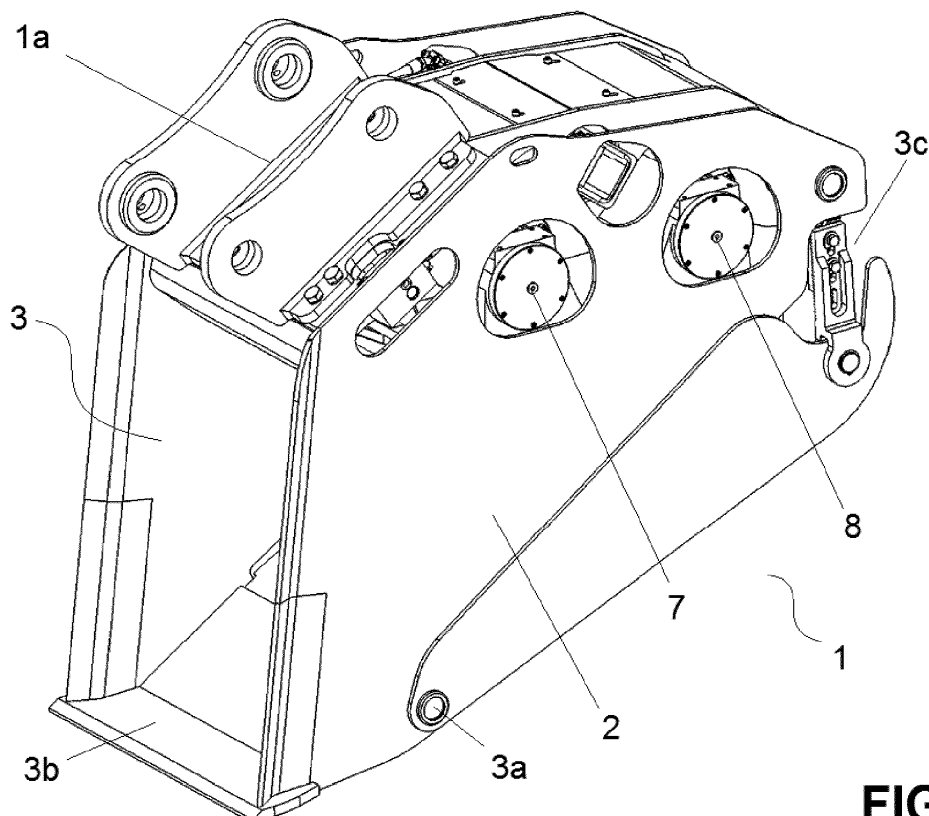
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(54) **BUCKET FOR CRUSHING STONES AND THE LIKE**

(57) Bucket (1) for grinding stones and the like comprising two eccentric shafts (7, 8) with a movement synchronized with each other and are securely joined with one movable jaw (5) so that they impart a circular motion

on the entire movable jaw (5) which puts a homogeneous pressure on the material to be crushed against the fixed jaw (6), driving the crushed material towards the outlet.



**FIG.1**

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## Description

[0001] The object of the present invention relates to a bucket of the type used in civil engineering machinery, such as excavators and backhoes, comprising means to crush stone and similar materials.

## State of the art

[0002] In the technical field of the invention, self-propelled vehicles equipped with buckets for collecting material such as stone or the like, inside which a crushing mechanism is provided for crushing the material collected to the desired size, are known.

[0003] Amongst others, an example of a known crushing means comprises two jaws, of which one moves pivotally relative to the other. The jaws are moved in a manner such as to compress between them, and hence to crush, the material which is introduced into the bucket. However, these crushing means lead to some disadvantages which result in poor performance in the processing of the material crushed.

[0004] The document US 3959897 describes a device for crushing stone, comprising an excavating bucket that has a vibrating cutter head and a crusher that includes a pair of jaws which are moved one towards the other through an eccentric oscillating shaft. However, in this document, the shaft oscillation is so limited as to produce just an up-and-down movement of the jaws. I.e., this device does not describe a complete rotational movement of the jaws.

[0005] On the other hand, the document EP1138834 describes a crushing bucket which, in contrast to the previous document, describes a complete rotational movement in the jaws. However, this document does not describe a forward motion which allows admitting stones or similar material on the inside of the bucket.

[0006] Finally, the document ES2258161T3 describes a bucket for crushing and screening stone that is a combination of the two above-mentioned documents, since it describes a full rotational movement and a forward movement.

[0007] This solution, despite the fact that optimizes the effective and efficient crushing of the stone, has deficiencies in the intake of material into the bucket. The translational and rotary motion avoids an efficient intake of material, which considerably reduces the crushing capacity. In addition, this elliptical motion (translation and rotation) causes the same pressure is not put throughout the jaw since in the shaft ends of the imaginary ellipse, when the movable jaw rises, the pressure is lower than in the movement parallel to the flow direction which is where the crushing actually occurs. The lack of uniform pressure implies a lower performance and, therefore, a lower crushing capacity. Similarly, the performance of the buckets described in the prior art are affected by problems in the stagnation of the product at the inlet of the bucket mouth that must be solved.

## Description of the invention

[0008] It is an objective of the present invention a bucket for crushing stones and the like with an optimized performance achieved by obtaining a stone crushing without blockages at the inlet of the bucket mouth. This objective is achieved through the elements described in the independent claim. Other particular embodiments are described in its dependent claims.

[0009] The device object of the invention incorporates two elements that allow, separately, or as a whole, solving the technical problems defined in the state of the art.

[0010] Thus, the movable jaw that incorporates the bucket performs an essentially circular motion. This circular motion allows, at the same time that compresses the material (stone) housed inside, said material to be introduced simultaneously inwards. In addition, given that is a circular motion, pressure and advancement of the movable jaw is completely homogeneous across the contact surface of the movable jaw, which increases its crushing capacity.

[0011] Another aspect of the invention, the bucket includes an inclined plate at the inlet joined to the movable jaw and having a certain angle of inclination so that due to said angle and movement of the movable jaw it avoids the blockage of material at the inlet and directs it towards the jaws of the bucket.

[0012] The combination of both elements (circular motion and inclined plate) also allows even more satisfactorily solving the technical problem described.

[0013] Throughout the description and claims, the word "comprises" and its variations are not intended to exclude other technical features, additives, components or steps. For those skilled in the art, other objects, advantages and characteristics of the invention will emerge in part from the description and in part from the practice of the invention. The following examples and drawings are provided by way of illustration, and are not intended to be limiting of the present invention. Furthermore, the present invention covers all the possible combinations of particular and preferred embodiments herein indicated.

## Brief description of the figures

[0014] There follows a very brief description of a series of drawings that help to provide a better understanding of the invention and which are associated expressly with an embodiment of said invention that is presented as a non-limiting example thereof.

FIG. 1 shows a frontal perspective view of the bucket object of the invention.

FIG. 2 shows a second rear perspective view of the bucket object of the invention.

FIG. 3 shows a top view of the bucket without protections, appreciating the set of eccentrics that make up the invention.

FIG. 4 shows a side view of the bucket of the invention without protections where the movement of material within the crushing bucket of the invention is outlined.

#### Explanation of a detailed embodiment of the invention

**[0015]** In the accompanying figures, the bucket formed according to the present invention is shown by the reference number 1. The bucket 1 is arranged so that it can be connected to an arm of a machine for public works, of the type excavator or backhoe not shown in accompanying figures. To do this, it has a mooring 1a to the machine arm of the type known, for example, in the documents ES2304330, ES2192478 or ES1017841U or equivalent systems.

**[0016]** The bucket 1 comprises a scoop-shape body which is configured in a modular fashion. Thus, the inlet 3 of the bucket 1 is attached to the sideguards 2 of the jaws (5, 6) through connecting elements 3a that allow the replacement of the blade 3b or the sideguards 2 in case of wear, quite common in this type of machinery. Precisely, to avoid the elements lose their position during the work, side tensioners (3c) are incorporated.

**[0017]** The inlet 3 is configured as an opening for the load of broken stone, gravel, stones and the like and having a cross section which is enlarged in comparison with an opposite outlet 4 for the discharge of the crushed material, after the crushing process carried out inside the body of the bucket 1.

**[0018]** The elements that allow crushing the stone at the inlet are the aforementioned jaws (5, 6). These are configured in a movable jaw 5 located on a fixed jaw 6. Both jaws (5, 6) are accessible and removable in case of wear of the same. In addition, conventionally, the contact surfaces (5a, 6a) of the jaws (5, 6), that is the surfaces facing each other, are provided with longitudinal grooves extending parallel to the flow direction of the stone entered and suitable to facilitate the crushing of the same. The grooves define a plurality of ribs and recesses, alternating in succession in a manner such that a rib of the movable jaw 5 corresponds to a recess of the fixed jaw 6, so that, during the movement of the first jaw 5, the crushing of the material is more vigorous. Moreover, since the ribs of one jaw can penetrate the recesses of the other jaw, the crushing can be particularly fine.

**[0019]** The driving means of the movable jaw 5 are shown in detail in FIG. 3. These driving means comprise a pair of eccentric shafts (7, 8) driven by at least a hydraulic motor (7a, 8a) per shaft by respective belts (7b, 8b). To synchronize the movement of the pairs of eccentrics (7, 8) both are joined by one central toothed belt 9. The use of belts is easier to engage, so it is the preferred solution. However, any other motion transmission element could be susceptible of being used. The only limitation is that the movement must be synchronized to create a circular motion in the movable jaw 5.

**[0020]** The hydraulic pressure for the movement of the motors (7a, 8a) is preferably received from the own machine for public work.

**[0021]** The synchronized movement of the eccentric shafts (7, 8) as shown in FIG. 4, has the particularity of imparting a circular motion to the movable jaw 5, to which are severally joined. This circular and rotary motion imparted to the movable jaw 5 causes this to move describing a circle and pushing the material against the fixed jaw 6 with a homogeneous pressure on the entire contact surface 5a. In addition, given the direction of rotation of the movable jaw 5, which is counter-clockwise, the cited movable jaw 5 allows trapping the material at the inlet and put it inwards simultaneously.

**[0022]** An inclined plate 10 joined to the movable jaw 5 is arranged at the inlet which in its circular motion and due to its angle of inclination prevents the material from hitting the input 3 of the bucket 1 and from building up, blocking it.

**[0023]** Indeed, the crushing buckets described in the state of the art describe more or less complex systems to prevent the building up of material at the inlet, including roller, vibratory systems, or other even more complex mechanically. However, given the circular motion of the movable jaw 5 to which is joined, and also given its inclination, the inclined plate 10, in each of its movements, unlock the stones locked at the input of the bucket 1, pushing them towards the inlet 3, so that the movable jaw 5 itself can, in its motion, capture them inwards of the bucket 1 itself crushing them against the fixed jaw 6. This simple solution surprisingly increases the overall performance of the bucket 1 compared with the known solutions. The technical problem can be solved either with the inclined plate 10, or the movement of the movable jaw 5, or by combining both effects.

**[0024]** Preferably, the 1a inclined plate 10 is inverted "L"-shaped to provide it with greater strength and resistance.

**[0025]** It should be noted that if the movement of the eccentric shafts (7, 8) is clockwise, a reverse process occurs, the expelling of the stone inside the bucket 1, which is useful to avoid clogging, since at any given time the direction of rotation can be changed and expel the stones that block the normal operation of the bucket 1.

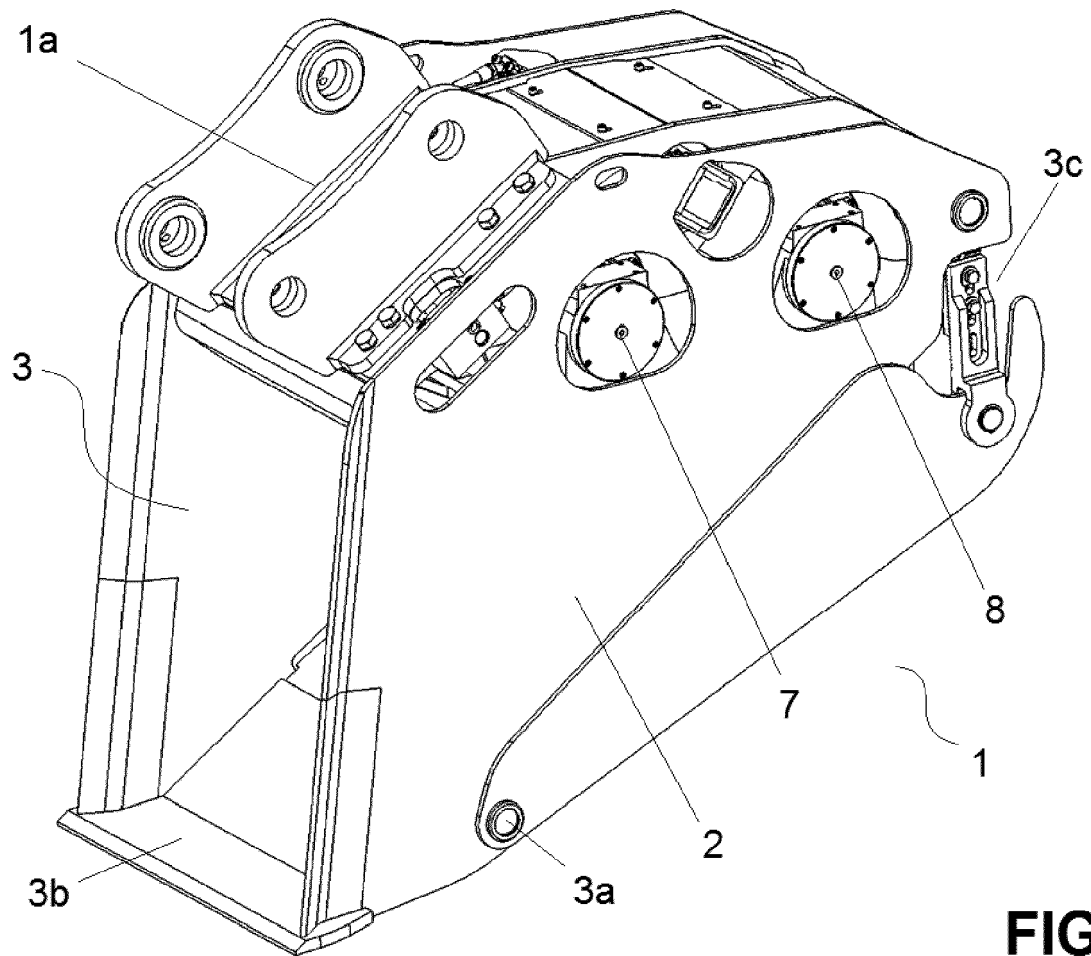
**[0026]** The bucket 1 is completed with a plurality of protections and elements configured in a modular fashion, so that they can be easily replaced in case of wear or break.

#### Claims

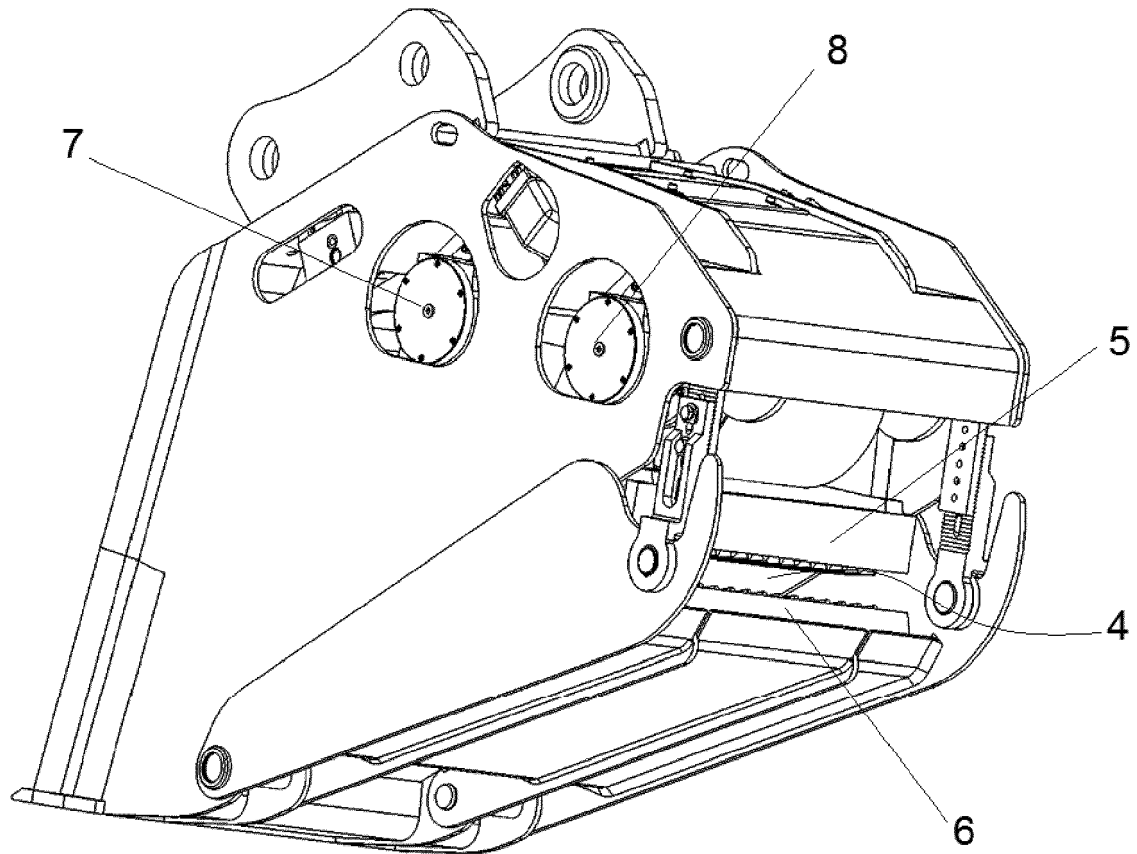
1. A bucket (1) for crushing stones and the like comprising: a scoop-shape body defining an inlet (3) for the stone to be crushed and an outlet (4) for the crushed stone, among which an flow direction for the stone is defined; means for crushing stone, the crushing means comprising a first movable jaw (5)

and a second fixed jaw (6) housed in the scoop-shape body and facing each other, so that a lower surface (5a) of the movable jaw (5) is faced with an upper surface (6) of the fixed jaw (6); and driving means of the first movable jaw (5) with regard to the second fixed jaw (6), the cited moving means comprising at least two eccentric shafts (7, 8) with a movement jointly and synchronised with each other; **characterized in that**

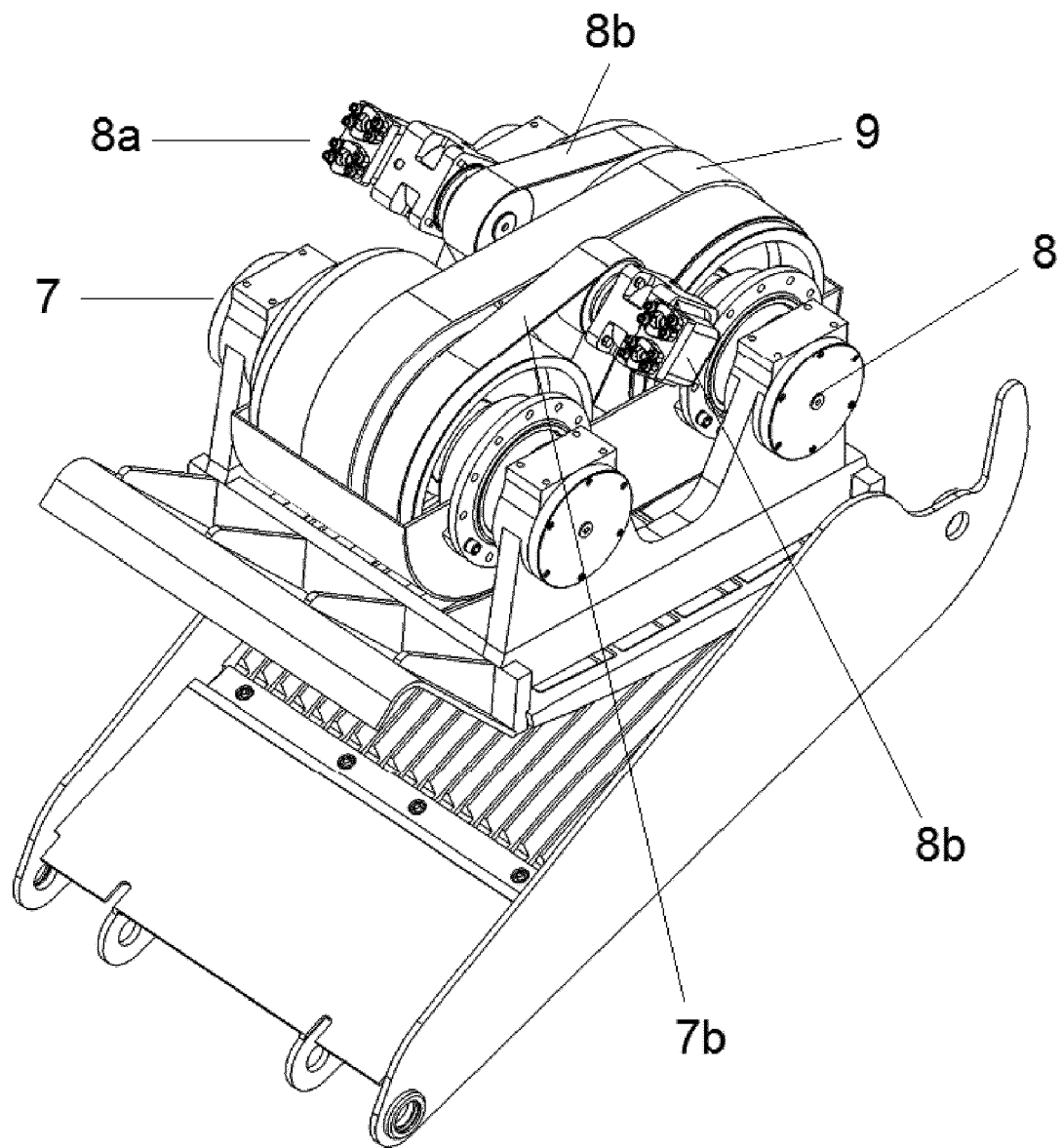
- a. the eccentric shafts (7, 8) are securely joined to the movable jaw (5) so that they impart a circular motion on the entire movable jaw (5) which puts a homogeneous pressure on the material to be crushed against the fixed jaw (6); or
  - b. **in that** it comprises an inclined plate (10) securely joined to the movable jaw (5) in the input area (3) of the scoop forming the body of the bucket (1); or
  - c. **in that** it comprises (a) and (b).
2. The bucket (1) according to claim 1 wherein the driving means of the movable jaw (5) comprise two eccentric shafts (7, 8) which are driven, respectively, by two hydraulic motors (7a, 8a) the motion of which is transmitted by both belts (7b, 8b); and wherein the motion of the eccentric shafts (7, 8) is jointly and synchronised by a central toothed belt (9).
3. The bucket (1) according to any of the preceding claims wherein the input (3) is attached to the sideguards (2) of the jaws (5, 6) by means of connecting elements (3a) such that they allow the substitution of a blade (3b) or the sideguards (2); and they also incorporate side tensioners (3c) to adjust their position.
4. The bucket (1) according to any of the preceding claims wherein all elements are removable.



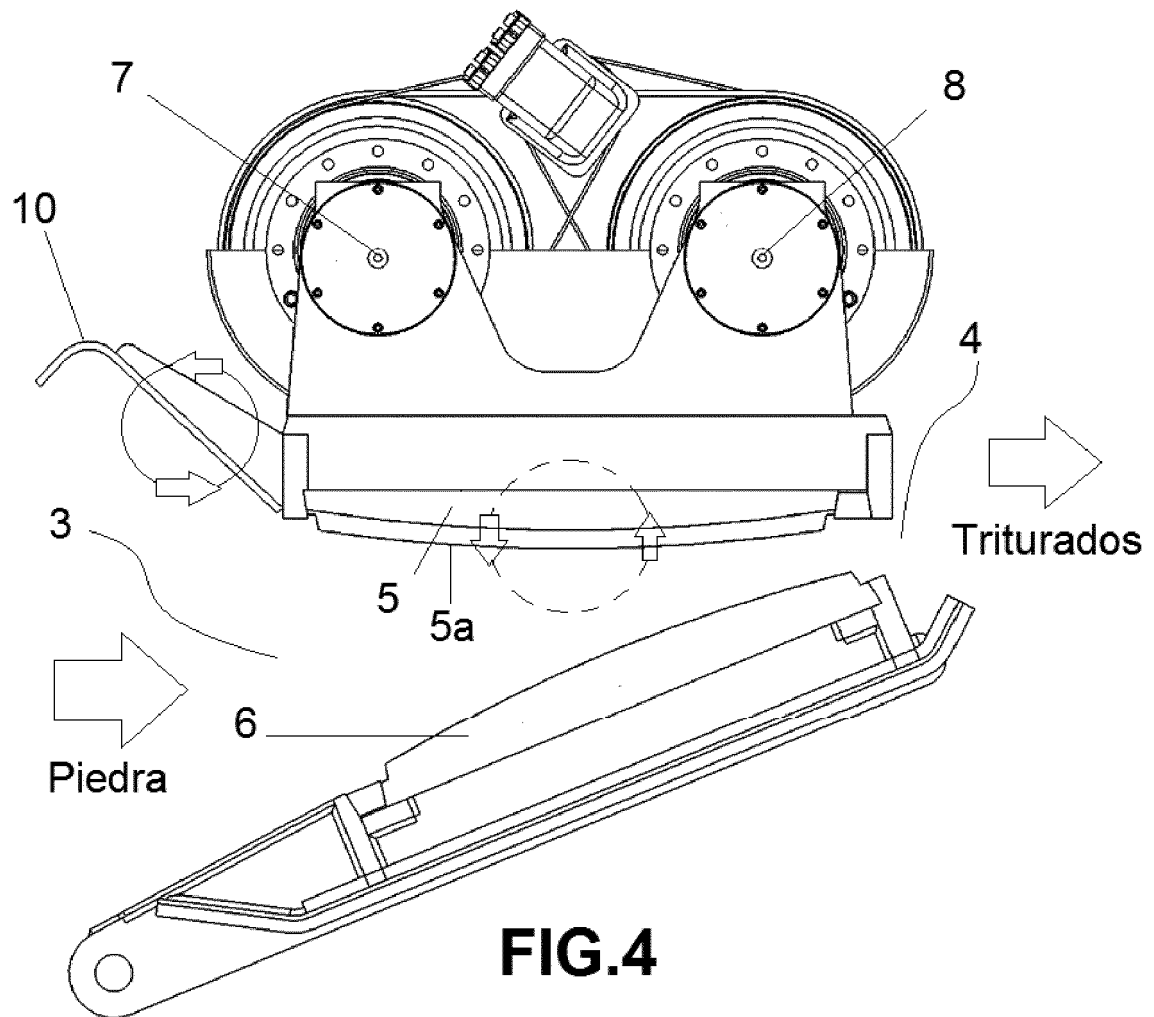
**FIG.1**



**FIG.2**



**FIG.3**





## EUROPEAN SEARCH REPORT

Application Number  
EP 15 16 1016

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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                     |                                                             |                                          |
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| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Citation of document with indication, where appropriate, of relevant passages                                                                       | Relevant to claim                                           | CLASSIFICATION OF THE APPLICATION (IPC)  |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | US 2004/050986 A1 (ROSSI ROBERT R [US])<br>18 March 2004 (2004-03-18)<br>* paragraphs [0044], [0062]; figures 1,4,4A *                              | 1,4                                                         | INV.<br>E02F3/40<br>B02C1/04<br>E02F3/96 |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | US 2012/018558 A1 (GERVAIS JOSEPH LUCIEN FERNAND [CA] ET AL)<br>26 January 2012 (2012-01-26)<br>* paragraphs [0020], [0090] - [0094]; figures 7,8 * | 2                                                           |                                          |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | JP 2010 064008 A (UEDA IND)<br>25 March 2010 (2010-03-25)<br>* abstract; figures 2-1, 6-2 *                                                         | 1                                                           |                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                     |                                                             | TECHNICAL FIELDS SEARCHED (IPC)          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                     |                                                             | E02F<br>B02C<br>F16G                     |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                     |                                                             |                                          |
| Place of search<br><b>Munich</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                     | Date of completion of the search<br><b>2 September 2015</b> | Examiner<br><b>Papadimitriou, S</b>      |
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ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|-------------------------------------------|---------------------|----------------------------|---------------------|
| US 2004050986 A1                          | 18-03-2004          | NONE                       |                     |
| -----                                     |                     |                            |                     |
| US 2012018558 A1                          | 26-01-2012          | CA 2763096 A1              | 21-01-2012          |
|                                           |                     | US 2012018558 A1           | 26-01-2012          |
|                                           |                     | WO 2012009799 A1           | 26-01-2012          |
| -----                                     |                     |                            |                     |
| JP 2010064008 A                           | 25-03-2010          | NONE                       |                     |
| -----                                     |                     |                            |                     |

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- US 3959897 A [0004]
- EP 1138834 A [0005]
- ES 2258161 T3 [0006]
- ES 2304330 [0015]
- ES 2192478 [0015]
- ES 1017841 U [0015]