(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 800 295 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
07.04.2021 Bulletin 2021/14

(21) Application number: **19382842.3**

(22) Date of filing: **01.10.2019**

(51) Int Cl.:
E02F 3/40 *(2006.01)* ***B02C 1/04*** *(2006.01)*
E02F 3/407 *(2006.01)* ***E02F 3/96*** *(2006.01)*

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

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

(57) Crusher bucket (1) for crushing stones and the like, comprising an eccentric shaft integrally attached with a moving jaw (5) through a moving side support (10) such that it imparts a substantially rectilinear movement in the entire moving jaw (5) which exerts a homogeneous pressure on the material to be crushed against the fixed jaw (6).

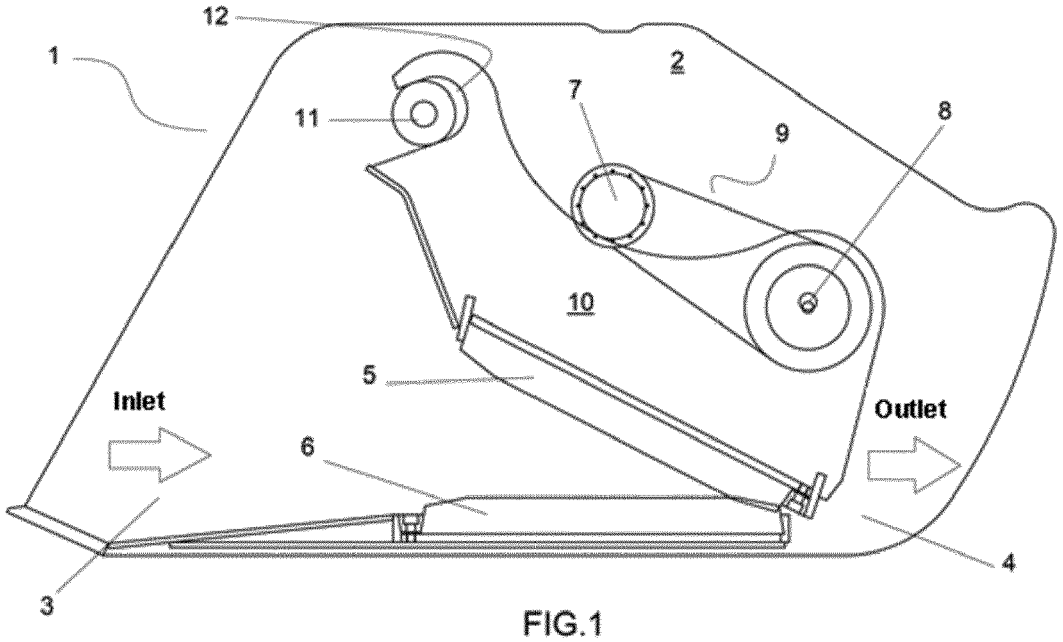

FIG.1

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Description

Object of the Invention

[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 for crushing stone and similar materials.

State of the Art

[0002] Self-propelled vehicles equipped with buckets or scoops for collecting material such as stone or the like, inside which there are arranged crushing means for crushing the collected material to the desired size, are known in the technical field of the invention.

[0003] Among others, a known example of crushing means comprises two jaws, one of which moves in a pivoting manner with respect to the other and both jaws move such that they compress the material between them, crushing it. However, these crushing means lead to some drawbacks which cause a poor performance in the processing of the crushed material.

[0004] Document US 3959897 describes a device for crushing stone comprising an excavating bucket or scoop having a vibrating cutter head and a crusher including a pair of jaws which are moved towards one another by means of an eccentric oscillating shaft. Nevertheless, in this document, the oscillation of the shaft is so limited that the jaws are only moved from top to bottom. In other words, this device does not describe a complete rotational movement of the jaws.

[0005] Moreover, document EP1138834 describes a crusher bucket which, unlike the preceding document, does indeed describe a complete rotational movement of the jaws. Nevertheless, this document does not describe a forward movement which allows gradually taking stones or similar material into the bucket.

[0006] Finally, document ES2258161T3 describes a scoop or bucket for crushing and sieving stone which is a combination of the two documents described, as it indeed describes a complete rotational movement and a forward movement.

[0007] Despite the fact that this solution optimizes effective and efficient crushing of the stone, it presents drawbacks in the intake of the material into the scoop. The translational and rotational movement prevents an efficient intake of the material, which considerably reduces the crushing capacity. Furthermore, this elliptical (translational and rotational) movement means that the same pressure is not exerted on the entire jaw given that at the ends of the axis of the imaginary ellipse, when the moving jaw is raised, the pressure is lower than in the movement parallel to the flow direction where crushing actually takes place. The lack of uniform pressure implies a lower performance, and therefore a lower crushing capacity. Similarly, the performance of the buckets or scoops described in the state of the art is affected by problems that must be solved concerning the product blocking up the inlet of the bucket mouth.

[0008] Finally, document EP3073019 describes a moving jaw incorporating the bucket that performs an essentially circular movement. This circular movement allows, at the same time, the compression of the material (stone) housed therein and the introduction of said material inwards simultaneously. Furthermore, given that it is a circular movement, the pressure and forward movement of the moving jaw is completely homogeneous on the entire contact surface of the moving jaw, increasing its crushing capacity. In another aspect of the mentioned document EP3073019, the bucket incorporates an inclined plate at an inlet integral with the moving jaw and having a certain angle of inclination such that, due to said angle and movement of the moving jaw, it prevents the material from blocking the inlet and directs it towards the jaws of the bucket.

Description of the Invention

[0009] An objective of the present invention relates to a crusher bucket for crushing stones and the like with an optimized performance which is achieved by obtaining stone crushing that increases the crushing capacity of the bucket. This objective is achieved with the elements described in the independent claim. Other particular embodiments are described in the dependent claims.

[0010] More specifically, the crusher bucket for crushing stones and the like object of the present invention comprises a scoop-shaped body defining an inlet for the stone to be crushed and an outlet for the crushed stone, between which there is defined a stone flow direction; means for crushing the stone, the crushing means comprising a first moving jaw and a second fixed jaw which are housed in the scoop-shaped body and arranged facing one another, such that a lower surface of the moving jaw is facing an upper surface of the fixed jaw; and activating means for activating the first moving jaw with respect to the second fixed jaw, characterized in that the mentioned movement means consist of a motor which drives an eccentric shaft through a transmission element; and wherein said eccentric shaft is integral with the moving jaw through a moving side support which is configured as a side plate parallel to the side guards in a transverse position with respect to the inlet and outlet of material; and wherein said moving side support comprises two ends, one of them being integral with the eccentric shaft, whereas the opposite end has an inverted C-shaped opening housing at least one bolt configured for limiting the rotational movement exerted by the eccentric shaft to a single degree of freedom, that rotational movement being transformed essentially into a rectilinear movement in the direction marked by the inverted C-shaped opening.

[0011] Throughout the description and the claims, the word "comprises" and variants thereof do not seek to exclude other technical features, additions, components,

or steps. For those skilled in the art, other objects, advantages, and features of the invention will be inferred 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 do not seek to limit the present invention. Furthermore, the present invention covers all the possible combinations of particular and preferred embodiments herein indicated.

Brief Description of the Drawings

[0012] A series of drawings which help to better understand the invention and are expressly related with an embodiment of said invention, presented as a non-limiting example thereof, will be described very briefly below.

[0013] Figure 1 shows a schematic view of the crusher bucket object of the present invention. The following reference numbers are used in said Figure 1:

1. Crusher bucket
2. Side guards
3. Inlet for the material to be crushed
4. Outlet for the crushed material
5. Upper or moving jaw
6. Lower or fixed jaw
7. Hydraulic motor
8. Eccentric shaft
9. Transmission element
10. Moving side support
11. Attachment bolts
12. Inverted C-shaped opening

Explanation of a Detailed Embodiment of the Invention

[0014] In the attached drawings, the bucket or scoop formed according to the present invention is indicated by means of reference 1. The bucket 1 is arranged so that it can be connected to an arm of an excavator- or backhoe-type machine for public works not shown in the attached drawings. To that end, it has a fastener for fastening to the arm of the machine of the type known, for example, in documents ES2304330, ES2192478, or ES1017841U, or equivalent systems.

[0015] Typically, the bucket 1 comprises an external structure similar to buckets described in the state of the art, particularly the one described in document EP3073019, and comprising a scoop-shaped body which has a modular configuration. The inlet 3 of the bucket 1 is therefore attached to the side guards 2 of the jaws 5 and 6 by means of any attachment elements which allow replacing the blade or the side guards 2 themselves in the event of wear, a rather common occurrence in this type of machinery.

[0016] The inlet 3 is configured as an opening for loading broken stone, gravel, stones, and the like and has a cross-section that is larger in comparison with an opposite outlet 4 for unloading the crushed material after the crushing process carried out inside the body of the bucket 1.

[0017] The elements which allow crushing the stone at the inlet are the mentioned jaws 5 and 6. These jaws are configured as a moving jaw 5 located on a fixed jaw 6. Both jaws 5 and 6 are accessible and removable in the event of wear thereof. Furthermore, conventionally, the contact surfaces of the jaws 5 and 6, i.e., the surfaces facing one another, are provided with longitudinal grooves extending parallel to the flow direction of the introduced stone and suitable for facilitating the crushing thereof. The grooves define a plurality of ribs and recesses, alternating successively such that a rib of the moving jaw 5 corresponds with a recess of the fixed jaw 6, such that the crushing of the material is stronger during the movement of the first jaw 5. Furthermore, given that the ribs of one jaw can penetrate the recesses of the other jaw, the crushing can be particularly fine.

[0018] The activating means for activating the moving jaw 5 consist of a hydraulic motor 7 which drives an eccentric shaft 8 through a transmission element 9, typically a toothed belt. The eccentric shaft 8 is in turn integral with a moving side support 10, which is configured as a side plate parallel to the side guards 2, there being at least one moving side support 10 for each side of the bucket 1, in a transverse position with respect to the inlet 3 and outlet 4 of the material. The moving side support 10 has the particularity of having two ends, one of them being integral with the eccentric shaft 8, whereas the opposite end has an inverted C-shaped opening 12 hosing respective bolts 11, one for each moving side support 10 on each side of the bucket 1, as mentioned above.

[0019] Therefore, when the motor 7 receives hydraulic pressure, preferably from the machine for public works itself, it transmits its rotation to the eccentric shaft 8 which, as a result of its own eccentric configuration, imparts an eccentric rotational movement to the moving side supports 10, which are integral with both the eccentric shaft 8 and the moving jaw 5 itself. Nevertheless, there is a need to take into account that, precisely, the bolts 11 are configured for limiting the movement exerted by the eccentric shaft 8 to a single degree of freedom, that rotational movement being transformed essentially into a rectilinear movement in the direction marked by the inverted C-shaped opening 12, given that, as can be observed in Figure 1, there is a certain space which enables relative movement of the moving side support 10 with respect to the bolt 11.

[0020] The indicated configuration allows concentrating the entire force vector generated in the eccentric shaft 8 in one and the same rectilinear movement, whereby a substantially linear movement can be imparted in the moving jaw 5, pressing the material against the fixed jaw 6 with a homogeneous pressure on the entire contact surface, with a greater force than in other crusher buckets described in the state of the art.

[0021] The bucket 1 is completed with a plurality of protections and elements having a modular configuration, such that they can be readily replaced in the event

of wear or breakage.

Claims

1. A crusher bucket (1) for crushing stones and the like, comprising: a scoop-shaped body defining an inlet (3) for the stone to be crushed and an outlet (4) for the crushed stone, between which there is defined a stone flow direction; means for crushing the stone, the crushing means comprising a first moving jaw (5) and a second fixed jaw (6) which are housed in the scoop-shaped body and arranged facing one another, such that a lower surface of the moving jaw (5) is facing an upper surface (6) of the fixed jaw (6); and activating means for activating the first moving jaw (5) with respect to the second fixed jaw (6), **characterized in that** the mentioned movement means consist of a motor (7) which drives an eccentric shaft (8) through a transmission element (9); and wherein said eccentric shaft (8) is integral with the moving jaw (5) through a moving side support (10) which is configured as a side plate parallel to the side guards (2) in a transverse position with respect to the inlet (3) and outlet (4) of the material; and wherein said moving side support (10) comprises two ends, one of them being integral with the eccentric shaft (8), whereas the opposite end has an inverted C-shaped opening (12) housing at least one bolt (11) configured for limiting the rotational movement exerted by the eccentric shaft (8) to a single degree of freedom, that rotational movement being transformed essentially into a rectilinear movement in the direction marked by the inverted C-shaped opening (12).

2. The bucket (1) according to claim 1, wherein the motor (7) is a hydraulic motor.

3. The bucket (1) according to claim 2, wherein the motor (7) receives hydraulic pressure through a connection to an arm of an excavator- or backhoe-type machine for public works.

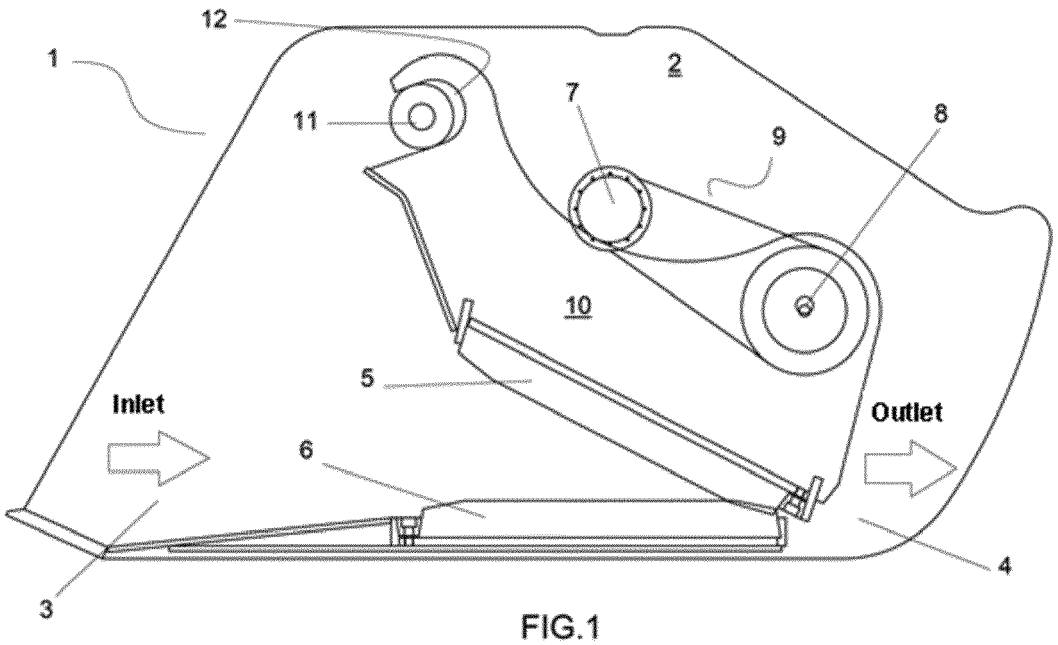

FIG.1

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EUROPEAN SEARCH REPORT

Application Number
EP 19 38 2842

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 2 572 789 A1 (ITO SHOKAI KK [JP]) 27 March 2013 (2013-03-27) * abstract; figures 1-5 *	1	INV. E02F3/40 B02C1/04 E02F3/407
A,D	ES 2 258 161 T3 (MECCANICA BREGANZESE S R L) 16 August 2006 (2006-08-16) * figures *	1	E02F3/96
A,D	EP 3 073 019 A1 (ARACAMA MARTINEZ DE LAHIDALGA JAVIER [ES]) 28 September 2016 (2016-09-28) * abstract; figures *	1	
A	US 5 630 555 A (BOYD PHILLIP G [NZ]) 20 May 1997 (1997-05-20) * column 3, line 65 - column 4, line 44; figures 1,2a,2b,4 *	1	
A	US 2 921 750 A (MARCELLO PICALARGA) 19 January 1960 (1960-01-19) * column 2, line 56 - column 3, line 50; figure 1 *	1	TECHNICAL FIELDS SEARCHED (IPC)
A	US 2009/261188 A1 (IAFRATE JOHN A [US]) 22 October 2009 (2009-10-22) * paragraph [0017]; figure 2 *	1	E02F B04C B02C
A	CN 208 810 140 U (XINCHANG NUOQU INTELLIGENT TECH CO LTD) 3 May 2019 (2019-05-03) * abstract; figures *	1	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	6 April 2020	Kühn, Thomas

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 19 38 2842

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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06-04-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2572789 A1	27-03-2013	BR 112012029266 A2	26-07-2016
		EP 2572789 A1	27-03-2013
		JP 4945012 B2	06-06-2012
		JP 4996776 B2	08-08-2012
		JP 5069805 B2	07-11-2012
		JP 2012066252 A	05-04-2012
		JP 2012066253 A	05-04-2012
		JP WO2011145631 A1	22-07-2013
		KR 20130120983 A	05-11-2013
		RU 2012154631 A	27-06-2014
		US 2013153697 A1	20-06-2013
		WO 2011145233 A1	24-11-2011
		WO 2011145631 A1	24-11-2011
ES 2258161 T3	16-08-2006	AT 324497 T	15-05-2006
		AU 2002339731 A1	19-03-2004
		CA 2495300 A1	11-03-2004
		CN 1650072 A	03-08-2005
		DE 60211037 T2	14-09-2006
		DK 1532321 T3	28-08-2006
		EP 1532321 A1	25-05-2005
		ES 2258161 T3	16-08-2006
		HU 0500595 A2	28-12-2005
		MX PA05002160 A	30-09-2005
		PT 1532321 E	31-08-2006
		RO 123225 B1	30-03-2011
		SI 1532321 T1	31-10-2006
		UA 80716 C2	25-10-2007
		US 2005242220 A1	03-11-2005
		WO 2004020747 A1	11-03-2004
EP 3073019 A1	28-09-2016	EP 3073019 A1	28-09-2016
		ES 2690076 T3	19-11-2018
		WO 2016151178 A1	29-09-2016
US 5630555 A	20-05-1997	NONE	
US 2921750 A	19-01-1960	NONE	
US 2009261188 A1	22-10-2009	US 2009261188 A1	22-10-2009
		US 2014203122 A1	24-07-2014
		WO 2009146185 A2	03-12-2009
CN 208810140 U	03-05-2019	NONE	

EPO FORM P0459

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 2258161T3 **[0006]**
- EP 3073019 A **[0008] [0015]**
- ES 2304330 **[0014]**
- ES 2192478 **[0014]**
- ES 1017841 U **[0014]**