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

SCHAUFEL ZUM ZERKLEINERN VON STEINEN UND DERGLEICHEN
BENNE DE CONCASSAGE DE PIERRES ET AUTRES

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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 WO2004020747, on which the preamble of claim 1 is based, 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.

[0008] Document US2004050986 discloses a mobile jaw crusher assembly for crushing objects is provided. The assembly includes a frame and a first crushing member that is configured to be moved and at least partially rotated by a vehicle. The first crushing member is configured to be attached to the vehicle. A second crushing member is also present and faces the first crushing member. The first and second crushing members define a crushing chamber that is used for crushing objects. The second crushing member is configured to be moved and at least partially rotated by the vehicle. However, the cited document fails to teach a shaft configuration that provides a circular movement in the mobile jaw as well as an inclined plate attached to the mobile jaw.

[0009] Finally, document US2012018558 relates to the field of rock crushers, in particular, rock crusher attachments for earth moving equipment or the like. The rock crusher attachment includes a front bucket portion configured for scooping rocks to be crushed and a rear crusher portion connected to and in communication with the rear of the bucket portion. The crusher portion includes a housing and a crushing assembly accommodated within the housing. The housing including a pair of spaced apart side panels. The crushing assembly has a lower jaw fixed between the side panels of the housing and an upper movable jaw mounted opposite and spaced apart from the lower jaw. The upper movable jaw assembly includes a support, an upper jaw plate attached to the underside of the support and a jaw-actuating drive assembly operable to urge the upper movable jaw assembly to move between an open jaw setting and a closed jaw setting. The support is pivotally connected between the side panels adjacent the front of the housing. The jaw-actuating drive assembly includes at least one motor carried by the support. The at least one motor is urged to move along with the upper movable jaw assembly relative to the lower jaw, when the crusher assembly is actuated. However, as well as other documents cited in the prior art, this document fail to teach a shaft configuration that provide a circular movement in the mobile jaw as well as an inclined plate attached to the mobile jaw.

Description of the invention

[0010] 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 claim 1. Other particular embodiments are described in its dependent claims.

[0011] 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.

[0012] 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 it 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.

[0013] 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.

[0014] The combination of both elements (circular motion and inclined plate) also allows even more satisfactorily solving the technical problem described.

[0015] 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

[0016] 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

[0017] 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.

[0018] 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.

[0019] 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.

[0020] 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.

[0021] 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.

[0022] The hydraulic pressure for the movement of the motors 7a,8a is preferably received from the own machine for public work.

[0023] 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.

[0024] 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.

[0025] 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.

[0026] Preferably, the inclined plate 10 is inverted "L"-shaped to provide it with greater strength and resistance.

[0027] 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.

[0028] 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 a 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) faces 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) **characterized in that**

said driving means comprises at least two eccentric shafts (7, 8) which are driven, respectively, by two hydraulic motors (7a,8a) the motion of which is transmitted by belts (7b, 8b); and wherein the motion of the eccentric shafts (7, 8) is synchronised by a cen-

tral toothed belt (9); and wherein:

(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); and

(b) the bucket (1) comprises an inclined plate (10) securely joined to the movable jaw (5) in the inlet (3) of the scoop-shaped body of the bucket (1);

(b.1) the inclined plate (10) having an angle of inclination with respect to the movable jaw (5) arranged to direct the material to be crushed towards the jaws (5, 6) of the bucket (1).

2. The bucket (1) according to claim 1 wherein the input (3) is attached to 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 sidewalls (2); and they also incorporate side tensioners (3c) to adjust their position.
3. The bucket (1) according to any of the preceding claims wherein the inclined plate (10) is inverted L-shaped.

Patentansprüche

1. Schaufel (1) zum Zerkleinern von Steinen und dergleichen, umfassend:

einen schaufelförmigen Körper, der einen Einlass (3) für das zu zerkleinernde Gestein und einen Auslass (4) für das zerkleinerte Gestein definiert, zwischen denen eine Fließrichtung für das Gestein definiert ist;

Mittel zum Zerkleinern von Gestein, wobei das Zerkleinerungsmittel ein erste bewegliche Backe (5) und eine zweite feste Backe (6) umfasst, die in dem schaufelförmigen Körper untergebracht sind und einander gegenüber liegen, sodass eine untere Fläche (5a) der beweglichen Backe (5) einer oberen Fläche (6) der festen Backe (6) zugewandt ist; und

Antriebselement für die erste bewegliche Backe (5) bezüglich der zweiten festen Backe (6),

dadurch gekennzeichnet, dass

das Antriebselement mindestens zwei Exzenterwellen (7, 8) umfasst, die jeweils von zwei Hydraulikmotoren (7a, 8a) angetrieben werden, deren Bewegung durch Riemen (7b, 8b) übertragen wird; und wobei die Bewegung der Exzenterwellen (7, 8) durch einen zentralen Zahnriemen (9) synchronisiert wird; und wobei:

- (a) die Exzenterwellen (7, 8) fest mit der beweglichen Backe (5) verbunden sind, sodass sie eine Kreisbewegung auf die gesamte bewegliche Backe (5) ausüben, die einen homogenen Druck auf das zu zerkleinernde Material gegen die feste Backe (6) ausübt; und 5
- (b) die Schaufel (1) eine geneigte Platte (10) umfasst, die im Einlass (3) des schaufelförmigen Körpers der Schaufel (1) fest mit der beweglichen Backe (5) verbunden ist; 10
- (b.1) wobei die geneigte Platte (10) einen Neigungswinkel in Bezug auf die bewegliche Backe (5) aufweist, der so gestaltet ist, dass das zu zerkleinernde Material den Backen (5, 6) der Schaufel (1) zugeführt wird. 15
2. Schaufel (1) nach Anspruch 1, wobei der Einlass (3) mittels Verbindungselementen (3a) an den Seitenteilen (2) der Backen (5, 6) so befestigt ist, dass sie den Austausch einer Klinge (3b) oder der Seitenteile (2) ermöglichen; und wobei sie auch Seitenspanner (3c) zum Einstellen ihrer Position aufweisen. 20
3. Schaufel (1) nach einem der vorstehenden Ansprüche, wobei die geneigte Platte (10) wie ein umgekehrtes L geformt ist. 25
- (a) les arbres excentriques (7, 8) sont reliés solidement à la mâchoire mobile (5) de telle sorte qu'ils donnent un mouvement circulaire à l'ensemble de la mâchoire mobile (5) qui exerce une pression homogène sur le matériau à broyer contre la mâchoire fixe (6) ; et
- (b) la benne de terrassement (1) comprend une plaque inclinée (10) solidement reliée à la mâchoire mobile (5) dans l'entrée (3) de la structure incurvée de la benne de terrassement (1) ;
- (b.1) le plateau incliné (10) ayant un angle d'inclinaison par rapport à la mâchoire mobile (5) agencé pour diriger le matériau à broyer vers les mâchoires (5, 6) de la benne de terrassement (1).
2. La benne de terrassement (1) selon la revendication 1, dans laquelle l'entrée (3) est fixée aux protecteurs latéraux (2) des mâchoires (5, 6) au moyen d'éléments de raccordement (3a) de sorte qu'ils permettent le remplacement d'une pale (3b) ou des protecteurs latéraux (2) ; et ils comprennent également des tendeurs latéraux (3c) pour ajuster leur position.
3. La benne de terrassement (1) selon l'une quelconque des revendications précédentes, dans laquelle le plateau incliné (10) est en forme de L inversé.

Revendications

1. Une benne de terrassement (1) pour le broyage de pierres et similaires comprenant : 30
- une structure incurvée définissant une entrée (3) pour la pierre à broyer et une sortie (4) pour la pierre broyée, parmi lesquelles une direction d'écoulement de la pierre est définie ; 35
- des moyens pour broyer la pierre, les moyens de broyage comprenant une première mâchoire mobile (5) et une seconde mâchoire fixe (6) logées dans la structure incurvée et se faisant face, de sorte qu'une surface inférieure (5a) de la mâchoire mobile (5) fait face à une surface supérieure (6) de la mâchoire fixe (6) ; et 40
- des moyens d'entraînement de la première mâchoire mobile (5) par rapport à la deuxième mâchoire fixe (6) 45
- caractérisé en ce que** 50
- lesdits moyens d'entraînement comprennent au moins deux arbres excentriques (7, 8) qui sont entraînés, respectivement, par deux moteurs hydrauliques (7a, 8a) dont le mouvement est transmis par des courroies (7b, 8b) ; et dans lesquels le mouvement des arbres excentriques (7, 8) est synchronisé 55
- par une courroie dentée centrale (9) ; et dans lesquels :

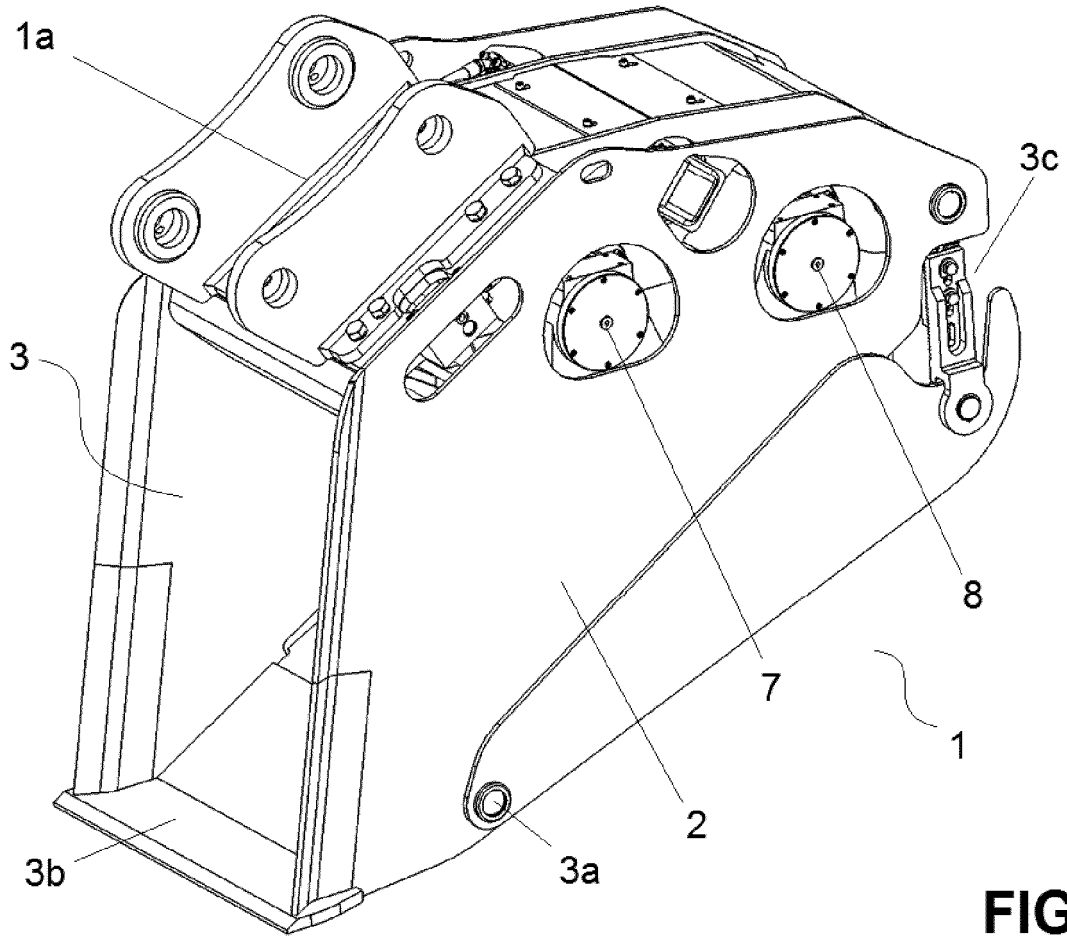


FIG.1

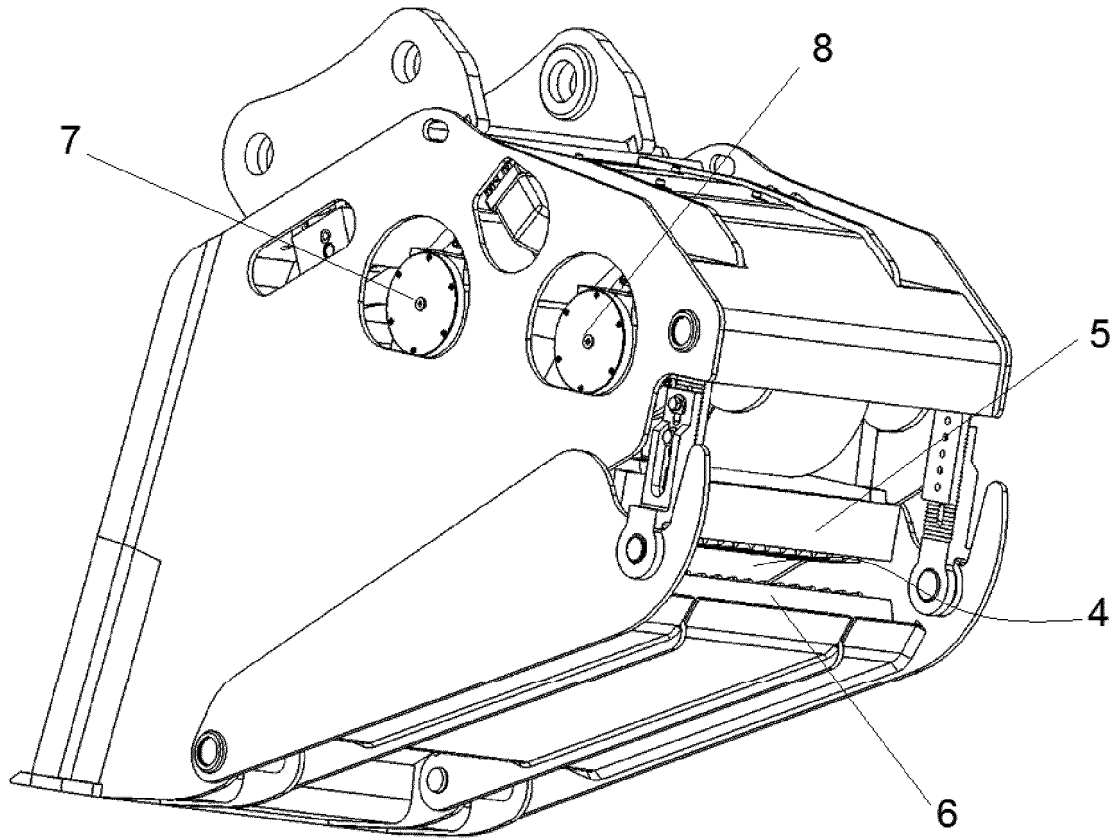


FIG.2

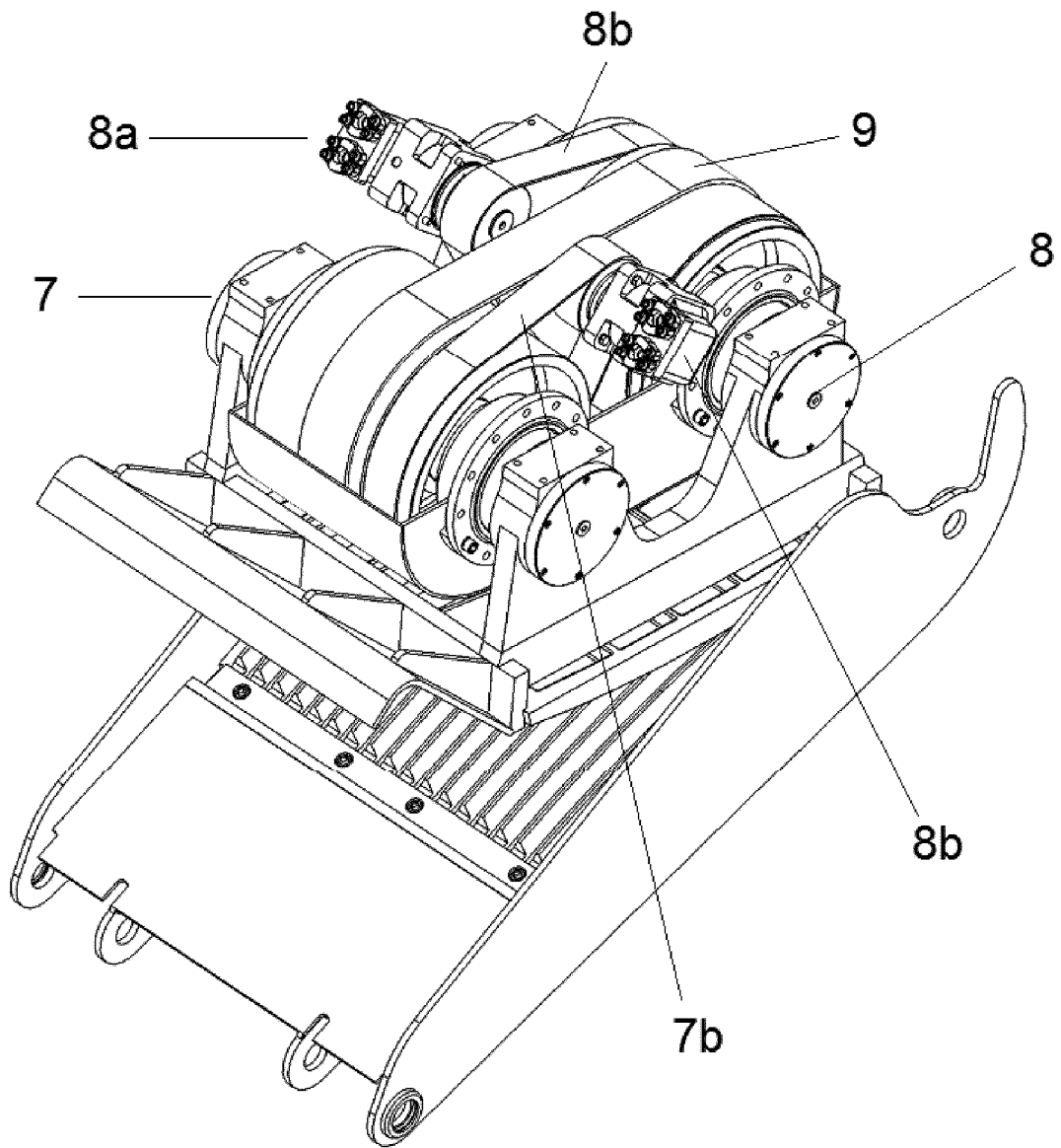
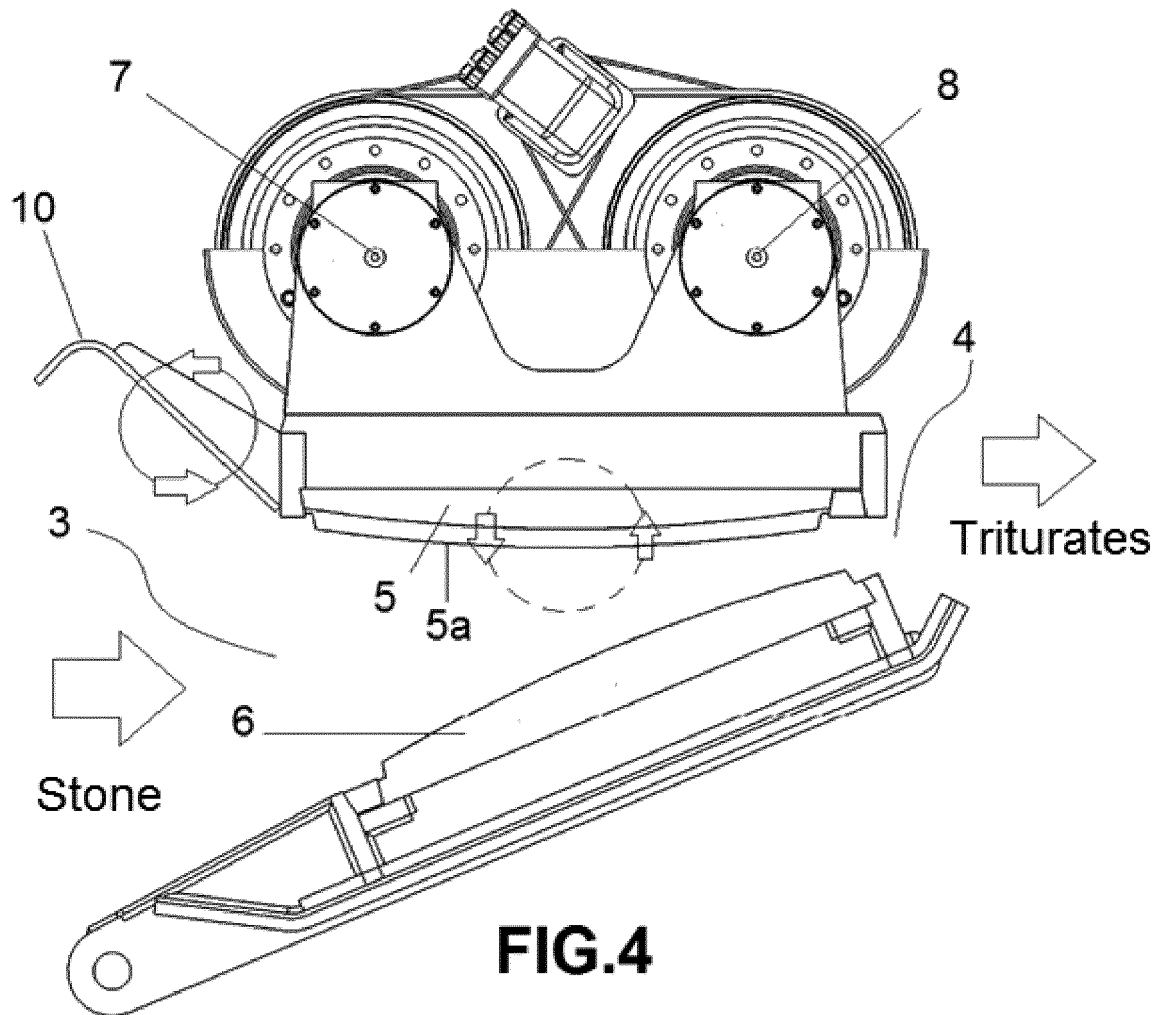


FIG.3



REFERENCES CITED IN THE DESCRIPTION

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