



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
06.11.2013 Bulletin 2013/45

(51) Int Cl.:
E02F 3/96 (2006.01) **E02F 3/40** (2006.01)
E02C 1/02 (2006.01)

(21) Application number: **11852386.9**

(86) International application number:
PCT/ES2011/070856

(22) Date of filing: **13.12.2011**

(87) International publication number:
WO 2012/089879 (05.07.2012 Gazette 2012/27)

(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

(30) Priority: **27.12.2010 ES 201031953 P**

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(54) **SYSTEM FOR GRINDING STONES AND THE LIKE**

(57) System for grinding stones and the like that may be mounted on a fixed structure, on a movable structure (such as movable stone crushers), or, alternatively, may be mounted at the end of an articulated arm of a vehicle of the type used for earth-moving, said system also being used to grind other types of material, such as, for example, materials for recycling (tires, glass, plastic, etc.), incorporating a stationary body (6) and a movable body (7) in mutually inclined planes, such that the product (4) to be ground is fed at one of the ends thereof and the ground product emerges at the opposite end thereof, there being means for transmitting movement to the movable body (7) that can move with respect to the stationary body (6).

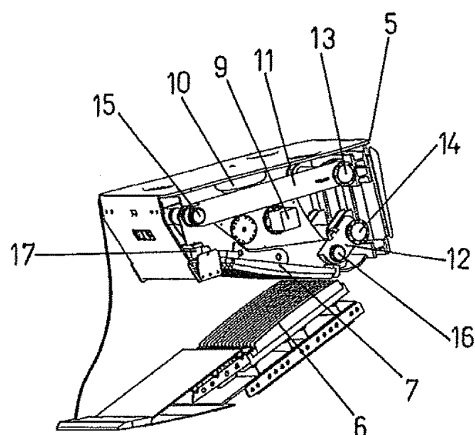


Fig. 5

Description

OBJECT OF THE INVENTION

[0001] The present invention, as expressed in the wording of the present specification, relates to a system for grinding stones and the like, being of the type of systems constituted by a main frame mounting a stationary body and a movable body, the stationary body and the movable body being arranged in mutually inclined planes, such that the product to be ground is fed at one of the ends thereof and the ground product emerges at the opposite end thereof, there being means for transmitting movement to the movable body that can move with respect to the stationary body, which purpose is the transmission of a vibration movement to the movable body to grind the product.

[0002] Likewise, with the purpose of achieving greater grinding performance, an additional device may be incorporated to the system, such as a hydraulic cylinder, for transmitting movement to the movable body, collaborating with the opening between jaws in order to introduce a larger quantity of product to be ground.

[0003] In addition, another object of the invention is the regulation of the granulometry of the product to be ground.

FIELD OF APPLICATION

[0004] The present specification describes a system for grinding stones and the like, which grinding system may be mounted on a fixed structure, on a movable structure (such as movable stone crushers), or, alternatively, may be mounted at the end of an articulated arm of a vehicle of the type used for earth-moving.

[0005] Likewise, the grinding system object of the invention may also be used to grind other types of material, such as, for example, materials for recycling (tires, glass, plastic, etc.).

BACKGROUND OF THE INVENTION

[0006] Several types of machines for grinding stones and the like have been known for many years, such that the type of jaw grinders are constituted by a fixed jaw and a movable jaw that actuated by a motor transform the rotational movement into a swinging movement of the movable body by means of an eccentric shaft. Likewise, the grinding system incorporates fastening means and regulating means of the grinding size of the stones and the like.

[0007] This generic execution can materialize in different forms, thus obtaining different types of jaw grinders based on the same concept.

[0008] In earth moving, on the other hand, vehicles provided with an articulate arm mounting a bucket for the simple pick up and displacement the product, are being used.

[0009] With the passage of time, the aforementioned buckets used to pick up and move earth have evolved by incorporating a system that allows grinding stones and the like; that is to say, the bucket picks up the product, grinds it in its interior, and then evacuates it in the desired size.

[0010] To achieve the foregoing, based on the technology for grinding stones and the like, the bucket that picks up the product to be ground incorporates a stationary body and a movable, pivoting body, having means to displace the movable body based on an eccentric cam actuated by a motor.

[0011] Therefore, we can take into account different patent documents, such as EP 1, 532, 321, which describes a ladle to grind and sift stones and the like incorporating a belt transmission to transmit movement from a hydraulic motor to the shaft of an eccentric cam with the purpose of displacing the movable body.

[0012] Likewise, we can take into account different documents that describe different means for grinding stones and the like, given that this technology has been used for many years. We can cite the following documents: US 3, 959, 897; US 1, 954, 288; DE 580 475; US 2, 500, 109; EP 1, 138, 834; WO 03/062541; JP 11028373; JP 8021108; and JP 9053252.

[0013] We can also take into account other documents, such as CN 201316636, which describes a vibrating grinder comprising two movable jaws and a supporting system.

[0014] Document FR 2689035 describes a procedure for grinding materials with a device having a vibrating effect, based on two surfaces wherein the material to be ground is introduced, at least one of the surfaces being subject to a vibrating effect and great frequency produced by means equipped to receive masses transmitting the desired vibrating movement to the surfaces during their rotation.

[0015] Likewise, document JP 11033420 describes a *grinding system*, based on a frame with a stationary body, a movable body provided with movement with respect to the stationary body, and conducting means constituted by a single arm, joined by one of its ends to the movable body, and to which movement is transmitted by an eccentric shaft at its other end.

[0016] Document CN 2885411 describes a *grinding system*, based on a frame with a stationary body and a movable body provided with movement with respect to the fixed body, which movable body rotates around a point to describe the trajectory of the movement. However, the point of rotation of this system is subject to greater stresses, generated by the grinding vibration, than the points of rotation of the invention.

[0017] Finally, we can also take into account other patent documents such as WO 201104293; WO 2011109850; CN 201760303; JP 201110475; and CN 101628246, such that, for example, document JP 201110475 describes a stone crusher with a stationary frame and a movable frame that rotates around a shaft,

the movable frame being conducted by a controlling element, and document CN 101628246 describes a hydraulic crushing clamp with a hydraulic mechanism, comprising a cylinder, an energy store, and a conduct connecting a rear cavity of the body of the cylinder and the store, the crushing clamp using inert gas and not needing a motor.

DESCRIPTION OF THE INVENTION

[0018] The present specification describes a system for grinding stones and the like, being of the type of systems constituted by a main frame mounting a stationary body and a movable body with respect to the stationary body, the stationary body and the movable body being arranged in mutually inclined planes, such that the product to be ground is fed at one of the ends thereof and the ground product emerges at the opposite end thereof, there being means for transmitting movement to the movable body that can move with respect to the stationary body. Therefore, the system comprises the following:

- eccentric masses, actuated by a motor, joined together with the movable body;
- supporting and conducting means of the movable body, constituted by:
 - vibration-absorbing means, and;
 - at least two arms, each one of them joined rotationally to the main frame by one of its ends, and to the movable body by the other.

[0019] In a preferred embodiment of the invention, the supporting and conducting means of the movable body are defined by vibration-absorbing means and by two sets of arms, each one of them joined rotationally to the main frame at one of its ends, and to the movable body at the other. Said vibration-absorbing means can be materialized, for example, by a shock absorber.

[0020] In addition, the vibration-absorbing means may be joined together with the main frame.

[0021] Furthermore, the sets of arms supporting and conducting the movable body can have different lengths.

[0022] Likewise, the rotational connection to the main frame of at least one of the sets of arms composing the supporting and conducting means of the movable body may be regulable, which also allows obtaining different trajectories of the movable body with the purpose of improving the grinding.

[0023] On the other hand, the lengths of the arms composing the supporting and conducting means of the movable body may be regulated, with which different trajectories of the movable body may also be obtained, such that by varying the trajectory, the grinding is improved.

[0024] In a version of a practical embodiment of the invention, the system incorporates an additional device for transmitting movement to the movable body by means of the vibration-absorbing means.

[0025] The aforementioned additional device for transmitting movement to the movable body may be defined by a hydraulic cylinder.

[0026] This way, the sleeve of the hydraulic cylinder collaborating with the transmission of movement to the movable body may be affixed to the main frame and the piston to the vibration-absorbing means, or vice versa.

[0027] In addition, the route of the piston of the hydraulic cylinder may be regulated by a first end of travel and a second end of travel, which may be hydraulic and regulate the granulometry of the ground product. The aforementioned ends of travel may be constituted by any other equivalent means.

[0028] On the other hand, the system incorporates supporting and vibration-absorbing means of the movable body, joined together with the main frame, which operate when the system is actuated and without a load, that is to say, when the system is actuated and is not grinding any product. These means may be constituted by silentblocks, for example.

[0029] The regulating means of the grinding granulometry are defined by the displacement of the stationary body with respect to the main frame, or by the displacement of the movable body, which allow obtaining said regulation in a simple, conformable, and quick way. The stationary body may be displaced in the longitudinal direction with respect to the main frame to which it is affixed. The movable body may be displaced by means of the translation of some of the rotational connections of the arms to the main frame or to the movable body.

[0030] In a preferred embodiment of the invention, the eccentric masses rotate in a synchronized manner and in the opposite direction, with the purpose of generating vibration in the direction of the central shaft between them.

[0031] To supplement the description being made, and with the purpose of aiding a better comprehension of the characteristics of the invention, a set of drawings is attached to the present invention, which figures represent the most characteristic details thereof in an illustrative and not limitative manner.

BRIEF DESCRIPTION OF THE DESIGNS

[0032]

Figure 1.- Shows a lateral elevational view of a vehicle for earth-moving, provided with an articulated arm mounting a bucket incorporating the grinding system object of the invention, showing the bucket in the pick-up position of the product to be ground.
 Figure 2.- Shows a lateral elevational view of the vehicle of the previous figure, showing the bucket in the grinding position of the previously picked up product.
 Figure 3.- Shows a lateral elevational view of a stationary grinding plant incorporating the grinding system object of the invention.

Figure 4.- Shows a perspective view of a bucket incorporating the grinding system object of the invention.

Figure 5.- Shows a view of the bucket of the previous figure according to a first view, wherein a lateral sheet has been eliminated, showing the stationary body, the movable body, the vibration-absorbing means, and two sets of conducting arms of the movable body, as well as an actuating motor of the eccentric masses.

Figure 6.- Shows a view of the bucket of figure 3 according to a second view, wherein a lateral sheet has been eliminated, one arm of one of the sets of arms, the actuating motor of the eccentric masses, and a lateral wall of the housing thereof, showing the stationary body, the movable body, and the lower set, and an arm of the upper set of conducting arms of the movable body, as well as the eccentric masses.

Figure 7.- Shows a rear elevational view of a bucket incorporating the system object of the invention.

Figure 8.- Shows a view according to section I-I of the previous figure, showing the stationary body, the movable body, and an arm of each one of the conducting sets of the movable body.

Figure 9.- Shows a view according to section II-II of figure 7, showing the stationary body, the movable body, the supporting and vibration-absorbing means, and the eccentric masses.

Figure 10.- Shows a sectioned view, similar to the previous figure, wherein the system incorporates an additional device, such as a hydraulic cylinder, for transmitting movement to the movable body.

Figure 11.- Shows a sectioned view, similar to the previous figure, wherein the system incorporates a first and second hydraulic ends of travel to regulate the piston thereof, in addition to the hydraulic cylinder.

DESCRIPTION OF A PREFERRED EMBODIMENT

[0033] Based on the aforementioned figures and according to the adopted numeration, we can observe how the system for grinding stones and the like object of the invention may be incorporated to a bucket 3, adaptable to an articulated arm 2 of an earth-moving vehicle 1, such that, by means thereof, as shown in figures 1 and 2 of the designs, product 4 to be ground with the bucket 3 may be picked up, and by placing the bucket 3 approximately in the vertical position, the grinding of the product with the desired granulometry is carried out.

[0034] This way, the system is constituted by a main frame 5, in this case based on the structure of the bucket 3 itself, which mounts a stationary body 6 and a movable body 7, the stationary body 6 and the movable body 7 being arranged in mutually inclined planes, there being means for transmitting movement to the movable body 7 in addition to supporting and conducting means of the

movable body 7.

[0035] Therefore, and as indicated above, upon carrying out the task, the bucket 3 picks up the product 4 to be ground with its feeding mouth, and with the movement transmitted to the movable body 7, the ground product emerges at the opposite end thereof.

[0036] The means for transmitting movement to the movable body 7 are based on eccentric masses 8, which rotate by means of respective shafts 18 and are joined together with the movable body 7, such that at least one of the shafts 18 is actuated by an hydraulic 9 or other kind of motor, which movable body 7 is suspended by vibration-absorbing means 10, such as, for example, a shock absorber, joined together with the main frame 5, and by at least two conducting arms thereof rotationally connected to the main frame 5 at one of their ends, and also rotationally connected to the movable body 7 at the other end.

[0037] In a practical embodiment of the invention, as shown in figures 5 and 6 of the designs, the supporting and conducting means of the movable body 7 are defined by vibration-absorbing means 10, joined together with the main frame 5 and by two sets of arms 11 and 12, each one of them rotationally connected at one of their ends to the main frame 5 by means of a first shaft 13 and a second shaft 14, and at the other end to the movable body 7 by means of a third shaft 15 and a fourth shaft 16, respectively.

[0038] This way, the system being actuated and having a load, that is to say, with the system grinding product, the movable body 7 is supported by the vibration-absorbing means 10 and by the set of arms 11 and 12.

[0039] The actuation of the movable body 7 shall be determined by actuating the motor 9, which shall cause the rotation of the eccentric masses 8 which, by being joined together with the movable body 7, leads to the vibration thereof and to the pressing of the product against the stationary body 6, breaking it according to the desired granulometry.

[0040] Figures 8 and 9 show how, during the actuation of the movable body 7, the same moves according to arrow A, dragging the product simultaneously towards the rear exit section with arrow B, grinding.

[0041] Likewise, in a practical embodiment of the invention, the sets of arms 11 and 12 may present different lengths, as shown in the figures of the designs, allowing to obtain different trajectories of the movable body 7.

[0042] In addition, the rotational connection of the main frame 5 to at least one of the sets of the two sets of arms composing the supporting and conducting means of the movable body 7 may be regulated, which allows obtaining different trajectories of the movable body 7 with the purpose of improving the grinding.

[0043] Therefore, for example, the shaft 13 or the shaft 14 may be displaceable in any direction, which changes the trajectory of the movable body 7.

[0044] In an equivalent execution, the lengths of the arms composing the supporting and conducting means

of the movable body 7 may be regulated, which likewise allows obtaining different trajectories of the movable body 7; that is to say, the length of at least one of the sets of arms supporting the movable body 7 would be modified in this practical execution, achieving the same effect of varying the trajectory of the movable body.

[0045] With the purpose of achieving a greater grinding performance, the system may incorporate an additional device to increase the opening between the jaws, which additional device for transmitting movement to the movable body 7 may be defined by a hydraulic cylinder 19.

[0046] The aforementioned hydraulic cylinder 19 may be affixed to the main frame 5 through its sleeve, given that the piston 20 shall be affixed to the vibration-absorbing means 10, or may be materialized in a reverse assembly.

[0047] In addition, with the purpose of obtaining a ground product according to the desired granulometry, it may incorporate a first end of travel 23 and a second end of travel 24, which allow regulating the granulometry to between 150 mm and 20 mm, for example.

[0048] This way, the path of the piston 20 of the pushing hydraulic cylinder 19 being 100 mm, the position of said cylinder forces the 100 mm-path of the piston to provide an opening between the stationary body 6 and the movable body 7 at the rear part "d" (through which the ground material emerges), depending on the travel of the piston 20.

[0049] Therefore, a granulometry of 150 mm is obtained with the piston 20 fully retracted, and a granulometry of 20 mm is obtained with the piston fully extended.

[0050] This way, and aided with a first and second hydraulic or other kind of end of travel, we can play with the path of the piston, such that, for example:

- If we place the first end of travel 23 in the 0 position and the second end of travel 24 in the 100 position, that is to say, in the minimum and maximum positions, with a full travel of the piston equivalent to $D = 100$ mm, we would have a granulometry between 150 and 20 mm.
- If we place the first end of travel 23 in the 0 position and the second end of travel 24 in the 50 position, that is to say, the minimum and intermediate positions of its path, the travel is equivalent to $D = 50$ mm, and we would have a granulometry between 150 and 70 mm.
- If we place the first end of travel 23 in the 50 position and the second end of travel 24 in the 100 position, that is to say, the intermediate and maximum positions of its path, the travel would be equivalent to $D = 50$ mm, and we would have a granulometry between 70 and 20 mm.

[0051] Lastly, we could adjust the granulometry and the positions even more, by placing the first end of travel 23 in the 30 position and the second end of travel 24 in

the 70 position, both intermediate positions in its path, obtaining a travel equivalent to $D = 40$ mm and a granulometry between 110 mm and 70 mm approximately, for example.

[0052] This way, the granulometry of the ground product is fully regulable.

[0053] In this embodiment, wherein an additional device for transmitting movement to the movable body 7 is affixed to the main frame 5, an opening 21 must be made to access the same in order to incorporate a reinforcing element 22 thereof.

[0054] On the other hand, the system incorporates supporting and vibration-absorbing means of the movable body 7, joined together with the main frame 5, which operate when the system is actuated and without a load, that is to say, in those moments when no product is being ground, such that these supporting means also absorb the vibration and may be materialized by silentblocks 17.

[0055] The regulating means of the grinding granulometry are defined by the displacement of the stationary body 6 with respect to the main frame 5, or by the displacement of the movable body 7. Thus, the stationary body 6 is joined together with the main frame 5 through any conventional means, and when the granulometry is desired to be varied, it may be displaced in the desired distances in the longitudinal direction with respect to the main frame 5.

[0056] Figures 8 and 9 of the designs show how the stationary body 6 can be displaced with respect to the main frame 5, according to arrow C, allowing to obtain the desired granulometry of the ground product.

[0057] This execution allows regulating the granulometry in a simple, comfortable and quick way, given that there is easy access to the aforementioned stationary body 6.

[0058] With respect to the other regulating means of the grinding granulometry, the movable body 7 may be displaced by means of the translation of the shaft 16 or the shaft 14, rotational connections of the arm 12 to the movable body 7 or to the main frame 5, respectively.

[0059] In a practical embodiment of the invention, the eccentric masses 8 shall rotate in a synchronized manner and in the opposite direction.

[0060] Figure 9 of the designs shows how, in a practical embodiment of the invention, the system may be adapted to a fixed structure, remaining in the vertical position, the product to be ground being fed at the upper part, and emerging at the lower part.

[0061] Based on the described system, performance is improved by increasing the impact rate and maintaining the power.

Claims

1. System for grinding stones and the like, being of the type of systems constituted by a main frame (5) mounting a stationary body (6) and a movable body

(7) with respect to the stationary body (6), the stationary body (6) and the movable body (7) being arranged in mutually inclined planes, such that the product (4) to be ground is fed at one of the ends thereof and the ground product emerges at the opposite end thereof, there being means for transmitting movement to the movable body (7) with respect to the stationary body (6), **characterized in that** the system comprises the following:

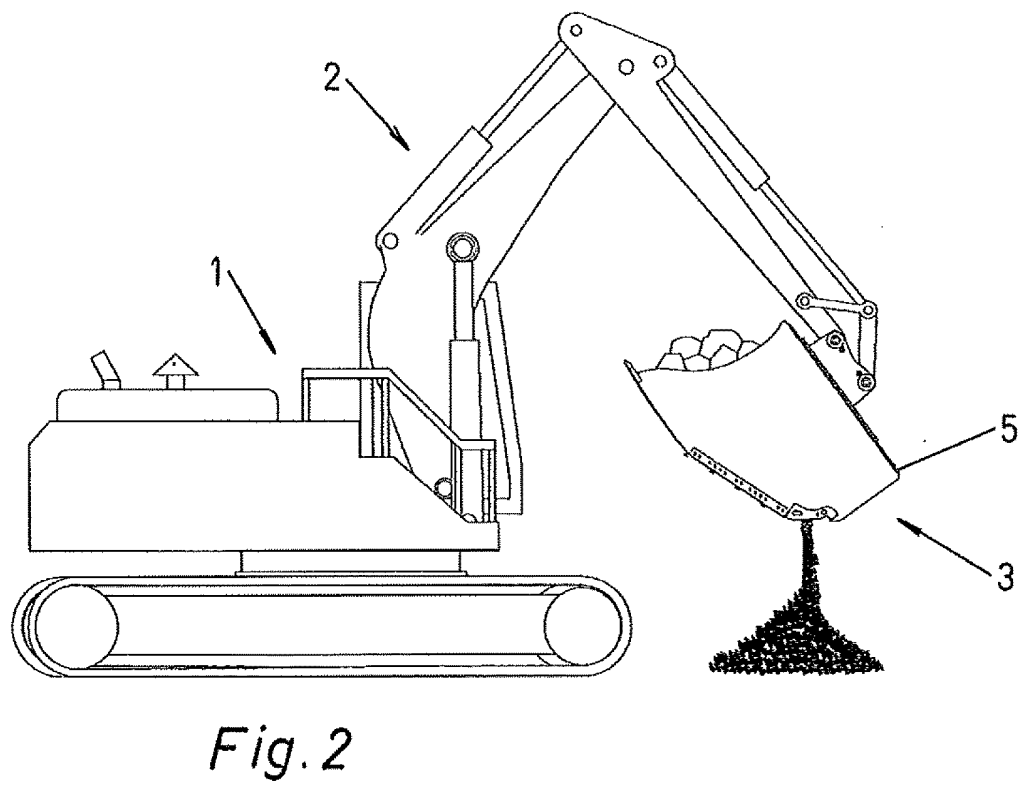
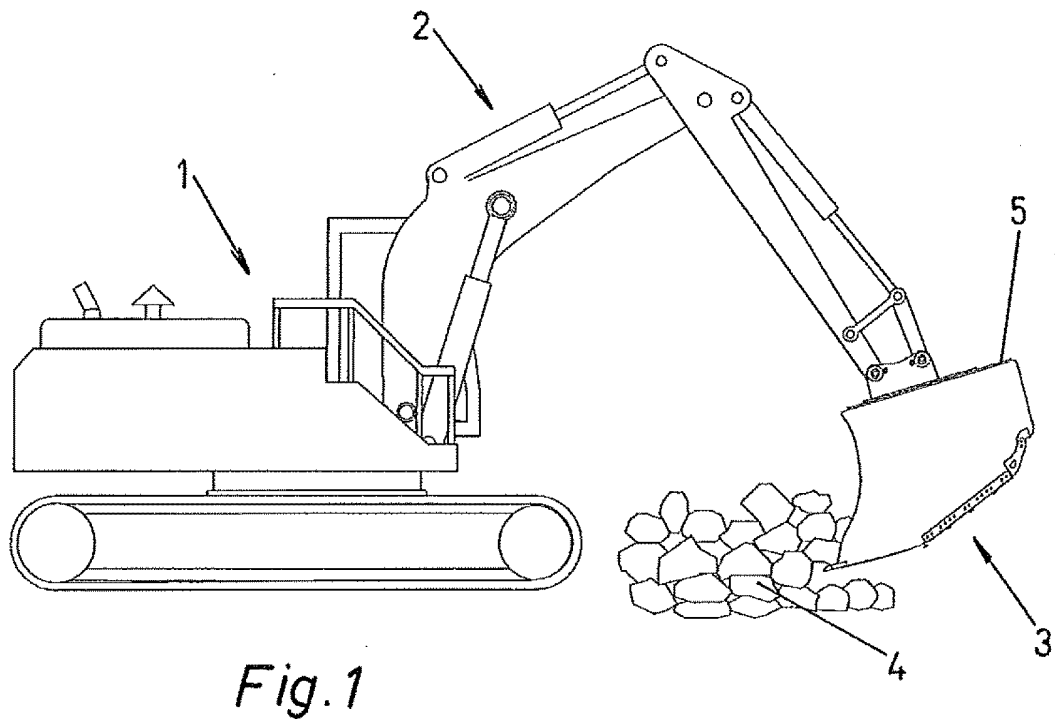
- eccentric masses (8), actuated by a motor (9), joined together with the movable body (7);
- supporting and conducting means of the movable body (7), constituted by:

- vibration-absorbing means (10), and;
- at least two arms, each one of them joined rotationally to the main frame (5) at one of its ends, and to the movable body (7) at the other end.

2. System for grinding stones and the like, according to claim 1, **characterized in that** the supporting and conducting means of the movable body (7) are defined by vibration-absorbing means (10) and by two sets of arms (11 and 12), each one of them rotationally connected at one of their ends to the main frame (5), and at the other end to the movable body (7).
3. System for grinding stones and the like, according to claim 1, **characterized in that** the vibration-absorbing means (10) is joined together with the main frame (5).
4. System for grinding stones and the like, according to claim 2, **characterized in that** the arms of both sets of supporting and conducting arms (11 and 12) of the movable body (7) present different lengths.
5. System for grinding stones and the like, according to claim 2, **characterized in that** the rotational connection to the main frame (5) of at least one set of arms (11 and 12) of the supporting and conducting means of the movable body (7), is regulable.
6. System for grinding stones and the like, according to claim 2, **characterized in that** the length of at least one of the sets of arms (11 and 12) composing the supporting and conducting means of the movable body (7), is regulable.
7. System for grinding stones and the like, according to claim 1, **characterized in that** it incorporates an additional device for transmitting movement to the movable body (7) by means of the vibration-absorbing means (10).
8. System for grinding stones and the like, according

to claim 7, **characterized in that** the additional device for transmitting movement to the movable body (7) is defined by a hydraulic cylinder (19).

9. System for grinding stones and the like, according to claim 8, **characterized in that** the path of the piston (20) of the hydraulic cylinder (19) is regulated by a first end of travel (23) and a second end of travel (24), regulating the granulometry of the ground product.
10. System for grinding stones and the like, according to claim 1, **characterized in that** the system incorporates means (17), joined together with the main frame (5), for supporting and absorbing the vibration of the movable body (7), which operate when the system is actuated and without a load.
11. System for grinding stones and the like, according to claim 1, **characterized in that** the regulating means of the grinding granulometry are defined by the displacement of the stationary body (6) in the longitudinal direction, with respect to the main frame (5).
12. System for grinding stones and the like, according to claim 1, **characterized in that** the eccentric masses (8) rotate in a synchronized manner and in the opposite direction.



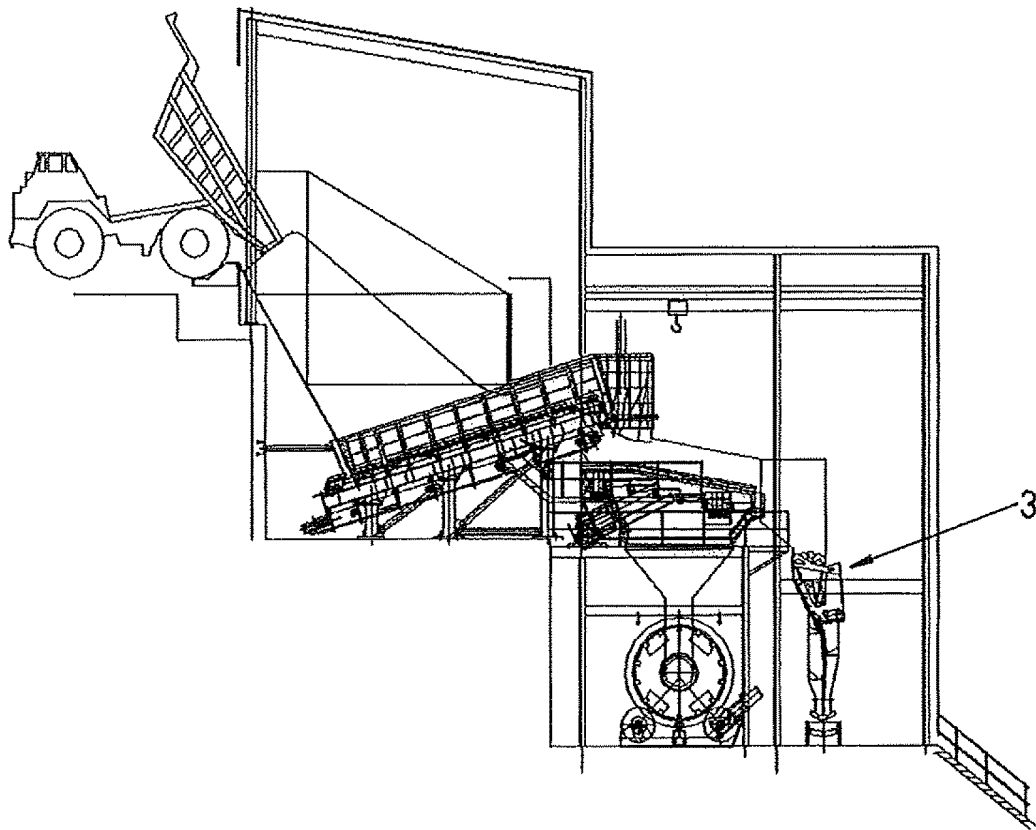


Fig. 3

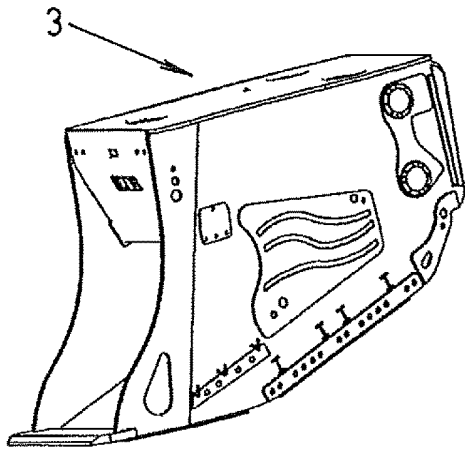


Fig. 4

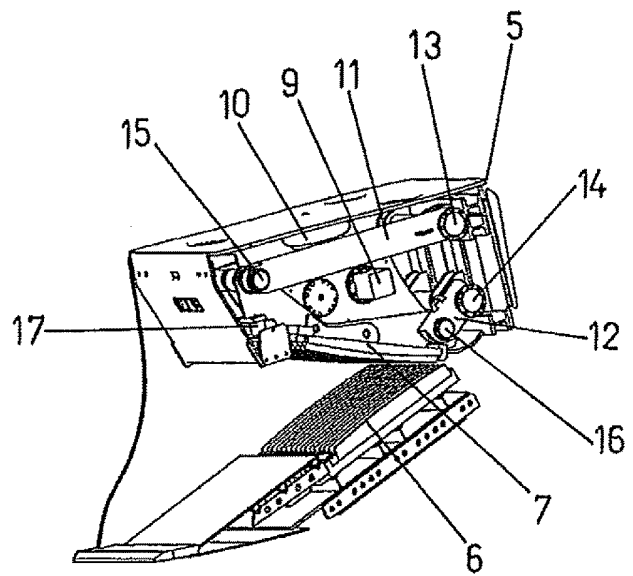


Fig. 5

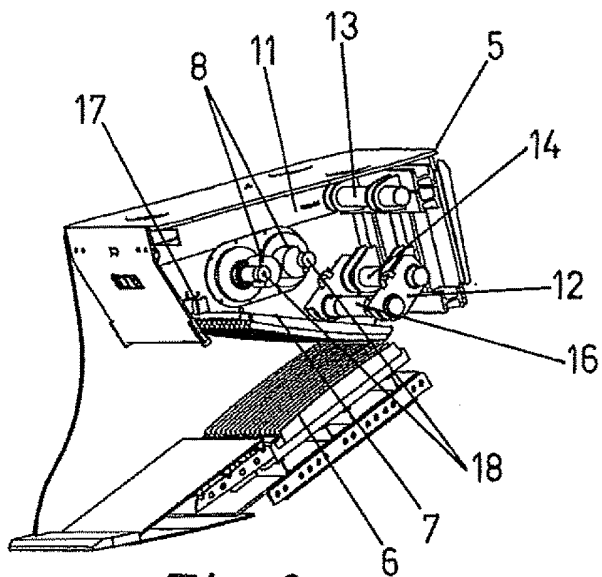


Fig. 6

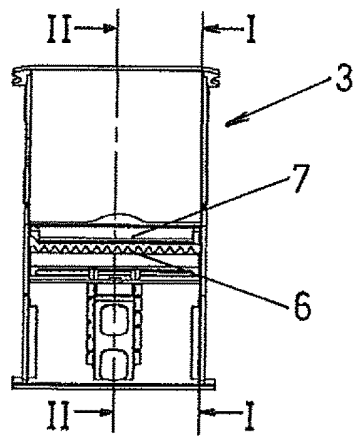


Fig. 7

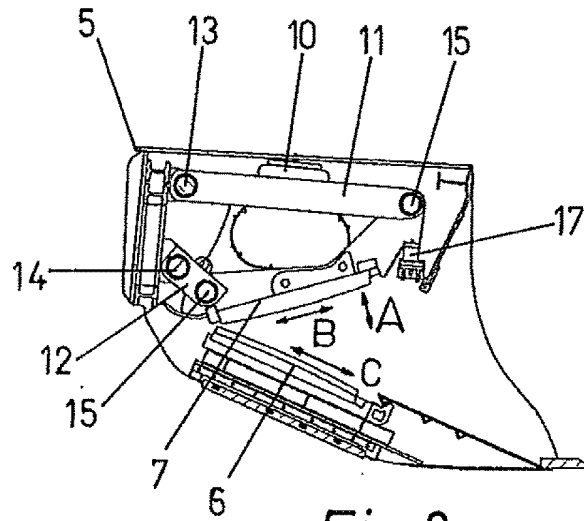


Fig. 8

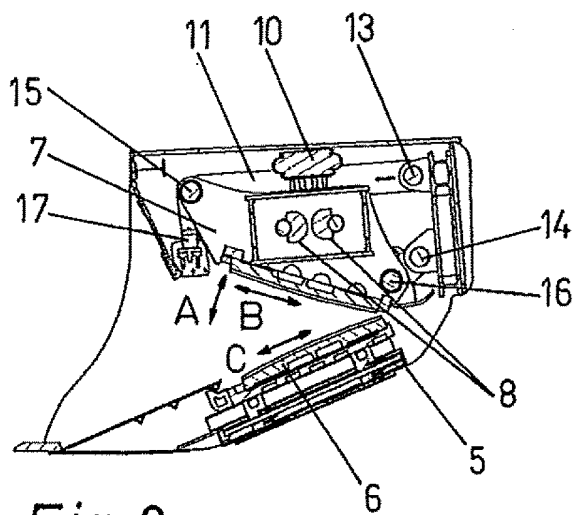
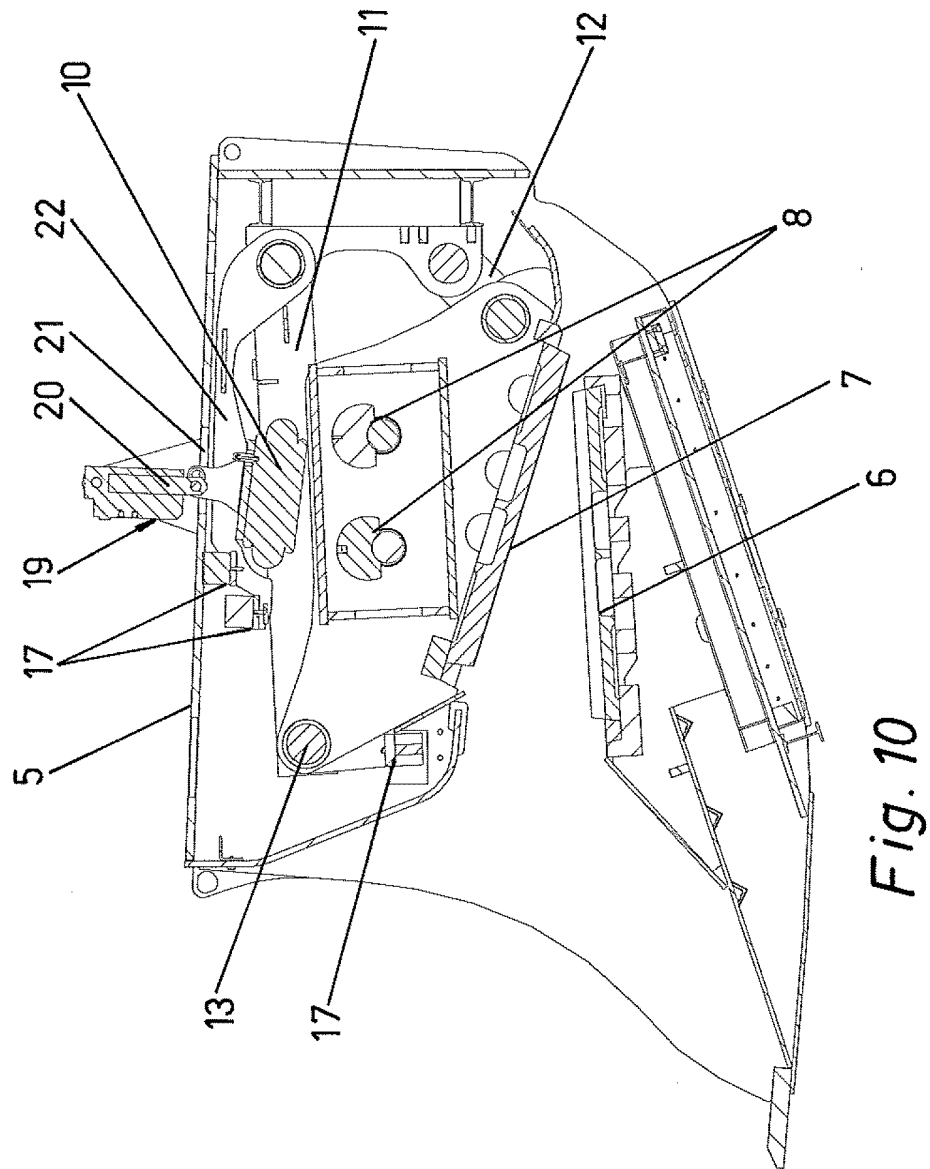


Fig. 9



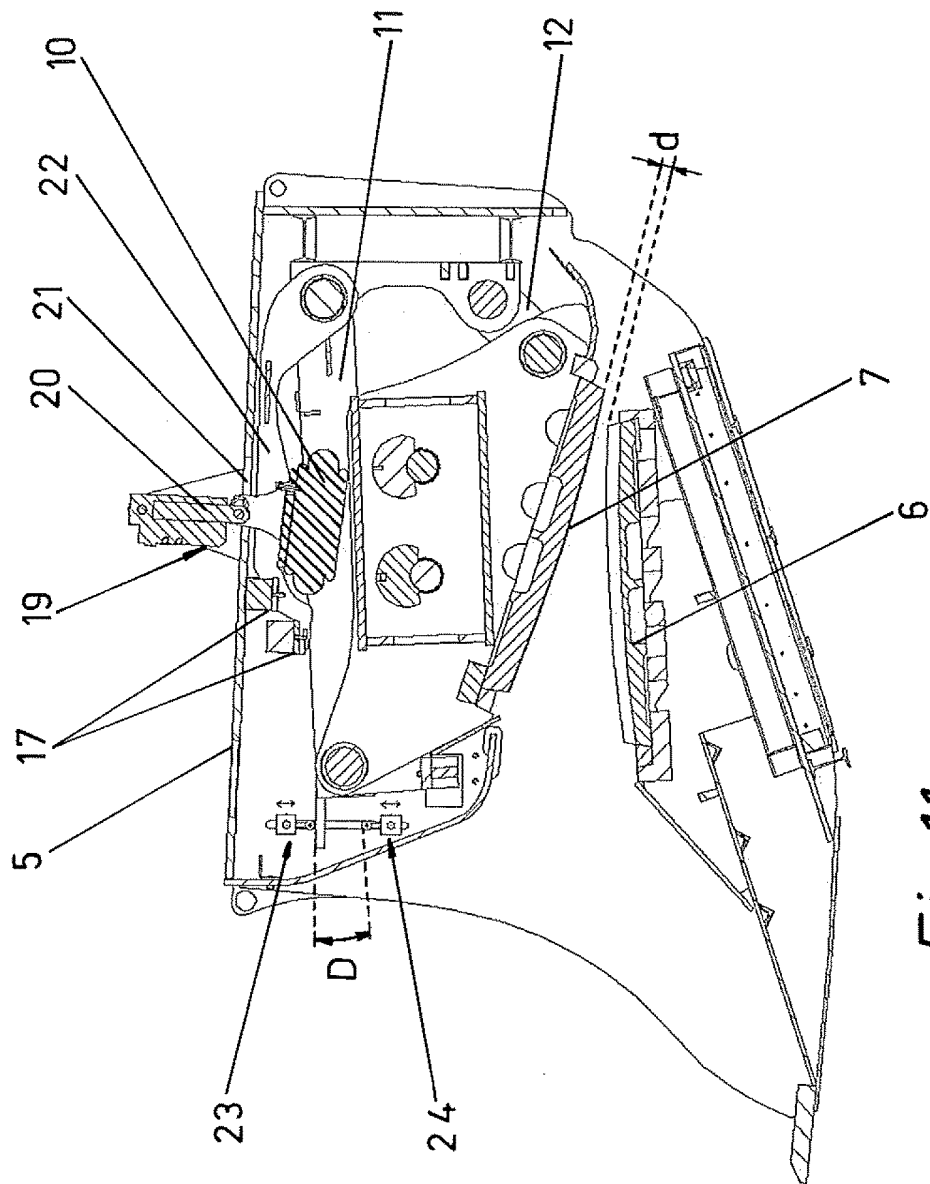


Fig. 11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2011/070856

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

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)
E02F, B02C

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)

EPODOC, INVENES, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 11033420 A (FUJIWARA YOSHIHARU ET AL.) 09/02/1999, figures & Abstract from DataBase EPODOC. Retrieved from EPOQUE; AN JP-19871197-A.	1,3
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☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search
17/02/2012

Date of mailing of the international search report
(29/03/2012)

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International application No.

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CLASSIFICATION OF SUBJECT MATTER

E02F3/96 (2006.01)

E02F3/40 (2006.01)

B02C1/02 (2006.01)

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