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EP 1 567 272 B1

Description

FIELD OF THE INVENTION

[0001] The invention relates to the field of the acceleration of material, in particular a stream of granular or particulate material, with the aid of a rotor, in particular with the aim of causing the accelerated grains or particles to collide with an impact member at such a velocity that they break.

BACKGROUND TO THE INVENTION

[0002] According to a known technique the movement of a stream of material can be accelerated with the aid of a rotor. With this technique the material is fed onto the central part of a rotor blade of a rapidly rotating rotor and is then picked up by one or more accelerator members which are provided with an acceleration surface and are arranged around that central part. Acceleration can take place by either sliding along (under the influence of centrifugal force) or a stroke (impact) by the acceleration surface (or a combination of sliding and impact). Acceleration by sliding does not affect the material; in that, the particles are only accelerated. During acceleration by impact the particles are simultaneously accelerated and loaded; such that comminution can take place. The accelerated material is then propelled outwards at high velocity and can now be collected by a stationary impact member that is arranged around the rotor with the aim of causing the material to break during the collision.

[0003] Many rotors for acceleration by sliding are known. A rotor with accelerator members that are placed on the rotorblade and are fixed (but removable) attached to the rotor which therefore is equipped with a support member such that the accelerator member can be dismantled for replacement is for example disclosed in US 5,248,101 (Rose). US 6,149,086 (Young) describes an accelerator member that is secured with a heavy bolt, US 6,179,234 (Marshall) an accelerator member that is firmly anchored in the support member with the aid of centrifugal force and US 5,921,484 (Smith) describes a guide member that is provided along the guide surface with a cavity in which own material deposits under influence of centrifugal forces. The known guide members are exposed-to intense guide wear, therefore such a cavity can also be filled with a highly abrasive material, i.e. a construction material containing carbides, preferably tungsten carbides; and such an accelerator member is known (amongst others) from US 6,033,791 (Smith). US 3,767,127 (Wood) discloses an accelerator member which is of symmetrical V-shaped construction (with the V pointing towards the axis of rotation) and is provided with two acceleration surfaces and is anchored firmly under the influence of centrifugal force (centrifugal locking). Symmetry allows for operation in both directions, doubling the lifetime and the wear material is consumed more effectively and are very easy to replace and do not have to be specially secured. The problem, however, is that under influence of centrifugal force the stresses concentrate in the V-shaped pointed part. As a result fracture easily takes place at the location of this location. US 1,875,817 has disclosed a device with pivoting accelerator members (hammers). Here, the stresses concentrate around the pivot opening

[0004] A device for acceleration by impact is know from WO 98/16319 which was drawn up in the name of the Applicant. The known rotor can be equipped with several different types (configurations) of accelerator members; that is, a guiding member and an associated co-rotating impact member. The accelerator units that are disclosed can - among others - be fixed or pivotally attached to the rotor and be provided with a selfrotating impact surface. A similar but symmetrical device of this type is disclosed in WO 01/21313, which was drawn up in the name of the Applicant.

[0005] The rotors described above do rotate about a vertical axis. A device where the rotor rotates about a non-vertical axis is disclosed in WO 00/67909, which was drawn up in the name of the Applicant. WO 02/36263 which is in the name of applicant discloses a direct multiple impact rotor where the co-rotating impact member is provided with an autogenous impact face; also the guide members can be provided with an autogenous guiding face.

[0006] The known rotors have the advantage that they are simple, effective and can be applied for comminution of a wide range of particle material such as sand, stones, rocks, ores, minerals, cemenclincker, coal, slags, ashes, glass and building waste; but also materials like beans etc. which break when (sufficiently) loaded by impact. The known rotors have however also disadvantages. An important problem with the known accelerator members are the high forces that are exerted on the accelerator member (and the attaching arrangements and the support member) mainly by centrifugal force in the case of guide members and by a combination of (1) centrifugal force and (2) rapidly repeating impulse loading in the case of impact members. The centrifugal force increases progressively with (1) the rotational velocity and (2) the weight (mass) of the impact member, in which context a centrifugal force in excess of 100 kN can be considered under practical conditions. The impulse (impact) loading increases progressively with (1) the diameter (mass) and (2) the hardness (elasticity) of the impinging material, in which context grains with a weight of 1 to 2 kg which impinge repeatedly at a velocity of 50 to 100 m/sec can be considered under practical conditions. These forces can (do often) concentrate around the fixing arrangement; that is, where the accelerator member is fixed to the support member. This is not only a problem with fixed sliding, guiding and co-rotating impact members; but even more so for pivotally attached accelerator members and (fixed) accelerator members which protrude from the edge of the rotor where the maximum centrifugal forces are generated.

[0007] Because the material from which the accelerator members are made must have a high resistance to wear, this material must be as hard as possible (Rc > 55/60) for which normally a white iron alloy is applied. However, such a material is brittle and consequently not well able to withstand the tensile forces which are generated by the centrifugal loading and the impulse loading. Consequently, fracture can occur in the accelerator members (in the attaching arrangement), as a result of which part of the accelerator member, or the entire accelerator member, is propelled outwards at high velocity, which gives rise to a substantial imbalance. This can cause severe damage. Moreover, wear on the accelerator members can be concentrated in particular with centrifugal accelerator members:

- In the case of guide members a channel in which wear is concentrated forms fairly rapidly along the guide surface, as a result of which a deep channel forms fairly rapidly. This weakens the guide member, which can break as a result.
- In the case of co-rotating impact members the movement (direction of movement) of the stream of material between the accelerator member and the co-rotating impact member is invariant (with respect to the rotational velocity) and is essentially deterministic. As a result, the material impinges on the co-rotating impact member in a highly concentrated manner. As a result a deep cavity can form fairly rapidly in the impact surface. The impact member is consequently severely weakened, as a result of which it can break.
- In the case of the known guide members which are provided along the guide surface with one or more cavities in which own material deposits, a weak construction can be produced under the effect of wear, as a result of which fracture can occur. The same applies in the case of guide members where such cavities are filled with a highly wear resistant construction material.

[0008] The known rotors and accelerator members (and edge protection members) can therefore take a limited maximum loading which severely restricts the maximum size of the feed material that can be processed and the maximum velocity at which the particles can be accelerated and the maximum velocity reduces sharply when the feed size increases.

[0009] Several methods are known to strengthen wear members in such a way that wear members can withstand higher forces; in case of accelerating members centrifugal forces and impact forces. Therefore, a wear part is provided with a strengthening member that has a greater tensile strength than the wear part, creating a composite wear member. It is of course of utmost importance that the wear part and the strengthening member are completely joined together. Composite wear parts are known from AU-A-22760/83 (Vickers) and WO84/04760 (Dolman). Such wear parts are used for hammer crushers which are known from DE 3618195 A1; which hammers are pivotally attached to a rotor to impact with particles that are fed from outwards towards to rotor. The pivotally attachment limits the impact forces that act on the wear part to a considerable degree. Much higher forces are generated when the wear parts are fixedly attached to the rotor; as is described before.

[0010] Another important problem is that the support member which carries the accelerator member is often positioned behind the accelerator member (that is along the side opposite of the acceleration surface) and can therefore be (heavily) damaged when the accelerator members wear through. Repair or replacement is normally very difficult because the rotor has to be taken out and this is time consuming; and therefore expensive. To avoid such damage regular inspection is necessary for which the rotor has to be stopped and the crusher has to be opened, which can result in a considerable downtime. Automatic systems that control such wear are very expensive and have so far not proven to be reliable. Pivotally connected accelerator members do normally not have these problems when the support member is not placed behind the accelerator member.

[0011] In order nevertheless to achieve a reasonable tool life, the known accelerator members must therefore be of extra heavyweight construction, so that no pieces start to break away when channels and cavities form. As a result of this additional weight, the mounting construction (and the support member) must also be made extra heavy, which makes the wear parts even heavier, and special provisions have to be made in order to attach the heavy accelerator member well to the support member. As a result of the low tensile strength of the hard, and consequently brittle, wear material, the accelerator members must for this be provided with extra heavy hooks and large projections and the mounting must be secured, for which bolts are often needed. All of this makes the replacement of the wear parts complicated and time-consuming, whilst the tool life, certainly in the case of abrasive material, remains restricted. An additional aspect that is certainly equally important is that a large amount of wear material remains; this is at least the additional portion that is needed to ensure that the accelerator member does not break and the additional structural material for the mounting. Frequently only 25% of the wear material is actually consumed.

[0012] WO 03/000423 A2, which is in the name of applicant, discloses an accelerator member that is provided with a strengthening member along the backside; that is, the side opposite of (parallel with) the acceleration surface. Such a strengthened accelerator member consists out of an accelerator block of white iron alloy and a strengthening member of unalloyed or low alloy steel. The strengthening member, which has an appreciable greater tensile strength then the accelerator block, is firmly joined together with the strengthening member to form a structural composite strengthened accelerator member. Such a strengthening member can withstand much higher impact and centrifugal forces and the high tensile strength makes it possible to provide the strengthening member with a simple attaching arrangement for mounting the accelerator member to the support member; which is also positioned along the backside of the accelerator member.

[0013] The known accelerator member with reinforcement member has the advantage that the accelerator block can withstand much higher impact forces and centrifugal stresses; and allows for a simple but efficient and strong fixing arrangement. However, the accelerator member with reinforcement member has also disadvantages. So is the position of the strengthening member along the backside highly vulnerable to damage when the accelerator member (block) wears through, and the same counts for the fixing arrangement and the support member; actually the situation is essentially similar to the problem noticed with the support member as discussed before. Moreover, the backside of an accelerator member is often not the most suitable place for mounting (attaching) the accelerator member to the rotor; in particular with protruding accelerator members which are normally clamped (wedged) or pivotally attached.

AIM OF THE INVENTION

[0014] The aim of the invention is, therefore, to provide an accelerator member for a rotor that rotates about an axis of rotation, as described above, that does not have these disadvantages, or at least displays these to a lesser extent. That is, providing an accelerator member that is hard and strong enough to withstand a combination of centrifugal forces and impact forces and guarantees a long lifetime, is provided with an attachment arrangement for easy and quick exchange that is strong enough to withstand said forces and - most important - is designed in such a way that the attaching arrangement is not damaged when the accelerator member wear through completely under influence of sliding forces and impact forces generated by the particles when they are accelerated with the aim of the accelerator member. This is achieved with:

- a rotary accelerator device for accelerating particle material with the aid of at least one rotating structural composite accelerator member in at least one phase, for comminution of the material by impact, comprising:
- a rotor that is able to rotate about an axis of rotation in at least one direction of rotation, which rotor is provided with at least one rotorblade that is directed essentiallytransversally to the axis of rotation;
- a metering member for metering the material onto the rotor;
- at least one accelerator unit that at least consists out of one separate accelerator member for accelerating the metered material in at least one phase, which rotorblade is provided with a support member for carrying the accelerator member, which accelerator member is some distance away from the axis of rotation and consists out of at least one accelerator block that is made out of at least a white iron alloy-part, which white iron alloy part is provided with at least one acceleration surface that at least partially extends in an outward direction when seen from the axis of rotation and is directed essentially perpendicular to the plane of rotation, which white iron alloy part can be provided with at least one cavity that extends along at least a part of the acceleration surface and can be filled with a filling material with a composition different from the white iron alloy part such that the acceleration surface consists partly out of the filling material that is at least partly surrounded by the white iron alloy part, which white iron alloy part of the accelerator block is provided with a strengthening member, which strengthening member is provided with an attachment side, of which white iron alloy part the transversal side surface is provided with an attachment surface, such that at least part of the attachment side and at least part of the attachment surface are joined together to form a structural strengthened composite accelerator member, which strengthening member is made of an unalloyed, or low alloy steel that, after thermal hardening of the accelerator member, has an appreciably greater tensile strength than the white iron alloy part, which strengthening member is provided with an attaching arrangement for attaching the accelerator member to the support member, in such a way that the accelerator member can be dismantled for replacement because of wear;
- <u>characterised in that:</u>
  - the attachment side is directed essentially transversally to the accelerating surface and located at a position along and outside the wear area that is formed when said accelerator member wears out under influence of wear generated during accelerating of the particles by sliding and/or impact, such that the attachment arrangement is not damaged when the accelerator member wear through completely.

[0015] The invention is further described in the claims, to which reference is made here.

[0016] The strengthened accelerator member is provided with an accelerator block of which an outer surface that is directed essentially transversally to the acceleration surface is provided with a strengthening member; that is:

- along a transversal side that is directed essentially parallel to the plane of rotation, and/or;
- along a transversal side that is directed slightly angled to the plane of rotation, and/or;

- along a transversal side that is directed essentially transversally to the plane of rotation and is directed towards the axis of rotation.

[0017] The accelerator member can be placed on top of the rotorblade but also underneath the rotorblade.

[0018] The accelerator member according to the invention therefore consists essentially of an accelerator block that is made of a hard (for example > Rc 55-65) wear material having - however - a low tensile strength because it is brittle, which is provided with a (metal) strengthening member having a high tensile strength (and lesser hardness). Therefore, the accelerator block is made out of a white iron alloy, that is hardened by heat treatment after casting. Preferably, the white iron alloy employed in the invention is an ASTM specification A532, class IIIA alloy, which has the following composition: 2.3 to 3.0 (wt) % carbon, up to 1.5 (wt) % nickel, 23 to 28 (wt) % chromium and up to 1.5 (wt) % molybdenum (plus trace impurities). Most preferably, the white iron will contain a chromium content of about 25 (wt) %. Typical alloys for white iron alloy are (according German specifications) Hartguss (FeMnSiC3.4), Chrom-Hartguss (FeCr12C2.1, FeCr15Mo3C3, FeCr20Mo2C3, FeCr25Mo1C3, FeCr13Nb9MoTiC2.3) and Nickel-Hartguss (FeNi4Cr2C3.3, FeNi4Cr2C2.6, FeCr9Ni6Si2C3). In case the accelerator block is used for acceleration by impact an alloy containing manganese the alloy can be selfhardening under influence of impact. The strengthening member is made out of an unalloyed or low alloy steel with preferably a low carbon content (< 0,25%) making this steel essentially unresponsive to heat treatment (or responsive only along the outer surface); and the steel therefore contains its high tensile strength when the accelerator member is subjected to heat treatment to harden the white iron alloy part. Typical low alloy steels are for plain low carbon steels ASTM number 1010, 1020, A36, A516 Grade 70 and for high strength low alloy steels ASTM number A440, A633 Grade E and A656 Grade 1. But for both the white iron alloy part (accelerator block) and the low alloy part (strengthening member) other compositions of the alloy can be used as long as the white iron alloy has the required hardness or wear resistance and the low alloy part a (tensile) strength that is substantially higher than the (tensile) strength of the white iron alloy part, which (tensile) strength is not significantly influenced when the accelerator member is subjected to a heat treatment for hardening the white iron alloy part. Normally, the hardening process is based on strain hardening, but precipitation hardening or a combination of strain hardening and precipitation hardening is also possible for certain alloys. In case of strain hardening the hardenability of the white iron alloy part is based on the formation of martensite as a result of a given heat treatment; and it is important that the composition of the white iron alloy part is so chosen that the accelerator block hardens not only at the surface but to a large degree throughput the entire interior of the accelerator block.

[0019] The strengthening member is normally a steel plate or steel block that [1] strengthens the accelerator member making it suitable to withstand high impact and centrifugal loading (that is much higher than with the known non-reinforced accelerator members), [2] allows for a strong and simple attaching arrangement, [3] makes it possible to design both the accelerator member and the support member less voluminous and [4] - most important - makes it possible to attach the strengthening member in such a way that both the strengthening member and the support member are not damaged when the accelerator member wears through.

[0020] The attaching arrangement that is part of the strengthening member can have different designs, for example a hook, a protruding pen, a wedge shaped hook (dovetail) which allow for a centrifugal locking only. It is also possible to use a bolt-connection of a clamp. It is preferred that the attaching is secured by centrifugal locking only, but it is possible that the safety bolt or safety pin is required.

[0021] Loading of the accelerator member can occur by [1] sliding (guiding), [2] impact (in particular when large grains impinge on the accelerator member at high impact velocity), [3] a combination of sliding and impact (for example with angled impact) and [4] due to centrifugal forces; all of which types of loading can take place combined in one way or another.

[0022] The strengthening member holds the accelerator block material together when this comes under stress - even when cracks arise - to a certain extend. This makes it possible to make the accelerator member of less heavyweight construction and even to make it slim compared with an accelerator member that is not provided with a strengthening member and is loaded in the same way. On the other hand the strengthening member makes it possible to design the accelerator member with a (much) thicker accelerator block behind the acceleration surface which makes it possible to increase lifetime to a significant degree. The high tensile strength of the strengthening member furthermore makes it possible to provide the accelerator member with simple and lightweight (restricted volume) connector or attaching arrangement by means of which the accelerator member is joined to the support member, or attaching members, as a result of which both the accelerator member and the support member need to be of less heavyweight construction and can be constructed in a manner that makes rapid replacement of the wear parts possible. All this makes it possible to utilise the wear material to a maximum and makes operation procedures in practice much easier. When the accelerator member wears through comminution intensity decreases which shows visually by an increase of the amount of oversize; and can also be automatically detected when - in a close system - the recirculation load increases, for which the recirculation belt of course has to be provided with a weighing device. Upon detection of a certain overload the crusher (or input) can be automatically switched off (or manually in case of visual control). Moreover, in case of a rotor with a symmetric configuration which is operational in both directions of rotation, the direction of rotation can be automatically reversed when the (first half) of the accelerator member wears through and be automatically stopped when the other half wears through.

[0023] The accelerator member can - as described before - be [1] a sliding member for accelerating the material by sliding only, [2] a guide member for guiding the material towards a co-rotating impact member, [3] a co-rotating impact member which is associated with the guide member and [4] a protruding impact member which is carried along the edge of the rotor (and other type of accelerator members which are carried by the rotor and accelerate (or contribute to the acceleration) of the material).

[0024] The aim of the invention is specifically targeted at the use of the strengthened accelerator member in the form of a (co-rotating) impact member as described before.

[0025] The accelerator member is carried by the rotor with the aid of a support member, in such a way that the accelerator member is (easily exchangeable) and can be [1] fixed attached, [2] pivotally attached and [3] be fixed attached and provided with a selfrotating acceleration surface. Fixed attachment can be achieved in many different ways - according to the invention preferably by centrifugal locking - for which purpose amongst others can be used (I) a hook member and [2] a dove tail like member. The strengthening member can also be provided with bolt holes for attachment of the accelerator member with the rotorblade with bolts which in this case are the support members. Attachment can be secured with lock bolts and/or lock pins and/or lock plates but also be centrifugaly locked only.

[0026] The axis of rotation can be vertical, horizontal or angled. The support member (and accelerator member) can be positioned [1] on top of the rotor blade, [2] between two (parallel) rotor blades, [3] underneath against a rotor blade, [4] protruding along the edge of the rotor and even [5] protrude underneath or on top of the rotor; in all cases the support member can partly be positioned in the rotorblade.

[0027] The invention provides the possibility wherein the rotor rotates in one direction only or in both directions, preferably with a symmetric (V-shaped) configuration.

[0028] Here material is understood to be a fragment, grain or a particle or a stream of fragments, grains or particles, designated here in general as material of non-uniform shape.

[0029] The term strengthening plate is also used to designate all other shapes if these do not specifically have the appearance of a plate.

[0030] The accelerator block can be a massive rectangular block, but also have another shape, and can be provided with one or more open spaces or cavities along the acceleration surface which can be filled with a filling material; that is, [1] an insert of a material that has a greater wear resistance (hardness) than the white iron alloy, which insert is firmly joined to the cavity walls in the white iron alloy part, [2] a high abrasive inlay of filling material (more wear resistant of harder than the block material that is made out of white iron alloy) i.e. consists out of carbides, preferably tungsten carbides or ceramic material. Hard metal is understood to be an alloy of at least one hard, wear-resistant constituent in the form of tungsten carbide or titanium carbide and at least one soft metal constituent in the form of cobalt, iron or nickel. The invention provides a possibility for the material from which the accelerator block is made at least partially consists of ceramic material. Here ceramic material is understood to be a material that at least partially consists of aluminium oxide (corundum - Al_2O_3) and/or at least partially consists of silicon oxide (SiO_2), but here ceramic material can also be understood to be materials such as carbides and silica sand. It is also possible that the cavity fills [3] with own particle material creating a partly autogenous acceleration face under influence of centrifugal force. With these cavities the filling material is surrounded by white iron alloy material.

[0031] It is also possible that the accelerator block is cylindrical with the cylindrical axis essentially parallel to the axis of rotation and with (at least part of) the cylindrical surface acting as acceleration surface. It is also possible that the accelerator member is symmetrical for example V-shaped, preferably with the V pointing outwards. A pivotally attached accelerator member is preferably shaped essentially as a triangle or V-shaped with the point directing towards the axis of rotation. In case of a co-rotating impact member the accelerator member is designed in such a way that the accelerator block extends from the impact surface backwards essentially along the prolonged spiral trajectory; for which it has to be taken into account that the spiral trajectory can shift (outwards or inwards) when wear along the accelerator (guiding) surface progresses.

[0032] It is obvious that extreme demands have to be put to the strength of the bond between the accelerator block and the strengthening member. The ultimate goal is to achieve a bond strength equal to the strength of the block respectively the strengthening member.

[0033] The cohesion between the attachment side (of the strengthening member) and the attachment surface (of the accelerator block) is preferably achieved with the aid of heat treatment, the invention providing, inter alia, the following production methods:

First production method wherein the strengthening member and the accelerator block are joined firmly together by successive casting of the strengthening member and the accelerator block one after the other in accordance with a first production method, wherein the strengthening member is cast using a first melt of unalloyed or low alloy steel and the accelerator block is cast against the attachment side immediately thereafter using a second melt of white iron alloy, at the point in time when the first melt is still in the fluid state, or at least the attachment side is at a temperature such that complete fusion of the first and second melt takes place along the attachment side, wherein the alloys of the first and second melt are not identical, wherein the composition of the alloys is so chosen that when the accelerator member is subjected to thermal after-treatment the accelerator block develops the desired hardness and the strengthening member retains the desired tensile strength, wherein the attachment side describes an essentially straight surface, wherein the attachment side describes an essentially horizontal surface during the production of the accelerator member, wherein, after the strengthening plate (member) has been cast, the attachment side is first provided with a film of an agent which prevents, or at least as far as possible prevents, oxidation occurring along the attachment side.

Second production method wherein the strengthening member and the accelerator block are joined firmly together by successive casting of the strengthening member and the accelerator block one after the other, wherein the accelerator member is cast using a first melt of white iron alloy and the strengthening member is cast against the attachment surface immediately thereafter using a second melt of unalloyed or low alloy steel, at the point in time when the first melt is still in the fluid state, or at least the attachment side is at a temperature such that complete fusion of the first and second melt takes place along the attachment side, wherein the alloys of the first and second melt are not identical, wherein the composition of the alloys is so chosen that when the accelerator member is subjected to thermal after-treatment the accelerator block develops the desired hardness and the strengthening member retains the desired tensile strength, wherein the attachment surface describes an essentially straight surface, wherein the attachment surface describes an essentially horizontal surface during the production of the accelerator member, wherein, after the strengthening plate (member) has been cast, the attachment surface is first provided with a film of an agent which prevents, or at least as far as possible prevents, oxidation occurring along the attachment surface.

Third production method wherein the strengthening member and the accelerator block are joined firmly together by casting the accelerator block against the strengthening member, wherein the white iron alloy of the accelerator block is cast against a strengthening member in the form of a piece of plate material of unalloyed or low alloy steel, wherein, before the accelerator block is cast, the metal plate is brought to a temperature that is approximately the same as the temperature of the melt, wherein, during the production of the accelerator member, an additional layer of melt material is also applied to the back of the metal plate, that is the side opposite the attachment side, such that the metal plate assumes virtually the same temperature as the melt, which additional layer is then removed, for which purpose the back is provided with a film of an agent which prevents cohesion between the back and the additional layer cast on. The strengthening plate can be provided with at least one opening, which makes it simpler to fill the mould when casting and reduces the temperature stresses even further.

[0034] It is clear that these production methods can also be used for the production of other reinforced rotorparts.

BRIEF DESCRIPTION OF THE DRAWINGS

[0035] For better understanding, the aims, characteristics and advantages of the device of the invention which have been discussed, and other aims, characteristics and advantages of the device of the invention, are explained in the following detailed description of the device of the invention in relation to accompanying diagrammatic drawings.

[0036] **Figure 1** shows, diagrammatically, a first embodiment of an accelerator member according to the invention.

[0037] **Figure 2** shows, diagrammatically, a second embodiment of an accelerator member according to the invention.

[0038] **Figure 3** shows, diagrammatically, a third embodiment of an accelerator member according to the invention.

[0039] **Figure 4** shows, diagrammatically, a top view according **Figure 5,** of a fourth embodiment of an accelerator member according to the invention.

[0040] **Figure 5** shows, diagrammatically, a side view according **Figure 4,** of a fourth embodiment of an accelerator member according to the invention.

[0041] **Figure 6** shows, diagrammatically, a top view according **Figure 7,** of a fifth embodiment of an accelerator member according to the invention.

[0042] **Figure 7** shows, diagrammatically, a side view according **Figure 6,** of a fifth embodiment of an accelerator member according to the invention.

[0043] **Figure 8** shows, diagrammatically, a fifth embodiment of an accelerator member according to the invention.

[0044] **Figure 9** shows, diagrammatically, a top view according **Figure 10**, of a sixth embodiment of an accelerator member according to the invention.

[0045] **Figure 10** shows, diagrammatically, a side view according **Figure 9**, of a sixth embodiment of an accelerator member according to the invention.

[0046] **Figure 11** shows, diagrammatically, a front view according **Figure 10**, of a sixth embodiment of an accelerator member according to the invention.

[0047] **Figure 12** shows, diagrammatically, a top view according **Figure 13**, of a first embodiment of a rotatable rotor according to the invention.

[0048] **Figure 13** shows, diagrammatically, a perspective view according **Figure 12**, of a first embodiment of a rotatable rotor according to the invention.

[0049] **Figure 14** shows, diagrammatically, a top view B-B according **Figure 15,** of a second embodiment of a rotatable rotor according to the invention.

[0050] **Figure 15** shows, diagrammatically, a side view A-A according **Figure 14**, of a second embodiment of a rotatable rotor according to the invention.

[0051] **Figure 16** shows, diagrammatically, a top view D-D according **Figure 17,** of a a third embodiment of a rotatable rotor according to the invention.

[0052] **Figure 17** shows, diagrammatically, a side view C-C according **Figure 16,** of a third embodiment of a rotatable rotor according to the invention.

[0053] **Figure 18** shows, diagrammatically, a top view G-G according **Figure 19,** of a fourth embodiment of a rotatable rotor according to the invention.

[0054] **Figure 19** shows, diagrammatically, a side view E-E according **Figure 18**, of a fourth embodiment of a rotatable rotor according to the invention.

[0055] **Figure 20** shows, diagrammatically, a side view F-F according **Figure 18**, of a fourth embodiment of a rotatable rotor according to the invention.

[0056] **Figure 21** shows, diagrammatically, a side view H-H according **Figure 22,** of a fifth embodiment of a rotatable rotor according to the invention.

[0057] **Figure 22** shows, diagrammatically, a top view I-I according **Figure 21,** of a fifth embodiment of a rotatable rotor according to the invention.

[0058] **Figure 23** shows, diagrammatically, a side view J-J according **Figure 24,** of a sixth embodiment of a rotatable rotor according to the invention.

[0059] **Figure 24** shows, diagrammatically, a top view K-K according **Figure 23,** of a sixth embodiment of a rotatable rotor according to the invention.

[0060] **Figure 25** shows, diagrammatically, a seventh embodiment of a rotatable rotor according to the invention.

[0061] **Figure 26** shows diagrammatically, an eight embodiment of a rotatable symmetric rotor according to the invention.

[0062] **Figure 27** shows diagrammatically, a ninth embodiment of a symmetrical rotor according to the invention.

[0063] **Figure 28** shows diagrammatically, a tenth embodiment of a non-symmetrical rotor according to the invention.

[0064] **Figure 29** shows, diagrammatically, a first attaching arrangement of an accelerator member according **Figure 28**.

[0065] **Figure 30** shows, diagammatically, a second attaching arrangement of an accelerator member according **Figure 28**.

[0066] **Figure 31** shows, diagrammatically, a third attaching arrangement of an accelerator member according **Figure 28**.

[0067] **Figure 32** shows, diagrammatically, a fourth attaching arrangement of an accelerator member according **Figure 28**.

[0068] **Figure 33** shows, diagrammatically, a side view according **Figure 29.**

BEST WAY OF IMPLEMENTING THE DEVICE OF THE INVENTION

[0069] A detailed reference to the preferred embodiments of the invention is given below. Examples thereof are shown in the appended drawings. Although the invention will be described together with the preferred embodiments, it must be clear that the embodiments described are not intended to restrict the invention to those specific embodiments. On the contrary, the intention of the invention is to comprise alternatives, modifications and equivalents which fit within the nature and scope of the invention as defined by appended claims.

[0070] **Figure 1** shows, diagrammatically, a first embodiment of an accelerator member (1) according to the invention. The accelerator member (1) is carried by a rotorblade (not shown here) some distance away from the axis of rotation (2) and consists here out of one accelerator block (3) that is here made out of a white iron alloy part (247) (according the invention the accelerator block (3) is made out of at least a white iron alloy part (247)), which white iron alloy part (247) is provided with one acceleration surface (4) that at least partially extends in an outward direction when seen from the axis of rotation (2) and is here directed essentially perpendicular to the plane of rotation (5), which white iron alloy part (247) of the accelerator block (3) is provided with a transversal side surface (6), that is directed essentially transversally to the acceleration surface (4) and essentially parallel to the plane of rotation (5) and is characterised in that the white iron alloy part (247) of the accelerator block (3) is provided with a strengthening member (7), which strengthening member (7) is provided with an attachment side (8), of which white iron alloy part (247) of the accelerator block (3) the transversal side surface (6) is provided with an attachment surface (9), such that at least part of the attachment side (8) of the strengthening member (7) and at least part of the attachment surface (9) of the white iron alloy part (247) of the accelerator block (3) are joined together to form a structural composite accelerator member (1), which strengthening member (7) is made of an unalloyed, or low alloy steel that (after thermal hardening of the accelerator member (1)) has an appreciably greater tensile strength than the white iron alloy, which strengthening member (7) is provided with an attaching arrangement (10) - here a hook member - for attaching the accelerator member (1) to the rotorblade (not shown here) with the aid of a support member (here not shown) for centrifugal locking, which attaching arrangement (10) is so constructed that the accelerator member (1) firmly anchors itself against the support member (not shown here) under the influence of centrifugal force and in such a way that the accelerator member (1) can be easily dismantled for replacement because of wear.

[0071] The strengthening member (7) is here provided with an attachment side (8) which describes an essentially straight surface, and the white iron alloy part (247) of the accelerator block (3) is here provided with an attachment surface (9) which describes an essentially straight surface, such that at least part of the attachment side (8) of the strengthening member (7) and at least part of the attachment surface (9) of the white iron alloy part (247) of the of the accelerator block (3) are joined together along an essentially straight attachment plane (11) to form the structural composite accelerator member (1) where the accelerator block (3) is located essentially on one side of a straight dividing plane (12) on which is situated the attachment plane (11) and the strengthening member (7) is located essentially on the other side of the dividing plane (12). The strengthening member (7) here has a shape of a plate but can have a shape other than a plate shape.

[0072] **Figure 2** shows, diagrammatically, a second embodiment of an accelerator member (13) according to the invention that is essentially similar to the first embodiment from **Figure 1**, but the white iron alloy part (14) of the accelerator block (249) is here provided with (at least) one cavity (15) that extends along (at least) a part of the acceleration surface (16) and can be filled with a filling material (as described before) that has a composition different from the white iron alloy part (14), such that the acceleration surface (16) consists partly out of the filling material surrounded by the white iron alloy part (14); which cavity (15) can be filled with a filling material consisting at least partly out of either hard metal (preferably tungsten carbide), a ceramic material or a layer of own particle material, as described in detail before.

[0073] **Figure 3** shows, diagrammatically, a third embodiment of an accelerator member (17) according to the invention wherein the accelerator member (17) is provided with a selfrotating acceleration surface (18). Therefore, the accelerator block (19)- essentially describes a solid of revolution of which the axis of revolution (20) is essentially parallel to the axis of rotation (21), and of which the surface of revolution (18) is provided with the acceleration surface; in such a way that a selfrotating crushing surface is created. The strengthening member (22) is located underneath (essentially parallel to the plane of rotation (23)) the accelerator block (19) (solid of revolution) and is provided with an axis (24) that functions as attaching arrangement.

[0074] **Figures 4 and 5** show, diagrammatically, a fourth embodiment of an accelerator member (25) according to the invention wherein the accelerator member (25) is not fixed attached to a support member but is pivotally attached (26) to a support member (27) that essentially is an axis of which the axis of pivot (28) is essentially parallel to the axis of rotation (29) which can be vertical, horizontal or angled. The transversal side surface (30) that is provided with the strengthening member (31) is directed essentially transversal to the plane of rotation (32) and is directed towards the axis of rotation (29). Because the accelerator member (25) is symmetrical and provided with two acceleration surfaces (33)(34), the rotor (not shown here) can rotate in both directions (35). The acceleration surfaces (33)(34) are here each provided with a cavity (36)(37) that can be filled with a filling material as described before. Furthermore, the strengthening member (31) can be protected by a wear plate (not shown here) that surrounds the outside (38) of the strengthening member (31), which wear plate is centrifugally locked and can be secured by a protruding pen (not shown here).

[0075] **Figures 6 and 7** show, diagrammatically, a fifth embodiment of an accelerator member (39) according to the invention, which is constructed symmetrically in a V-shape (or an essentially truncated V-shape) with the point (40) not being oriented towards the axis of rotation (41); it is however possible that with a different construction the point (40) is oriented towards said axis of rotation (41). The transversal side surface (42) that is provided with the strengthening member (43) is here directed essentially parallel to the plane of rotation (44). The accelerator member (39) is provided with one accelerator block (45), which is provided with two acceleration surfaces (46)(47), which are essentially directed in opposite directions, that is, in a forward and a backward direction direction of rotation, such that the accelerator member (39) is mirror symmetrical with respect to a plane of symmetry (48) from the axis of rotation (41) that intersects the accelerator member (39) halfway between the acceleration surfaces (46)(47). An additional advantage is that a bed of own material is able to deposit at the location of the inside (seam) (49) of the V-shaped accelerator block (45) under the influence of centrifugal force: this prevents wear on, or damage to, the attaching arrangement (50) (hook member) and the part of the strengthening member (43) that is exposed, being able to occur at the location of the V-shaped seam (49).

[0076] The invention provides a possibility for the V-shaped accelerator member (39) to consist of a (single) accelerator block (45) or to be made up of two (identical) accelerator blocks (not shown here) to give an assembled accelerator block; it being possible for the accelerator blocks to be linked to one another at the location of the V seam with the aid of a linking member (not shown here); in this context consideration can be given to a hook connection, a connection with a pin or bolt, but also to a weld or other join, for example a clamping member, whilst the accelerator members can also be linked with the aid of the support member to give a V-shaped accelerator member.

[0077] The accelerator block (45) is here made out of a white iron alloy part (248). The strengthening member (43) is preferably made of metal, which has a sufficiently high tensile strength (significantly higher than the tensile strength of the white iron alloy accelerator block (45)) and a thickness such that the stresses (in the V seam (49)) can be absorbed.

[0078] The composite accelerator member (39) according to the invention provides a possibility for the strengthening member (43) to be provided with an attaching arrangement (50) in the form of an open or half-closed hook, a projection or of studs or threaded openings (not shown here) by means of which the accelerator member can be fixed or secured to the support member (not shown here) in such a way that it is firmly anchored under the influence of centrifugal force; that is centrifugal locking.

[0079] **Figure 8** shows, diagrammatically, a fifth embodiment of an accelerator member (51) according to the invention, essentially similar to the fourth embodiment from **Figures 6** and **7**, but here the accelerator member (51) is provided with two separate essentially identical accelerator blocks (52)(53) which are both connected with the same (one) strengthening member (54) and are here divided by an open space (joint) (55) each of which accelerator blocks (52)(53) are provided with an acceleration surface (56)(57), which are essentially directed in opposite directions, that is, in a forward and a backward direction of rotation, such that the accelerator member (51) is mirror symmetrical with respect to a plane of symmetry (58) from the axis of rotation (59) that intersects the accelerator member (51) halfway between the acceleration surfaces (56)(57). The open joint (55) prevents the transfer from one block (52) to the other block (53) of stresses which are caused by impact; and this can prevent that large pieces of accelerator block material break off when one side (block) of the accelerator member (51) wears out almost completely. The invention allows for an optimal open space (55) (joint) which has to be determined in practice; and can for example be V-shaped or rounded off in both horizontal and vertical direction.

[0080] **Figures 9, 10** and **11** show, diagrammatically, a sixth embodiment of an accelerator member (60) according to the invention, of a V-shaped assembled accelerator member (60) essentially similar to the fifth embodiment of **Figures 8** and **9**; but consists out of two separate accelerator members (61)(62). The attachment surfaces (63)(64) of each of the accelerator blocks (61)(62) is here slightly angled to the plain of rotation (65); that is downwards (66) towards the outside (67) of the accelerator member (60) which makes that the vertical thickness of the accelerator blocks (61)(62) increases in this direction (68→69). This can be necessary when the particle material has a tendency to wear out the accelerator block (52)(53) in a downward direction damaging the strengthening member (70); and actually provides in a simple way a better protection of the strengthening member (70).

[0081] **Figures 12** and **13** show, diagrammatically, a first embodiment of a rotatable rotor (71) according to the invention. The accelerator unit (72) is here provided with a guide member (73) and an accelerator member (74) that is associated with the guide member (73) which here are placed on top of the rotorblade (75), for accelerating the material in two phases; that is, in a first phase with the aid of guiding along the guiding surface (76) that extends towards the outer edge (77) of the rotor (71), such that the guided material is brought into a spiral path (78) directed backwards, viewed from a standpoint moving with the guide member (73). Please note that **Figure 13** shows only one accelerator unit (72). The accelerator member (74) is provided with a acceleration surface (79), that is oriented essentially transversely to the spiral path (78), for accelerating the guided material in a second phase by striking (impact) by the acceleration surface (79), the various aspects being such that the first acceleration phase (guide member (73) takes place a shorter radial distance away from the axis of rotation (80) than the second acceleration phase, which occurs an appreciably greater radial distance away. It is important that the accelerator block (81) of the accelerator member (74) extends, from the acceleration surface (79) backwards (79→83), (at least) along an extension (82) of the spiral path (78), in such a way that when the acceleration (impact) surface (79) moves backwards (79→83) when the accelerator block (81) wears out, the acceleration surface (79→83) stays oriented essentially transversally to the spiral path (78)(82).

[0082] Normally, there will be always some particles which do not accurately collide with the acceleration surface (79→83) of the accelerator block (81); that is, because particles can interfere with each other when they move along the guiding surface (76) and along the spiral path (78) which can cause a slight change of direction of some of the particles. Also rebounding particles can interfere with the deterministic spiral path (78). However, when the accelerator block (81) is located in the correct position (extension (82) of the spiral path (78) normally at least 95% of the particles, and often up to 99%, will collide correctly with the accerating surface (79→83) for acceleration by impact. It has however to be taken into account that the spiral path (78) widens somewhat when it moves further away from the guide member (73). It is preferred when the acceleration surface (79) at least circumscribes the spiral path (78). It has also to be taken into account that the position of the spiral path (78) can shift somewhat when the guide member (73) wears out. Furthermore, it is important that the spiral path (78) is not directed too low (or too high) because a parallel directed strengthening member (84) can than be heavily subjected to impacting particles. Because the strengthening member (84) has a much lower hardness than the white iron alloy part of the accelerator block (81), it will wear out much faster. The height (location) of the spiral path (78) can be adjusted with the height of the metering member (85).

[0083] **Figures 14** and **15** show, diagrammatically, a second embodiment of a rotatable rotor (86) according to the invention for accelerating particle material in two phases with the aid of an accelerator unit (245) that consist out of a first (87) and a second (88) rotating accelerator member that is associated with the first accelerator (87) member, for comminution of the material by impact against a stationary impact member that is positioned around the rotor (86) but is not shown here; and comprises a rotor (86) that is able to rotate about an essentially vertical axis of rotation (89), which rotor (86) is provided with a rotorblade (90) that is directed essentially transversally to the axis of rotation (89). The rotor (86) is provided with a metering member (91) for metering the material onto the metering surface (92) at a place near the axis of rotation (89). Both accelerator members (87) (88) are symmetrical and the rotor (86) can therefore rotate in both directions (93), that is forward (94) and backward (95). Actually, the second accelerator member (88) that is provided with a forward (96) and a backward (97) directed acceleration (impact) surface has been described in detail in Figures 6 and 7. The first accelerator member (87) is cylindrical and provided with two first acceleration surfaces (forward (98) and backward (99)), for accelerating the metered material in a first phase with the aid of guiding along the first acceleration surface (98) (99), in such a way that the guided material is brought into a spiral path (100) directed backwards, viewed from a standpoint moving with the first accelerator member (87). The rotor (86) has a stepped design with both accelerator members (87)(88) located at a level above the rotorblade (90). The rotorblade (90) is therefore provided with support members; a first support member (101) for carrying the first accelerator member (87) and the second support member (102) for carrying the second accelerator member (88). The attaching arrangement (103) of the first accelerator member (87) is here also a hook member. The first accelerator members (87) are kept in place by centrifugal force (centrifugal locking) and the position is further secured by the metering plate (91), which has to be taken out when the first accelerator member (87) has to be exchanged because of wear. Instead of a cylindrical shape, other shapes (for example a V-shape) are possible according to the invention. The second accelerator member (88) is provided with two second acceleration surfaces (forward (96) and backward (97)), which are oriented essentially transversely to the respective spiral paths (100)(104), for accelerating the guided material in a second phase by striking by the second acceleration surface (97)(97). During impact against the second acceleration surface (96)(97) the material is simultaneously loaded and accelerated.

[0084] **Figures 16** and **17** show, diagrammatically, a third embodiment of a rotatable rotor (105) according to the invention, essentially similar to the second embodiment from **Figures 14** and **15**, but the rotor (105) is here provided with additional protruding accelerator members (106) for accelerating rebounding material (that rebounds after it has collided with a stationary impact member that is positioned around the rotor (not shown here)) in a third phase. The protruding accelerator members (106) protrude from the edge (107) of the rotor (105) and are clamped in the rotor (105) with a clamp member (108) which is essentially a kind of dove tail; and the clamp opening (109) in the rotor (105) acts as support member. The transversal side surface (110) of the protruding accelerator member (106) that is provided with the strengthening member (111) is directed essentially transversal to the plane of rotation (112) and is directed towards the axis of rotation (113). The attaching arrangement or clamp member (108) is part of the strengthening member (111). Like the other (first (114) and second (115)) accelerator members, the (third) protruding accelerator member (106) is also symmetrical and provided with two (third) acceleration surfaces, forward (117) and backward (116) directed, and the rotor (105) is therefore rotatable in both directions (118). The protruding part (119) is the white iron part and also protects the outer edge surface (120) of the rotor (105) against wear. According the invention it is also possible to use another type of attaching arrangement for the protruding accelerator member (106), for example pivotly attached and the invention allows for the possibility that the accelerator member (106) protrudes from the edge (107) of the rotor (105) at a level above and underneath the rotorblade (121) (not shown here). The invention allows also for the possibility that the first (114) and/or second (115) accelerator members are also pivotaly attached.

[0085] **Figures 18, 19** and **20** show, diagrammatically, a fourth embodiment of a rotatable rotor (122) according to the invention, wherein the accelerator unit is provided with one accelerator member (123) for accelerating the material in one phase. The accelerator member (123) is here symmetrical V-shaped and placed on top of the rotorblade (124) with the V (125) pointing towards the axis of rotation (126) and provided with two (forward (127) and backward (128) directed) acceleration surfaces (sliding surfaces) which extend towards the outer edge (129) of the rotor (122), for accelerating the metered material with the aid of centrifugal sliding along the acceleration surface (127)(128). The attaching arrangement (130) is here a hook member for centrifugal locking but other attaching arrangements are possible according the invention. The material is metered on the metering surface (131) of the metering member (132) and from there taken up by the acceleration surface (127)(128). The metering member (132) is here in two parts, a central part (134) that is exchangeable but normally stays in place and an outer part (135) that secures the position of the accelerator members (123) and has to be taken out when the accelerator members (123) are replaced. Such a two-part metering member (132)(134)(135) has the advantage that, because the wear concentrates on the outer part (135), only the outer part (135) has to be exchanged regularly; the central part (134) has normally a much longer lifetime and has to be exchanged at much longer intervals. Also less weight has to be lifted during the exchange procedure. The outer part (135) of the metering member (132) extends along a part (136) of the acceleration surface (127)(128) such that the material is picked up by the acceleration surface (127)(128) at a location above the outer surface (137) of the rotor (122) that extends between the outer edge (138) of the metering surface (139) of the outer part (135) and the outer edge (129) of the rotorblade (124); and consequently moves along the acceleration surface (127)(128) at a level above the rotorblade (124) limiting the wear along the rotorblade (124). The outer surface (137) of the rotorblade (124) between the accelerator members (123) is covered by a wear protection plate (140) which is locked in the rotorblade (124) with the aid of two projections (141) which fit into notches (142) in the rotorblade (124); and can be further secured by bolts (207) for which the outer part (135) of the metering member (132) is provided with lock strips (143) which here also carry the outer part (135) of the metering member (132). By placing a ring (not shown here) on these lock strips (143) the height of the metering surface (144) of the outer part (135) is adjustable.

[0086] **Figures 21** and **22** show, diagrammatically, a fifth embodiment of a rotatable rotor (145) according to the invention. The symmetrical rotor (145) is rotatable around an essentially vertical axis of rotation (146) and is provided with an accelerator unit (147) for two-phase acceleration; that is a guide member (148) and an associated accelerator member (149) which are positioned underneath the rotorblade (150); and are both attached with an attaching arrangement (151)(152) for centrifugal locking. The rotor (145) has a central hole (153) in the middle for metering the material on a metering member (154) at a location underneath the rotorblade (150), which metering member (154) here actually carries the rotorblade (150) with supports (155) that also carry the guide members (148). The metering member (154) is carried by an axis (156). The material is picked up by the guide members (148) which bring the material in a spiral path (157) (when seen from a position moving with the guide members (148)) towards the accelerator members (149) of which the acceleration surfaces (158)(159) are directed essentially transversally to the respective spiral paths (157). During impact the material is simultaneously loaded and accelerated; which accelerated material is than thrown outwards for collision against a stationary impact member (not shown here) that is positioned around the rotor (145). The free hanging accelerator members (149) have the advantage that no or only a limited amount of wear takes place underneath the rotorblade (150) and the outer edge (160) of the rotor (145).

[0087] The accelerator member (149) fits in a lockhole (161) in the rotorblade (150) and is carried by a hook member (162) that is directed towards the axis of rotation (146) and two notches (163). The rotorblade (150) is on top (164) around the outer edge (160) provided with a lockring (165) that is provided with open lockspaces (166) at the locations of the accelerator members (149) in which open lockspaces (166) a lockplate (167) fits which secures the accelerator member (149); and the lockplate (167) is secured by centrifugal force (centrifugal locking).

[0088] **Figures 23** and **24** shows, diagrammatically, a sixth embodiment of a rotatable rotor (168) according to the invention, which is essentially similar to the fifth embodiment from **Figures 21** and **22;** but here the rotorblade (169) is on top (170) provided with a hollow axis (171) that carries the rotor (168); and the metering member (172) is carried by the rotorblade (169) with the aid of support members (173) and is located free underneath the rotorblade (169). Metering takes here place through a stationary hollow feedpipe (174) that is positioned in the hollow axis (171). According the invention it is possible also to support the metering member (172) with an support axis (here shown with dotted lines) (175), which makes a very strong construction. The rotor (168) is driven by the hollow axis (171) and the drive and the bearings are not shown here; optionally the rotor (168) can be supported by the support axis (175) which is not separately driven but is provided with bearings (not shown here).

[0089] **Figure 25** shows, diagrammatically, a seventh embodiment of a rotatable rotor (176) according to the invention for accelerating the material. The drawing is here not provided with the accelerator members etc.; only a reinforced outer edge protection member (177) is shown which can be applied for each of the rotors according to the invention. The outer edge (178) of the rotor (176) is here provided with wear plates (179) for protection against wear. The wear plates (179) are of a structural composite member essentially similar to the structural composite accelerator members (1); that is, an unalloyed steel strengthening member (180) provided with a dove tail (181) as attaching arrangement which along the outside (182) (attachment side) is connected with a white iron alloy part that functions as wear block (183) (plate). Such a reinforced outer edge protection member (177) is much stronger than a plain white iron edge protection member which are normally used with the known rotors and have a strong tendency to break under influence of impact of rebounding material.

[0090] Furthermore, the invention allows for the possibility that the metering member and the support protection member are also reinforced; that is provided with a strengthening member underneath. Likewise the accelerator members these parts are on top made out of a white iron alloy and are underneath provided with a unalloyed or low alloy steel plate.

[0091] **Figure 26** shows diagrammatically, an eight embodiment of a rotatable symmetric rotor (184) according to the invention, for accelerating the material in two phases, and provided with five sets of cylindrical guiding members (185) and associated V-shaped accelerator members (186). The rotor (184) is operational in two directions (187) and the development of the wear along the accelerator members (186) is illustrated in five stages (I to V). Stage I shows a fresh accelerator member (188) at the start of the production. Stage II shows how the wear (189) develops along the first side (190) of the accelerator member (186) and stage III shows the situation when the first side (191) wears through completely (192).

Feed material is than no longer loaded and crushed, increasing the oversize that is produced and consequently the recirculation load; that is, the oversize that is fed back to the rotor (184) (crusher). This increase in oversize can be observed visually which can be a signal for reversing the direction of rotation. However, the increase in oversize can also be automatically detected when the recirculation belt (not shown here) is provided with a weighing belt device (not shown here). When the oversize increases above a certain maximum, this can provide a signal for automatic reverse (193 → 194) of the direction of rotation of the rotor (184) when stage III has been reached. Stage IV shows the wear pattern (195) that develops on the other (second) side (196) of the accelerator member (186) when the direction of rotation (194) is reversed and stage V shows the situation when also this second side (197) has completely worn out (198). The weighing belt device (not shown here) will now again indicate too much oversize (recirculation load), and this can be a signal for automatic stop of the rotor (184) when stage V has been reached. This makes it possible to operate the rotor very easy in a fully automatic way.

[0092] **Figure 27** shows diagrammatically, a ninth embodiment of a symmetrical rotor (199) according to the invention that is rotatable in two directions located in a crusher (200) and is provided with a driving mechanism (not shown here) that is provided with a control system (not shown here) for controlling the rotational velocity of the rotor (199) and the direction of rotation of the rotor (199), which crusher (200) is provided with a first belt unit (201) that collects the crushed material from the crusher (200) and directs the crushed material towards a sieve unit (202) that separates the oversize (203) and the undersize (204) from the crushed material, which oversize (203) is returned to the crusher (200) with the aid of a recirculation belt unit (205) that collects the oversize (203) from the sieve (202), which amount of oversize (203) increases to a significant degree when the accelerator member (206) is completely worn out (stage III in **Figure 26**) and consequently becomes less and less functional, which recirculation belt (205) is provided with a weighing belt device (208) that measures the amount of the oversize (203) and signals this increase in weight towards the control system (not shown here). With the aid of the control system (not shown here) and the signal from the weighing belt device (208), the direction of rotation of the rotor (199) can be reversed when the amount (203) of oversize that is returned to the rotor (199) exceeds a certain maximum. When the second side of the accelerator member (206) also wears out completely (stage V in **Figure 26**) the same procedure makes it possible for the rotation of the rotor (199) to be stopped when the amount of oversize (203) that is returned to the rotor (199) exceeds a certain maximum; and a signal can be given (alarm) that the accelerator members (206) have to be exchanged. Because the amount of oversize increases gradually it is even possible to provide a signal when stage V is almost reached which makes it possible for the operator to be stand by when the accelerator members (206) have to be replaced.

[0093] This is a very interesting feature that makes the operation of a crusher (200) provided with a rotor (199) according to the invention much easier; actually, fully automatic and without necessary inspection. Known crushers are all very sensitive when the wear parts wear out completely because this can cause heavy damage to the support construction, the rotor and even the crusher as a whole. In practice operators have therefore to be very careful to avoid that the wear parts wear out completely. The rotor has to be regularly inspected visually for which the crusher has to be stopped and opened which can cause a loss of production. Often problems do occur because wear develops faster than anticipated, for example because the wear material of the wear parts is less hard (less wear resistant), a piece breaks off due to overloading or a casting fault or the particle material is somewhat harder or coarser than anticipated. The rotor (199) according the invention has the advantage that no damage can occur when the accelerator members (206) wear out completely; the accelerator members (206) only become less and less funcrional.

[0094] **Figure 28** shows diagrammatically, a tenth embodiment of a non-symmetrical (209) rotor according to the invention that is rotatable in one direction only (210). The rotor (209) is for illustration purposes equipped with accelerator members which are provided with similar accelerator blocks, but the strengthening members are equipped with different attaching arrangements. A first attaching arrangement (211) (**Figure 29**) is provided with a hook member (212) for centrifugal locking only. As can be seen in **Figure 33** the acceleration surface (213) is provided with two guiding strips along the bottom (214) and the top (215) to keep the material stream moving along the centre (216) of the acceleration surface (213). A second attaching arrangement (217) (**Figure 30**) is provided with a dove tail (like) member (218) for centrifugal locking. A third attaching arrangement (219) (**Figure 31**) is provided with a protruding stub (220) that extends outward from the bottom side (221) of the strengthening member (222) into a bracket hole (223) in the rotorblade (224) that acts as support member. A resilient locking element (225) is placed in a groove (226) to secure the accelerator member (227) in place. To avoid movement of the accelerator member (227) the protruding stub (220) is provided with a notch (228) that fits into the rotorblade (224). A fourth attaching arrangement (229) (**Figure 32**) is provided with a protruding stub (230) that extends outward from the bottom side (231) from the strengthening member (232) into a bracket hole (233) in the rotorblade (224) that acts as support member. Both the protruding stub (230) and the bracket hole (233) are angled slightly inwards with 2-4 degrees (α) with respect to a line (234) parallel to the axis of rotation (235) for centrifugal locking. To avoid movement of the accelerator member (236) the protruding stub (230) is provided with a notch (237) that fits into the rotorblade (224). This fourth attaching arrangement (239) allows for very easy and quick exchange of the accelerator member (236). In case of all four attaching arrangements (211)(217)(219)(229) the accelerator member (227)(236)(238)(239) can be additionally secured with a metering member (240). It is also important that the outer part (241) of the surface of the rotorblade (224) between the accelerator members (227)(236)(238)(239) is provided with wear plates (242) that protect both the rotorblade (224) and the edge (243) of the strengthening member (244) against sliding wear.

[0095] It is clear that the rotor and the accelerator members according the invention can be implemented with any other embodiment mentioned here in the invention - and embodiments derived therefrom. The support member can be located behind but also underneath the accelerator member, while many other fixing members also being conceivable according to the invention. The invention provides a possibility for at least one of the plate surfaces to be at least partially parallel to the acceleration surface, and provides a possibility for at least one of the plate surfaces to be at least partially oriented perpendicularly to the acceleration surface.

[0096] The drawings are not structural drawings but indicate diagrammatically - in sketch form - a number of possible embodiments and characteristics which are important or of essential importance for the description, the characterisation and the use of the rotor according to the invention. In the case of sections, shading is not always indicated and only the most important details are indicated by broken lines. Moreover, in sections only the components that are located on or close to these sections, i.e. of a section, are indicated and no items and members located further towards the rear.

[0097] The above descriptions of specific embodiments of the present invention have been given with a view to illustrative and descriptive purposes. They are not intended to be an exhaustive list or to restrict the invention to the precise forms given, and having due regard for the above explanation, many modifications and variations are, of course, possible. The embodiments have been selected and described in order to describe the principles of the invention and the practical application possibilities thereof in the best possible way in order thus to enable others skilled in the art to make use in an optimum manner of the invention and the diverse embodiments with the various modifications suitable for the specific intended use. The intention is that the scope of the invention is defined by the appended claims according to reading and interpretation in accordance with generally accepted legal principles, such as the principle of equivalents and the revision of components.

Claims

1. A rotary accelerator device for accelerating particle material with the aid of at least one rotating structural composite accelerator member in at least one phase, for comminution of said material by impact, comprising:

a rotor (86) that is able to rotate about an axis of rotation (2)(41)(89) in at least one direction of rotation, which rotor (86) is provided with at least one rotorblade (90) that is directed essentially transversally to said axis of rotation (2)(41)(89);
- a metering member (91) for metering said material onto said rotor (86);
- at least one accelerator unit (245) that at least consists out of one separate accelerator member (1)(13)(39)(87)(88) for accelerating said metered material in at least one phase, which rotorblade (90) is provided with a support member (101)(102) for carrying said accelerator member (1)(13)(39)(87)(88), which accelerator member (1)(13)(39)(87)(88) is some distance away from said axis of rotation (2)(41)(89) and consists out of at least one accelerator block (3)(45) that is made out of at least a white iron alloy part (14)(247)(248)(249), which white iron alloy part (14)(247)(248)(249) is provided with at least one acceleration surface (4)(16)(46)(47)(98)(99) that at least partially extends in an outward direction when seen from said axis of rotation (2)(41)(89) and is directed essentially perpendicular to the plane of rotation (5)(44)(246), which white iron alloy part (14)(247)(248)(249) can be provided with at least one cavity (15) that extends along at least a part of said acceleration surface (16) and can be filled with a filling material with a composition different from said white iron alloy part (14)(247)(248)(249) such that said acceleration surface (16) consists partly out of said filling material that is at least partly surrounded by said white iron alloy part (14)(247)(248)(249), which white iron alloy part (14)(247)(248)(249) of said accelerator block (3)(45) is provided with a strengthening member (7)(43), which strengthening member (7)(43) is provided with an attachment side (8), of which white iron alloy part (14)(247)(248)(249) said transversal side surface (6)(42) is provided with an attachment surface (9), such that at least part of said attachment side (8) and at least part of said attachment surface (9) are joined together to form a structural strengthened composite accelerator member (1)(13)(39)(87)(88), which strengthening member (7)(43) is made of an unalloyed, or low alloy steel that, after thermal hardening of said accelerator member (1)(13)(39)(87)(88), has an appreciably greater tensile strength than said white iron alloy part (14)(247)(248)(249), which strengthening member (7)(43) is provided with an attaching arrangement (10)(50)(103) for attaching said accelerator member (1)(13)(39)(87)(88) to said support member (101)(102), in

such a way that said accelerator member (1)(13)(39)(87)(88) can be dismantled for replacement because of wear;

- **characterised in that**:

- said attachment side is directed essentially transversally to said accelerating surface and located at a position along and outside the wear area that is formed when said accelerator member wears out under influence of wear generated during accelerating of said particles by sliding and/or impact, such that said attachment arrangement is not damaged when said accelerator member wear through completely.

2. Accelerator device according to Claim 1, wherein said transverse side surface is directed essentially parallel to said plane of rotation.

3. Accelerator device according to Claim 1, wherein said transverse side surface is directed slightly angles to said plane of rotation.

4. Accelerator device according to Claim 1, wherein said transversal side surface is directed essentially transversal to said plane of rotation and is not directed outwards when seen from said axis of rotation, is provided with said strengthening member.

5. Accelerator device according to Claim 1, wherein said strengthening member is provided with an attachment side which describes an essentially straight surface, and said accelerator block is provided with an attachment surface which describes an essentially straight surface, such that at least part of said attachment side of said strengthening member and at least part of said attachment surface of said accelerator block are joined together along an essentially straight attachment plane to form said structural composite accelerator member where said accelerator block is located essentially on one side of a straight dividing plane on which is situated said attachment plane and said strengthening member is located essentially on the other side of said dividing plane.

6. Accelerator device according to Claim 1, wherein said accelerator unit is provided with at least a first accelerator member and a second accelerator member that is associated with said first accelerator member, for accelerating said material in two phases, which first accelerator member is provided with at least a first acceleration surface, for accelerating said metered material in a first phase with the aid of guiding along said first acceleration surface, in such a way that said guided material is brought into a spiral path directed backwards, viewed from a standpoint moving with said first accelerator member, which second accelerator member is provided with at least a second acceleration surface, that is oriented essentially transversely to said spiral path, for accelerating said guided material in a second phase by striking by said second acceleration surface, the various aspects being such that said first acceleration phase takes place a shorter radial distance away from said axis of rotation than said second acceleration phase, which occurs an appreciably greater radial distance away.

7. Accelerator device according to Claim 1, wherein said accelerator unit is provided with at least one guide member and an accelerator member that is associated with said guide member, for accelerating said material in two phases, which guide member is provided with at least one guide surface that at least partially extends towards said outer edge of said rotor, for accelerating said metered material in a first phase with the aid of -guiding along said guide surface, such that said guided material is brought into a spiral path directed backwards viewed from a standpoint moving with said guide member, the acceleration surface of which accelerator member is oriented essentially transversely to said spiral path for accelerating said guided material in a second phase by striking by said acceleration surface, the various aspects being such that said first acceleration phase takes place a shorter radial distance away from said axis of rotation than said second acceleration phase, which occurs an appreciably greater radial distance away.

8. Accelerator device according to Claim 1, wherein said accelerator unit is provided with at least one accelerator member and a collision member that is associated with said accelerator member, for accelerating said material in two phases, wherein said first phase of the acceleration takes place with the aid of said accelerator member by guiding said metered material along said acceleration surface, in such a way that said guided material is brought into a spiral path directed backwards, viewed from a standpoint moving with said accelerator member, the collision surface of which collision member, which at least partially extends towards said outer edge of said rotor, is oriented essentially transversely to said spiral path for accelerating said guided material in a second phase by striking by said collision surface, the various aspects being such that said first acceleration phase takes place a shorter radial distance away from said axis of rotation than said second acceleration phase, which occurs an appreciably greater radial distance away.

9. Accelerator device according to Claim 1, wherein said accelerator unit is provided with one accelerator member for accelerating said material in one phase, which accelerator member is provided with at least one sliding surface that at least partially extends towards said outer edge of said rotor, for accelerating said metered material with the aid of sliding along said guide surface.

10. Accelerator device according to Claim 1, wherein said support member is located between said accelerator member and said rotorblade.

11. Accelerator device according to Claim 1, wherein said support member at least partly extends in said rotorblade.

12. Accelerator device according to Claim 1, wherein said suppport member extends at least between two parallel rotorblades.

13. Accelerator device according to Claim 1, wherein said rotor rotates about an essentially vertically directed axis of rotation and said rotorblade is facing upwards.

14. Accelerator device according to Claim 1, wherein said rotor rotates about an essentially vertically directed axis of rotation and said rotorblade is facing downwards.

15. Accelerator device according to Claim 1, wherein said accelerator member is not fixed attached to said support member.

16. Accelerator device according to Claim 15, wherein said accelerator member is pivotally attached to said support member.

17. Accelerator device according to Claim 15, wherein said accelerator member is provided with a selfrotating acceleration surface.

18. Accelerator device according to Claim 17, wherein said accelerator block essentially describes a solid of revolution of which the axis of revolution is essentially parallel to said axis of rotation, and of which the surface of revolution is provided with said acceleration surface.

19. Accelerator device according to one of Claims 1 and 16, wherein said accelerator unit is provided with an accelerator member of which at least the acceleration surface at least partially protrudes from the edge of said rotorblade.

20. Accelerator device according to one of Claims 6 and 7, wherein said accelerator block of said second accelerator member extends from said acceleration surface at least along an extension of said spiral path.

21. Accelerator device according to Claim 1, wherein said rotor rotates in two directions, a forward and a backward direction.

22. Accelerator device according to Claim 21, wherein said accelerator member is provided with two separate essentially identical accelerator blocks, each of which is provided with an acceleration surface, which are essentially directed in opposite directions, that is, in said forward and said backward direction, such that said accelerator member is mirror symmetrical with respect to a plane of symmetry from said axis of rotation that intersects said accelerator member halfway between said acceleration surfaces.

23. Accelerator device according to Claim 21, wherein said accelerator member is provided with one accelerator block, which is provided with two acceleration surfaces, which are essentially directed in opposite directions, that is, in said forward and said backward direction, such that said accelerator member is mirror symmetrical with respect to a plane of symmetry from said axis of rotation that intersects said accelerator member halfway between said acceleration surfaces.

24. Accelerator device according to one of Claims 22 and 23, wherein said mirror symmetrical accelerator member essentially describes a V-shape, the point not being oriented towards said axis of rotation.

25. Accelerator device according to one of Claims 22 and 23, wherein said mirror symmetrical accelerator member essentially describes a V-shape, the point being oriented towards said axis of rotation.

26. Accelerator device according to Claim 1, wherein said strengthening member has a shape other than a plate shape.

27. Accelerator device according to Claim 1, wherein said attaching arrangement is in the shape of a hook member, which is so constructed that said accelerator member firmly anchors itself against said support member under the influence of centrifugal force for centrifugal locking.

28. Accelerator device according to Claim 1, wherein said attaching arrangement is in the shape of a dovetail like member, which is so constructed that said accelerator member firmly anchors itself against said support member under the influence of centrifugal force for centrifugal locking.

29. Accelerator device according to Claim 1, wherein said attaching arrangement is provided with a separate element.

30. Accelerator device according to Claim 29, wherein said separate element consists out of at least one bolt member.

31. Accelerator device according to Claim 29, wherein said separate element has essentially the shape of a clamping member.

32. Accelerator device according to Claim 27, wherein said attaching arrangement is provided with a protruding stub that extends outward from the bottom side from said strengthening member into a bracket hole in said rotorblade that acts as support member.

33. Accelerator device according to Claim 32, wherein said protruding stub is angled slightly (2-4 degrees) backwards with respect to the axis of rotation.

34. Accelerator device according to Claim 1, wherein after thermal hardening of said accelerator member the hardness of said white iron alloy is greater than Rc55.

35. Accelerator device according to Claim 1, wherein said filling material at least partially consists out of hard metal.

36. Device according to Claim 35, wherein hard metal is understood to be an alloy of at least one hard, wear-resistant constituent in the form of tungsten carbide or titanium carbide and at least one soft metal constituent in the form of cobalt, iron or nickel.

37. Accelerator device according to Claim 1, wherein said filling material at least partially consists of ceramic material.

38. Device according to Claim 37, wherein ceramic material is understood to be a material that at least partially consists of aluminium oxide (Al_2O_3).

39. Device according to Claim 37, wherein ceramic material is understood to be a material that consists at least partially of silicon oxide (SiO_2).

40. Accelerator device according to Claim 1, wherein said cavity is filled with a deposit of said particle material under influence of centrifugal force, creating an acceleration surface that consists out of an autogenous bed of said particle material surrounded by said white iron alloy.

41. Accelerator device according to Claim 1, wherein said rotor is located in a crusher and is provided with a driving mechanism that is provided with a control system for controlling the rotational velocity of said rotor and the direction of rotation of said rotor, which crusher is provided with a belt unit that collects the crushed material from said crusher and directs said crushed material towards a sieve unit that separates the oversize from said crushed material, which oversize is returned to said crusher with the aid of a recirculation belt unit that collects the oversize material from said sieve, which amount of oversize increases to a significant degree when said accelerator member wears through and consequently becomes less functional, which recirculation belt is provided with a weighing system that measures the amount of said oversize material and signals this weight towards said control system.

42. Accelerator device according to Claim 41, wherein, with the help of said control system and said signal, the direction of rotation of said rotor can be reversed when the amount of oversize that is returned to said rotor exceeds a certain maximum.

43. Accelerator device according to Claim 41, wherein, with the help of said control system and said signal, the rotation of said rotor can be stopped when the amount of oversize that is returned to said rotor exceeds a certain maximum.

Patentansprüche

1. Eine rotierende Beschleunigungsvorrichtung zum Beschleunigen von Teilchenmaterial mit Hilfe wenigstens eines rotierenden strukturellen Verbundbeschleunigungselements in wenigstens einer Phase, zur Zerkleinerung besagten Materials durch Aufprall, umfassend:

- einen Rotor (86), der in der Lage ist, um eine Rotationsachse (2) (41) (89) in wenigstens einer Rotationsrichtung zu rotieren, welcher Rotor (86) mit wenigstens einem Rotorblatt (90) versehen ist, das im Wesentlichen transversal zu besagter Rotationsachse (2)(41)(89) gerichtet ist;
- ein Dosierelement (91) zum Dosieren besagten Materials auf besagten Rotor (86);
- wenigstens eine Beschleunigungseinheit (245), die wenigstens aus einem separaten Beschleunigungselement (1)(13)(39)(87)(88) zum Beschleunigen besagten dosierten Materials in wenigstens einer Phase besteht, welches Rotorblatt (90) mit einem Stützelement (101) (102) zum Tragen besagten Beschleunigungselements (1)(13)(39)(87)(88) versehen ist, welches Beschleunigungselement (1)(13)(39)(87)(88) in einem Abstand von besagter Rotationsachse (2)(41)(89) entfernt liegt und aus wenigstens einem Beschleunigungsblock (3)(45) besteht, der aus wenigstens einem weißen Roheisenlegierungsteil (14)(247)(248)(249) hergestellt ist,

welches weiße Roheisenlegierungsteil (14) (247)(248)(249) mit wenigstens einer Beschleunigungsfläche (4)(16)(46)(47)(98)(99) versehen ist, die sich, gesehen von besagter Rotationsachse (2) (41) (89) aus, in einer nach außen gerichteten Richtung erstreckt und im Wesentlichen senkrecht zur Rotationsebene (5)(44) (246) gerichtet ist, welches weiße Roheisenlegierungsteil (14)(247)(248)(249) mit wenigstens einem Hohlraum (15) versehen werden kann, der sich entlang wenigstens einem Teil besagter Beschleunigungsfläche (16) erstreckt und mit einem Füllmaterial mit einer Zusammensetzung, die sich von dem des besagten weißen Roheisenlegierungsteils (14) (247) (248) (249) unterscheidet, gefüllt werden kann, sodass besagte Beschleunigungsfläche (16) teilweise aus besagtem Füllmaterial besteht, das wenigstens teilweise von besagtem weißen Roheisenlegierungsteil (14) (247) (248) (249) umgeben ist, welches weiße Roheisenlegierungsteil (14) (247)(248)(249) besagten Beschleunigungsblocks (3) (45) mit einem Verstärkungselement (7) (43) versehen ist, welches Verstärkungselement (7) (43) mit einer Befestigungsseite (8) versehen ist, wovon besagte transversale Seitenfläche (6)(42) des weißen Roheisenlegierungsteils (14)(247)(248)(249) mit einer Befestigungsfläche (9) versehen ist, sodass wenigstens ein Teil besagter Befestigungsseite (8) und wenigstens ein Teil besagter Befestigungsfläche (9) aneinandergefügt sind, um ein strukturelles verstärktes Verbundbeschleunigungselement (1) (13) (39) (87) (88) zu bilden, welches Verstärkungselement (7) (43) aus einem unlegierten oder niedriglegierten Stahl besteht, der, nach thermischem Härten besagten Beschleunigungselements (1) (13) (39) (87) (88), eine merkbar größere Zugfestigkeit hat als besagtes weißes Roheisenlegierungsteil (14) (247) (248) (249), welches Verstärkungselement (7) (43) mit einer Befestigungsanordnung (10)(50)(103) zum Befestigen besagten Beschleunigungselements (1) (13) (39) (87) (88) an besagtem Stützelement (101) (102) versehen ist, derart, dass besagtes Beschleunigungselement (1) (13) (39) (87) (88) zum Ersetzen aufgrund von Verschleiß demontiert werden kann;

- **<u>dadurch gekennzeichnet, dass</u>**:

  - besagte Befestigungsseite im Wesentlichen transversal zu besagter Beschleunigungsfläche gerichtet ist und sich an einer Position entlang und außerhalb der Verschleißzone befindet, die gebildet wird, wenn besagtes Beschleunigungselement unter Einfluss von Verschleiß durchschleißt, der während des Beschleunigens der besagten Teilchen durch Gleiten und/oder Aufprall erzeugt wird, sodass besagte Befestigungsanordnung nicht beschädigt wird, wenn besagtes Beschleunigungselement vollständig durchschleißt.

2. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei besagte quergerichtete Seitenfläche im Wesentlichen parallel zu besagter Rotationsebene gerichtet ist.

3. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei besagte quergerichtete Seitenfläche leicht angewinkelt zu besagter Rotationsebene gerichtet ist.

4. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei besagte transversale Seitenfläche im Wesentlichen transversal zu besagter Rotationsebene gerichtet ist und nicht nach außen gerichtet ist, gesehen von besagter Rotationsachse, mit besagtem Verstärkungselement versehen ist.

5. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei besagtes Verstärkungselement mit einer Befestigungsseite versehen ist, die eine im Wesentlichen gerade Oberfläche beschreibt, und besagter Beschleunigungsblock mit einer Befestigungsfläche versehen ist, die eine im Wesentlichen gerade Oberfläche beschreibt, sodass wenigstens ein Teil besagter Befestigungsseite besagten Verstärkungselements und wenigstens ein Teil besagter Befestigungsfläche besagten Beschleunigungsblocks entlang einer im Wesentlichen geraden Befestigungsebene aneinandergefügt sind, um besagtes strukturelles Verbundbeschleunigungselement zu bilden, wo besagter Beschleunigungsblock sich im Wesentlichen an einer Seite einer geraden Trennebene befindet, an der sich besagte Befestigungsebene befindet, und besagtes Verstärkungselement sich im Wesentlichen an der anderen Seite besagter Trennebene befindet.

6. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei besagte Beschleunigungseinheit mit wenigstens einem ersten Beschleunigungselement und einem zweiten Beschleunigungselement, das besagtem ersten Beschleunigungselement zugeordnet ist, versehen ist, zum Beschleunigen besagten Materials in zwei Phasen, welches erste Beschleunigungselement mit wenigstens einer ersten Beschleunigungsfläche versehen ist, zum Beschleunigen besagten dosierten Materials in einer ersten Phase mit Hilfe des Führens entlang besagter erster Beschleunigungsfläche, derart, dass besagtes geführtes Material in eine spiralförmige Bahn gebracht wird, die rückwärts gerichtet ist, gesehen von einem Standpunkt, der sich mit besagtem ersten Beschleunigungselement mitbewegt, welches zweite Beschleunigungselement mit wenigstens einer zweiten Beschleunigungsfläche versehen ist, die im Wesentlichen transversal zu besagter spiralförmiger Bahn orientiert ist, zum Beschleunigen besagten geführten Materials in einer zweiten Phase durch Aufschlagen durch besagte zweite Beschleunigungsfläche, wobei die verschiedenen Aspekte so sind, dass besagte erste Beschleunigungsphase in einem kürzeren radialen Abstand von besagter Rotationsachse entfernt stattfindet als besagte zweite Beschleunigungsphase, die um einen merklich größeren radialen Abstand entfernt stattfindet.

7. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei besagte Beschleunigungseinheit mit wenigstens einem Führungselement und einem besagtem Führungselement zugeordneten Beschleunigungselement versehen ist, zum Beschleunigen besagten Materials in zwei Phasen, welches Führungselement mit wenigstens einer Führungsfläche versehen ist, die sich wenigstens teilweise zu besagter Außenkante besagten Rotors hin erstreckt, zum Beschleunigen besagten dosierten Materials in einer ersten Phase mit Hilfe des Führens entlang besagter Führungsfläche, sodass besagtes geführtes Material auf eine spiralförmige Bahn gebracht wird, die rückwärts gerichtet ist, gesehen von einem mit besagtem Führungselement bewegenden Standpunkt aus, wobei die Beschleunigungsfläche besagten Beschleunigungselements im Wesentlichen quer zu besagter spiralförmiger Bahn zum Beschleunigen besagten geführten Materials in einer zweiten Phase durch Aufschlagen durch besagte Beschleunigungsfläche orientiert ist, wobei die verschiedenen Aspekte so sind, dass besagte erste Beschleunigungsphase in einem kürzeren radialen Abstand von besagter Rotationsachse entfernt stattfindet als besagte zweite Beschleunigungsphase, die um einen merklich größeren radialen Abstand entfernt stattfindet.

8. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei besagte Beschleunigungseinheit mit wenigstens einem Beschleunigungselement und einem Kollisionselement, das besagtem Beschleunigungselement zugeordnet ist, versehen ist, zum Beschleunigen besagten Materials in zwei Phasen, wobei besagte erste Phase der Beschleunigung mit Hilfe besagten Beschleunigungselements durch Führen besagten dosierten Materials entlang besagter Beschleunigungsfläche stattfindet, derart, dass besagtes geführtes Material in eine spiralförmige Bahn gebracht wird, die rückwärts gerichtet ist, gesehen von einem mit besagtem Beschleunigungselement bewegenden Standpunkt aus, wobei die Kollisionsfläche besagten Kollisionselements, die sich wenigstens teilweise hin zu besagter Außenkante besagten Rotors erstreckt, im Wesentlichen quer zu besagter spiralförmiger Bahn zum Beschleunigen besagten geführten Materials in einer zweiten Phase durch Aufschlagen durch besagte Kollisionsfläche orientiert ist, wobei die verschiedenen Aspekte so sind, dass besagte erste Beschleunigungsphase in einem kürzeren radialen Abstand von besagter Rotationsachse entfernt stattfindet als besagte zweite Beschleunigungsphase, die um einen merklich größeren radialen Abstand entfernt stattfindet.

9. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei besagte Beschleunigungseinheit mit einem Beschleunigungselement zum Beschleunigen besagten Materials in einer Phase versehen ist, welches Beschleunigungselement mit wenigstens einer Gleitfläche versehen ist, die sich wenigstens teilweise zu besagter Außenkante besagten Rotors hin erstreckt, zum Beschleunigen besagten dosierten Materials mit Hilfe von Gleiten entlang besagter Führungsfläche.

10. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei besagtes Stützelement sich zwischen besagtem Beschleunigungselement und besagtem Rotorblatt befindet.

11. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei besagtes Stützelement sich wenigstens teilweise in besagtes Rotorblatt erstreckt.

12. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei besagtes Stützelement sich zwischen zwei parallelen Rotorblättern erstreckt.

13. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei besagter Rotor um eine im Wesentlichen vertikal gerichtete Rotationsachse rotiert und besagtes Rotorblatt nach oben gekehrt ist.

14. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei besagter Rotor um eine im Wesentlichen vertikal gerichtete Rotationsachse rotiert und besagtes Rotorblatt nach unten gekehrt ist.

15. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei besagtes Beschleunigungselement nicht fest an besagtem Stützelement befestigt ist.

16. Beschleunigungsvorrichtung gemäß Anspruch 15, wobei besagtes Beschleunigungselement schwenkbar an besagtem Stützelement befestigt ist.

17. Beschleunigungsvorrichtung gemäß Anspruch 15, wobei besagtes Beschleunigungselement mit einer selbstrotierenden Beschleunigungsfläche versehen ist.

18. Beschleunigungsvorrichtung gemäß Anspruch 17, wobei besagter Beschleunigungsblock im Wesent-

lichen einen Drehkörper beschreibt, dessen Drehachse im Wesentlichen parallel zu besagter Rotationsachse ist, und wovon die Drehoberfläche mit besagter Beschleunigungsfläche versehen ist.

19. Beschleunigungsvorrichtung gemäß einem der Ansprüche 1 und 16, wobei besagte Beschleunigungseinheit mit einem Beschleunigungselement versehen ist, wovon wenigstens die Beschleunigungsfläche wenigstens teilweise von der Kante besagten Rotorblatts vorragt.

20. Beschleunigungsvorrichtung gemäß einem der Ansprüche 6 und 7, wobei besagter Beschleunigungsblock besagten zweiten Beschleunigungselements sich von besagter Beschleunigungsfläche wenigstens entlang einer Verlängerung besagter spiralförmiger Bahn erstreckt.

21. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei besagter Rotor in zwei Richtungen rotiert, einer Vorwärts- und einer Rückwärtsrichtung.

22. Beschleunigungsvorrichtung gemäß Anspruch 21, wobei besagtes Beschleunigungselement mit zwei separaten, im Wesentlichen identischen Beschleunigungsblöcken versehen ist, wovon jeder mit einer Beschleunigungsfläche versehen ist, welche im Wesentlichen in entgegengesetzte Richtungen gerichtet sind, das heißt, in besagte Vorwärts- und besagte Rückwärtsrichtung, sodass besagtes Beschleunigungselement spiegelsymmetrisch in Bezug zu einer Symmetrieebene von besagter Rotationsachse aus ist, die besagtes Beschleunigungselement in der Mitte zwischen besagten Beschleunigungsflächen schneidet.

23. Beschleunigungsvorrichtung gemäß Anspruch 21, wobei besagtes Beschleunigungselement mit einem Beschleunigungsblock versehen ist, der mit zwei Beschleunigungsflächen versehen ist, welche im Wesentlichen in entgegengesetzte Richtungen gerichtet sind, das heißt, in besagte Vorwärts- und besagte Rückwärtsrichtung, sodass besagtes Beschleunigungselement spiegelsymmetrisch in Bezug zu einer Symmetrieebene von besagter Rotationsachse aus ist, die besagtes Beschleunigungselement in der Mitte zwischen besagten Beschleunigungsflächen schneidet.

24. Beschleunigungsvorrichtung gemäß einem der Ansprüche 22 und 23, wobei besagtes spiegelsymmetrisches Beschleunigungselement im Wesentlichen eine V-Form beschreibt, wobei die Spitze nicht zu besagter Rotationsachse hin orientiert ist.

25. Beschleunigungsvorrichtung gemäß einem der Ansprüche 22 und 23, wobei besagtes spiegelsymmetrisches Beschleunigungselement im Wesentlichen eine V-Form beschreibt, wobei die Spitze zu besagter Rotationsachse hin orientiert ist.

26. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei besagtes Verstärkungselement eine andere Form als eine Plattenform hat.

27. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei besagte Befestigungsanordnung in Form eines Hakenelements vorliegt, das so konstruiert ist, dass besagtes Beschleunigungselement sich unter dem Einfluss der Zentrifugalkraft zwecks zentrifugaler Verriegelung fest gegen besagtes Stützelement verankert.

28. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei besagte Befestigungsanordnung in Form eines schwalbenschwanzartigen Elements vorliegt, das so konstruiert ist, dass besagtes Beschleunigungselement sich unter dem Einfluss der Zentrifugalkraft zwecks zentrifugaler Verriegelung fest gegen besagtes Stützelement verankert.

29. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei besagte Befestigungsanordnung mit einem separaten Element versehen ist.

30. Beschleunigungsvorrichtung gemäß Anspruch 29, wobei besagtes separates Element aus wenigstens einem Bolzenelement besteht.

31. Beschleunigungsvorrichtung gemäß Anspruch 29, wobei besagtes separates Element im Wesentlichen die Form eines Klemmelements hat.

32. Beschleunigungsvorrichtung gemäß Anspruch 27, wobei besagte Befestigungsanordnung mit einem vorspringenden Stumpf versehen ist, der sich von der Unterseite von besagtem Verstärkungselement nach außen in eine Klammeröffnung in besagtem Rotorblatt erstreckt, das als Stützelement fungiert.

33. Beschleunigungsvorrichtung gemäß Anspruch 32, wobei besagter vorspringender Stumpf in Bezug zur Rotationsachse geringfügig (2-4 Grad) nach hinten abgewinkelt ist.

34. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei nach thermischem Härten besagten Beschleunigungselements die Härte besagter weißer Roheisenlegierung größer als Rc55 ist.

35. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei besagtes Füllmaterial wenigstens teilweise aus Hartmetall besteht.

36. Vorrichtung gemäß Anspruch 35, wobei Hartmetall als eine Legierung von wenigstens einem harten, verschleißfesten Bestandteil in Form von Wolframkarbid oder Titankarbid und wenigstens einem Weichmetallbestandteil in Form von Kobalt, Eisen oder Nickel verstanden wird.

37. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei besagtes Füllmaterial wenigstens teilweise aus Keramikmaterial besteht.

38. Vorrichtung gemäß Anspruch 37, wobei Keramikmaterial als ein Material verstanden wird, das wenigstens teilweise aus Aluminiumoxid (Al_2O_3) besteht.

39. Vorrichtung gemäß Anspruch 37, wobei Keramikmaterial als ein Material verstanden wird, das wenigstens teilweise aus Silikonoxid (SiO_2) besteht.

40. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei besagter Hohlraum unter Einfluss von Zentrifugalkraft mit einer Ablagerung besagten Teilchenmaterials gefüllt wird, wodurch eine Beschleunigungsfläche erzeugt wird, die aus einem autogenen Bett besagten Teilchenmaterials, umgeben von besagter weißer Roheisenlegierung, besteht.

41. Beschleunigungsvorrichtung gemäß Anspruch 1, wobei besagter Rotor sich in einem Brechwerk befindet und mit einem Antriebsmechanismus versehen ist, der mit einem Steuersystem zum Regeln der Rotationsgeschwindigkeit besagten Rotors und der Rotationsrichtung besagten Rotors versehen ist, welches Brechwerk mit einer Bandeinheit versehen ist, die das gebrochene Material von besagtem Brechwerk sammelt und besagtes gebrochenes Material zu einer Siebeinheit lenkt, die das Überkorn von besagtem gebrochenen Material abscheidet, welches Überkorn mit Hilfe eines Rückführbandes, das das Überkornmaterial von besagtem Sieb sammelt, zu besagtem Brechwerk zurückgeführt wird, welche Menge an Überkorn zu einem signifikanten Umfang ansteigt, wenn besagtes Beschleunigungselement abschleißt und folglich weniger funktionell wird, welches Rückführband mit einem Wägesystem versehen ist, das die Menge besagten Überkornmaterials misst und dieses Gewicht zu besagtem Regelsystem signalisiert.

42. Beschleunigungsvorrichtung gemäß Anspruch 41, wobei, mit Hilfe besagten Regelsystems und besagten Signals, die Rotationsrichtung besagten Rotors umgekehrt werden kann, wenn die zu besagtem Rotor zurückgeführte Menge an Überkorn ein bestimmtes Maximum überschreitet.

43. Beschleunigungsvorrichtung gemäß Anspruch 41, wobei, mit Hilfe besagten Regelsystems und besagten Signals, die Rotation besagten Rotors gestoppt werden kann, wenn die zu besagtem Rotor zurückgeführte Menge an Überkorn ein bestimmtes Maximum überschreitet.

Revendications

1. Dispositif d'accélération rotatif pour accélérer une matière particulaire à l'aide d'au moins un membre faisant office d'accélérateur composite structurel rotatif en au moins une phase, pour la comminution de ladite matière par choc, comprenant :

- un rotor (86) qui est à même de tourner autour d'un axe de rotation (2) (41) (89) dans au moins une direction de rotation, ledit rotor (86) étant muni d'au moins une ailette de rotor (90) qui est orientée essentiellement en direction transversale par rapport audit axe de rotation (2) (41) (89) ;
- un membre de dosage (91) pour doser ladite matière sur ledit rotor (86) ;
- au moins une unité d'accélération (245) qui est au moins constituée par un membre séparé faisant office d'accélérateur (1) (13) (39) (87) (88) pour accélérer ladite matière dosée en au moins une phase, ladite ailette de rotor (90) étant munie d'un membre de support (101) (102) pour supporter ledit membre faisant office d'accélérateur (1) (13) (39) (87) (88), ledit membre faisant office d'accélérateur (1) (13) (39) (87) (88) étant situé à une certaine distance dudit axe de rotation (2) (41) (89) et étant constitué par au moins un bloc d'accélération (3) (45) qui est réalisé à partir d'au moins une pièce en alliage de marcassite (14) (247) (248) (249), ladite pièce en alliage de marcassite (14) (247) (248) (249) étant muni d'au moins une surface d'accélération (4) (16) (46) (47) (98) (99) qui s'étend au moins en partie vers l'extérieur lorsqu'on regarde à partir dudit axe de rotation (2) (41) (89) et qui est orientée essentiellement perpendiculairement au plan de rotation (5) (44) (246), ladite pièce en alliage de marcassite (14) (247) (248) (249) pouvant être munie d'au moins une cavité (15) qui s'étend le long d'au moins une partie de ladite surface d'accélération (16) et qui peut être remplie avec une matière de charge dont la composition est différente de celle de ladite pièce en alliage de marcassite (14) (247) (248) (249), de telle sorte que ladite surface d'accélération (16) est constituée en partie par ladite matière de charge qui est entourée au moins en partie par ladite pièce en alliage de marcassite (14) (247) (248) (249), ladite pièce en alliage de marcassite (14) (247) (248) (249) dudit bloc d'accélération (3) (45) étant munie d'un membre de renforcement (7) (43), ledit membre de renforcement (7)

(43) étant muni d'un côté de fixation (8), la surface latérale transversale (6) (42) de ladite pièce en alliage de marcassite (14) (247) (248) (249) étant munie d'une surface de fixation (9), de telle sorte qu'au moins une partie dudit côté de fixation (8) et au moins une partie de ladite surface de fixation (9) sont jointes l'une à l'autre pour former un membre composite renforcé structurel faisant office d'accélérateur (1) (13) (39) (87) (88), ledit membre de renforcement (7) (43) étant constitué d'acier non allié ou faiblement allié qui, après le durcissement thermique dudit membre faisant office d'accélérateur (1) (13) (39) (87) (88), possède une résistance à la traction notablement supérieure à celle de ladite pièce en alliage de marcassite (14) (247) (248) (249), ledit membre de renforcement (7) (43) étant muni d'un arrangement de fixation (10) (50) (103) pour la fixation dudit membre faisant office d'accélérateur (1) (13) (39) (87) (88) audit membre de support (101) (102), de telle sorte que ledit membre faisant office d'accélérateur (1) (13) (39) (87) (88) peut être démonté à des fins de remplacement à cause de problèmes d'usure,

- **caractérisé en ce que** :

  - ledit côté de fixation est orienté essentiellement en direction transversale par rapport à ladite surface d'accélération et étant disposée à un endroit situé le long et à l'extérieur de la zone d'usure qui se forme lorsque ledit membre faisant office d'accélérateur s'use sous l'influence de l'usure générée au cours de l'accélération desdites particules par glissement et/ou par choc, de telle sorte que ledit arrangement de fixation n'est pas endommagé lorsque ledit membre faisant d'office d'accélérateur est victime d'une usure complète.

2. Dispositif d'accélération selon la revendication 1, dans lequel ladite surface latérale transversale est orientée essentiellement parallèlement audit plan de rotation.

3. Dispositif d'accélération selon revendication 1, dans lequel ladite surface latérale transversale est orientée en formant légèrement un angle par rapport audit plan de rotation.

4. Dispositif d'accélération selon la revendication 1, dans lequel ladite surface latérale transversale est orientée essentiellement en direction transversale par rapport audit plan de rotation et n'est pas orientée vers l'extérieur lorsqu'on regarde à partir dudit axe de rotation, et est munie dudit membre de renforcement.

5. Dispositif d'accélération selon la revendication 1, dans lequel ledit membre de renforcement est muni d'un côté de fixation qui décrit une surface essentiellement rectiligne, et ledit bloc d'accélération est muni d'une surface de fixation qui décrit une surface essentiellement rectiligne, de telle sorte qu'au moins une partie dudit côté de fixation dudit membre de renforcement et au moins une partie de ladite surface de fixation dudit bloc d'accélération sont jointes l'une à l'autre le long d'un plan de fixation essentiellement rectiligne pour former ledit membre composite structurel faisant office d'accélérateur, ledit bloc d'accélérateur étant disposé essentiellement d'un côté d'un plan de séparation rectiligne dans lequel est situé ledit plan de fixation, et ledit membre de renforcement est disposé essentiellement de l'autre côté dudit plan de séparation.

6. Dispositif d'accélération selon la revendication 1, dans lequel ladite unité d'accélération est munie d'au moins un premier membre faisant office d'accélérateur et d'un deuxième membre faisant office d'accélérateur qui est associé audit premier membre faisant office d'accélérateur, pour accélérer ladite matière en deux phases, ledit premier membre faisant office d'accélérateur étant muni d'au moins une première surface d'accélération pour accélérer ladite matière dosée dans une première phase à l'aide d'un guidage le long de ladite première surface d'accélération, de telle sorte que ladite matière guidée est amenée dans une voie en spirale orientée vers l'arrière, lorsqu'on regarde à partir d'un point de vue qui se déplace avec ledit premier membre faisant office d'accélérateur, ledit deuxième membre faisant office d'accélérateur étant muni d'au moins une deuxième surface d'accélération qui est orientée essentiellement transversalement par rapport à ladite voie en spirale pour accélérer ladite matière guidée dans une deuxième phase en étant heurtée par ladite deuxième surface d'accélération, les divers aspects étant tels que ladite première phase d'accélération a lieu à une distance radiale plus courte à l'écart dudit axe de rotation que ladite distance à laquelle a lieu ladite deuxième phase d'accélération qui se produit à une distance radiale notablement supérieure.

7. Dispositif d'accélération selon la revendication 1, dans lequel ladite unité d'accélération est munie d'au moins un membre de guidage et d'un membre d'accélération qui est associé audit membre de guidage, pour accélérer ladite matière en deux phases, ledit membre de guidage étant muni d'au moins une surface de guidage qui s'étend au moins en partie en direction dudit bord externe dudit rotor, pour accélérer ladite matière dosée dans une première phase à l'aide d'un guidage le long de ladite surface de guidage, de telle sorte que ladite matière guidée est amenée dans une voie en spirale orientée vers l'arrière lorsqu'on regarde à partir d'un point de vue qui se déplace avec ledit membre de guidage, la surface d'accélération dudit membre faisant office d'accélérateur étant orientée essentiellement transversalement par rapport à ladite voie en spirale pour accélérer ladite matière guidée dans une deuxième phase en étant heurtée par ladite surface d'accélération, les divers aspects étant tels que ladite première phase d'accélération a lieu à une distance radiale plus courte à l'écart dudit axe de rotation que ladite distance à laquelle a lieu ladite deuxième phase d'accélération qui se produit à une distance radiale notablement supérieure.

8. Dispositif d'accélération selon la revendication 1, dans lequel ladite unité d'accélération est munie d'au moins un membre faisant office d'accélérateur et d'un membre de collision qui est associé audit membre faisant office d'accélérateur, pour accélérer ladite matière en deux phases, ladite première phase de l'accélération ayant lieu à l'aide dudit membre faisant office d'accélérateur en guidant ladite matière dosée le long de ladite surface d'accélération, de telle sorte que ladite matière guidée est amenée dans une voie en spirale orientée vers l'arrière lorsqu'on regarde à partir d'un point de vue qui se déplace avec ledit membre faisant office d'accélérateur, la surface de collision dudit membre de collision, qui s'étend au moins en partie en direction dudit bord externe dudit rotor, étant orientée essentiellement transversalement par rapport à ladite voie en spirale pour accélérer ladite matière guidée dans une deuxième phase en étant heurtée par ladite surface de collision, les divers aspects étant tels que ladite première phase d'accélération a lieu à une distance radiale plus courte à l'écart dudit axe de rotation que ladite distance à laquelle a lieu ladite deuxième phase d'accélération qui se produit à une distance radiale notablement supérieure.

9. Dispositif d'accélération selon la revendication 1, dans lequel ladite unité d'accélération est munie d'un membre faisant office d'accélérateur pour accélérer ladite matière en une phase, ledit membre faisant office d'accélérateur comportant au moins une surface de glissement qui s'étend au moins en partie en direction dudit bord externe dudit rotor pour accélérer ladite matière dosée à l'aide d'un glissement le long de ladite surface de guidage.

10. Dispositif d'accélération selon la revendication 1, dans lequel ledit membre de support est disposé entre ledit membre faisant office d'accélérateur et ladite ailette de rotor.

11. Dispositif d'accélération selon la revendication 1, dans lequel ledit membre de support s'étend au moins en partie dans ladite ailette de rotor.

12. Dispositif d'accélération selon la revendication 1, dans lequel ledit membre de support s'étend au moins entre deux ailettes de rotor parallèles.

13. Dispositif d'accélération selon la revendication 1, dans lequel ledit rotor tourne autour d'un axe de rotation orienté essentiellement à la verticale et ladite ailette de rotor est orientée vers le haut.

14. Dispositif d'accélération selon la revendication 1, dans lequel ledit rotor tourne autour d'un axe de rotation orienté essentiellement à la verticale et ladite ailette de rotor est orientée vers le bas.

15. Dispositif d'accélération selon la revendication 1, dans lequel ledit membre faisant office d'accélérateur n'est pas fixé en immobilité audit membre de support.

16. Dispositif d'accélération selon la revendication 15, dans lequel ledit membre faisant office d'accélérateur est fixé en pivotement audit membre de support.

17. Dispositif d'accélération selon la revendication 15, dans lequel ledit membre faisant office d'accélérateur est muni d'une surface d'accélération du type à rotation automatique.

18. Dispositif d'accélération selon la revendication 17, dans lequel ledit bloc d'accélération décrit essentiellement un solide de révolution dont l'axe de révolution est essentiellement parallèle audit axe de rotation, et dont la surface de révolution est munie de ladite surface d'accélération.

19. Dispositif d'accélération selon l'une quelconque des revendications 1 et 16, dans lequel ladite unité d'accélération est munie d'un membre faisant office d'accélérateur dont au moins la surface d'accélération fait saillie au moins en partie par rapport au bord de ladite ailette de rotor.

20. Dispositif d'accélération selon l'une quelconque des revendications 6 et 7, dans lequel ledit bloc d'accélération dudit deuxième membre faisant office d'accélérateur s'étend à partir de ladite surface d'accélération au moins le long d'un prolongement de ladite voie en spirale.

21. Dispositif d'accélération selon la revendication 1, dans lequel ledit rotor tourne dans deux directions, à savoir une direction vers l'avant et une direction vers l'arrière.

22. Dispositif d'accélération selon la revendication 21, dans lequel ledit membre faisant office d'accélérateur est muni de deux blocs d'accélération séparés essentiellement identiques, chacun étant muni d'une surface d'accélération, qui sont orientés essentiellement dans des directions opposées, c'est-à-dire dans ladite direction vers l'avant et dans ladite direction vers l'arrière, de telle sorte que ledit membre faisant office d'accélérateur présente une symétrie spéculaire par rapport à un plan de symétrie s'étendant à partir dudit axe de rotation, qui coupe ledit membre faisant office d'accélérateur, à mi-distance entre lesdites surfaces d'accélération.

23. Dispositif d'accélération selon la revendication 21, dans lequel ledit membre faisant office d'accélérateur est muni d'un bloc d'accélération qui est muni de deux surfaces d'accélération qui sont orientées essentiellement dans des directions opposées, c'est-à-dire dans ladite direction vers l'avant et dans ladite direction vers l'arrière, de telle sorte que ledit membre faisant office d'accélérateur présente une symétrie spéculaire par rapport à un plan de symétrie s'étendant à partir dudit axe de rotation, qui coupe ledit membre faisant office d'accélérateur, à mi-distance entre lesdites surfaces d'accélération.

24. Dispositif d'accélération selon l'une quelconque des revendications 22 et 23, dans lequel ledit membre faisant office d'accélérateur, du type à symétrie spéculaire, décrit essentiellement une configuration en V, dont la pointe n'est pas orientée en direction dudit axe de rotation.

25. Dispositif d'accélération selon l'une quelconque des revendications 22 et 23, dans lequel ledit membre faisant office d'accélérateur, du type à symétrie spéculaire, décrit essentiellement une configuration en V, dont la pointe est orientée en direction dudit axe de rotation.

26. Dispositif d'accélération selon la revendication 1, dans lequel ledit membre de renforcement possède une configuration différente d'une configuration plate.

27. Dispositif d'accélération selon la revendication 1, dans lequel ledit arrangement de fixation présente la configuration d'un membre en forme de crochet, qui est construit de telle sorte que ledit membre faisant office d'accélérateur vient s'ancrer fermement contre ledit membre de support sous l'influence de la force centrifuge pour obtenir un verrouillage centrifuge.

28. Dispositif d'accélération selon la revendication 1, dans lequel ledit arrangement de fixation présente la configuration d'un membre en forme de queue d'aronde, qui est construit de telle sorte que ledit membre faisant office d'accélérateur vient s'ancrer fermement contre ledit membre de support sous l'influence de la force centrifuge pour obtenir un verrouillage centrifuge.

29. Dispositif d'accélération selon la revendication 1, dans lequel ledit arrangement de fixation est muni d'un élément séparé.

30. Dispositif d'accélération selon la revendication 29, dans lequel ledit élément séparé est constitué par au moins un membre faisant office de boulon.

31. Dispositif d'accélération selon la revendication 29, dans lequel ledit élément séparé possède essentiellement la configuration d'un membre de serrage.

32. Dispositif d'accélération selon la revendication 27, dans lequel ledit arrangement de fixation est muni d'un talon faisant saillie qui s'étend vers l'extérieur par rapport au côté inférieur dudit membre de renforcement pour pénétrer dans un trou de support pratiqué dans ladite ailette de rotor qui fait office de membre de support.

33. Dispositif d'accélération selon revendication 32, dans lequel ledit talon faisant saillie forme un angle orienté légèrement (2 à 4 degrés) vers l'arrière par rapport à l'axe de rotation.

34. Dispositif d'accélération selon la revendication 1, dans lequel, après le durcissement thermique dudit membre faisant office d'accélérateur, la dureté dudit alliage de marcassite est supérieure à Rc55.

35. Dispositif d'accélération selon la revendication 1, dans lequel ladite matière de charge est constituée au moins en partie de métal dur.

36. Dispositif selon la revendication 35, dans lequel, par métal dur on entend un alliage d'au moins un constituant dur, résistant à l'usure sous la forme de carbure de tungstène ou de carbure de titane et d'au moins un constituant de métal mou sous la forme de cobalt, de fer ou de nickel.

37. Dispositif d'accélération selon la revendication 1, dans lequel ladite matière de charge est constituée au moins en partie d'une matière céramique.

38. Dispositif selon la revendication 37, dans lequel par matière céramique on entend une matière qui est constituée au moins en partie d'oxyde d'aluminium (Al_2O_3).

39. Dispositif selon la revendication 37, dans lequel par matière céramique on entend une matière qui est constituée au moins en partie d'oxyde de silicium (SiO_2).

40. Dispositif d'accélération selon la revendication 1, dans lequel ladite cavité est remplie avec un dépôt de ladite matière particulaire sous l'influence de la force centrifuge, en générant une surface d'accélération qui est constituée par un lit autogène de ladite matière particulaire entouré par ledit alliage de marcassite.

41. Dispositif d'accélération selon la revendication 1, dans lequel ledit rotor est disposé dans un dispositif d'écrasement et est muni d'un mécanisme d'entraînement qui est équipé d'un système de commande pour commander la vitesse de rotation dudit rotor et la direction de rotation dudit rotor, ledit dispositif d'écrasement étant muni d'une unité en forme de courroie qui récolte la matière broyée et qui dirige ladite matière broyée en direction d'une unité de tamisage qui sépare le refus de ladite matière broyée, ledit refus étant renvoyé audit dispositif d'écrasement à l'aide d'une unité sous la forme d'une courroie de recirculation qui récolte la matière de refus émanant dudit tamis, la quantité dudit refus augmentant à un degré significatif lorsque ledit membre faisant office d'accélérateur subit une usure complète et par conséquent devient moins fonctionnel, ladite courroie de recirculation étant munie d'un système de pesée qui mesure la quantité de ladite matière de refus et qui signale ce poids en retour audit système de commande.

42. Dispositif d'accélération selon la revendication 41, dans lequel, à l'aide dudit système de commande et dudit signal, la direction de rotation dudit rotor peut être inversée lorsque la quantité de refus qui est renvoyé audit rotor dépasse une certaine valeur maximale.

43. Dispositif d'accélération selon la revendication 41, dans lequel, à l'aide dudit système de commande et dudit signal, la rotation dudit rotor peut être arrêtée lorsque la quantité de refus qui est renvoyé audit rotor dépasse une certaine valeur maximale.

Fig. 1

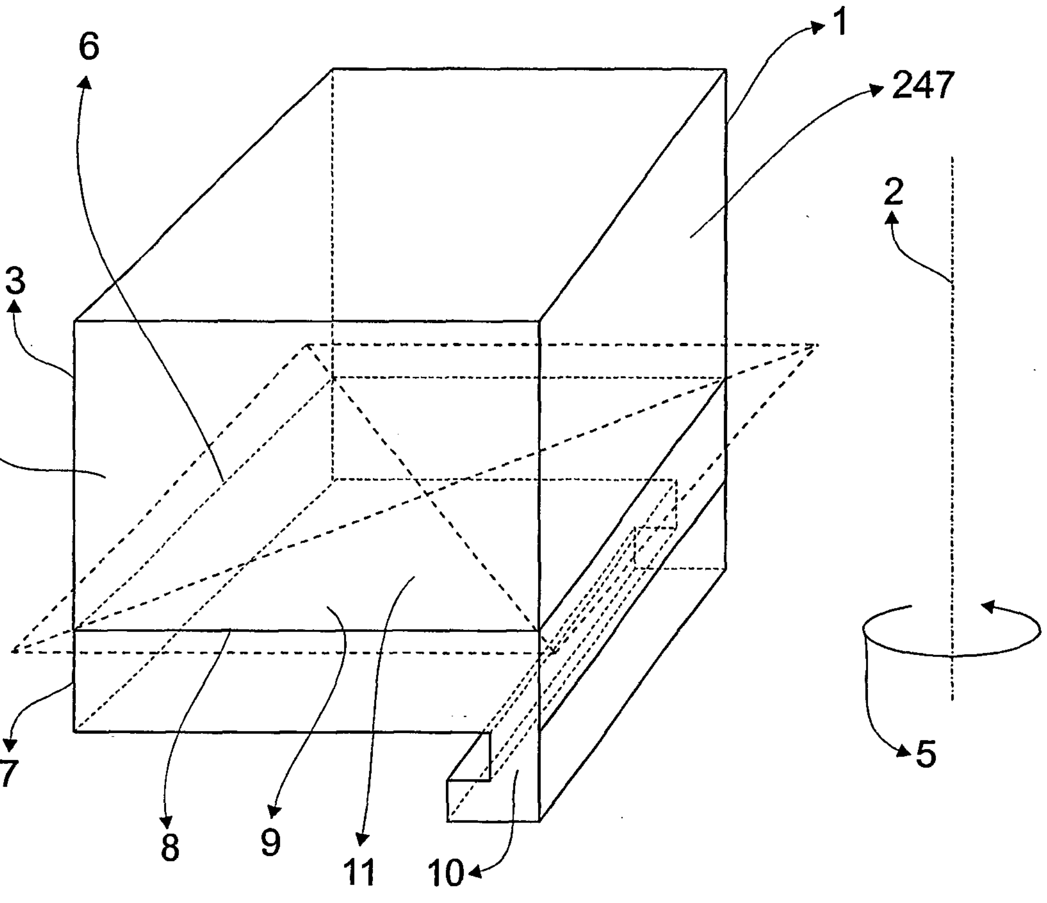


Fig. 2

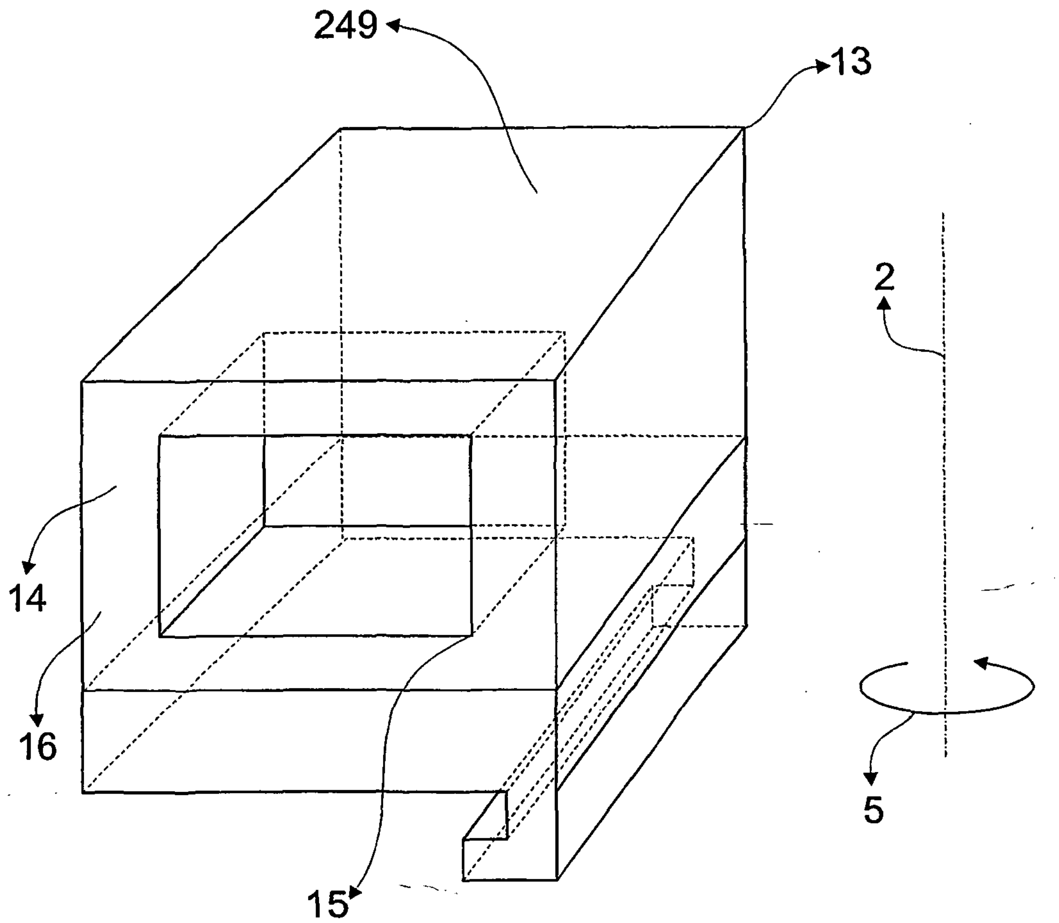


Fig. 3

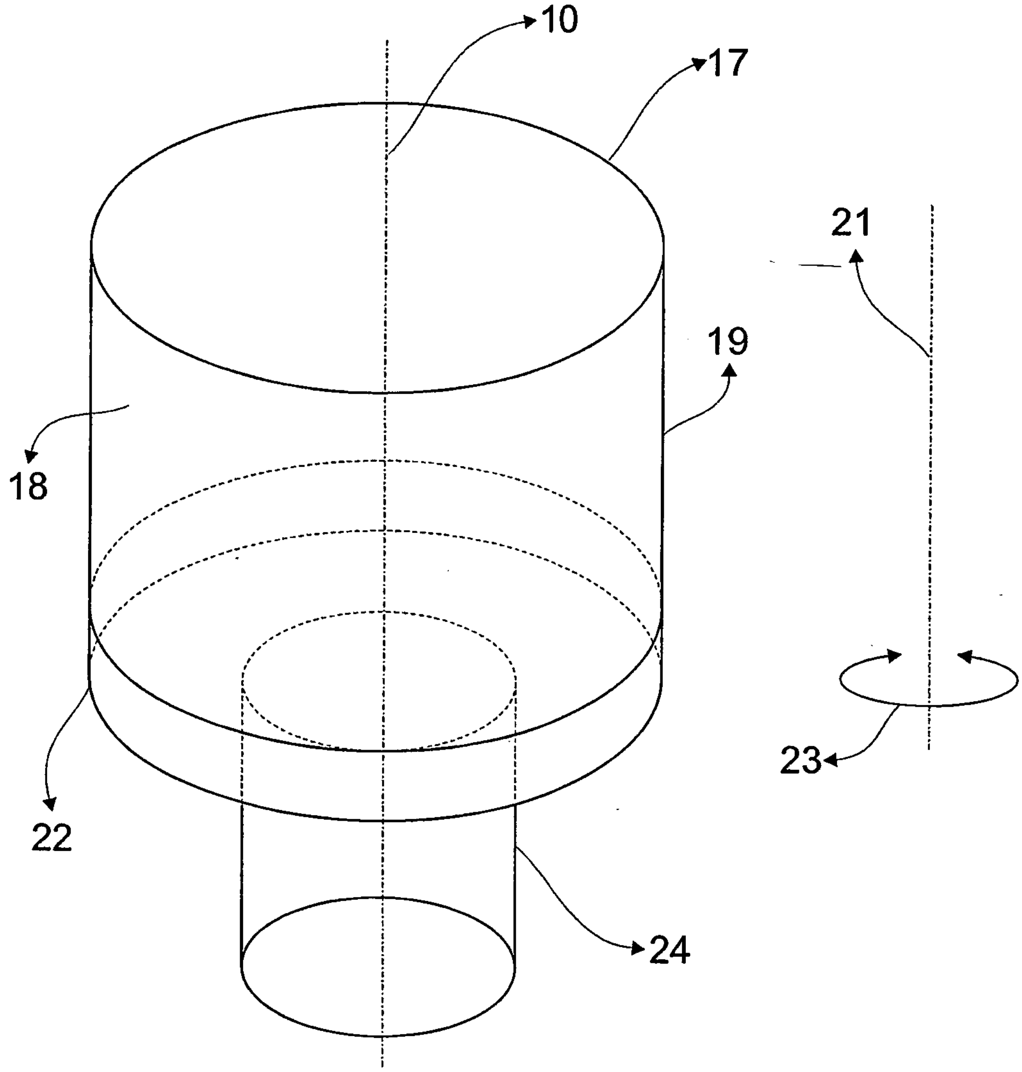


Fig. 4

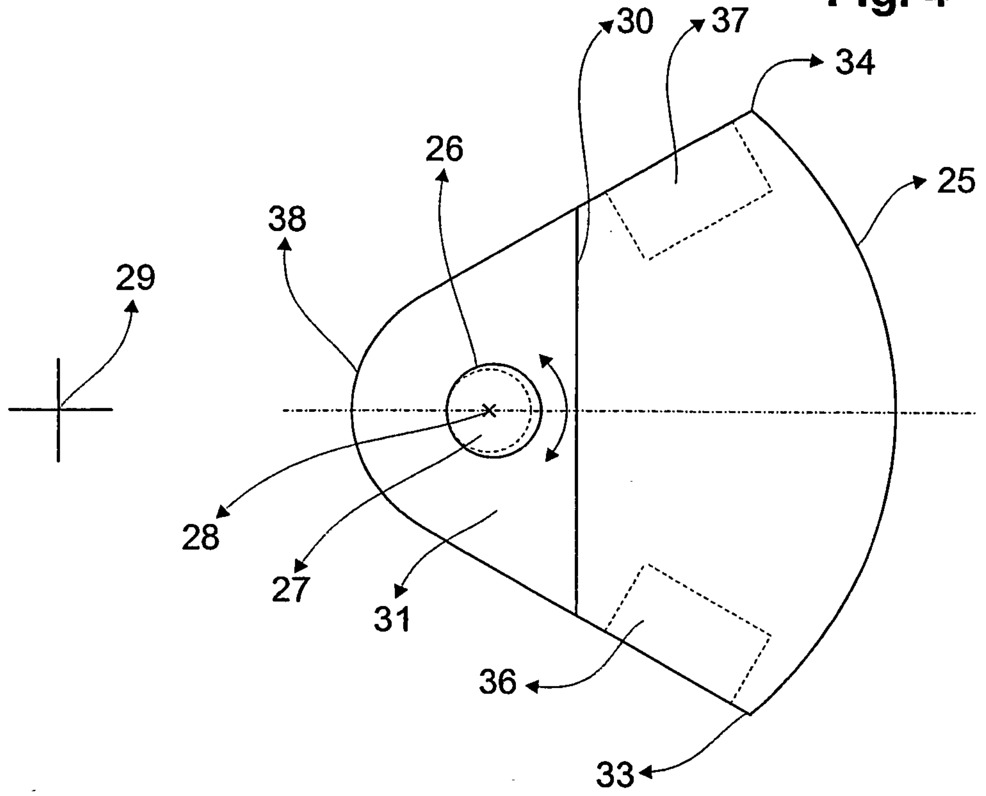


Fig. 5

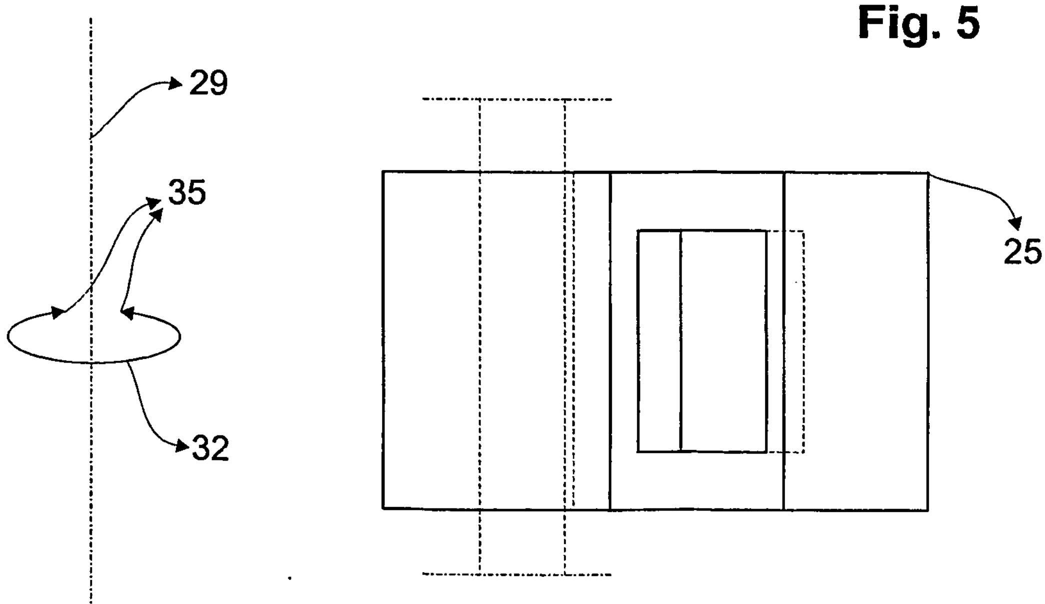
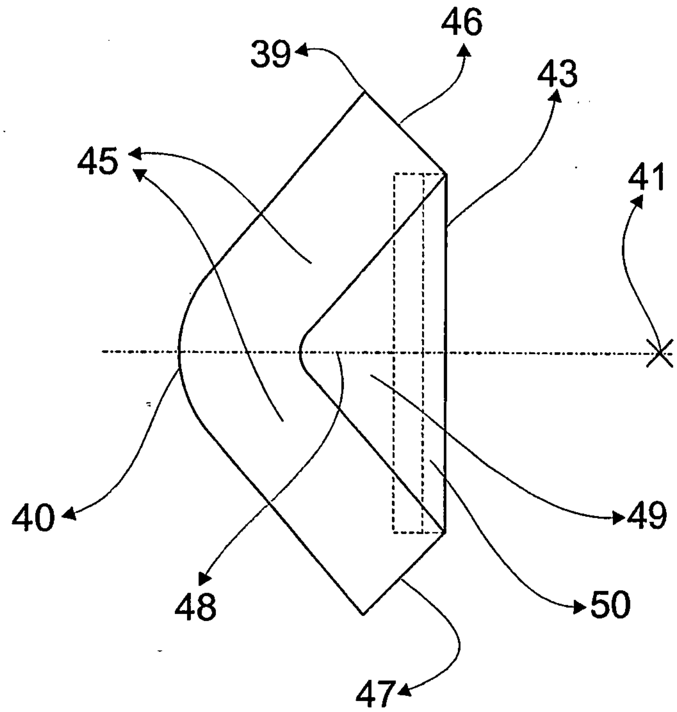


Fig. 6



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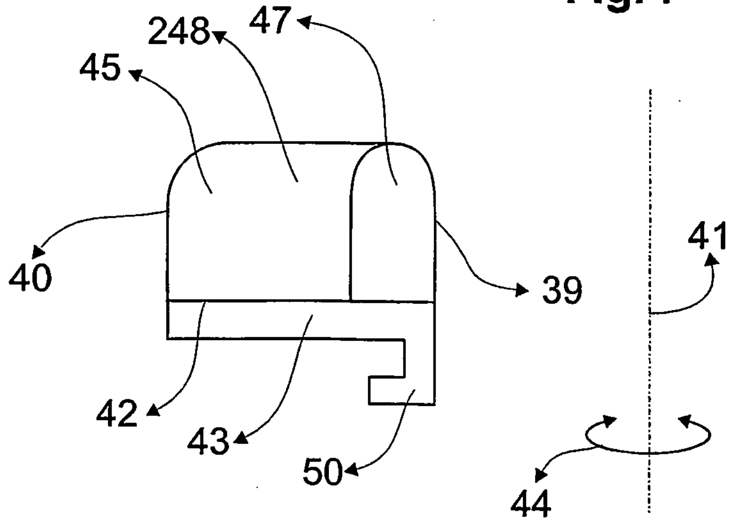
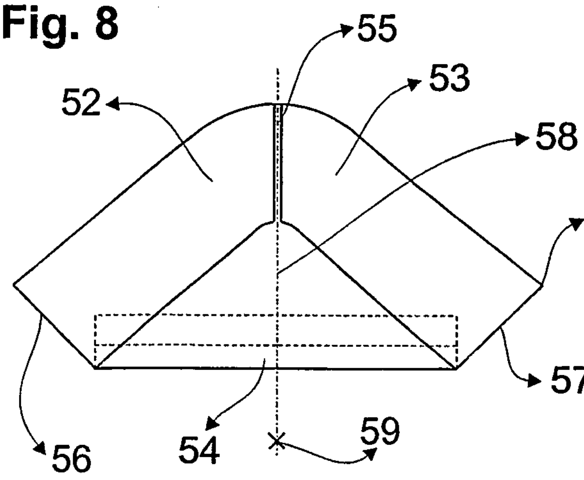


Fig. 8



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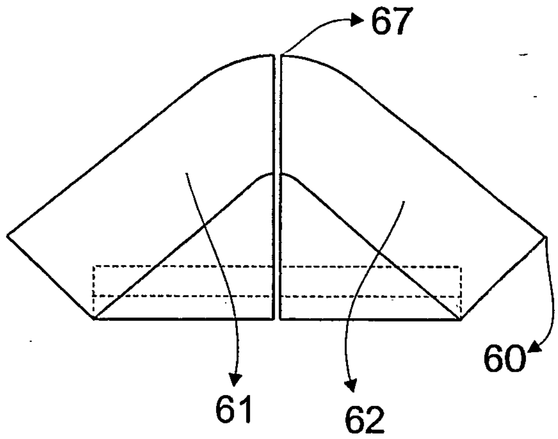


Fig. 10

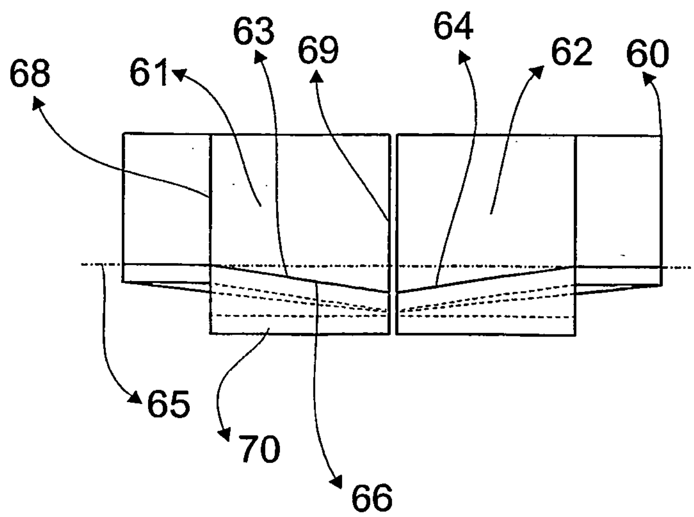
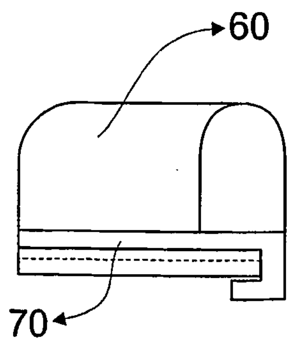


Fig. 11



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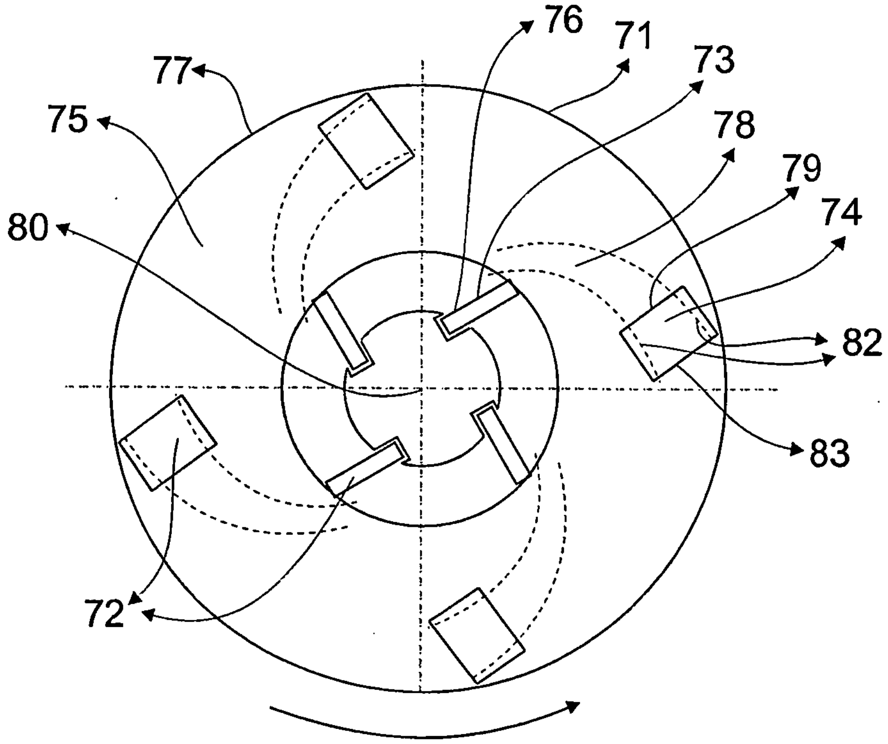
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Fig. 13

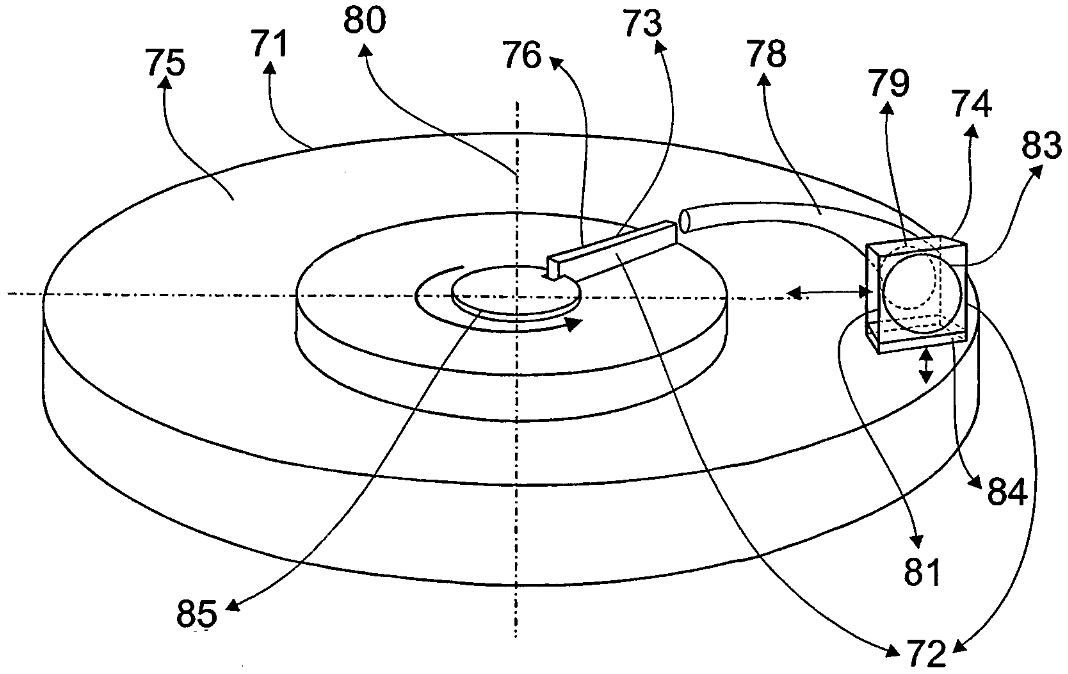
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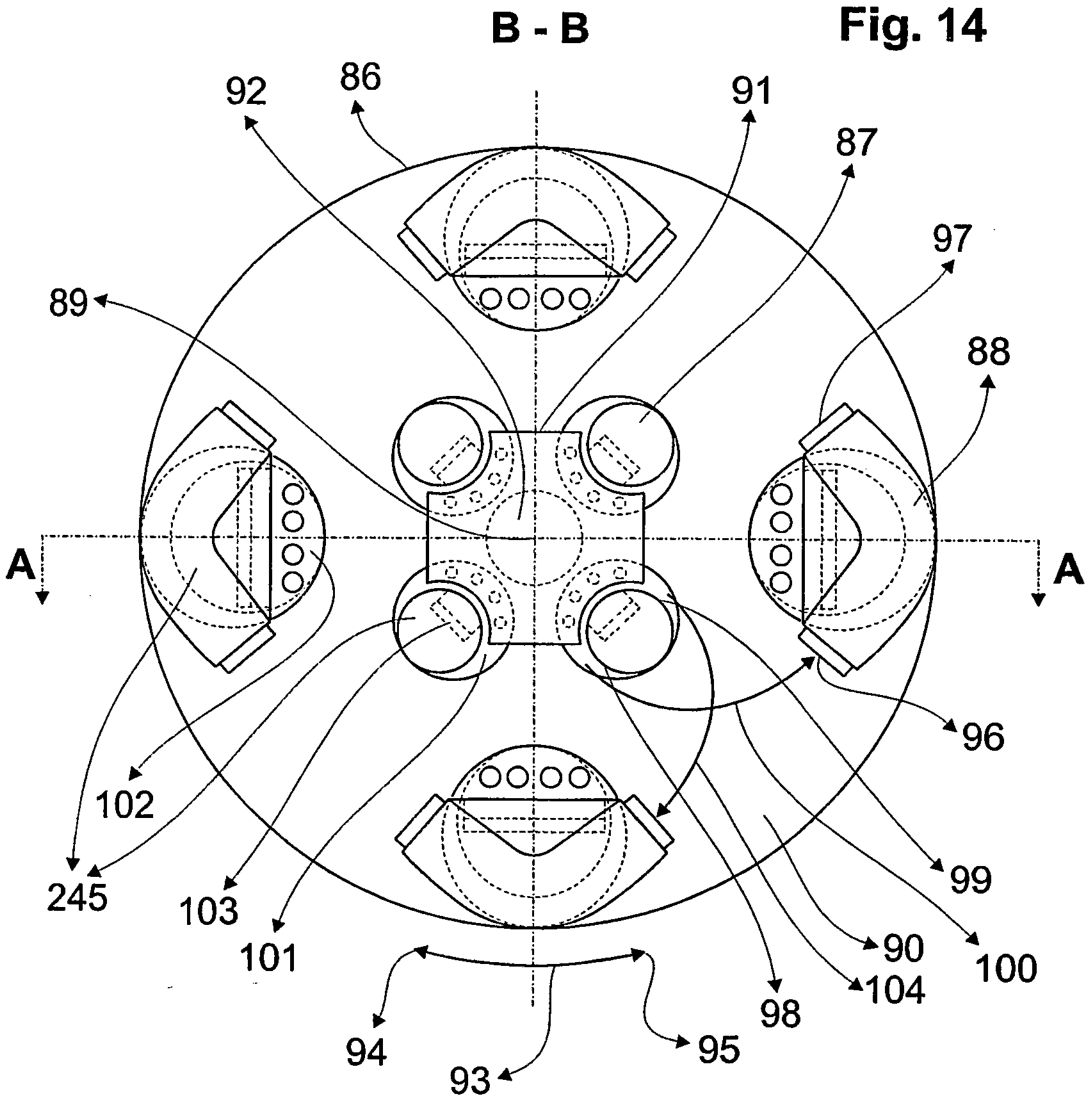
Fig. 14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86
91
87
97
89
88
A
A
102
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103
101
96
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90
100
104
98
94
93
95

Fig. 15

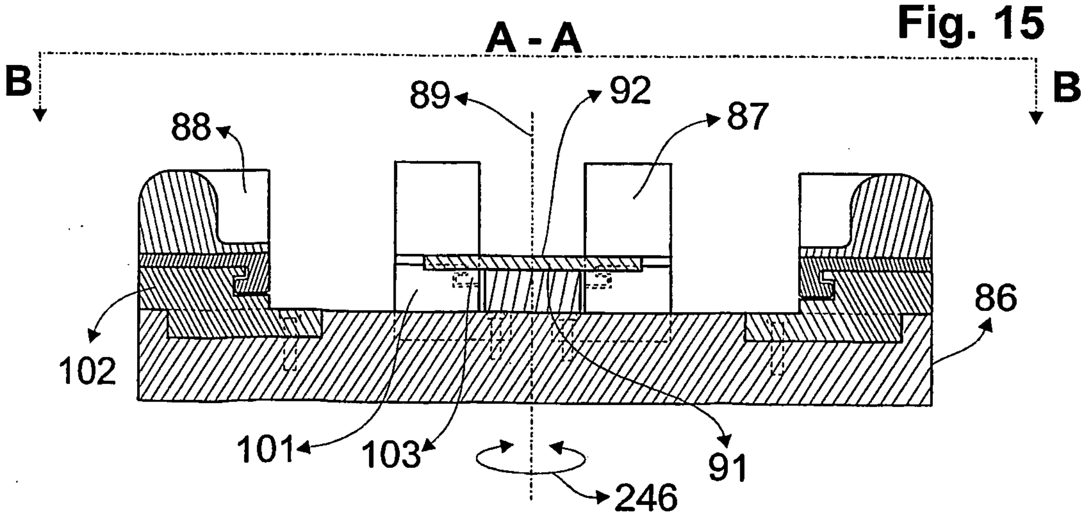
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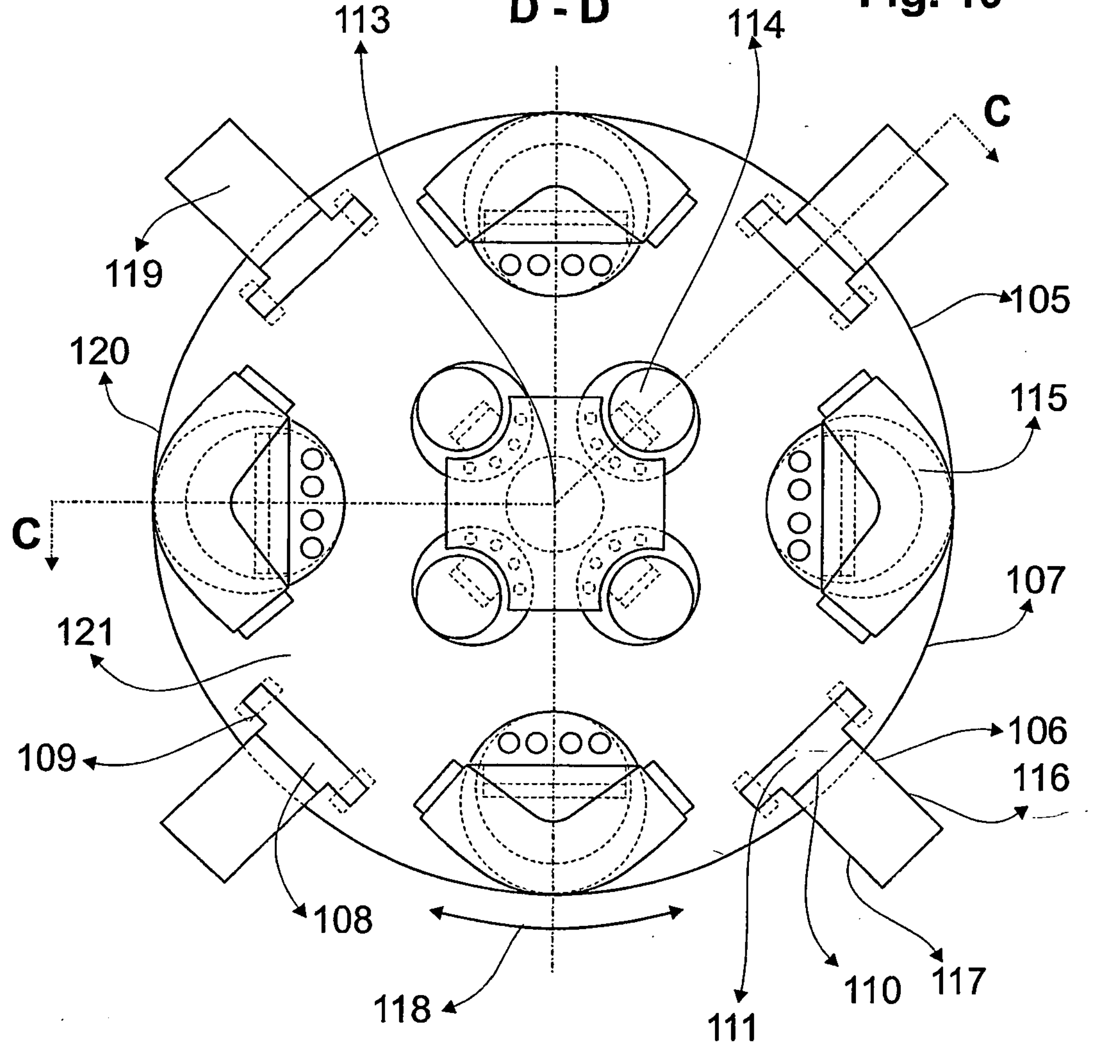
Fig. 16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114
C
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115
C
107
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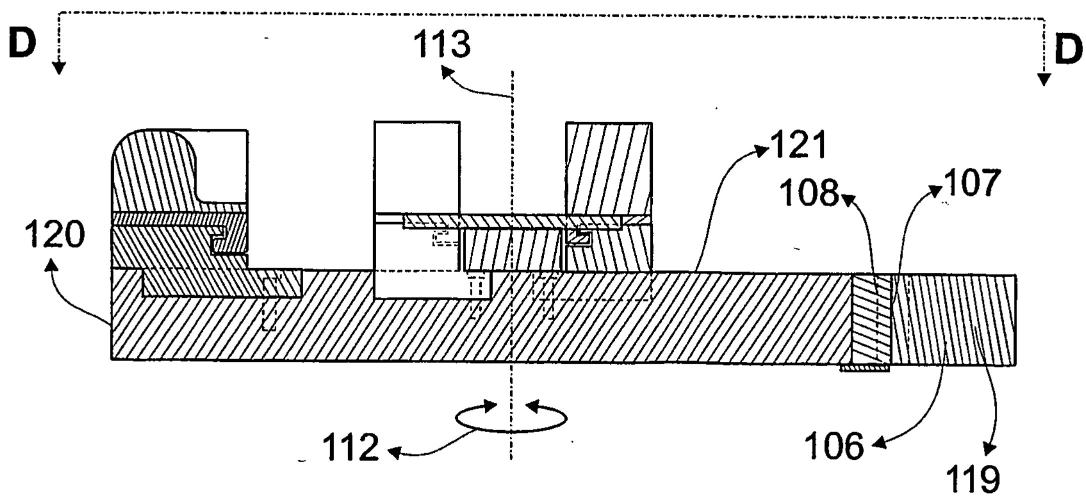
Fig. 17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D
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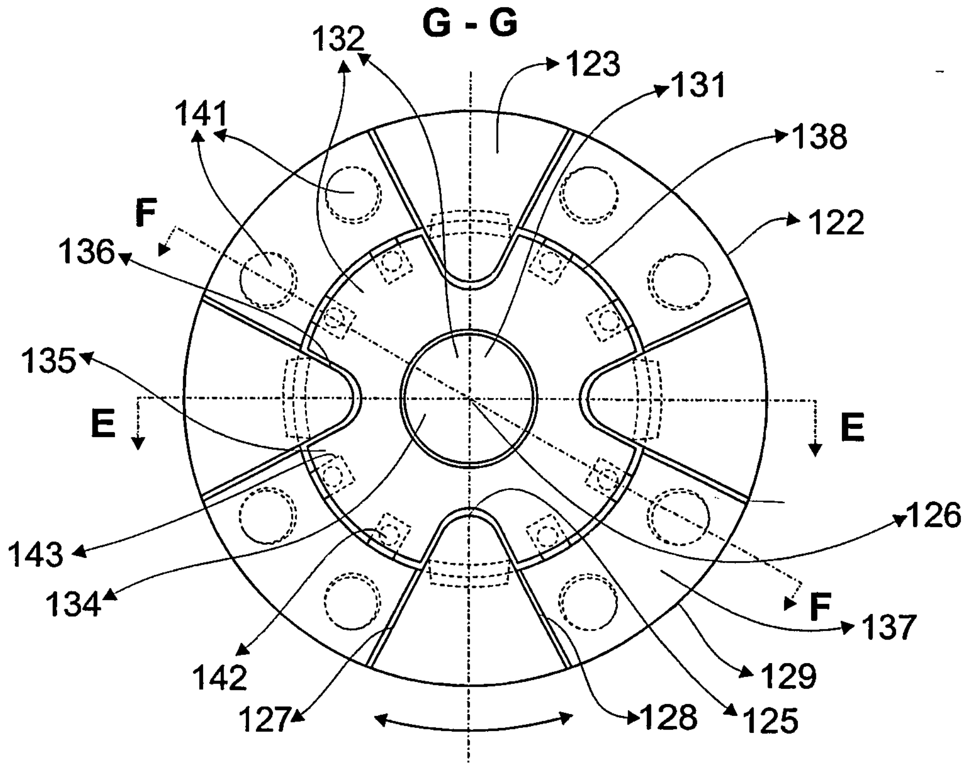
Fig. 18



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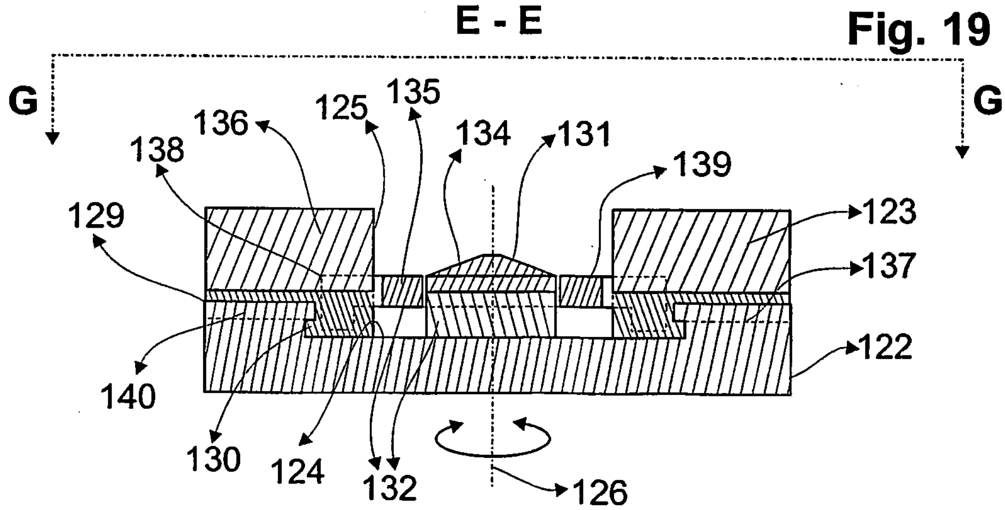
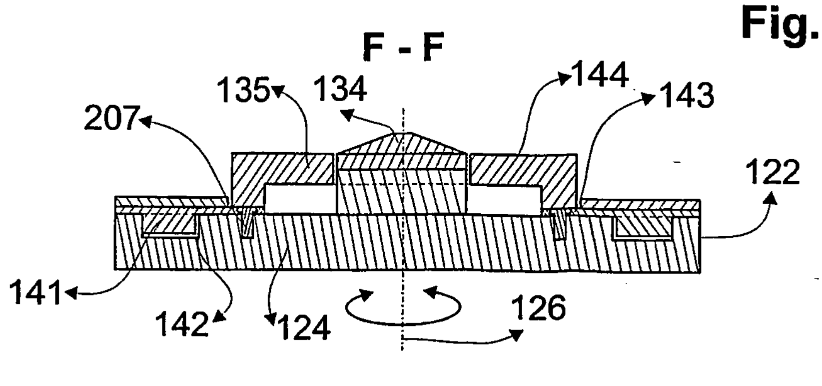


Fig. 20



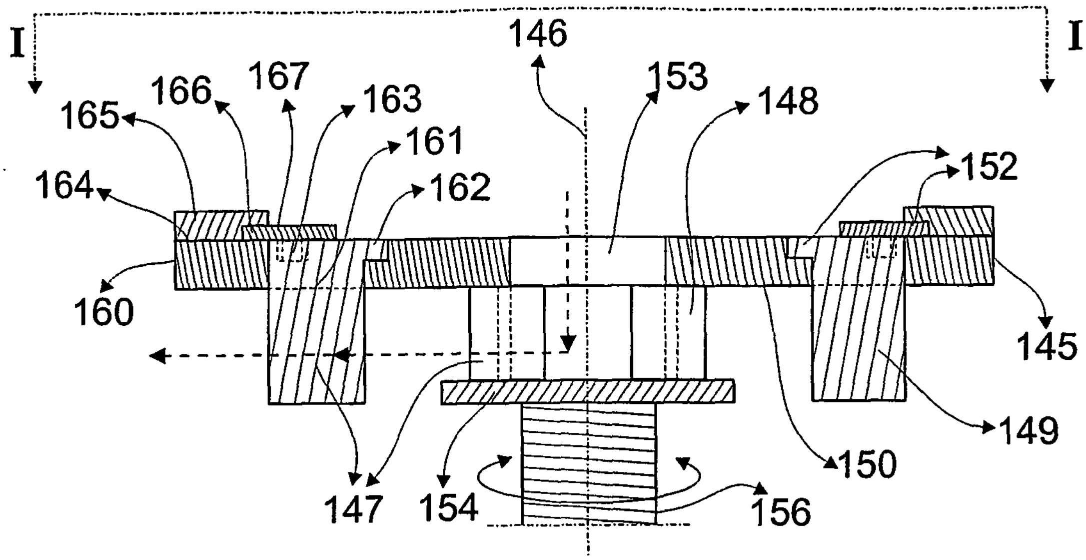

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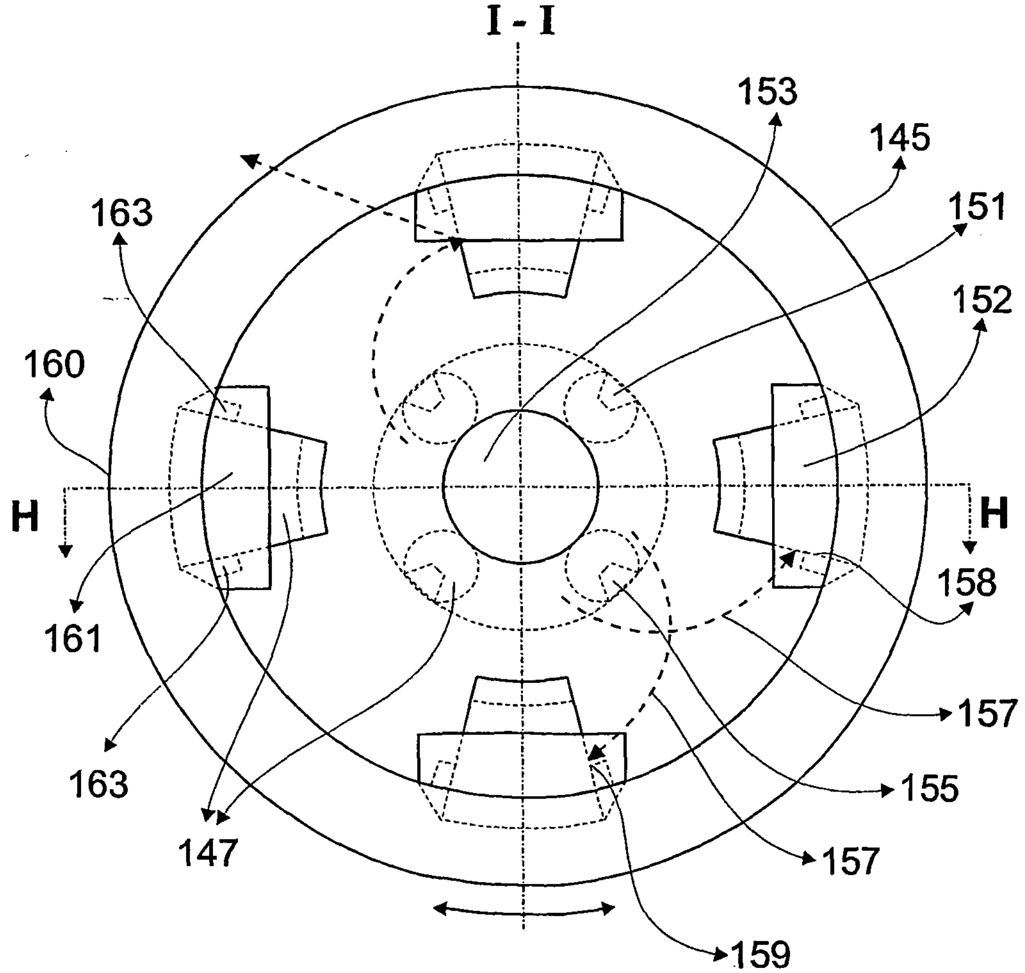
Fig. 21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H
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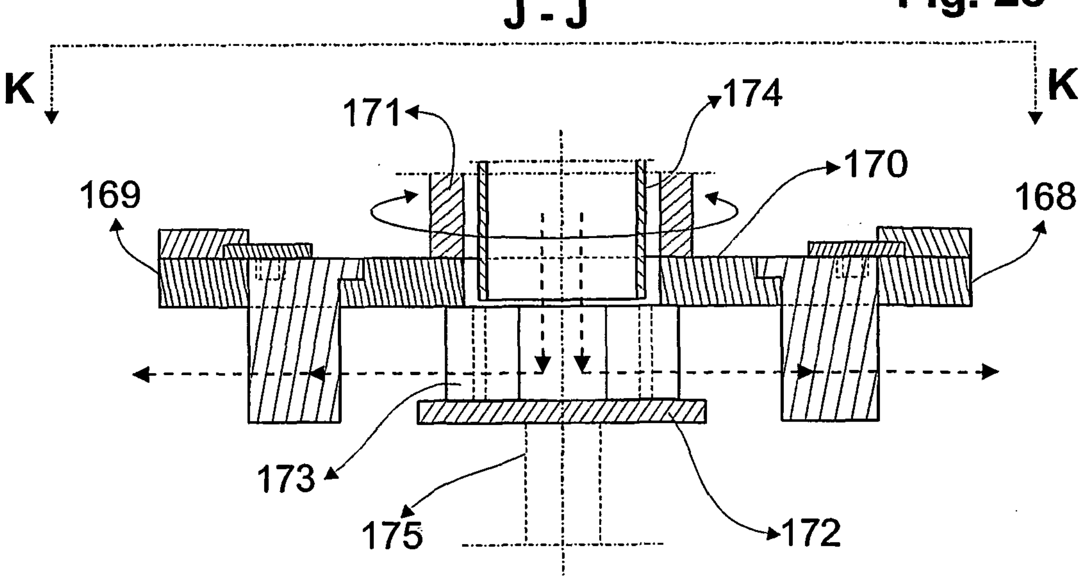
Fig. 22

Fig. 23



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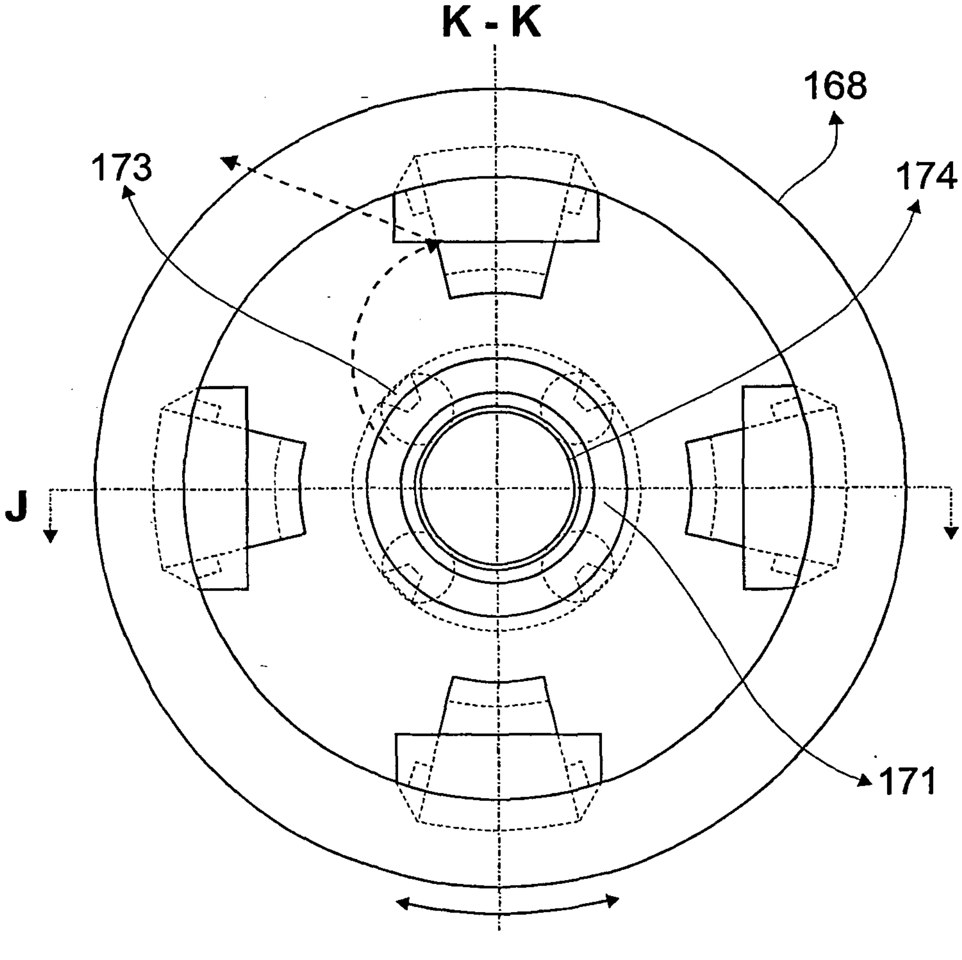

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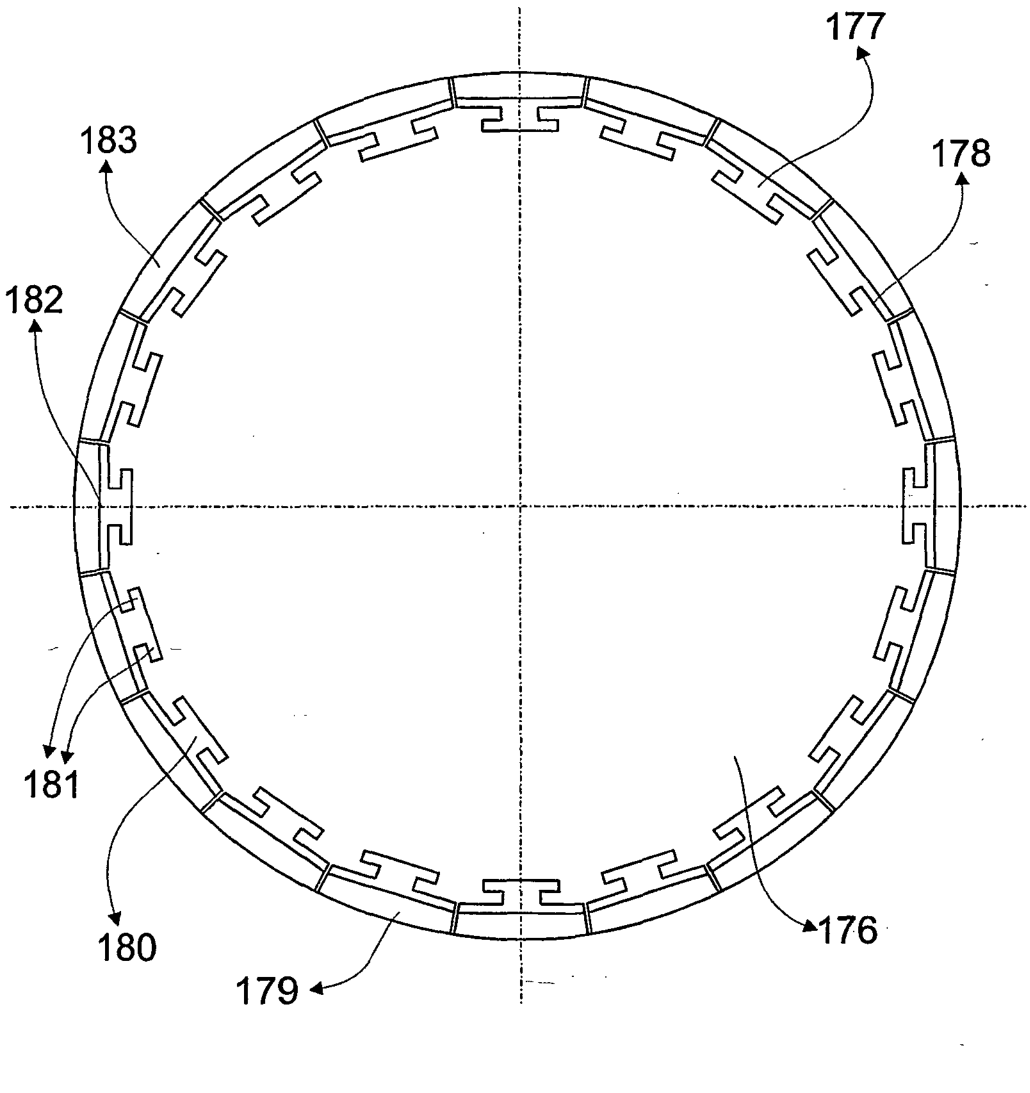

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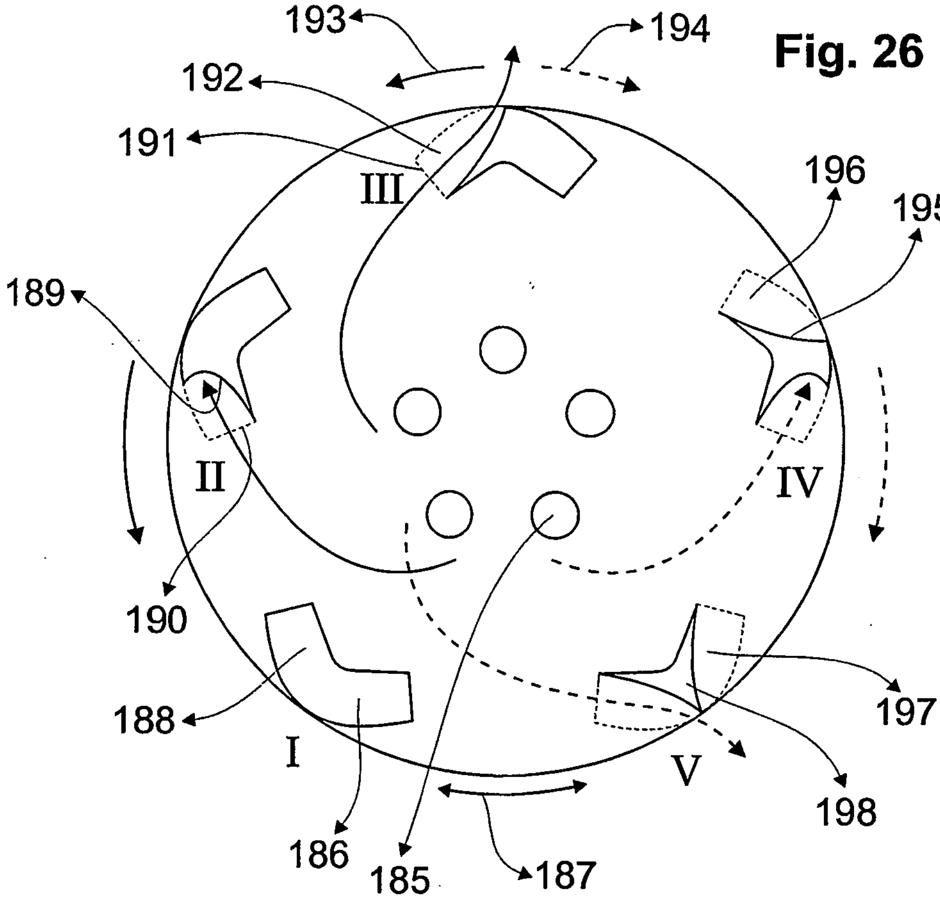
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Fig. 27

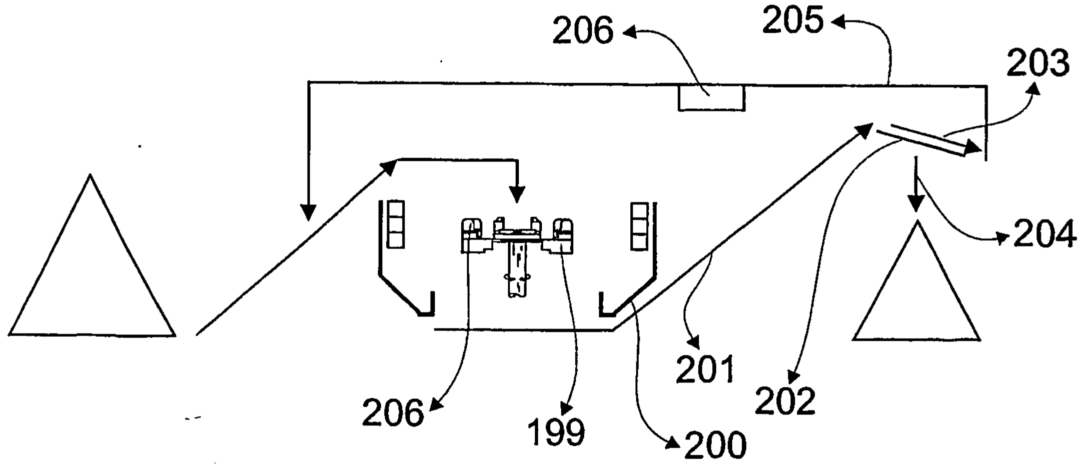
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Fig. 28

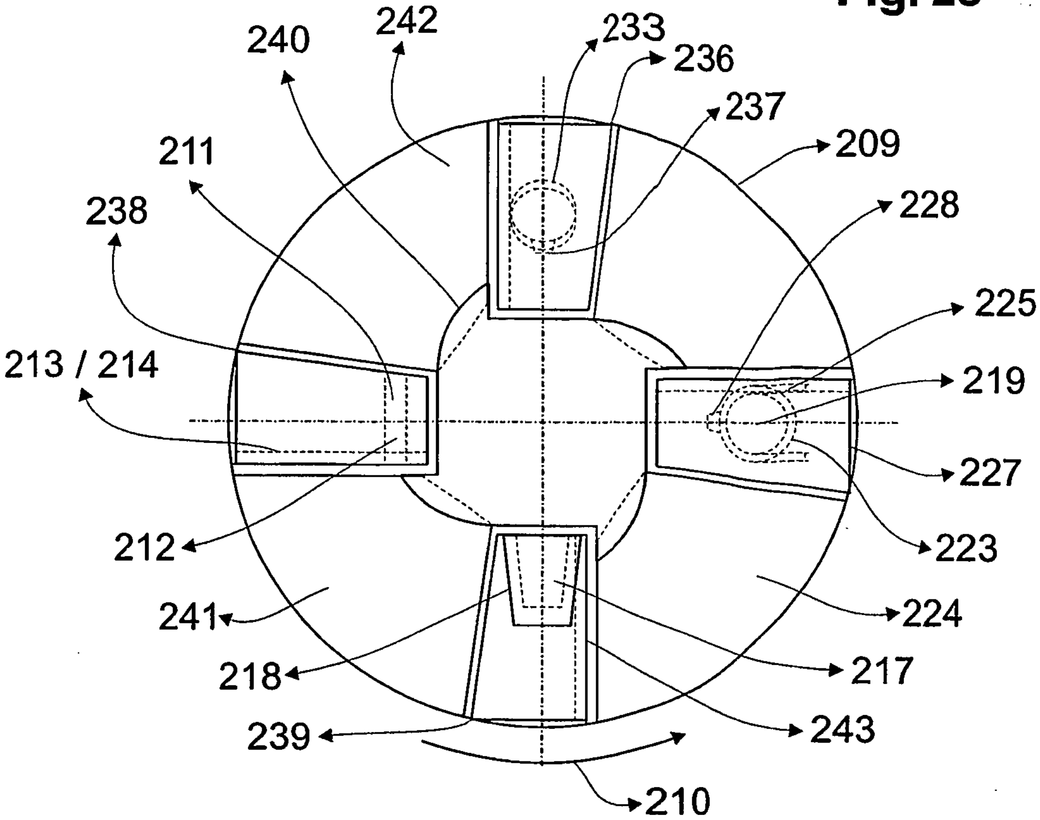
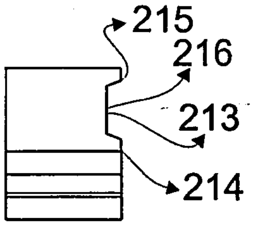


Fig. 33



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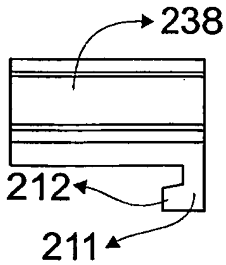

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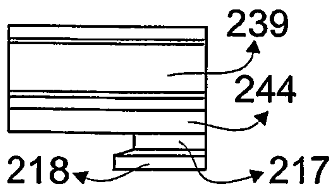

Fig. 31

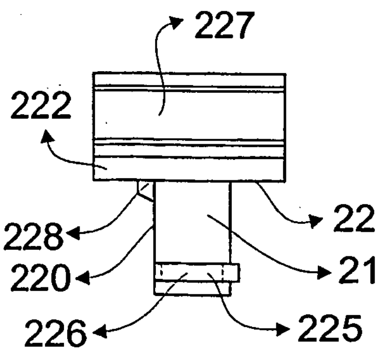

Fig. 32