Australia

Patents Act 1952-1973

APPLICATION ACCEPTED AND AMENDMENTS ALLOWED 24-11-89

Convention Application for a Patent

We, SBM WAGENEDER Gesellschaft m.b.H.,

of Matzingthalstrasse 21, A-4662 Laakirchen, Austria

hereby apply for the grant of a Patent

for an invention entitled "IMPACT MILL"

which is described in the accompanying complete specification.

LODGED AT SUB-OFFICE 30 OCT 1987 Melbourne

PATENT OFFICE $100 FORTY DOLLARS

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PER STAMP TO VALUE OF $140 ATTACHED MAIL OFFICER

This application is a Convention application and is based on the application numbered A 2882/86 for a patent or similar protection made in Austria on 30th October, 1986.

Our address for service is: CALLINAN AND ASSOCIATES Patent Attorneys, of 48-50 Bridge Road, Richmond, State of Victoria, Australia.

Dated this 30th day of October, 1987.

SBM WAGENEDER Gesellschaft m.b.H.

By its Patent Attorneys:

CALLINANS

Form 6
Form 7

COMMONWEALTH OF AUSTRALIA
Patents Act 1952

Declaration in Support of (a) A Convention Application (b) ~~An Application~~ for a Patent ~~or Patent of Addition~~

In support of the ~~Application~~/Convention Application made by

(c) SBM WAGENEDER Gesellschaft m.b.H.

for a patent/~~patent of addition~~ for an invention entitled:

(d) IMPACT MILL

I/~~We~~ (e) Josef Viechtbauer

of (f) Matzingthalstrasse 21, A-4662 Laakirchen, Austria

do solemnly and sincerely declare as follows:—

1. (g) ~~I am/we are the applicant(s) for the patent/patent of addition~~

(h) I am/~~we are~~ authorised by SBM WAGENEDER Gesellschaft m.b.H.

the applicant for the patent/~~patent of addition~~ to make this declaration on its behalf.

2. (i) The basic application(s) as defined by Section 141 of the Act was/~~were~~ made in Austria on the 30th day of October 1986 by SBM WAGENEDER Gesellschaft m.b.H.

3. (j) ~~I am/we are the actual inventor(s) of the invention~~

~~or~~

(k) ~~I am/we are the actual inventor(s) of the invention referred to in the basic application.~~

~~or~~

" "
Gunter Muller
Miller v.Aichholzstrasse 26a
A-4810 Gmunden, Austria

(l)

~~of~~

is/~~are~~ the actual inventor(s) of the invention and the facts upon which ~~I am/we are~~ the applicant is entitled to make the application as follows:

(m) The applicant is a person who would, if a patent were granted upon an application made by the said actual inventor, be entitled to have the patent assigned to it.

4. The basic application(s) referred to in paragraph 2 of this Declaration was/~~were~~ the first application(s) made in a Convention country in respect of the invention the subject of the application.

(n) Declared at Laakirchen this 18th day of September 1987.

SIGN X .....

HERE .....

To The Commissioner of Patents

(a) Delete for Non-Convention Application.
(b) Delete for Convention Application.
(c) Insert Full Name of Applicant.
(d) Insert Title of Invention.
(e) Insert Full Names of Declarant(s).
(f) Insert Address(es) of Declarant(s).
(g) Delete when Applicant is a Company.
(h) Delete when Applicant is an Individual. Fill in Name of Applicant, if a Company.
(i) For Non-Convention Applications delete. For Convention Application, fill in details of basic application.
(j) Delete for Non-Convention Application by Assignee of Inventor and for Convention Application.
(k) Delete for Non-Convention Application by Inventor and for Convention Application by Assignee.
(l) Delete for Application by Inventor. For Application by Assignee, insert name, address and occupation of Inventor.
(m) Insert details of Assignment, etc. Date of Assignment only is insufficient.
(s) Delete for Non-Convention Application.
(n) Insert place and date of signature.

(12) PATENT ABRIDGMENT (11) Document No. AU-B-80527/87
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 593401

(54) Title
IMPACT MILL WITH VERTICAL ROTOR

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(71) Applicant(s)
SBM WAGENEDER GESELLSCHAFT M.B.H.

(72) Inventor(s)
GUNTER MULLER

(74) Attorney or Agent
CALLINAN LAWRIE

(56) Prior Art Documents
EP 187252
AU 35358/84 B02C 13/18, 13/28, 19/11
AU 33401/78 B02C 13/06, 13/09, 13/18, 13/28

(57) Claim

1. An impact mill for crushing stone or the like including a substantially annular housing, and including: a rotor with an axial intake opening, said rotor being arranged on a vertical driveshaft forming an annular gap relative to the housing and having a bottom plate with a central impact plate member, a cover plate with a central aperture and blades forming ejection openings between the bottom and cover plates, the sides of said blades which face towards the axis of the rotor each being provided with a pocket for receiving crushed material, the ejection side of the pocket being provided with a replaceable wearing portion which is formed by a carrier body reinforced by a hard metal bar, said hard metal bar forming an edge reinforcement of the ejection side and comprising a wearing surface which is outwardly set back from a contact plane of the marginal edges of the material-receiving pocket, an outer edge which projects beyond the periphery of the rotor, and a pocket-side surface which forms one of the inside surfaces of said material-receiving pocket, wherein the pocket-side surface is disposed substantially

perpendicularly to said contact plane of the marginal edges of said material-receiving pocket and said set-back wearing surface of said hard metal bar extends in an arcuately convex configuration.

9. A replaceable wearing portion to be mounted at a peripheral ejection opening of a rotor of an impact mill for crushing stone or the like, said rotor being arranged on a vertical driveshaft and having a bottom plate with a central impact plate member, a cover plate with a central intake aperture and ejection blades defining the ejection openings between the bottom and cover plates, which replaceable wearing portion includes a carrier body reinforced by a hard metal bar which has an ejection edge, a set back outer edge and a wearing surface connecting the ejection edge and the outer edge, wherein the replaceable wearing portion is of a substantially L-shaped configuration, and wherein the longer limb of the L-shaped wearing portion is formed by the carrier body which is substantially plate-shaped, and the shorter limp is formed by the hard metal bar, the wearing surface being convexly arcuately curved.

Australia

Form 10

PATENTS ACT 1952

COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE

Short Title:

Int. Cl:

593401

Application Number:
Lodged:

This document contains the amendments made under Section 49 and is correct for printing.

Complete Specification—Lodged:
Accepted:
Lapsed:
Published:

Priority:

Related Art:

TO BE COMPLETED BY APPLICANT

Name of Applicant: SBM WAGENEDER Gesellschaft m.b.H.

Address of Applicant: Matzingthalstrasse 21, A-4662 Laakirchen, Austria.

Actual Inventor: "GUNTER MULLER"

Address for Service: CALLINANS [redacted] Patent Attorneys, of 48-50 Bridge Road, Richmond, State of Victoria, Australia.

Complete Specification for the invention entitled: "IMPACT MILL".

The following statement is a full description of this invention, including the best method of performing it known to me:—*

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* Note: The description is to be typed in double spacing, pica type face, in an area not exceeding 250 mm in depth and 160 mm in width, on tough white paper of good quality and it is to be inserted inside this form.

The invention relates to an impact mill for crushing stone or the like comprising a substantially annular housing whose inwardly facing impact surfaces are preferably formed, after the deposit of a layer of crushed material, by said material, and comprising a rotor with an axial intake opening, which rotor is arranged on a vertical driveshaft forming an annular gap relative to the housing and has a bottom plate with a central impact plate member, a cover plate with a central aperture and blades forming ejection openings between the bottom and cover plates, the sides of the blades which face towards the axis of the rotor each being provided with a pocket for receiving crushed material, wherein the ejection side of the pocket has a replaceable wearing portion which is formed by a carrier body with a hard metal bar as marginal edge reinforcement, which preferably comprises an alloy with a tungsten carbide component of over 91%, the remainder being substantially cobalt, and forms a wearing surface which is set back in the ejection direction and whose surface portion adjoining the material-receiving pocket includes an angle with a contact plane of the marginal edges of the material-receiving pocket and whose outer edge projects beyond the periphery of the rotor.

European laid-open application No. 187252 already discloses an impact mill of that kind. In that arrangement the hard or carbide metal reinforcement is of a substantially L-shaped form which extends radially outwardly from the ejection-side edge of the material pocket and which includes an angle of between 180° and 195° with the contact plane, in that first operative surface portion. A second surface portion then adjoins same in set-back relationship in an outward direction, projecting beyond the periphery of the rotor. It has now been found that the service life of the entire wearing portion is less than was expected as the ejection-side

inside surface of the material-receiving pockets, which is mainly formed by the carrier body, is exposed to surprisingly high grinding loadings and is therefore eroded more rapidly than the exposed hard metal bar.

The invention is now based on the problem of further improving such impact mills so that the operating times thereof are as far as possible determined only by the service life of the hard metal reinforcement elements.

In accordance with an aspect of the invention there is provided an impact mill for crushing stone or the like including a substantially annular housing, and including: a rotor with an axial intake opening, said rotor being arranged on a vertical driveshaft forming an annular gap relative to the housing and having a bottom plate with a central impact plate member, a cover plate with a central aperture and blades forming ejection openings between the bottom and cover plates, the sides of said blades which face towards the axis of the rotor each being provided with a pocket for receiving crushed material, the ejection side of the pocket being provided with a replaceable wearing portion which is formed by a carrier body reinforced by a hard metal bar, said hard metal bar forming an edge reinforcement of the ejection side and comprising a wearing surface which is outwardly set back from a contact plane of the marginal edges of the material-receiving pocket, an outer edge which projects beyond the periphery of the rotor, and a pocket-side surface which forms one of the inside surfaces of said material-receiving pocket, wherein the pocket-side surface is disposed substantially perpendicularly to said contact plane of the marginal edges of said material-receiving pocket and said set-back wearing surface of said hard metal bar extends in an arcuately convex configuration.

According to a further aspect of the invention there is provided a replaceable wearing portion to be mounted at a

peripheral ejection opening of a rotor of an impact mill for crushing stone or the like, said rotor being arranged on a vertical driveshaft and having a bottom plate with a central impact plate member, a cover plate with a central intake aperture and ejection blades defining the ejection openings between the bottom and cover plates, which replaceable wearing portion includes a carrier body reinforced by a hard metal bar which has an ejection edge, a set back outer edge and a wearing surface connecting the ejection edge and the outer edge, wherein the replaceable wearing portion is of a substantially L-shaped configuration, and wherein the longer limb of the L-shaped wearing portion is formed by the carrier body which is substantially plate-shaped, and the shorter limb is formed by the hard metal bar, the wearing surface being convexly arcuately curved.

As tests have shown, the configuration and arrangement of the wearing portion according to the invention also reinforces the ejection-side inside surface of the material pocket so that the grinding action of the material also wears away the hard metal bar at the surface which is disposed transversely with respect to the ejection direction. Therefore wear of the hard metal bar occurs not only at the wearing surface which is set back from the contact plane, but the inward surface is also worn away to the same extent. The hard metal bars are thus worn away completely, whereas the carrier body which is disposed at the bottom of the material-receiving pocket is subjected to a lower loading, thereby producing the optimum service life.

The expression substantially perpendicular to the contact plane means a deviation from the perpendicular of up to 15° as the aim is to produce a substantially perpendicular configuration relative to the portion, adjacent to the marginal edge, of the curved surface of the material which is formed in the material-receiving pocket. That curved surface

is dependent on the material and the speed of rotation and follows a spiral line. For the usual situations of use, an angle of about 95° to 100° has been found to be a satisfactory average value.

A preferred embodiment provides that the arcuate wearing surface extends over a quarter of a circle. In that connection the arc substantially corresponds to the line of ejection of the material so that the wearing surface is worn away in a fairly uniform manner. The edges between the wearing surface and the mounting surface which bears against the carrier body or the inside surface of the hard metal bar, on the pocket side thereof, are preferably rounded.

The carrier body which is used to support the hard metal bar, in particular consisting of steel, is preferably of a substantially plate-like configuration and has a bevelled contact surface for the hard metal bar. The entire wearing portion is of an L-shaped configuration, in which respect it has been found to be advantageous for the two surfaces on the pocket side, that is to say the inside surfaces of the hard metal bar and the surface of the carrier body which forms the bottom of the pocket, to extend substantially symmetrically with respect to a radius of the rotor. The symmetry angle is preferably 50° to 55°.

The invention will now be described in greater detail with reference to the Figures of the accompanying drawings, without being restricted thereto.

Figure 1 is a view in vertical section through an impact mill according to the invention;

Figure 2 is a view in horizontal section through a rotor in a first embodiment; and

Figure 3 is a view on an enlarged scale in detail of one end of a rotor blade, which is fitted with the wearing body.

The impact mill according to the invention has an annular housing 1 on a substructure which has the drive

and the discharge opening for the crushed material. The housing 1 is of a substantially U-shaped configuration in cross-section, with the open side facing towards the middle. Therein the material which is deposited in operation of the mill forms impact surfaces. A rotor 2 which is driven by the motor 3 is arranged rotatably about a vertical axis 8 in the housing 1, an annular gap 6 remaining between the rotor 2 and the housing 1, through which the crushed material drops downwardly to the discharge opening. The rotor 2 has a bottom plate 9, a cover plate 10 and blades 11 arranged therebetween. The cover plate 10 is provided with a central opening through which the material to be crushed, which is delivered by way of the filling opening 4, passes into the interior of the rotor 2. Disposed beneath the opening in the cover plate 10 is an impact plate or disc member 7 which distributes the material to be crushed which is accelerated in the rotor 2 by means of the blades 11 and which is finally flung by centrifugal force through discharge openings 16 against the impact surfaces of the housing 1 and is thus broken up. The peripheral speed of the rotor is preferably 60 to 72 m/s. As the rotor 2 naturally causes a strong air movement, the production of dust is avoided by the air passing out of the rotor 2 being passed by way of baffle plates 41 into a direction-changing passage 42 from which it is returned to the opening in the cover plate 10 (arrow D). That arrangement gives rise to an internal circulation of air so that there is no external production of dust.

As can be seen from Figure 2, the rotor 2 is provided with three blades 11 which extend substantially in the peripheral direction, leaving free a middle region of the same size as the impact plate or disc member 7. Each blade 11 comprises a three-sided member with an outward side which is curved to correspond to the periphery of the

rotor, and two inward sides, wherein a first and a second inward side of a respective pair of blades 11 define an ejection passage which decreases in size towards the discharge opening 16. One of the two inward sides extends in a concave configuration, thereby forming a material-receiving pocket 17 in which material accumulates at the beginning of the crushing operation, the surface of the material forming an impact surface whereby the blade 11 is protected from damage. A contact plane B which contacts the two marginal edges of the material-receiving pocket 17 in which the rotary movement of the rotor causes the formation of a surface of material which follows a curved line 27 preferably extends substantially tangentially relative to the impact plate or disc member 7 and, with an axial plane A or a radius of the rotor (Figure 3), includes an angle of preferably 35°. Arranged at the ejection end of the blade 11 at which surface protection by means of an accumulation of material is no longer possible is a replaceable wearing portion which projects beyond the periphery of the rotor and which comprises a steel carrier body 12 which is secured to the blade 11, and a low-wear hard metal or carbide metal bar 13, in particular of type B 10 T with a tungsten carbide component of 94%, a Vickers hardness of 1450 HV and a tungsten carbide grain size of between 0.002 and 0.004 mm. The wearing portions which project beyond the periphery of the rotor protect the peripheral parts of the blades so that the armouring which is to be provided at that location can be thinner.

Figure 3 shows detail of the end of a blade 11, which is fitted with the wearing body. The carrier body 12 which is secured to the end of the blade by means of screws 14 is for example of the illustrated, substantially plate-like configuration. In cross section the hard metal bar 13 represents a part of a circular surface and has an outer, arcuate wearing surface 21, an inner surface 20 which forms one of the inside surfaces of the material-receiving pocket

17, and a mounting face 22 which bears against a bevelled support surface on the carrier body 12. The hard metal bar 13 may also be divided in respect of height into a plurality of portions.

The hard metal bar 13 is secured to the end of the carrier body 12, being in particular brazed thereto, in such a way that the tangent to the wearing surface 21 and the separation edge 24 lies approximately in the contact plate B and the inner surface 20 extends at an angle of between 90° and 105°, preferably 95°, to the plane B. The width of the inside surface 20 is approximately two thirds of the radius of curvature of the wearing surface 21. The width of the mounting surface 22 approximately corresponds to the length of the radius of curvature and the mounting surface 22 and the inner surface 20 include an angle of between 100° and 115°, preferably of 105°. The wearing portion is therefore generally of an L-shaped configuration, with the shorter limb being formed by the hard metal bar 13 and the longer limb formed by the carrier body 12, and the two include an angle of preferably 95° to 110°, preferably 105°. The overall arrangement of the wearing portion is preferably such that the miter plane of the wearing portion lies in an axial plane A.

The claims defining the invention are as follows:

1. An impact mill for crushing stone or the like including a substantially annular housing, and including: a rotor with an axial intake opening, said rotor being arranged on a vertical driveshaft forming an annular gap relative to the housing and having a bottom plate with a central impact plate member, a cover plate with a central aperture and blades forming ejection openings between the bottom and cover plates, the sides of said blades which face towards the axis of the rotor each being provided with a pocket for receiving crushed material, the ejection side of the pocket being provided with a replaceable wearing portion which is formed by a carrier body reinforced by a hard metal bar, said hard metal bar forming an edge reinforcement of the ejection side and comprising a wearing surface which is outwardly set back from a contact plane of the marginal edges of the material-receiving pocket, an outer edge which projects beyond the periphery of the rotor, and a pocket-side surface which forms one of the inside surfaces of said material-receiving pocket, wherein the pocket-side surface is disposed substantially perpendicularly to said contact plane of the marginal edges of said material-receiving pocket and said set-back wearing surface of said hard metal bar extends in an arcuately convex configuration.

2. The impact mill as claimed in Claim 1, wherein said hard metal bar comprises an alloy with a tungsten carbide component in excess of 91%, the remainder being substantially cobalt.

3. The impact mill as claimed in Claim 1 or Claim 2, wherein inwardly facing impact surfaces of said annular housing are formed, after the deposit of a layer of crushed material, by said material.

4. The impact mill as claimed in any one of Claims 1 to 3, wherein said arcuate wearing surface extends over a quarter of a circle.

5. The impact mill as claimed in any one of Claims 1 to 4, wherein the inner surface of said hard metal bar, which lies in said material-receiving pocket, includes an angle (α) of about 95° with said contact plane.

6. The impact mill as claimed in any one of Claims 1 to 5, wherein a mounting surface and said inner surface which lies in said material-receiving pocket include an angle of 105°.

7. The impact mill as claimed in any one of Claims 1 to 6, wherein the edge between said wearing surface and said mounting surface is rounded.

8. The impact mill as claimed in any one of Claims 1 to 7, wherein said carrier body is of a substantially plate-shaped configuration and has a bevelled support surface for said mounting surface of said hard metal bar.

9. A replaceable wearing portion to be mounted at a peripheral ejection opening of a rotor of an impact mill for crushing stone or the like, said rotor being arranged on a vertical driveshaft and having a bottom plate with a central impact plate member, a cover plate with a central intake aperture and ejection blades defining the ejection openings between the bottom and cover plates, which replaceable wearing portion includes a carrier body reinforced by a hard metal bar which has an ejection edge, a set back outer edge and a wearing surface connecting the ejection edge and the outer edge, wherein the replaceable wearing portion is of a substantially L-shaped configuration, and wherein the longer limb of the L-shaped wearing portion is formed by the carrier body which is substantially plate-shaped, and the shorter limp is formed by the hard metal bar, the wearing surface being convexly arcuately curved.

10. The wearing portion as claimed in Claim 9, wherein said hard metal bar comprises an alloy with a tungsten carbide component in excess of 91%, the remainder being substantially cobalt.

11. The wearing portion as claimed in Claim 9 or 10,

wherein said arcuate wearing surface extends over a quarter of a circle.

12. The wearing portion as claimed in any one of Claims 9 to 11, wherein said substantially plate-shaped carrier body has a bevelled support surface for said hard metal bar.

13. The wearing portion as claimed in any one of Claims 9 to 12, wherein said hard metal bar has an inner surface and a mounting surface supported by said bevelled support surface of said carrier body, the inner surface and the mounting surface including an angle of 105°.

14. The wearing portion as claimed in any one of Claims 9 to 13, wherein the outer edge between said wearing surface and said mounting surface is rounded.

15. The wearing portion as claimed in any one of Claims 9 to 14, wherein said inner surface of said hard metal bar and a tangential plane of said ejection edge include an angle of about 95°.

16. The wearing portion as claimed in any one of Claims 9 to 15, wherein said substantially plate-shaped carrier body has an inner surface, the inner surface of said hard metal bar and the inner surface of the carrier body including an angle in the range of from 95° to 110°.

17. An impact mill for crushing stone or the like, substantially as described herein with reference to the accompanying drawings.

D A T E D this 5th day of October, 1989.

SBM WAGENEDER Gesellschaft m.b.H.
By its Patent Attorneys:
CALLINAN LAWRIE

Fig. 1

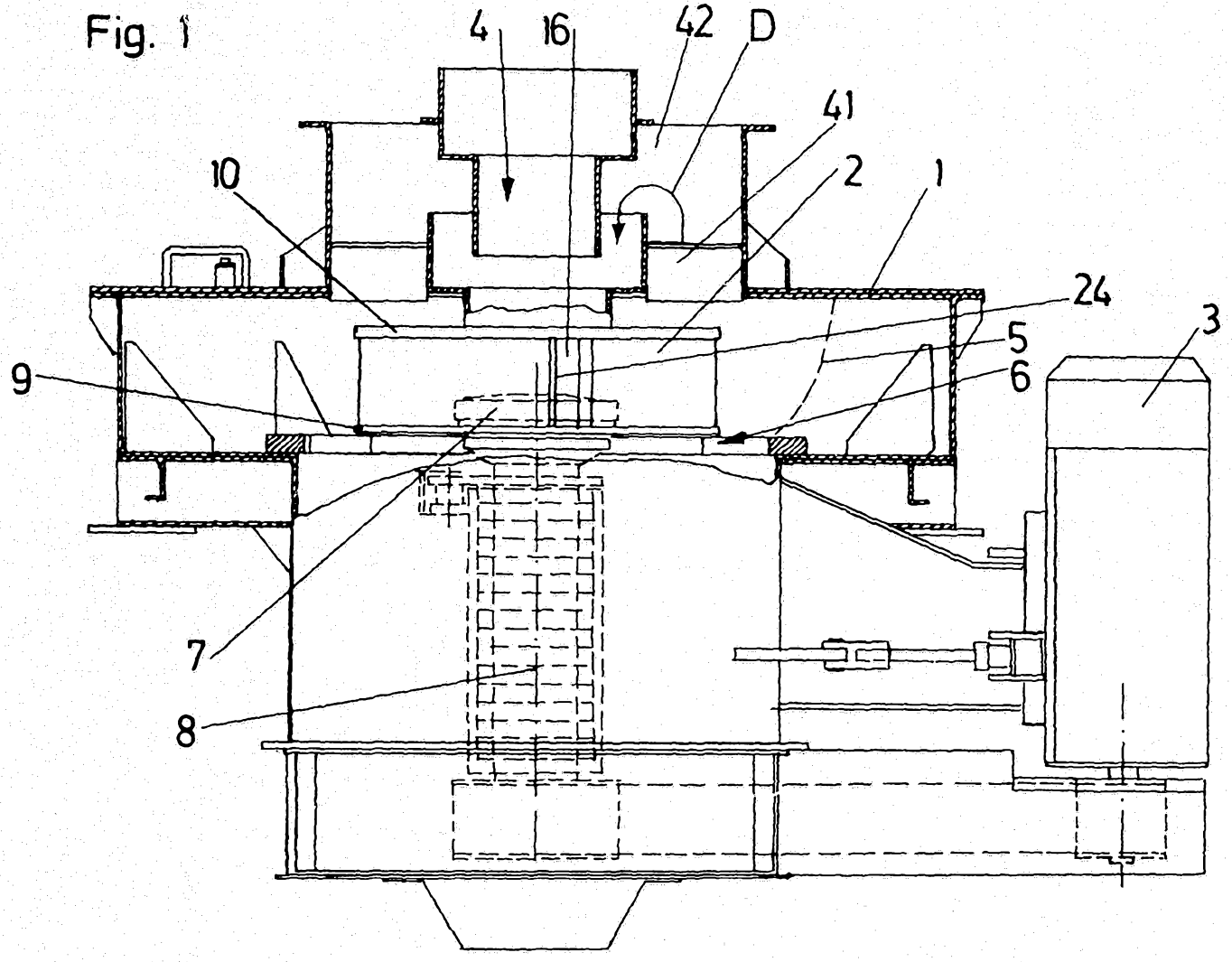

Fig. 2

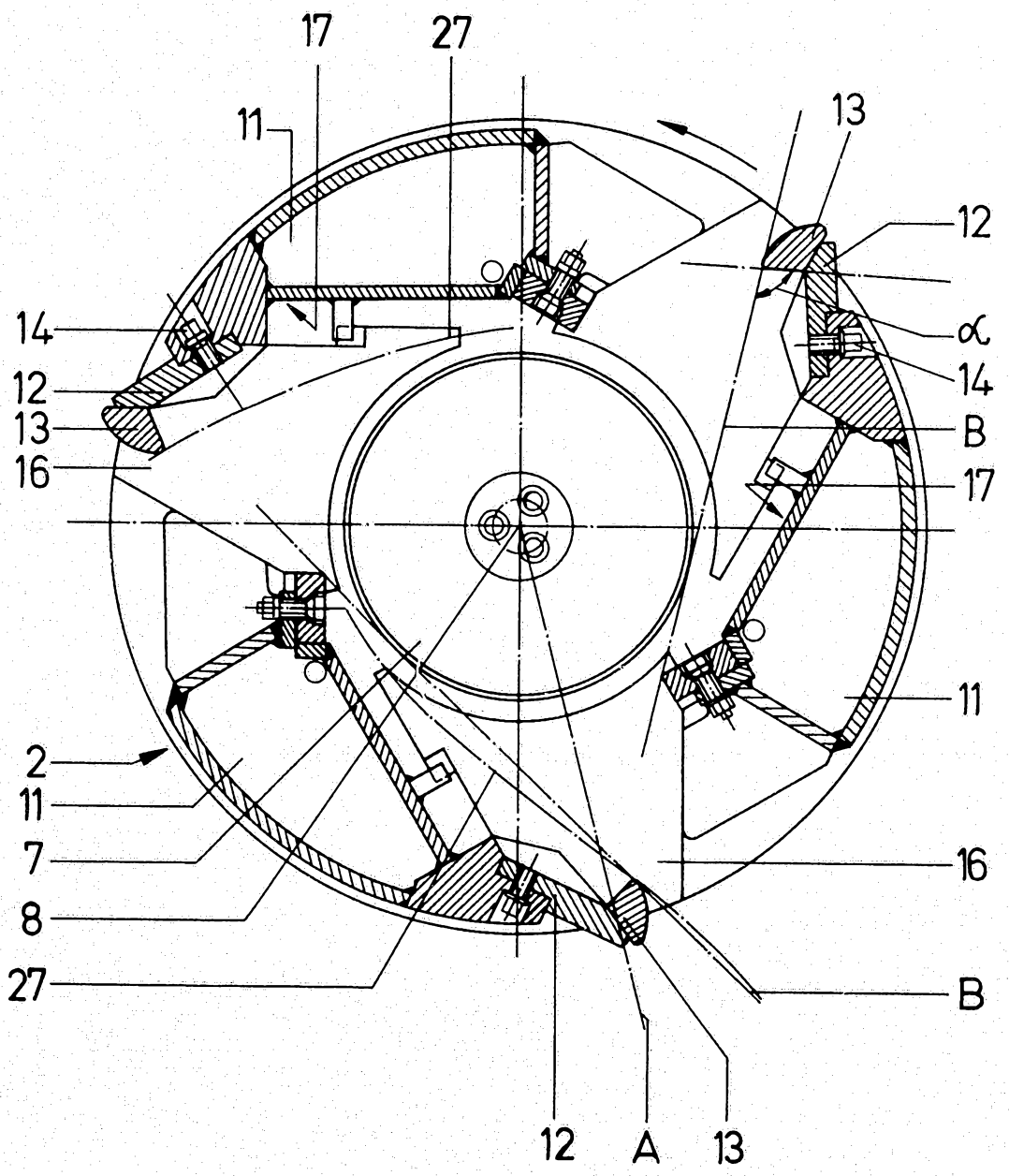

Fig. 3