(12) STANDARD PATENT (11) Application No. **AU 2007294069 B2**
(19) AUSTRALIAN PATENT OFFICE

(54) Title
Mill arrangement with uniform dust distribution and method of operating a mill arrangement

(51) International Patent Classification(s)
F23K 1/00 (2006.01) ***F23K 3/02*** (2006.01)

(21) Application No: **2007294069** (22) Date of Filing: **2007.07.30**

(87) WIPO No: **WO08/028727**

(30) Priority Data

(31) Number	(32) Date	(33) Country
10 2006 042 060.8	**2006.09.05**	**DE**

(43) Publication Date: **2008.03.13**
(44) Accepted Journal Date: **2011.08.11**

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(56) Related Art
US 6186079
GB 828515
US 6481361

(12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT) VERÖFFENTLICHTE INTERNATIONALE ANMELDUNG

(19) Weltorganisation für geistiges Eigentum
Internationales Büro

PCT

(43) Internationales Veröffentlichungsdatum
13. März 2008 (13.03.2008)

(10) Internationale Veröffentlichungsnummer
WO 2008/028727 A1

(51) Internationale Patentklassifikation:
F23K 1/00 (2006.01) *F23K 3/02* (2006.01)

(21) Internationales Aktenzeichen: PCT/EP2007/057848

(22) Internationales Anmeldedatum:
30. Juli 2007 (30.07.2007)

(25) Einreichungssprache: Deutsch

(26) Veröffentlichungssprache: Deutsch

(30) Angaben zur Priorität:
10 2006 042 060.8
5. September 2006 (05.09.2006) DE

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(81) Bestimmungsstaaten *(soweit nicht anders angegeben, für jede verfügbare nationale Schutzrechtsart)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH,

[Fortsetzung auf der nächsten Seite]

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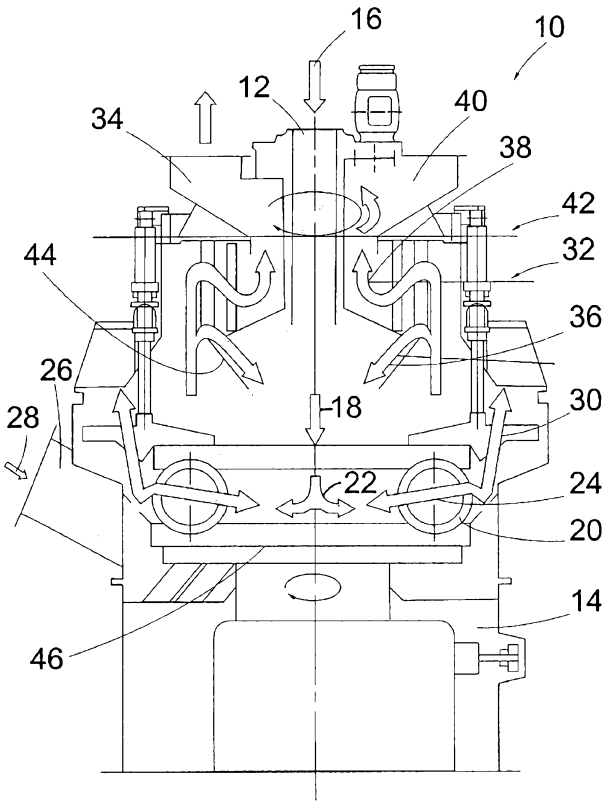
(54) Title: MILL ARRANGEMENT WITH UNIFORM DUST DISTRIBUTION AND METHOD OF OPERATING A MILL ARRANGEMENT

(54) Bezeichnung: MÜHLENANORDNUNG MIT GLEICHMÄSSIGER STAUBVERTEILUNG UND VERFAHREN ZUM BETRIEB EINER MÜHLENANORDNUNG



(57) Abstract: A mill arrangement (10) for producing coal dust, comprising a mill (14), a plurality of dust lines (34), which conduct coal dust from the mill to a burner, a dust distributor (40) for distributing the coal dust to the dust lines, and means (42) for influencing the dust flow in the dust lines, is characterized in that the means for influencing the dust flow are formed such that their cross section can be changed and they are arranged in the mill upstream of the dust lines, between a sifter (32) and the dust distributor.

(57) Zusammenfassung: Eine Mühlenanordnung (10) zur Erzeugung von Kohlestaub, enthaltend eine Mühle (14), eine Mehrzahl von Staubleitungen (34), welche Kohlestaub von der Mühle zu einem Brenner leiten, einen Staubverteiler (40) zur Verteilung des Kohlestaubs auf die Staubleitungen, und Mittel (42) zur Beeinflussung der Staubströmung in den Staubleitungen, ist dadurch gekennzeichnet, dass die Mittel zur Beeinflussung der Staubströmung querschnittsverändernd ausgebildet sind und in der Mühle vor den Staubleitungen zwischen einem Sichter (32) und dem Staubverteiler angeordnet sind.

PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) **Bestimmungsstaaten** *(soweit nicht anders angegeben, für jede verfügbare regionale Schutzrechtsart)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), eurasisches (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), europäisches (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Erklärungen gemäß Regel 4.17:

— *hinsichtlich der Identität des Erfinders (Regel 4.17 Ziffer i)*

— *hinsichtlich der Berechtigung des Anmelders, ein Patent zu beantragen und zu erhalten (Regel 4.17 Ziffer ii)*

— *hinsichtlich der Berechtigung des Anmelders, die Priorität einer früheren Anmeldung zu beanspruchen (Regel 4.17 Ziffer iii)*

— *Erfindererklärung (Regel 4.17 Ziffer iv)*

Veröffentlicht:

— *mit internationalem Recherchenbericht*

2007294069 03 Mar 2009

Mill Assembly with Uniform Dust Distribution and Method of Operating a Mill Assembly

Field of the Invention

The invention relates to a mill assembly for the generation of coal dust comprising

(a) a mill

(b) a plurality of dust lines for transferring coal dust from the mill to a burner,

(c) a coal distributor for the distribution of coal dust from the dust lines and

(d) means for influencing the dust distribution in the coal lines.

The invention relates further to a device for influencing the dust distribution in a mill assembly. The invention finally relates to a method for the even distribution of coal dust generated in a mill to a plurality of dust lines by means of a dust distributor.

Background of the Invention

Such a mill assembly serves to grind coal into coal dust. Such coal dust is transferred to a burner through one or more coal lines. The coal dust is burnt in the burner and the heat generated therein can be used for the generation of electricity or the like. By optimizing the ratio of fuel to air in the burner the efficiency of the generation of heat can be improved. Also, the emission of substances damaging for the environment, especially nitrogen oxides (NO_x) can be minimized. For this purpose the amount of dust in the burner must be controlled.

Different flow conditions are formed in a mill due to, for example, the engine and various built-in components. Also, blocking air having a temperature which is too low or the formation of water steam will influence the flow conditions. Streaks of coal dust can be formed thereby which do not dissolve. The formation of streaks cannot be controlled and no predictions can be made regarding their formation. this leads to an uneven distribution of dust on the coal lines. Different amounts of fuel is transferred to the burners fed by the coal lines. This is not desired.

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Prior Art

It is known to install baffels inside the coal lines. Such baffels form resistances to reduce the transferred amount of dust in the dust lines. The baffels, however, do not provide satisfying results.

Object of the invention

It is an object of the invention to provide an assembly of the above mentioned kind, which will allow an even distribution of dust in the dust lines and thereby on the burners.

Summary of the invention

According to a first aspect of the invention there is provided a Mill assembly (10) for the generation of coal dust comprising

(a) a mill (14)

(b) a plurality of dust lines (34) for transferring coal dust from the mill to a burner,

(c) a coal distributor (40) for the distribution of coal dust from the dust lines and

(d) means (42) for influencing the dust distribution in the coal lines.

characterized in that

(e) the means for influencing the dust flow is adapted to change the cross section and that they are arranged in the mill before the dust lines.

According to another aspect of the invention there is provided a method for the even distribution of coal dust generated in a mill to a plurality of dust lines by means of a dust distributor, characterized by the steps of:

(i) Arranging elements influencing the cross section in the range of the dust distributor,

(ii) Reducing the flow cross section for flow transferring too little dust into the dust line, and

(iii) Increasing the flow cross section for flow transferring too much dust into the dust line.

According to preferred embodiments of the invention this object is achieved in that the means for influencing the dust flow is adapted to change the cross section and that they are arranged in the mill before the dust lines. Such a change of the effective cross section can be achieved by, for example, baffles or flaps or the like. Preferably the mill is provided with a classifier for the separation of large and small particles and the means for influencing the dust flow are arranged between the classifier and the dust distributor. Contrary to known measures the flow is influenced already before its distribution on the dust lines. It has been shown that at this position the transferred amount of dust is increased due to the suction effect if the effective flow cross section is decreased. On the other hand the transferred amount of dust can be reduced if the effective flow cross section is increased. The change, therefore, must be effected opposite to the change with known baffles inside the dust lines.

Known installations can be upgraded with such an assembly which is adapted to influence the dust flow. Such a flange can be provided with a down shute portion and a housing portion arranged in alignment coaxially around the down shute portion, whereby an annular space is formed and the annular space can be segmented by means of separating walls extending in a radial direction corresponding to the positioning of the dust distributor and the amount of dust lines, at least one flap being provided in each segment which can be adjusted from the outside between a position with a maximum cross section in the flow direction and a position with a minimum cross section in the flow direction. If the flap of a segment is adjusted in a position lateral to the flow direction the effective cross section is reduced. Accordingly, the flow velocity is increased in this segment. Due to the suction effect more dust is flowed through the dust line. On the other hand the flap in a segment may be directed parallel to the flow direction. The flow velocity is then lower and the transferred amount of dust is smaller.

Preferably the means for influencing the cross section are adjustable from the outside. It is a further option to adjust the means for influencing the cross section by measuring the amount of dust in the dust lines by means of well known online measuring methods and to automatically control the means for influencing the cross section. The distribution can thereby be adapted even upon a change of the flow

conditions. In a further modification of the invention the means are exchangeable. Instead of upgrading existing installations with a flange the means for influencing the cross section can also be integrated into the dust distributor.

Preferrably, the mill is operated according to a method with the following steps:

(i) Arranging elements influencing the cross section in the range of the dust distributor,

(ii) Reducing the flow cross section for flow transferring too little dust into the dust line, and

(iii) Increasing the flow cross section for flow transferring too much dust into the dust line.

It is understood that the invention can be exercised with all kinds of mills independent of the mill being a vertical- or a tube mill and independent of a static or a rotating classifier being used. Also, the feeding of milling material can be effected on the side or in the center.

Further modifications of the invention are subject matter of the subclaims. An embodiment of the invention is described below in greater detail with reference to the accompanying drawings.

Brief description of the drawings

Preferred embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings:

Fig. 1 is a schematic representation of a vertical mill assembly with a ball ring mill,

Fig. 2 shows a flow guiding assembly in greater detail,

Fig. 3 is a top view of an individual flow guiding element of a flow guiding assembly of Fig. 2,

Fig.4 is a cross sectional view of the flow guiding element of Fig. 2,

Fig.5 shows the flow body in greater detail,

Fig.6 is a perspective view of a flow guiding element of Fig. 2, and

Fig.7 is another perspective view of the flow guiding element of Fig. 2.

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Description of the preferred embodiments

Fig. 1 shows a mill assembly generally denoted with numeral 10. The mill assembly is a vertical mill with a centered milling material feeder 12. The milling material enters a ball ring mill 14 through a down shute. This is represented by arrows 16 and 18. The milling material is conveyed outwardly in the ball ring mill 14 and ground by balls 20. This is represented by arrows 22 and 24.

A carrier gas is flowed through a jet ring or a jet slot into the mill at a gas connector 26 on its side. This is represented by an arrow 28. Gas flows into the annular space around the ball ring mill 14. There, the milling material is absorbed by the gas flow. The gas flow carries the milling material on the outside upwardly in the direction of the arrow denoted with numeral 30. The milling dust generated in such a way is dried and conveyed by the gas.

The milling dust is carried to a static or rotating classifier 32 and to the dust lines 34 which are connected thereto. In the classifier large particles fall downwards onto a particle backflow cone 44 towards the center and onto the grinding plate 46. This is represented by an arrow 36. Milling material which is sufficiently ground to fine dust flows upwardly in the direction of the arrow 38. The fine dust is distributed on the dust lines in a dust distributor 40.

A flow guiding assembly 42 is arranged between the dust distributor 40 and the classifier 32.

The flow guiding assembly 42 is shown in greater detail in Fig. 2. The flow guiding assembly 42 has the form a of a flange and is tightly screwed to the dust distributor 40 above the classifier 32. Bore holes 48 are provided for this purpose. In such a way existing mills can be upgraded with such flow guiding assemblies 42. Otherwise the flow guiding assembly 42 can be integrated into the dust distributor 40. The flow guiding assembly 42 comprises an inner cylindrical portion 50 of the down shute 12. A cylindrical outer housing 52 is provided in alignment around the down shute 12. An annular space 54 is formed between the down shute portion 50 and the outer housing

52. The annular space 54 is divided into four segments 64, 66, 68 and 70 by radial walls 56, 58, 60 and 62. The flows through the segments 64, 66, 68 and 70 are completely separated once it is installed. Dust flowing through one of these segments is transferred to a well defined dust line by the the dust distributor 40.

The effective cross section is, by way of example, shown in bold lines in Fig. 2 for the dust flow flowing through the segment 64. It is limited by walls 56 and 58 and the corresponding portions of the down shute 50 and the housing.

Flow guiding elements 72 are schematically shown in Fig. 2. Such flow guiding elements 72 are used to influence the effective flow cross section. Actuators 74 are provided on the outside for this purpose. Two such flow guiding elements 72 are provided in each of the segments 64, 66, 68 and 70. The flow guiding elements 72 are designed such that a reduction of the cross section by a desired percentage can be achieved with them.

Fig. 3 and 4 show a flow guiding element 72 in greater detail. The flow guiding element 72 comprises a shaft 76. The shaft is rotationally symmetric. It extends through an insert 78 into the outer space of the housing 52 into the flow channel in the annular space 54. The insert 78 has a square form and it is inserted and screwed into a corresponding window in the housing 52 with screws 82. The assembly is designed in such a way that there are no projections or edges in the flow channel. A flow body 86 is fitted on the inner end 84 of the shaft. The bore 94 in the flow body 86 provided for this purpose has a recess 92 (Fig. 5) which is engaged with a fit-in key provided at the shaft. The flow body 86 is screwed to the spindle in an axial direction with a screw 88. the flow element extends as far as the down shute 50 without, however, touching it.

On the opposite end 90 the spindle is provided with a multi-sided member 96. The spindle can be roated about an axis 98 (Fig. 3) by use of a suitable tool. The flow body 86 is then also rotated. Depending on the position the flow body has a larger diameter in a direction lateral to the flow direction or not. The shaft 76 is beared in a housing 100. The housing 100 is provided with a display having a scale 102. A

pointer 104 which is tightly fixed to the shaft 76 indicates the position of the flow body 80.

In the present embodiment the flow body 86 has the cross sectional form of a rhombus. It is understood, however, that any other form may be suitable also. If the flow element shows wear and tear the screws at the insert can be released. Then the spindle with the flow body 86 can be taken out. The flow body 86 can be exchanged and inserted together with the spindle. In such a way it is not necessary to exchange the entire flange.

The foregoing describes only preferred embodiments of the present invention and modifications, obvious to those skilled in the art, can be made thereto without departing from the scope of the present invention.

The term "comprising" (and its grammatical variations) as used herein is used in the inclusive sense of "including" or "having" and not in the exclusive sense of "consisting only of".

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CLAIMS

1. Mill assembly (10) for the generation of coal dust comprising
   (a) a mill (14)
   (b) a plurality of dust lines (34) for transferring coal dust from the mill to a burner,
   (c) a classifier (32) for the separation of large and small particles,
   (d) a coal distributor (40) positioned in the flow betweeen the classifier and the dust lines for the distribution of coal dust consisting of the fine partilces separated by the classifier on the dust lines, and
   (e) means (42) for influencing the dust distribution in the coal lines, arranged between the calssifier (32) and the coal distributor (40)
   characterized in that
   (f) the means for influencing the dust flow is adapted to change the cross section and that they are arranged in the mill before the dust lines.

2. Mill assembly according to claim 1, characterized in that the means for influencing the dust flow are formed by a flange having a down shute portion (50) and a housing portion (80) arranged in alignment coaxially around the down shute portion, whereby an annular space (54) is formed and the annular space is segmented by means of separating walls (56, 58, 60, 62) extending in a radial direction corresponding to the positioning of the dust distributor and the amount of dust lines, at least one flap (86) being provided in each segment (64, 66, 68, 70) which is adapted to be adjusted from the outside between a position with a maximum cross section in the flow direction and a position with a minimum cross section in the flow direction.

3. Mill assembly according to any of the preceeding claims, characterized in that the means (86) for influencing the dust flow are adjustable from the outside.

4. Device (42) for influencing the dust distribution in a mill assembly (10) according to any of the preceeding claims, wherin the device is adapted to

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influence the effective cross section of the dust-containing gas flow, characterized in that flow guiding elements (72) are provided to change the cross section of the flow.

5. Method for the even distribution of coal dust generated in a mill to a plurality of dust lines by means of a dust distributor, characterized by the steps of:
   (i) Arranging elements influencing the cross section in the range of the dust distributor,
   (ii) Reducing the flow cross section for flow transferring too little dust into the dust line, and
   (iii) Increasing the flow cross section for flow transferring too much dust into the dust line.

6. A mill assembly for the generation of coal dust, the mill being substantially as herein described with reference to the accompanying drawings.

7. A device for influencing the dust distribution in a mill, the device being substantially as herein described with reference to the drawings.

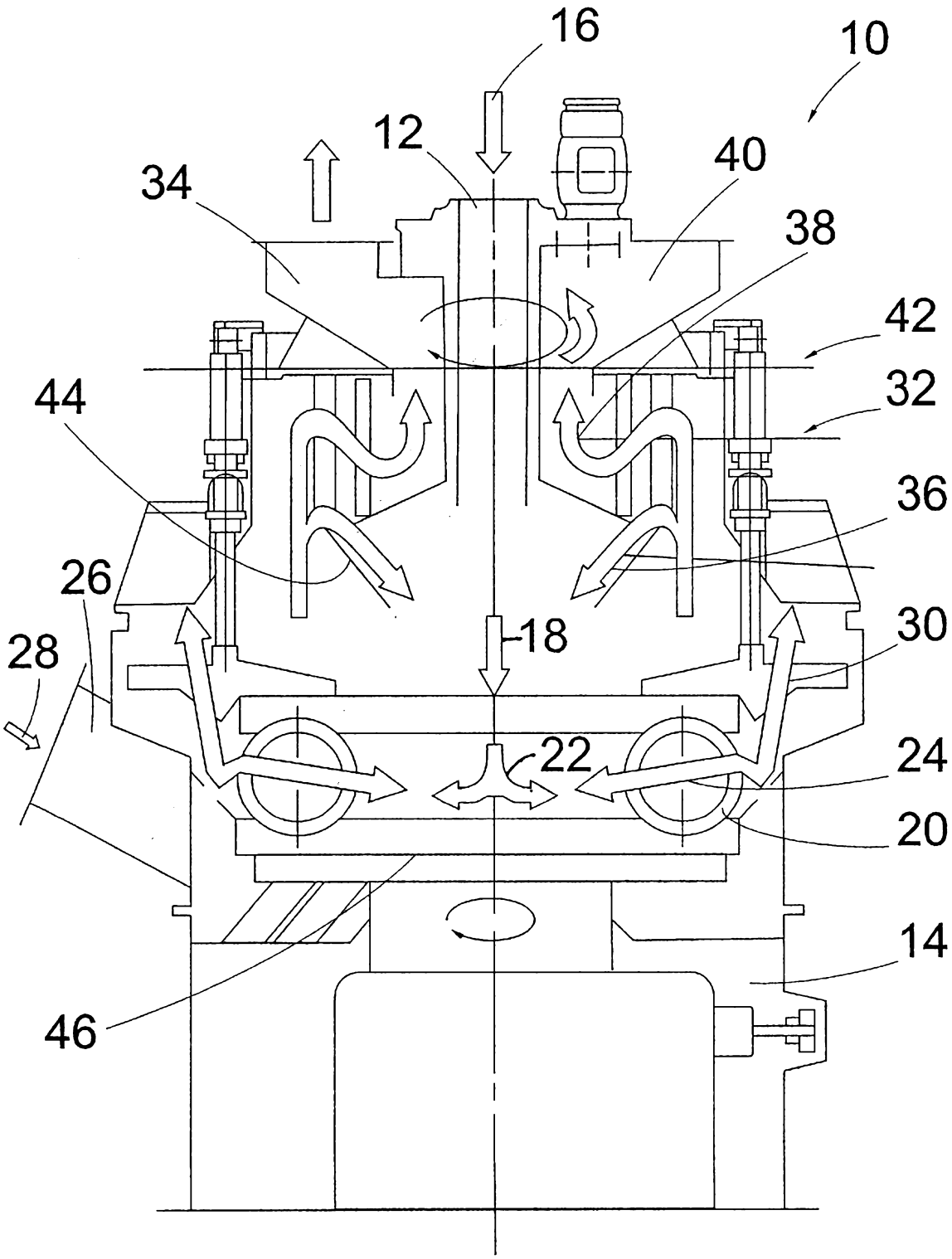
8. A method for the even distubution of coal dust generated in a mill, the method being substantially as herein described with reference to the drawings.

Dated this 22nd day July 2011

BABOCK BORSIG SERVICE GmbH

BY:
FRASER OLD & SOHN
Patent Attorney for the Applicant

Fig. 1



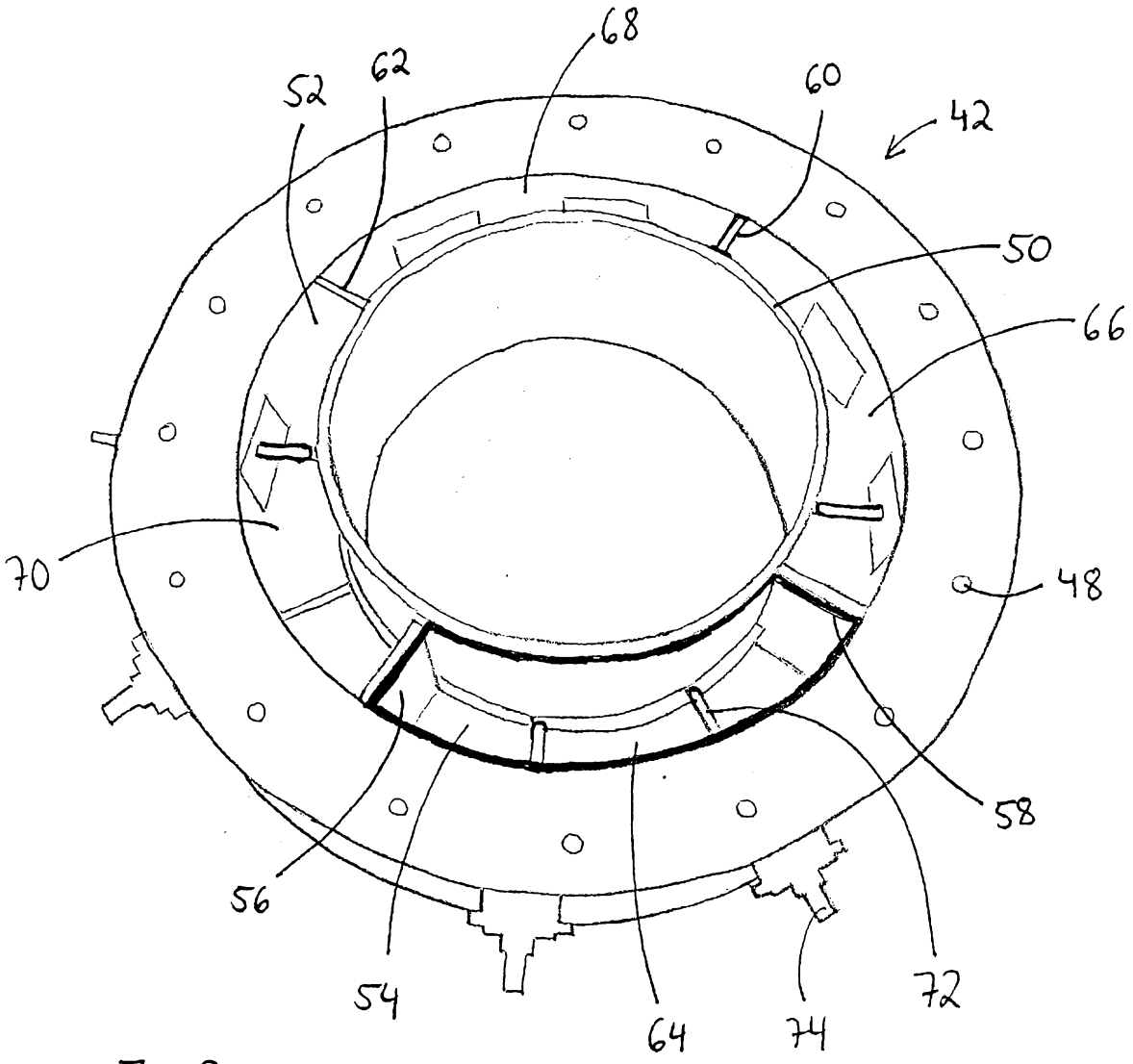


Fig. 2

Fig. 3

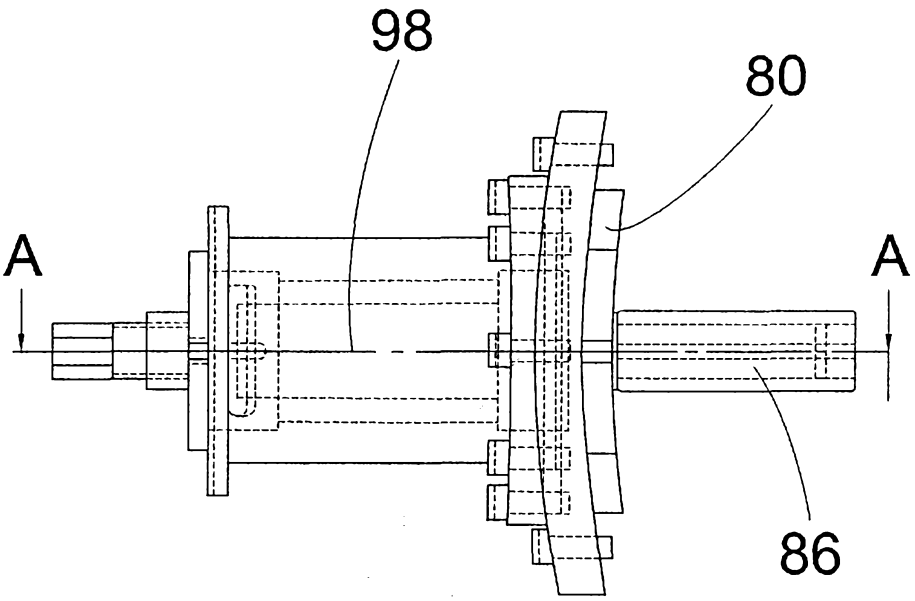
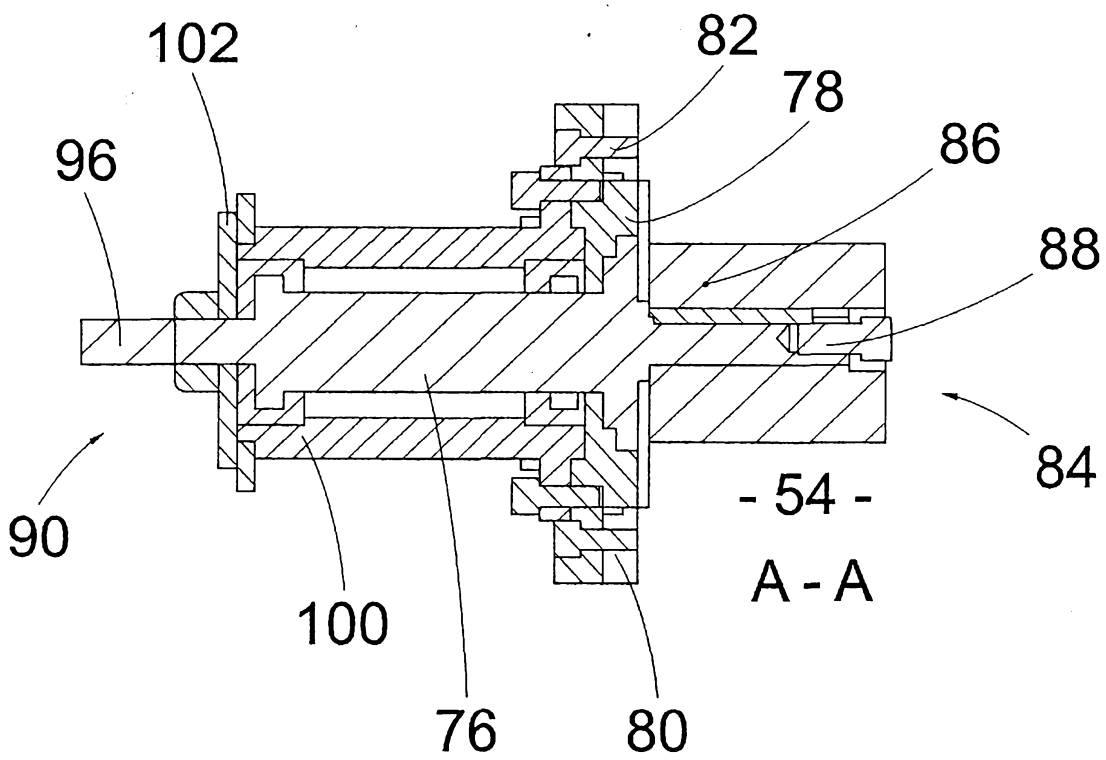


Fig. 4



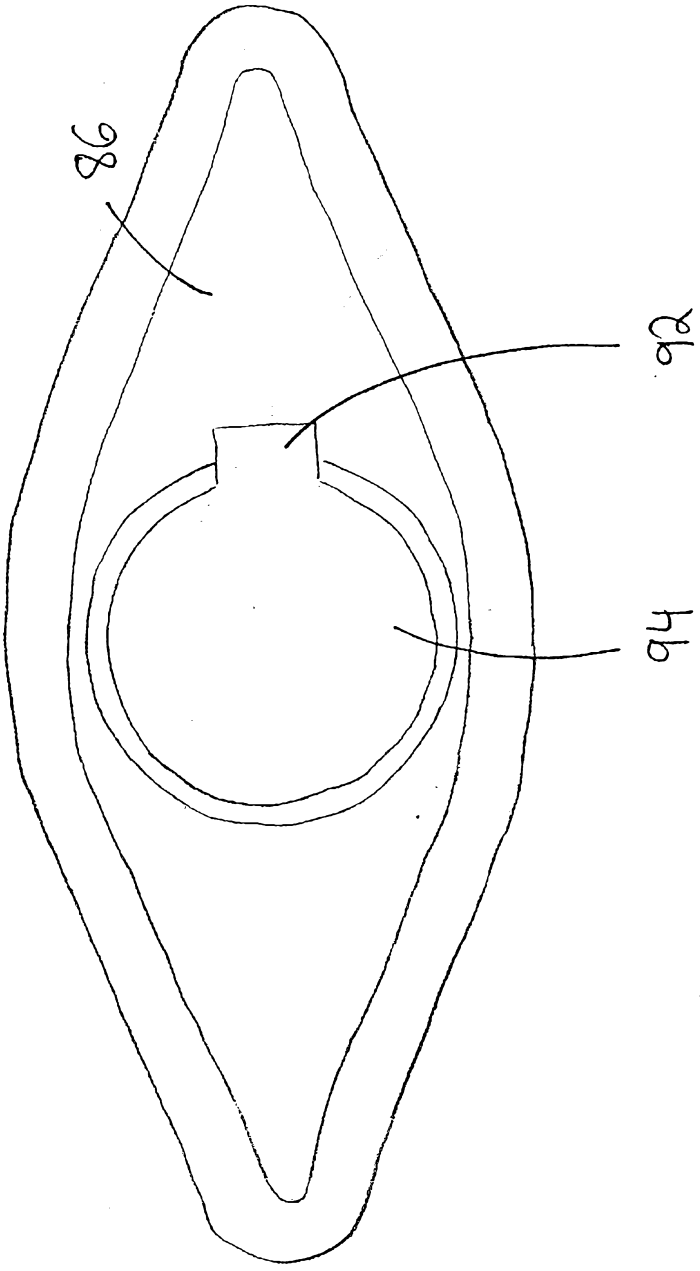


Fig.5

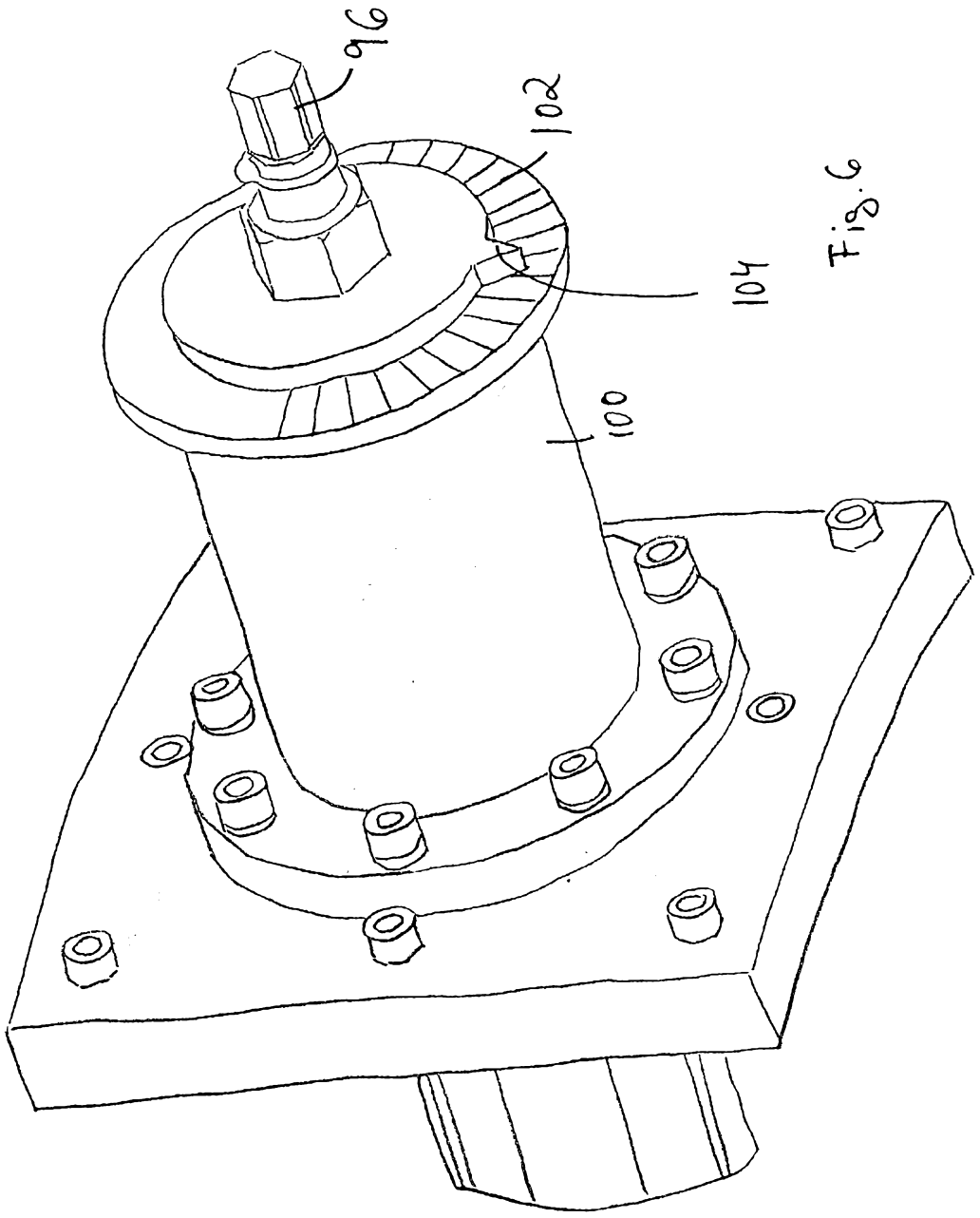


Fig. 6

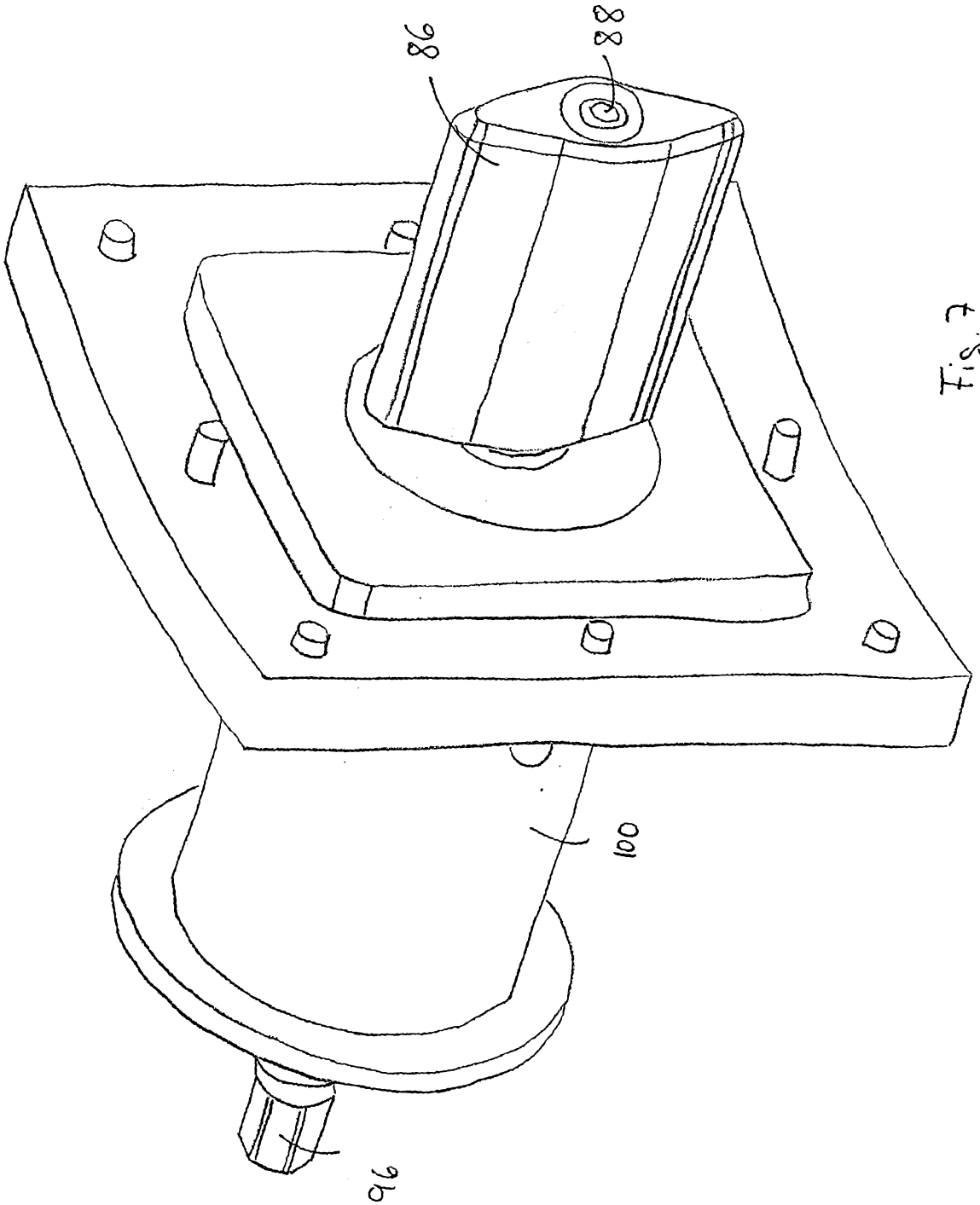


Fig 7