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(54) **A ROLLER MILL AND A METHOD OF OPERATING A ROLLER MILL**

(57) The roller mill has a frame, at least one roller pair, which comprises a first roller (12) and a second roller (14), which first and second roller are parallel, so that there is a gap (16) between them. The width of the gap is adjustable by changing the distance between the first roller and second roller, and the first and second roller are connected together with a power transmission mechanism, which is adapted to transmit the rotational movement of the first roller to the second roller with a desired transmission ratio. Said power transmission mechanism having a freewheel clutch (72), which is arranged to allow the second roller to rotate at a rotating speed higher than the rotating speed determined based on the transmission ratio.

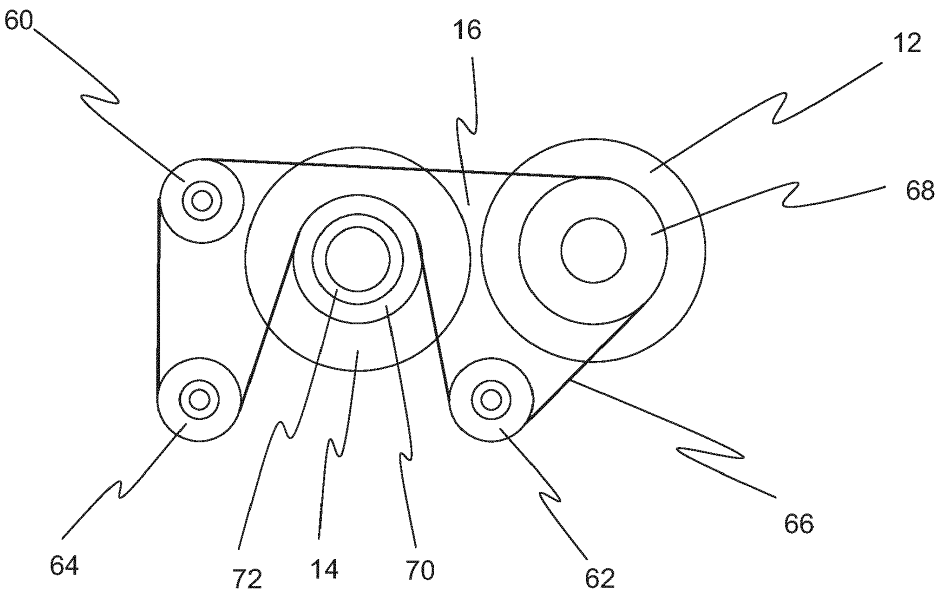

Fig. 2c

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Description

Field of the invention

[0001] The invention relates to a roller mill for crushing and/or flattening feed raw material, which roller mill has a frame, at least one roller pair, which comprises a first roller and a second roller, which first and second roller are parallel, so that there is a gap between them, the width of which gap is adjustable by changing the distance between the first roller and second roller, and which first and second roller are connected together with a power transmission mechanism, which is adapted to transmit the rotational movement of the first roller to the second roller with a desired transmission ratio. The invention also relates to a method of operating a roller mill.

Prior art

[0002] Feed to be used for feeding production animals is manufactured e.g. from various cereal plants, corn, soy, peas and other legumes. The feed is manufactured by crushing the grains or beans of the feed plants and adding a preservative among the generated crush. The grains or beans can be crushed as dried or fresh. The nutritional content of feed manufactured from fresh-crushed grains and beans is higher than that of feed manufactured from dry matters. Additionally, the manufacturing of such feed is less expensive, because the feed raw material does not have to be dried.

[0003] Crushing of feed plant grains or beans is usually done with a roller mill, which has two parallel cylindrical rollers rotated with a motor. The rollers are connected together with a power transmission mechanism, so that the rotation of the first roller causes the second roller to rotate in an opposite direction to the first roller. The motor rotating the rollers can belong to the roller mill or the roller mill can be connected via an axle to an external power engine, such as a tractor. The granular raw material of the feed, i.e. the grains or beans, are led to pass through the gap between the rollers, whereby they are crushed or at least flattened, so that the surface structure of the grains is broken. One of the rollers is made to be moveable in the horizontal direction, so that the width of the gap between the rollers can be changed in accordance with the grain size of the feed raw material presently to be crushed. The rotating speed of the second roller is generally adjusted to be lower than the rotating speed of the first roller, whereby a grinding effect improving the crushing and/or flattening is achieved in the narrowest point between the rollers. The outer surface of the rollers can have embossing, which promotes passing of the granular material into the gap between the rollers. One roller mill operating with the above-mentioned principle is described in publication GB 2347065 B.

[0004] In known roller mills, the power transmission between the roller pair is implemented with a fixed transmission, where the first roller is rotated with a motor at a desired first rotating speed and the transmission mechanism forces the second roller to rotate at a second rotating speed determined by the transmission, which second rotating speed is lower than the first rotating speed. Transmission is generally implemented with gear wheels or belt transmission.

[0005] In some roller mill use situations, the friction between the first and second roller achieved by the feed raw material to be crushed passing between the rollers is so large, that the second roller strives to rotate at a higher rotating speed than the power transmission ratio allows. In such a situation, the power transmission begins to slow down the rotating speed of the second roller, which increases the power demand of the motor rotating the rollers and strains the transmission.

[0006] Publication EP 0514953 A2 describes a roller mill, which has a first and a second roller, between which there is a gap, into which material to be crushed is led. The width of the gap can be altered by moving the second roller. The first roller is rotated with a motor and the rotational movement is transmitted to the second roller with a transmission mechanism combining the ends of the rollers. The transmission mechanism comprises a freewheel clutch, which enables the rotation of the second roller with a rotating speed higher than the transmission ratio. The roller mill described in the publication is intended especially for crushing rock material.

[0007] An object of the invention is to provide a roller mill and a method of operating a roller mill, with which problems related to prior art can be reduced. The objects of the invention are obtained with a roller mill and a method, which are characterised in what is presented in the independent claims. Some advantageous embodiments of the invention are presented in the dependent claims.

Brief summary of the invention

[0008] The invention relates to a roller mill for crushing and/or flattening feed raw material, which roller mill has a frame, at least one roller pair, which comprises a first roller and a second roller, which first and second roller are parallel, so that there is a gap between them. The width of the gap is adjustable by changing the distance between the first roller and second roller, and the first and second roller are connected together with a power transmission mechanism, which is adapted to transmit the rotational movement of the first roller to the second roller with a desired transmission ratio. Said transmission mechanism comprises a freewheel clutch, which freewheel clutchis arranged to allow the second roller to rotate at a rotating speed greater than the rotating speed determined based on the transmission ratio. The roller mill additionally comprises measuring means for measuring the rotating speed of the second roller.

[0009] In one advantageous embodiment of the roller mill according to the invention, said freewheel clutchcan be locked into a fixed position, whereby the rotating speed of the second roller is determined based on the rotating speed of the first roller and the transmission ratio.

[0010] A second advantageous embodiment of the roller mill according to the invention comprises measuring means for measuring the rotating speed of the first roller.

[0011] In still another advantageous embodiment of the roller mill according to the invention, the first roller is attached to the frame in an immobile manner and the second roller is attached to the frame in a mobile manner, and the roller mill additionally comprises adjustment means for moving the second roller.

[0012] Still another advantageous embodiment of the roller mill according to the invention additionally comprises an feeding device for feeding feed raw material into the gap between the first and second roller.

[0013] Still another advantageous embodiment of the roller mill according to the invention additionally comprises a control unit for controlling the operation of said adjustment means and feeding device.

[0014] In still another advantageous embodiment of the roller mill according to the invention, said control unit is configured to adjust the width of the gap between the first and second roller and/or to adjust the operation of the feeding device based on the rotating speeds of the first roller and second roller.

[0015] Still another advantageous embodiment of the roller mill according to the invention comprises a transmission axle for connecting the first roller to a power source not belonging to the roller mill, such as a tractor.

[0016] In still another advantageous embodiment of the roller mill according to the invention, said power transmission mechanism connecting the first and second roller is a mechanical transmission mechanism, such as a chain or belt mechanism, and said freewheel clutch is placed at the end of the second roller.

[0017] The method according to the invention for using the above-described roller mill comprises selecting a threshold speed for the rotating speed of the second roller, which threshold speed is higher than or as high as the rotating speed determined based on the transmission ratio, feeding feed raw material into the gap between the first and second roller, measuring the rotating speed of the second roller during use of the roller, comparing the measured rotating speed to the threshold speed and adjusting the width of the gap between the first and second roller, adjusting the amount of feed raw material to be fed into the gap between the first and second roller and/or locking or releasing the freewheel clutchbased on the difference between the rotating speed of the second roller and the threshold speed.

[0018] Advantageously, the input speed of the feed raw material and/or the width of the gap between the first and second roller is increased, if it is desired to maximize the production capacity of the roller mill. Alternatively, if it is desired to maximize the grinding effect achieved with the roller mill, the freewheel clutch is locked, if the measured rotating speed exceeds the threshold speed. The threshold speed can at its lowest be as high as the rotating speed determined based on the transmission ratio.

[0019] In one advantageous embodiment of the method according to the invention, before the use of the roller mill is begun, the gap between the first roller and second roller is adjusted to a desired width by moving the second roller, the second roller is rotated manually in the rotating direction allowed by the freewheel clutch while the first roller is stationary, and the width of the gap is measured during the rotation of the second roller. The rotating of the second roller can ensure that the surfaces of the rollers of the roller pair do not touch each other during the rotating.

[0020] In another advantageous embodiment of the method according to the invention, before the use of the roller mill is begun, the second roller is rotated manually in the rotating direction allowed by the freewheel clutch while the first roller is stationary, and the condition of the rollers is assessed by checking the surface of the second roller. Faults in the roller surfaces are generally caused by hard objects, such as rocks or nails, that have ended up in the gap between the rollers. Such an object that has ended up in a gap usually leaves a mark in both rollers. Visual checking of the surface of the second roller is thus mostly sufficient for checking the condition of the roller pair.

[0021] In still another advantageous embodiment of the method according to the invention, fresh, undried granular raw material is used at the feed raw material, such as cereal grains, corn grains, soy beans, peas or other legumes.

[0022] An advantage of the invention is that due to the freewheel clutch, the rotating speed of the second roller can freely exceed the rotating speed determined based on the transmission ratio, whereby the friction between the rollers does not stress the power transmission mechanism. The power transmission mechanism can thus be implemented in a structurally lighter way, which generates savings in manufacturing costs. The risk of breaking of the power transmission mechanism is also reduced, which generates savings in service and repair costs.

[0023] An additional advantage of the invention is that the transmission mechanism does not slow down the first roller, i.e. it does not stress the motor rotating the first roller, which decreases fuel consumption of the motor and operating costs of the roller mill.

Brief description of the drawings

[0024] In the following, the invention will be described in detail. In the description, reference is made to the enclosed drawings, in which

figure 1	shows as an example a roller mill according to the invention seen diagonally from the front and above,
figure 2a	shows the roller mill of figure 1 seen from the side, from the direction of the first end,
figure 2b	shows the roller mill of figure 1 seen from the side, from the direction of the second end,
figure 2c	shows the power transmission mechanism of the roller mill shown in figure 1 and
figure 3	shows as an example a roller mill according to the invention as a crosssectional view.

Detailed description of the invention

[0025] Figure 1 shows as an example a roller mill according to the invention seen diagonally from the front and above. The roller mill has a frame 10, which comprises four substantially vertical pillars 30 and a substantially square-shaped support ring 32 formed of horizontal beams. The pillars are at their upper ends attached to the corners of the support ring. The support ring and pillars support a silo 34. The silo is a funnel-shaped structural part open at its top side, which has an upper part 35 shaped like a cut pyramid above the support ring, and a lower part 36 below the support ring, placed within the circuit delimited by the pillars. The lower part of the silo also has the shape of a cut cone and its downward-pointing tip is connected to the feeding device 40. In the lower part of the frame, within an imaginary circuit delimited by the pillars, there is a crushing unit, which is placed inside a casing 38 which can be opened. The feeding device feeds feed raw material in the silo to be crushed and/or flattened along input channels 42 to the two roller pairs of the crushing unit inside the casing in a way described below. The driving force of the roller pairs is produced with a power engine outside the roller mill, such as a tractor. For connecting to an external power engine, the roller mill has a transmission axle 18, the end of which extends outside the first end of the casing.

[0026] Figure 2a shows the roller mill of figure 1 seen from the side, from the direction of the first end. The section covering the first end wall of the casing has been removed in the figure, to better bring out the structure of the inner part of the casing. The roller mill shown in the figure has two roller pairs made up of a first roller 12 and a second roller 14. The figure shows the first ends of the axles of the two first rollers 12 and the two second rollers 14 and the bearing housings surrounding the ends. The first rollers are parallel in the middle of the crushing unit close to each other, and they are mounted on bearings with stationary first bearing housings 44 to the frame of the crushing unit. In figure 2a, the first end of the axle of the left-side first roller 12 extends outside the end wall of the casing and there are grooves, so-called spoors, in the longitudinal direction of the axle on its outer surface,. This axle functions as a drive axle 18, which is connected with an intermediary axle to the power engine rotating the first roller, advantageously the tractor. Around the first ends of the first axles there are gear wheels 46, the indentations of which intermesh with each other. Due to the gear wheels, the first rollers of both roller pairs begin to rotate in opposite directions, when the drive axle 18 is rotated with the power engine. The drive axle shown in the figure can also be in both ends of the first roller, which enables connecting of the drive axles of two subsequently placed roller mills with a connecting axle, whereby the connected roller mills can be used simultaneously with one power engine.

[0027] The second bearing housings 48 surrounding the ends of the axles of the second rollers 14 seen in the figure are eccentric bearing housings, which are attached in a mobile manner to the frame of the crushing unit. For moving the eccentric bearings, the roller mill has adjustment means, which comprise an adjustment axle 50 below the second bearing housing, which adjustment axle can be rotated with a suitable adjustment tool. On the section between the ends of the adjustment axle there is a slide 52, on which a turning lever 54 on the outer surface of the perimeter of the second bearing housing is placed. When the adjustment axle is rotated with the adjustment tool, the slide moves in the longitudinal direction of the adjustment axle and the turning lever fitted into a slot in the slide rotates the second bearing housing. Due to the eccentricity of the second bearing housing, the rotating of it causes the first end of the second roller 14 to move in relation to the first roller. The same kind of turning mechanism for the bearing housing of the second roller is also in the second end of the second roller, and these turning mechanisms are connected together with a chain transmission 56, due to which the second bearing housings in both ends of the second rollers always rotate in a synchronized manner.

[0028] In connection with the second bearing housing 48 there is additionally an adjustment cylinder 58 belonging to the adjustment means, the cylinder part of which is attached to the frame of the crushing unit, and the shaft of the piston protruding out of the cylinder is connected to the support structures of the second bearing housing. With the aid of the adjustment cylinder, the second bearing housing and with it the second roller are pushed toward the first roller. The hydraulic fluid pressure in the adjustment cylinder keeps the first and second roller at a standard distance from each other during use of the roller mill. The hydraulics line, which is not shown in the figure, of the adjustment cylinder has a so-called pressure accumulator, which receives pressure shocks and enables a temporary increase in the width of the gap between the first and second roller.

[0029] The adjustment means additionally comprise a wedge piece, not shown in the figure, between the first and second bearing housing, and possibly further a clearance strip, which is used for adjusting the minimum distance between the bearing housings, which minimum distance determines the width of the gap between the first and second roller. The attaching of the ends of the first and second rollers shown in figure 2a is known as such, which is not described further in this context.

[0030] Figure 2b shows the roller mill of figure 1 seen from the side, from the direction of the second end. Figure 2b thus shows the roller mill according to the invention from the opposite end to figure 2a. The section covering the second end wall of the casing has been removed in the figure, to better bring out the structure of the inner part of the casing. The figure shows the second ends of the axles of the two first rollers 12 and the two second rollers 14 and the bearing housings surrounding the ends. The second ends of the roller axles are supported on the frame of the crushing unit in the same way as their first ends. Around the second ends of the first rollers there are, however, no gear wheels, so the rotational movement of the first roller equipped with a drive axle is transmitted to the first roller of the second roller pair only through the first ends of the rollers. On the other hand, in the second ends of the rollers, there is a transmission mechanism, by means of which the rotational movement of the first roller 12 in both roller pairs is transmitted to the second roller 14 of the same roller pair.

[0031] The power transmission mechanism comprises a first control wheel 60, a second control wheel 62 and a tension wheel 64, as well as a belt 66, which circles around said control wheels, tension wheel and a first pulley wheel in the end of the axle of the first roller and a second pulley wheel in the end of the axle of the second roller, in the manner shown in figure 2b. Advantageously, the belt is a V-belt and the pulley wheels have a groove, in which the V-belt is fitted. The support structure of the tension wheel, by means of which the tension wheel is attached in a moveable manner to the crushing unit, comprises a spring member, with pulls the tension wheel away from the second control wheel by spring force. Due to the spring member and the moveable tension wheel, the belt of the transmission mechanism always stays at a suitable tension, even if it stretches during use.

[0032] Figure 2c shows the power transmission mechanism of the roller mill shown in figure 2b as a principle view. Around the end of the axle of the first roller 12 there is a first pulley wheel 68 and around the end of the axle of the second roller 14 there is a second pulley wheel 70. The belt 66 circles the first and second pulley wheel, the first and second control wheel 60, 62 and the tension wheel 64 in the manner shown in the figure, whereby the rotational movement of the first roller 12 rotated with the drive axle istransmitted to the second roller 14, so that the first and second roller rotate in opposite directions. The rotational direction of the rollers shown in figure 2c are selected so that the first roller 12 rotates counterclockwise and the second roller 14 rotates clockwise. Thus, the rotational movement of the rollers "pulls" the feed raw material to be fed between the rollers through the gap 16 between the rollers.

[0033] The ratio between the outer diameters of the first and second pulley wheel determines the transmission ratio of the transmission mechanism. In the roller mill according to the invention, the diameter of the first pulley wheel is smaller than the outer diameter of the second pulley wheel, so the rotating speed of the second roller is lower than the rotating speed of the first roller. The magnitude of the difference in the rotating speeds can be selected. The diameters of the pulley wheels can be selected so that the rotating speed of the second roller is 5-50 %, advantageously 20 %, more advantageously 10 % lower than the rotating speed of the first roller.

[0034] The first pulley wheel is attached to the axle in a fixed manner, so that it always rotates at the same rotating speed as the first roller. Between the axle of the second roller and the pulley wheel there is a freewheel clutch 72, which allows the pulley wheel to rotate freely around the axle in the opposite direction to the rotational direction of the first roller, but prevents the second pulley wheel from rotating around the axle in the rotational direction of the first roller. When using the roller mill, the second roller thus always rotates in the opposite direction to the first roller, and the rotating speed of the second roller at least as high as the rotating speed determined based on the transmission ratio of the power transmission mechanism. In some use situations, the feed raw material to be crushed or flattened being fed between the first and second roller forms such a high friction between the rollers that the rotational movement of the first roller is through the friction transmitted to the second roller more efficiently than with the powertransmission mechanism. In that case the rotating speed of the second roller can rise higher than the rotating speed determined based on the transmission ratio.

[0035] The freewheel clutch can if necessary be locked into a position, where it prevents the pulley wheel from rotating freely in both rotational directions. The locking of the freewheel clutch can be used when it is desired to maximize the grinding effect achieved with different rotating speeds with the roller mill.

[0036] Figure 3 shows the roller mill shown in figures 1 and 2a-2c as a cross-sectional view. The outer surface of the first and second rollers 12, 14 seen in the figures has a cylindrical shape. The rollers do not however have to have a cylindrical shape, but the invention can also be used in so-called disc roller mills, where the rollers are built up of discs fitted adjacently on an axle, the thickness of which discs decreases when moving from the roller axle toward the edge of the disc. In such disc roller mills, the gap between the rollers thus forms between the outer surfaces of overlapping discs. In the bottom of the silo 36 there is an feeding device 40, which comprises two parallel compartments 75 opening in the lower part of the silo, which compartments are separated from each other with a common partition wall 77. Within each compartment, there is a paddle wheel 76, which is rotated with a motor not shown in the figures. The rotating speeds of the paddle wheels are adjusted with the control unit 22, which is used to control the operation of the motors rotating the paddle wheels. A first input channel 42 diverges from the bottom of the first compartment, the end of which channel opens up above the first roller pair, and a second input channel 42 diverges from the bottom of the second compartment, the end of which channel opens up above the second roller pair. As a continuation of the ends of the input channel there are guide plates 78, which guide the feed raw material coming along the input channels precisely into the gap 16 between the rollers of the roller pair. The structure and operation of the feeding device is prior art known as such, which is not described in further detail in this context.

[0037] Beneath the first and second rollers there is an extraction chamber 80, into which the crushed or flattened feed raw material, which has passed through the gaps in the roller pairs, falls. The extraction chamber has two pairs of scrapers 82, which are used for detaching feed raw material which has stuck to the surface of the first and second roller. The feed raw material exits the extraction chamber though an opening in its wall (the opening is not shown in the figures).

[0038] The roller mill according to the invention is used for crushing or flattening granular feed raw material. The device is suited especially for flattening fresh feed raw material, but it can also be used for crushing dry feed raw material. The feed raw material can for example be grain, corn, soy, peas or other legumes.

[0039] Before beginning the crushing/flattening of feed raw material, the width of the gap between the first roller and the second roller, i.e. the roller clearance, is adjusted to be a desired width by moving the second roller with the adjustment means. The suitable width of the roller clearance can be checked and, if necessary, measured by rotating the second roller manually in the direction allowed by the freewheel clutch while the first roller is stationary. At the same time, the condition of the rollers can be visually assessed by checking the surface of the second roller.

[0040] When using the roller mill, a threshold speed is selected for the rotating speed of the second roller, which threshold speed is higher than or as high as the rotating speed determined based on the transmission ratio, and feed raw material is fed into the gap between the first and second roller by using the feeding device. The rotating speed of the second roller during use of the roller mill is measured with measuring means 84 and the measured rotating speed is compared to the threshold speed. If the rotating speed of the second roller exceeds the threshold speed selected based on the transmission ratio, this is a sign that large friction forces are at work between the roller pair. An increase in the rotating speed of the second roller means that the grinding effect between the rollers decreases. The rotating speed of the second roller can be affected either by adjusting the width of the gap between the first and second roller, or by adjusting the amount of feed raw material being fed into the gap between the first and second roller. If it is desired to maintain a desired difference in rotating speeds, the input speed of the feed raw material can be decreased. If it is desirable to maximize production capacity, the width of the gap between the first and second roller can be increased. To achieve a maximal grinding effect, the freewheel clutch can be locked, if necessary.

[0041] Some advantageous embodiments of the roller mill and method according to the invention have been described above. The invention is not limited to the solutions described above, but the inventive idea can be applied in different ways within the scope of the claims.

List of reference numbers:

10	frame
12	first roller
14	second roller
16	gap
18	transmission axle
22	control unit
30	pillar
32	support ring
34	silo
35	upper part
36	lower part
38	casing
40	feeding device
42	input channel
62	second control wheel
64	tension wheel
66	belt
68	first pulley wheel
70	second pulley wheel
72	freewheel clutch
75	compartment
76	paddle wheel
77	partition wall
78	guide plate
80	extraction chamber
82	scraper
84	measuring means

(continued)

44	first bearing housing
46	gear wheel
48	second bearing housing
50	adjustment axle
52	slide
54	turning lever
56	chain transmission
58	adjustment cylinder
60	first control wheel

Claims

1. A roller mill for crushing and/or flattening feed raw material, which roller mill has a frame (10), at least one roller pair, which comprises a first roller (12) and a second roller (14), which first and second roller are parallel, so that there is a gap (16) between them, the width of which gap (16) is adjustable by changing the distance between the first roller (12) and second roller (14), and which first and second roller (12, 14) are connected together with a power transmission mechanism, which is adapted to transmit the rotational movement of the first roller (12) to the second roller (14) with a desired transmission ratio, and which power transmission mechanism comprises a freewheel clutch (72), which freewheel clutch (72) is arranged to allow the second roller (14) to rotate at a rotating speed higher than the rotating speed determined based on the transmission ratio, **characterized in that** it comprises measuring means (84) for measuring the rotating speed of the second roller (14).

2. The roller mill according to claim 1, **characterized in that** said freewheel clutch (72) can be locked into a fixed position, whereby the rotating speed of the second roller (14) is determined based on the rotating speed of the first roller (12) and the transmission ratio.

3. The roller mill according to claim 1 or 2, **characterized in that** it comprises measuring means (84) for measuring the rotating speed of the first roller.

4. The roller mill according to any of the claims 1-3, **characterized in that** the first roller (12) is attached to the frame (10) in an immobile manner, and the second roller (14) is attached to the frame (10) in a mobile manner, and the roller mill additionally comprises adjustment means for moving the second roller (14).

5. The roller mill according to any of the claims 1-4, **characterized in that** it further comprises an feeding device (40) for feeding feed raw material into the gap (16) between the first roller (12) and the second roller (14).

6. The roller mill according to claim 5, **characterized in that** it further comprises a control unit (22) for controlling the operation of said adjustment means and feeding device (40).

7. The roller mill according to claim 6, **characterized in that** said control unit (22) is configured to adjust the width of the gap between the first and second roller (12, 14) and/or to adjust the operation of the feeding device (40) based on the rotating speeds of the first roller (12) and second roller (14).

8. The roller mill according to any of the claims 1-7, **characterized in that** it comprises a transmission axle (18) for connecting the first roller (12) to a power engine not belonging to the roller mill, such as a tractor.

9. The roller mill according to any of the claims 1-8, **characterized in that** said power transmission mechanism combining the first and second roller (12, 14) is a mechanical power transmission mechanism, such as a chain or belt mechanism, and said freewheel clutch (72) is placed at the end of the second roller (14).

10. A method of operating a roller mill according to any of the claims 1-9, **characterized in**

    - selecting a threshold speed for the rotating speed of the second roller (14), which threshold speed is higher than or as high as the rotating speed determined based on the transmission ratio,

- feeding feed raw material into the gap (16) between the first and second roller (12, 14),
- measuring the rotating speed of the second roller (14) during use of the roller mill,
- comparing the measured rotating speed to the threshold speed and
- adjusting the width of the gap between the first and second roller (12, 14), adjusting the amount of feed raw material being fed into the gap (16) between the first and second roller (12, 14) and/or locking or releasing the freewheel clutch (72) based on the difference between the rotating speed of the second roller (14) and the threshold speed.

11. The method according to claim 10, **characterized in** increasing the input speed of feed raw material and/or increasing the width of the gap (16) between the first and second roller (12, 14) in order to maximize the production capacity of the roller mill.

12. The method according to claim 10, **characterized in** locking the freewheel clutch (72), if the measured rotating speed exceeds the threshold speed, in order to achieve the maximum grinding effect.

13. The method according to any of the claims 10-12, **characterized in**, before starting use of the roller mill,

- adjusting the gap (16) between the first roller (12) and second roller (14) to have a desired width by moving the second roller (14),
- rotating the second roller (14) manually in the rotational direction allowed by the freewheel clutch (72) while the first roller (12) is stationary and
- measuring the width of the gap (16) during rotation of the second roller (14).

14. A method according to any of the claims 10-13, **characterized in**, before starting use of the roller mill,

- rotating the second roller manually in the rotational direction allowed by the freewheel clutch while the first roller is stationary and
- estimating the condition of the rollers by checking the surface of the second roller (14).

15. The method according to any of the claims 10-14, **characterized in** using fresh, undried granular raw material as feed raw material, such as cereal grains, corn grains, soy beans, peas or other legumes.

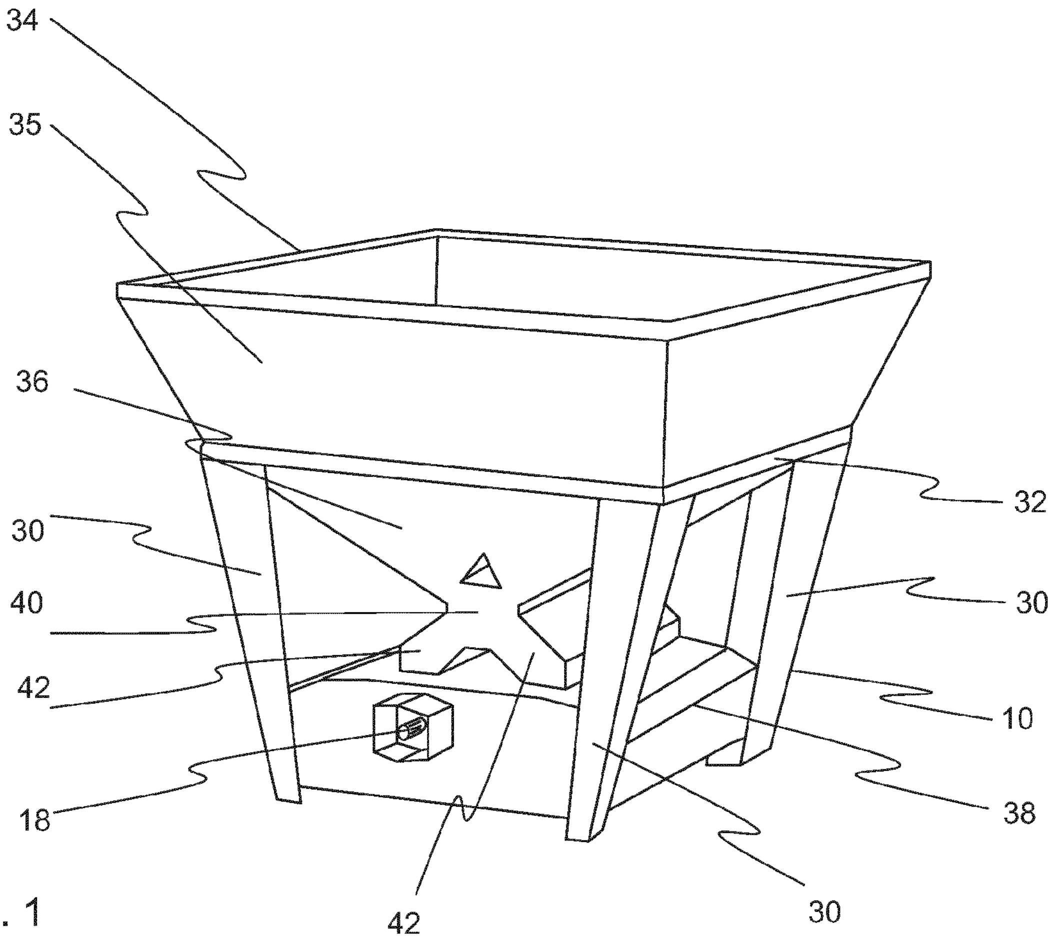
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Fig. 1

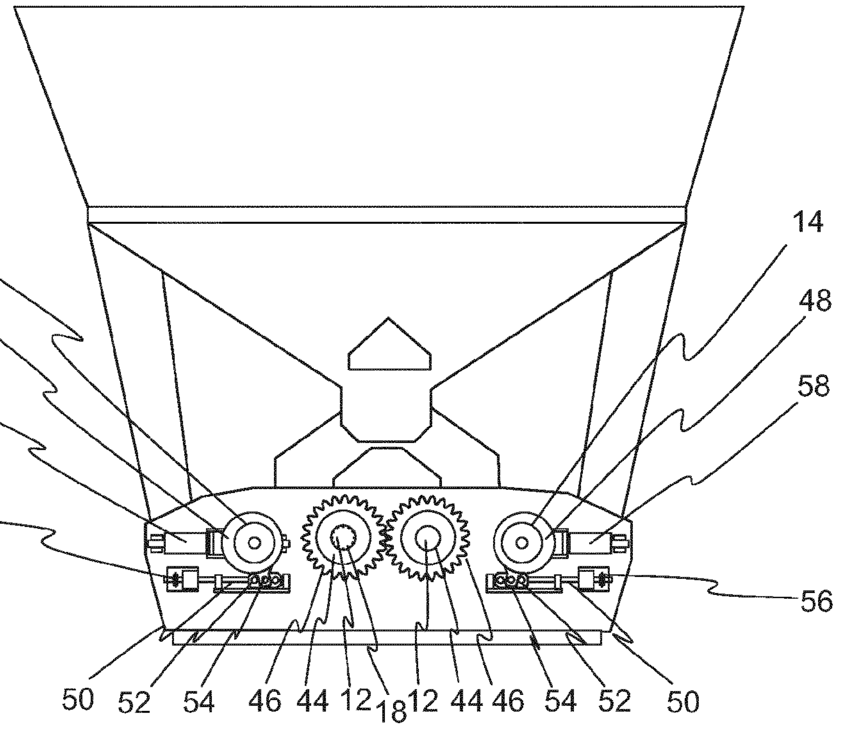
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Fig. 2a

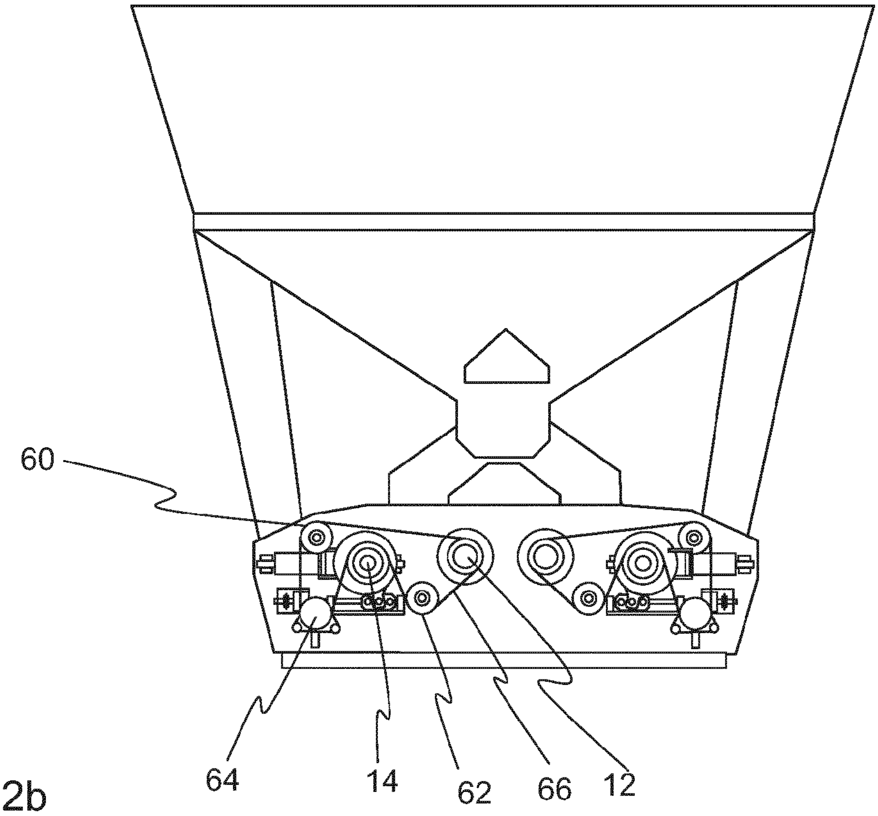

Fig. 2b

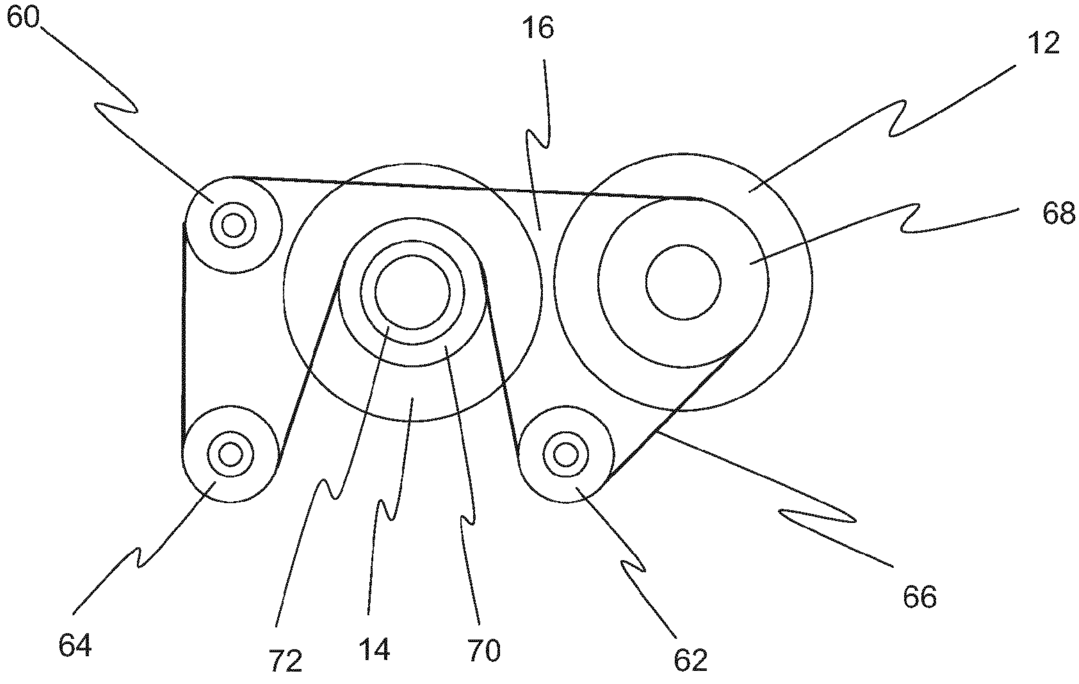

Fig. 2c

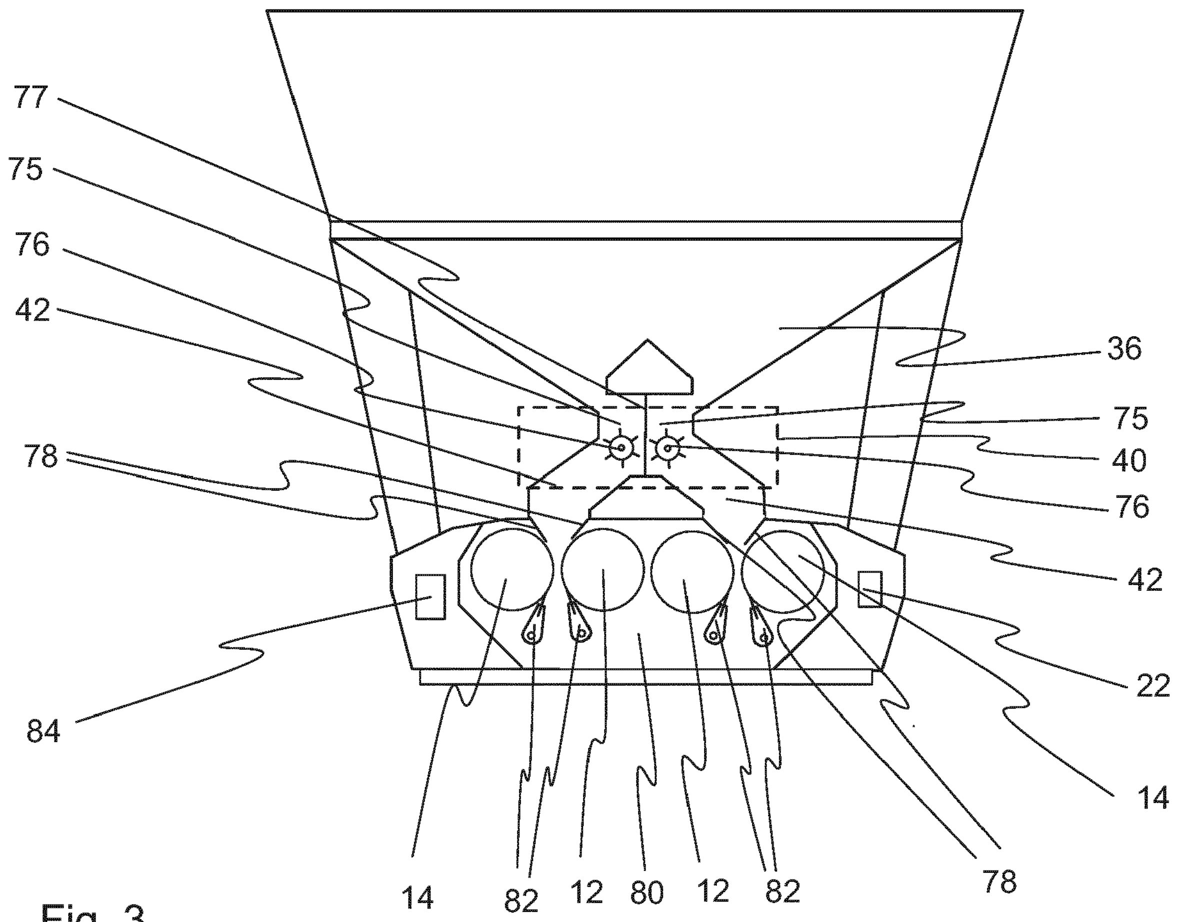

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 23 19 5849

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	19 February 2024	Laurim, Jana

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CATEGORY OF CITED DOCUMENTS

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