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(54) Improved pan mill for clay or aggregates in general

Verbesserter Kollergang für Ton oder Zuschlagstoffe im allgemeinen

Broyeur perfectionné à meules verticales pour argile ou agrégats en général

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(73) Proprietor: **BEDESCHI S.p.A.**
35010 Limena (Padova) (IT)

(72) Inventor: **Bedeschi, Guglielmo**
I-35100 Padova (IT)

(74) Representative:
Modiano, Guido, Dr.-Ing. et al
Modiano & Associati SpA
Via Meravigli, 16
20123 Milano (IT)

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Description

The present invention relates to an improved pan mill for clay or aggregates in general.

It is known that clay, as well as other kinds of aggregates, must be ground and mixed before being processed (for example mixed, fired, etcetera).

Clay can be ground by means of machines with cylindrical rollers.

For this purpose, the clay is processed beforehand in machines commonly termed pan mills before being ground in the roller mill.

Pan mills therefore perform a first crushing of the aggregate, which can then be sent to finer grinding in the roller mill.

For the sake of greater clarity in illustration, in the accompanying drawings, figures 1 and 2 are schematic views of the essential structure of known commercially available pan mills.

Accordingly, with reference to the above figures, a pan mill is substantially constituted by a supporting structure A including posts B that are anchored to the ground.

A substantially circular grinding surface C is fixed to the supporting structure A.

Two heavy circular grinding wheels D and E rest on the grinding surface C; the grinding wheel D is internal, whereas the grinding wheel E is external.

Said grinding wheels D and E are freely rotatable about their respective axis F and G.

Each one of the respective axes F and G is connected, by means of a corresponding oscillating arm H, to a vertical axis I that is rotatably coupled in a central region of the grinding surface C.

A gearmotor L is fixed on a frame M that surmounts the grinding surface C and turns the vertical axis I, which in turn rotates the grinding wheels D and E, which by friction on the grinding surface C also rotate about their own axis F and G.

The material to be ground is loaded continuously on one side of the grinding surface C by means of a belt N and is distributed over the entire grinding surface C by means of scrapers O.

A type of pan mill that is more advanced than the one here described is commercially available but does not introduce substantial modifications to the essential structure.

For the sake of completeness in description, it should be noted that in this more advanced type of pan mill the gearmotor is located substantially on the ground, and therefore below the grinding surface. Such a mill is known from DE-U-90 17356, and corresponds to the preamble of claim 1.

Placing the grinding wheel in this position entails some advantages, the main one being that it is possible to feed the pan mill from above in a substantially central position and thus perform the first grinding by means of the heavier inner grinding wheel.

Although this type of pan mill has improved and increased the production of ground material, it has not been able to solve the basic drawbacks that will be described hereinafter.

In view of the fact that the grinding wheels have a considerable weight and that indeed the characteristic of weight is directly proportional to the amount of ground material, it is evident that having the grinding wheels at different peripheral speeds induces a considerable resultant of the centrifugal force.

In view of this centrifugal force, the grinding wheels must be turned at extremely low speeds (generally 13 to 16 rpm) to avoid creating excessive imbalances in the machine structure.

Even the solution that adopts grinding wheels having different weights is unable to compensate for the difference in peripheral speed.

From the above description it is evident that production is therefore limited by the number of passes of the outer grinding wheel (or inner grinding wheel, depending on the type being considered) on the grids, the geometrical dimensions of the machine being equal, and currently this production is scarcely competitive with respect to that of other functionally equivalent machines and procedures.

A principal aim of the present invention is to provide a pan mill that does not have the drawbacks affecting known types.

In relation to this aim, an object of the present invention is to provide a pan mill in which the installed power and used power ratio, in proportion to the amount of production, is lower than in known types.

Another object of the present invention is to provide a pan mill the hourly production whereof can be compared, and is competitive, with that of other functionally equivalent machines.

This aim, these objects, and others which will become apparent hereinafter are achieved by an improved pan mill for clay or aggregates in general, according to the invention, which comprises, on a supporting structure, a substantially circular grinding surface in the center of which a shaft is rotatably coupled, said shaft having a substantially vertical rotation axis, grinding wheels being placed on said surface and being rigidly coupled so as to cover a revolving path with respect to said shaft, said grinding wheels rotating about respective substantially horizontal half-shafts that are always connected to said shaft along corresponding oscillating arms, means for removing the ground aggregate, and means for feeding the aggregate to be ground, characterized in that it comprises at least two pairs of said grinding wheels, each pair being constituted by two mutually identical grinding wheels that are arranged symmetrically with respect to said shaft, at least one of said at least two pairs having an inner grinding path and at least one having an outer crushing path so as to cover areas of said grinding surface that are substantially annular and partially interfere with each

other.

Further characteristics and advantages of the invention will become apparent from the following detailed description of an embodiment thereof, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

figures 1 and 2, as mentioned, relate to the state of the art;
figure 3 is an orthogonal projection of a pan mill according to the invention;
figure 4 is a top orthogonal projection of a pan mill according to the invention.

With reference to figures 3 and 4, a pan mill for clay or aggregates in general, according to the invention, is generally designated by the reference numeral 10.

The pan mill 10 comprises a supporting structure 11 constituted by four posts 12 surmounted by four cross-members 13, which are arranged so as to substantially form a square.

A substantially circular grinding surface 14 is arranged on the cross-members 13 and has a raised perimetric rim forming a wall 14a.

A shaft 15 having a substantially vertical rotation axis is supported and rotatably coupled substantially at the center of the grinding surface 14.

The shaft 15 is connected, by means of a universal joint not shown in the figures, to a gearmotor 16 arranged inside the supporting structure 11 and substantially fixed to the ground.

Four grinding wheels 17, 18, 19, and 20 are arranged on the grinding surface 14 and are retained so as to cover a revolving path with respect to the shaft 15.

The grinding wheels 17 to 20 are all identical as regards both their shape and their weight; they all furthermore rotate freely about their own half-shaft 21, which has a substantially horizontal longitudinal axis.

The grinding wheels 17 to 20 are arranged so as to form pairs that are mutually offset by substantially 90 sexagesimal degrees with respect to the revolving path about the shaft 15; each one of said pairs is constituted by two grinding wheels 17 and 18 and 19 and 20 arranged mutually symmetrically with respect to the shaft 15.

More specifically, each one of the half-shafts 21 of the pair of grinding wheels 17 and 18 is connected to a corresponding oscillating arm 22, which is in turn pivoted so as to form a hinge-like connection to a pivot 23 rigidly coupled to the shaft 15.

The respective half-shafts 21 of the pair of grinding wheels 19 and 20 are connected to corresponding oscillating arms 24 pivoted directly to the shaft 15.

From the above description and from the drawings it is evident that the pair of grinding wheels 17 and 18 provides a revolving path having a greater radius than the one related to the pair of grinding wheels 19 and 20; in this sense, the pair of grinding wheels 17 and 18 is described as outer pair, whereas the pair of grinding wheels 19 and 20 is described as inner pair.

It should also be specified that the outer pair of grinding wheels 17 and 18 rotates on a track 25 formed by perforated grilles, whereas the inner pair of grinding wheels 19 and 20 rotates on a solid track 26.

Two scrapers 27 are furthermore rigidly coupled to the motion of the grinding wheels 17 to 20 and are arranged symmetrically with respect to the shaft 15.

A conical hopper 28 for feeding the pair of inner grinding wheels 19 and 20 is arranged above the grinding wheels 17 to 20 in a position that is substantially central with respect to the grinding surface 14.

In practice, operation is as follows: the aggregate to be ground is conveyed by means of a belt above the hopper 28 and is poured into it.

The hopper 28 distributes the material to be ground in a region covered by the inner pair of grinding wheels 19 and 20, which performs a first grinding of the aggregate.

The motion of the grinding wheels 19 and 20 and the combined action of the scrapers 27 carries the aggregate, which at this point is already partially ground, in the region covered by the pair of grinding wheels 17 and 18, which further crushes the aggregate at the grilled track 25.

Then the aggregate crushed by the pair of grinding wheels 17 and 18 passes through the grilles and is collected by containers, not shown in the figures.

In practice, it has been observed that the intended aim and objects have been achieved; in particular, it should be noted that the pan mill according to the invention is perfectly balanced with respect to centrifugal forces, since the resultant is cancelled by the particular arrangement of the grinding wheels.

The fact should also be stressed that the amount of production of the pan mill with four grinding wheels is approximately double, even if one considers only the grinding and crushing action; this production amount increases further if one considers that said overall balance of the pan mill allows significantly higher rotation rates than those of commercially available pan mills.

Finally, it should be noted that the installed power, in proportion to the production amount, is consequently lower and at least halved, in practice, with respect to that of commercially available pan mills.

The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the inventive concept as defined by the claims.

In practice, the materials employed, so long as they are compatible with the contingent use, as well as the dimensions, may be any according to the requirements.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the inter-

pretation of each element identified by way of example by such reference signs.

Claims

1. Improved pan mill for clay or aggregates in general, which comprises, on a supporting structure (11), a substantially circular grinding surface (14) in the center of which a shaft (15) is rotatably coupled, said shaft (15) having a substantially vertical rotation axis, grinding wheels (17-20) being placed on said surface and being rigidly coupled so as to cover a revolving path with respect to said shaft (15), said grinding wheels (17-20) rotating about respective substantially horizontal half-shafts (21) that are always connected to said shaft (15) along corresponding oscillating arms (22,24), means (27) for removing the ground aggregate, and means (28) for feeding the aggregate to be ground, characterized in that it comprises at least two pairs of said grinding wheels (17-20), each pair (17,18; 19,20) being constituted by two mutually identical grinding wheels that are arranged symmetrically with respect to said shaft (15), at least one (19,20) of said at least two pairs having an inner grinding path (26) and at least one pair (17,18) having an outer crushing path (25) so as to cover areas of said grinding surface (14) that are substantially annular and partially interfere with each other.

2. Improved pan mill for clay or aggregates according to claim 1, characterized in that said at least two pairs (17,18; 19,20) are mutually offset, along said revolving path, substantially by 90 sexagesimal degrees.

3. Improved pan mill for clay or aggregates according to claim 1, characterized in that said at least one outer crushing pair (17,18) is associated with means for removing the ground inert material, said removal means being constituted by at least one grille (25) that is formed in said grinding surface at said revolving path related to said outer pair.

4. Improved pan mill for clay or aggregates according to one or more of the preceding claims, characterized in that said grinding wheels (17-20) are identical in shape and weight.

5. Improved pan mill for clay or aggregates according to one or more of the preceding claims, characterized in that said feeder means are constituted by at least one conical hopper (28) that is arranged above said grinding wheels (17-20) at said at least one pair (19, 20) of inner grinding wheels.

Patentansprüche

1. Verbesserter Kollergang für Ton oder Aggregate im allgemeinen, der auf einer Trägerstruktur (Trägerelement) (11) eine im wesentlichen kreisförmige Mahlfläche (14) aufweist, in deren Zentrum eine Welle (15) drehbar eingesetzt ist, wobei die Welle (15) eine im wesentlichen vertikale Drehachse aufweist, auf der genannten Mahloberfläche Schleifscheiben bzw. Schleifräder (17-20) angeordnet sind, die starr so befestigt sind, daß sie eine Umlaufbahn gegenüber der genannten Welle (15) bedecken, die genannten Schleifscheiben bzw. Schleifräder (17-20) sich jeweils im wesentlichen um horizontale Halbwellen (21) drehen, die stets mit der genannten Welle (15) entlang entsprechender oszillierender Arme (22,24) verbunden sind, Einrichtungen (Mittel) (27) zur Entfernung des gemahlenen Aggregats und Einrichtungen (Mittel) (28) zur Zuführung des zu mahlenden Aggregats, dadurch gekennzeichnet, daß er mindestens zwei Paare der genannten Schleifscheiben bzw. Schleifräder (17-20) umfaßt, wobei jedes Paar (17,18; 19,20) aus zwei untereinander identischen Schleifscheiben bzw. Schleifrädern aufgebaut ist, die in bezug auf die genannte Welle (15) symmetrisch angeordnet sind, wobei mindestens eines (19,20) der genannten mindestens zwei Paare eine innere Mahlbahn (26) aufweist und mindestens ein Paar (17,18) eine äußere Zerkleinerungsbahn (25) aufweist, so daß sie die Bereiche der genannten Mahlfläche (14) bedecken, die im wesentlichen ringförmig sind und sich teilweise überschneiden.

2. Verbesserter Kollergang für Ton oder Aggregate nach Anspruch 1, dadurch gekennzeichnet, daß die genannten mindestens zwei Paare (17,18; 19,20) entlang der genannten Umlaufbahn im wesentlichen um 90° (90/60) gegeneinander versetzt sind.

3. Verbesserter Kollergang für Ton oder Aggregate nach Anspruch 1, dadurch gekennzeichnet, daß das genannte mindestens eine äußere Zerkleinerungspaar (17,18) mit einer Einrichtung zur Entfernung des gemahlenen inerten Materials assoziiert ist, wobei die genannte Entfernungs-Einrichtung aus mindestens einem Gitter (25) besteht, das in der genannten Mahlfäche auf der genannten Umlaufbahn benachbart zu dem genannten äußeren Paar angeordnet ist.

4. Verbesserter Kollergang für Ton oder Aggregate nach einem oder mehreren der folgenden Ansprüche, dadurch gekennzeichnet, daß die genannten Schleifscheiben bzw. Schleifräder (17-20) in Gestalt und Gewicht identisch sind.

5. Verbesserter Kollergang für Ton oder Aggregate

nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die genannten Beschickungs-Einrichtungen aus mindestens einem konischen Trichter (28) bestehen, der oberhalb der genannten Schleifscheiben bzw. -räder (17-20) an dem mindestens einen Paar (19,20) der inneren Schleifscheiben bzw. Schleifräder angeordnet ist.

Revendications

1. Broyeur à meules verticales perfectionné pour de l'argile ou des agrégats en général, qui comprend, sur une structure de support (11), une surface de broyage (14) sensiblement circulaire au centre de laquelle un arbre (15) est couplé à rotation, ledit arbre (15) présentant un axe de rotation sensiblement vertical, des meules (17 à 20) étant placées sur ladite surface et étant rigidement couplées de façon à recouvrir un trajet tournant par rapport audit arbre (15), lesdites meules (17 à 20) tournant autour de demi-arbres respectifs (21) sensiblement horizontaux et qui sont reliés en permanence audit arbre (15), le long de bras oscillants correspondants (22, 24), des moyens (27) pour enlever l'agrégat moulu, et des moyens (28) pour alimenter en agrégat à meuler, caractérisé en ce qu'il comporte au moins deux paires desdites meules (17 à 20), chaque paire (17, 18 ; 19, 20) étant constituée de deux meules mutuellement identiques qui sont agencées symétriquement par rapport audit arbre (15), au moins l'une (19, 20) desdites au moins deux paires présentant un trajet intérieur de meulage (26) et au moins une paire (17, 18) présentant un trajet extérieur de broyage (25) de façon à couvrir des zones de ladite surface de meulage (14) qui sont sensiblement annulaires et qui interfèrent partiellement les unes avec les autres.

2. Broyeur à meules verticales perfectionné pour de l'argile ou des agrégats selon la revendication 1, caractérisé en ce que lesdites au moins deux paires (17, 18 ; 19, 20) sont mutuellement décalées, le long dudit trajet de rotation, sensiblement de 90° sexagésimaux.

3. Broyeur à meules verticales perfectionné pour de l'argile ou des agrégats selon la revendication 1, caractérisé en ce que ladite au moins une paire extérieure de meules de broyage (17, 18) est associée à des moyens pour enlever le matériau inerte moulu, lesdits moyens pour enlever étant constitués par au moins une grille (25) qui est formée dans ladite surface de broyage, sur ledit trajet tournant se rapportant à ladite paire extérieure.

4. Broyeur à meules verticales perfectionné pour de l'argile ou des agrégats selon une ou plusieurs des revendications précédentes, caractérisé en ce que lesdites meules (17 à 20) sont identiques en forme et en poids.

5. Broyeur à meules verticales perfectionné pour de l'argile ou des agrégats selon une ou plusieurs des revendications précédentes, caractérisé en ce que lesdits moyens d'alimentation sont constitués par au moins une trémie conique (28) qui est agencée au-dessus desdites meules (17 à 20) sur ladite au moins une paire (19, 20) de meules intérieures.

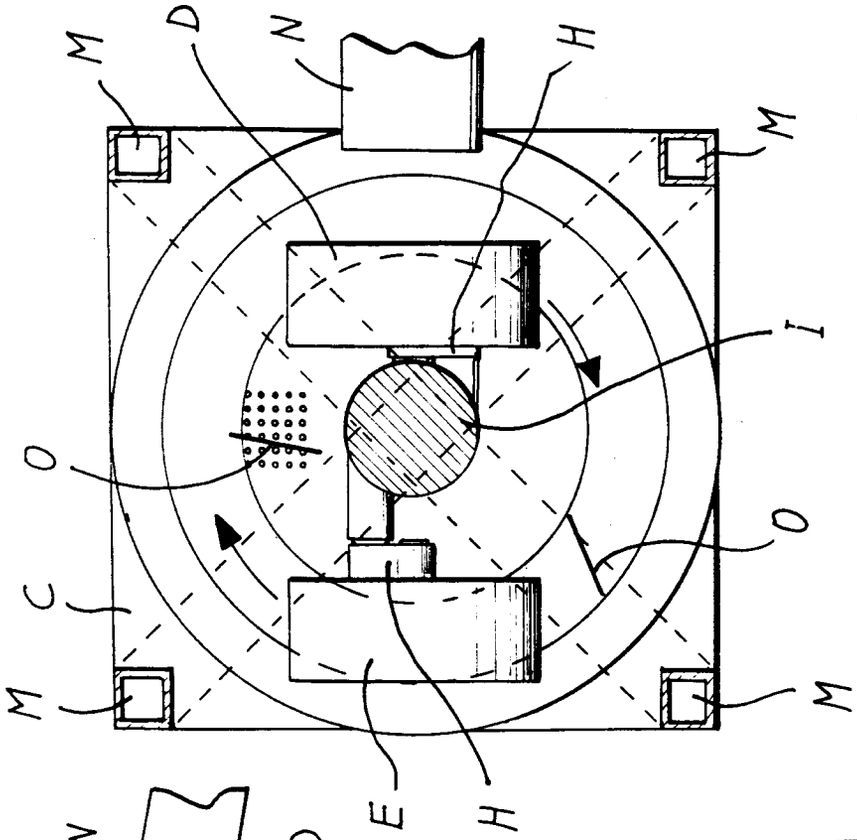


Fig.2

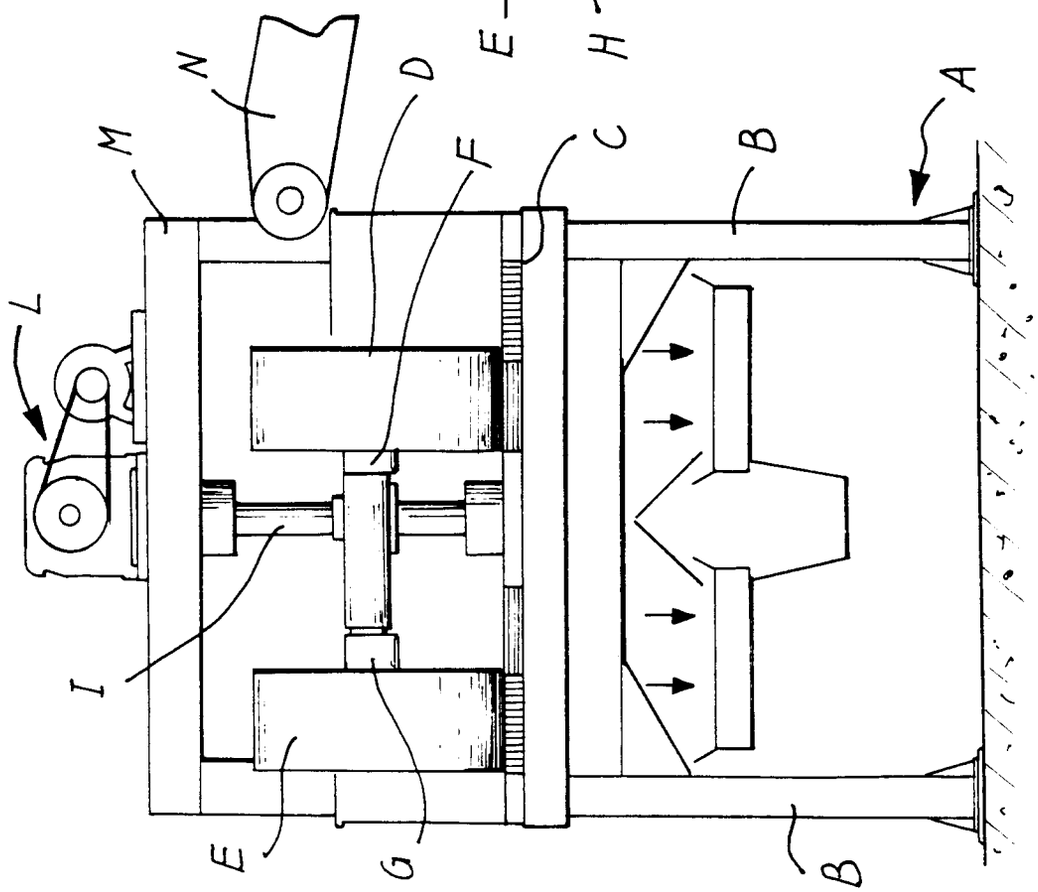


Fig.1

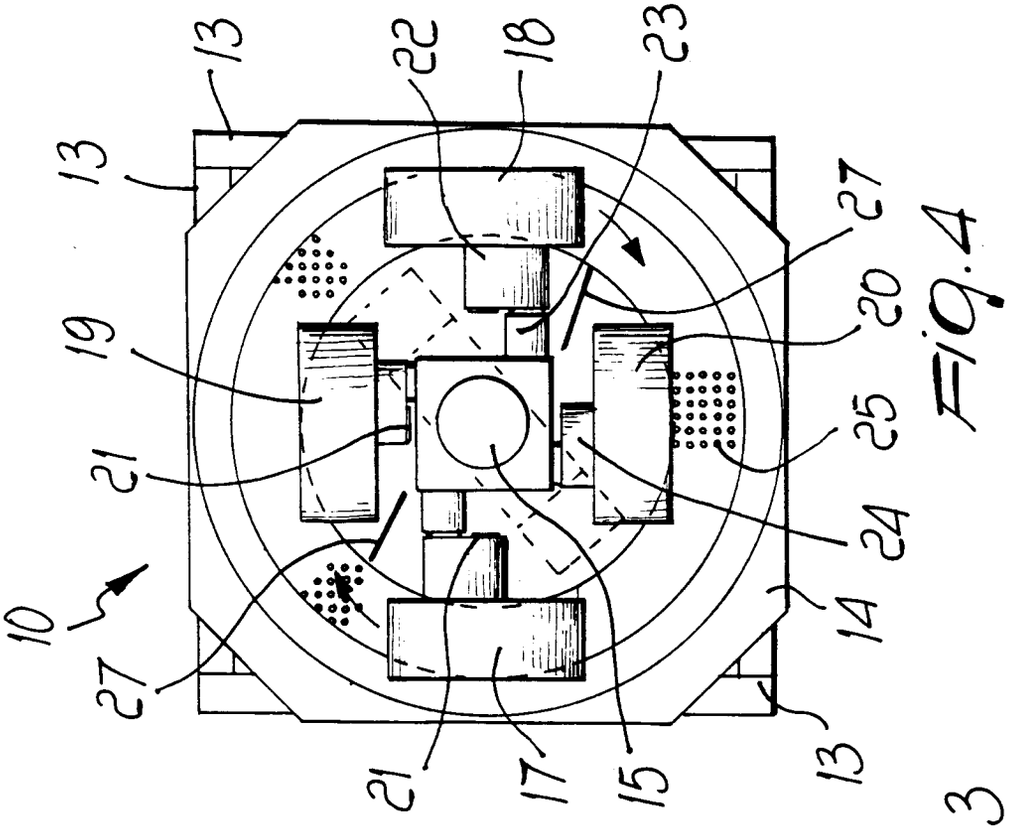

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Fig. 4

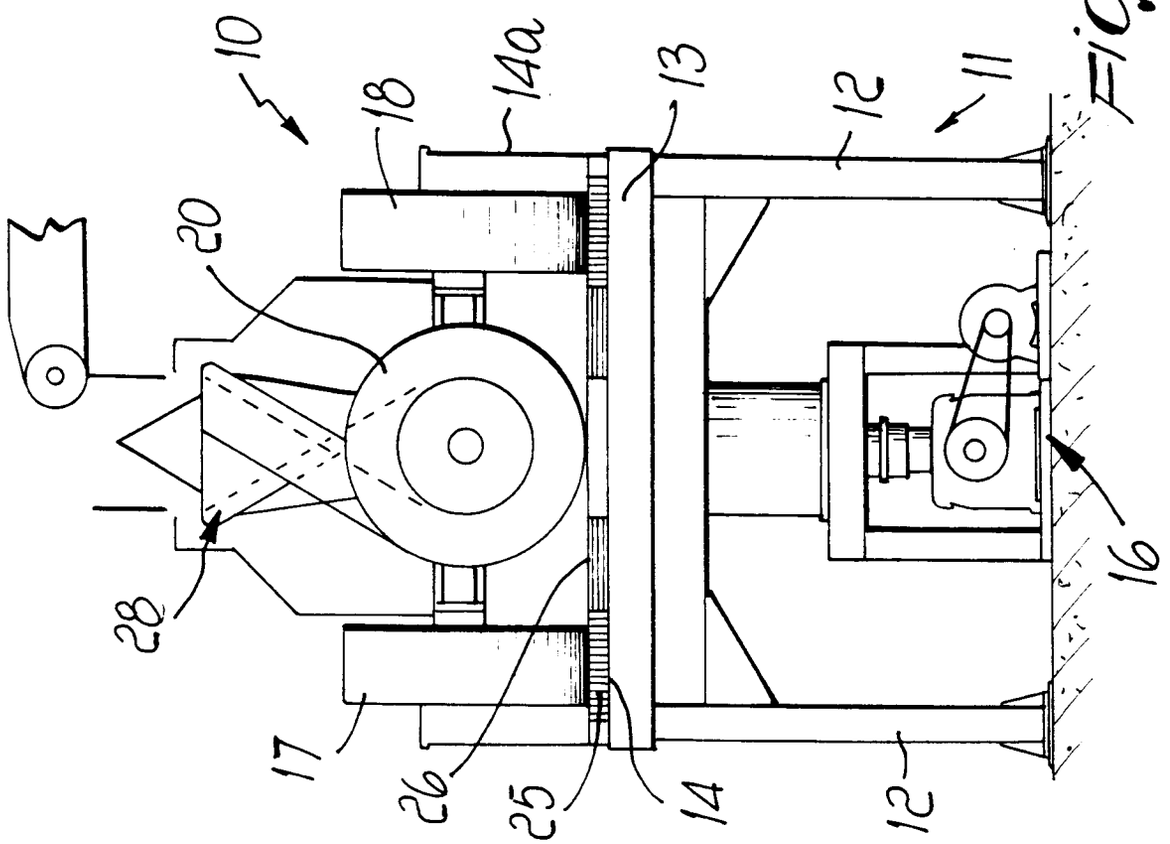

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Fig. 3