June 2, 1959 A. ANDREAS 2,889,119

SLINGING IMPACT BREAKERS

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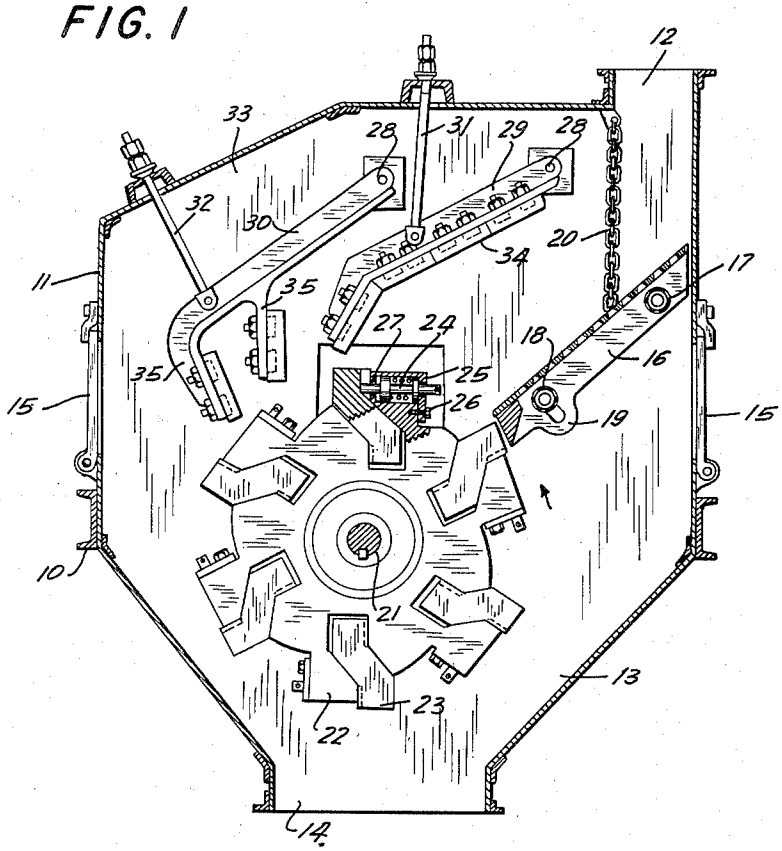
FIG. 1



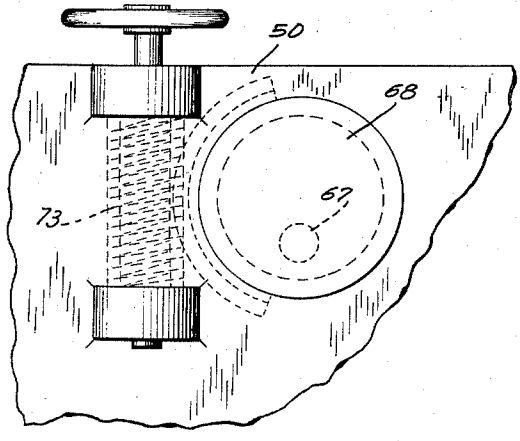


FIG. 3

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SLINGING IMPACT BREAKERS

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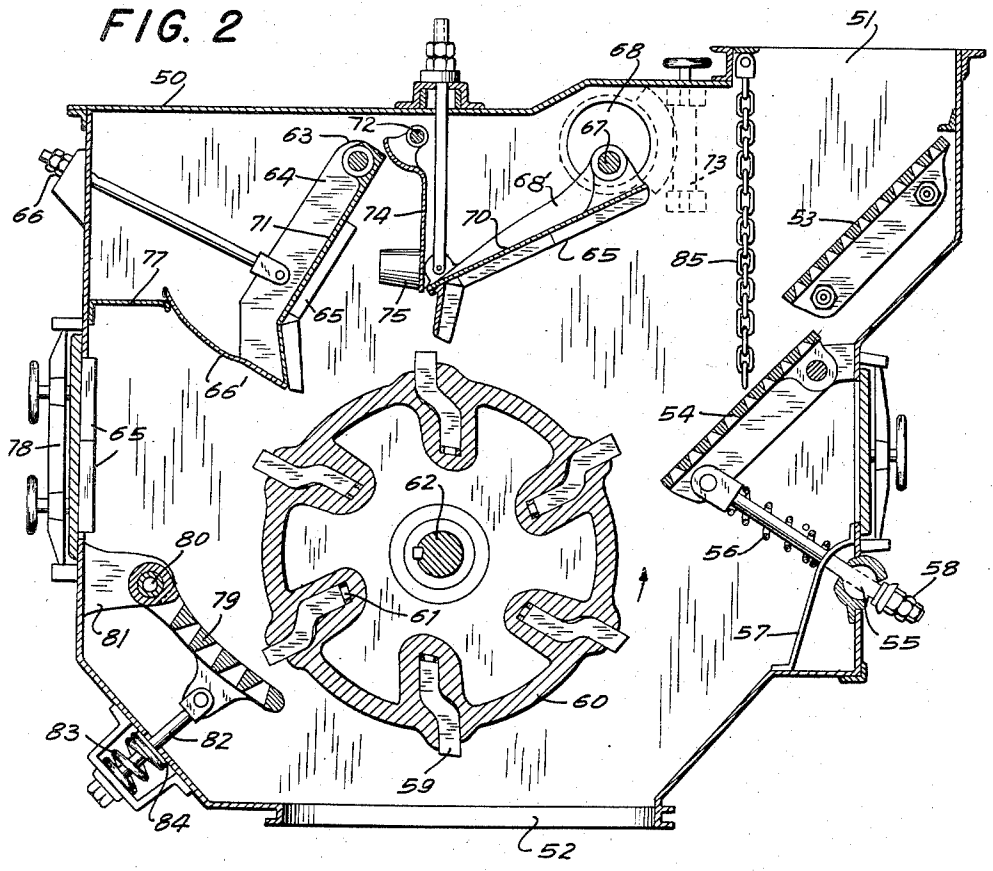
FIG. 2



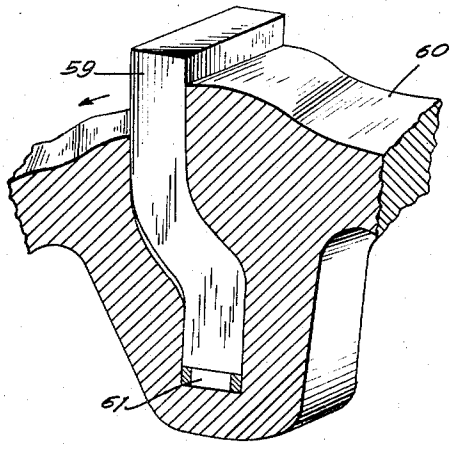


FIG. 4

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SLINGING IMPACT BREAKERS

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Application May 9, 1955, Serial No. 506,742
In Germany May 11, 1949
Public Law 619, August 23, 1954
Patent expires May 11, 1969
5 Claims. (Cl. 241—189)

My invention relates to improvements in disintegrators and crushing machines of the slinging impact type and has for one of its objects to provide a device of this character which will be relatively simple in construction, comparatively inexpensive to manufacture, install, and operate, and more efficient in use than those which have been proposed heretofore.

Another object of my invention is to provide an improved material apparatus having a rotary breaker provided with striking and slinging means. A further object is to provide impact means which are suspended in a pendulum manner and easily adjustable. A still further object is to provide a breaker giving way to particles of material that is not to be disintegrated, such breaker having impact means that quickly yield when struck by foreign bodies for rapidly returning to the operating position after removal of the foreign body.

Other objects of my invention will appear hereinafter as the description proceeds, since my invention consists in the novel details of construction, and combinations and arrangements of parts more fully described and particularly pointed out in the appended claims.

Referring to the accompanying drawings,

Fig 1 is a sectional view of a material reducing impact breaker embodying my invention,

Fig. 2 is a sectional view of another embodiment,

Fig. 3 is a view of a detail at a larger scale of the apparatus shown in Fig. 2, and

Fig. 4 illustrates another detail of it in perspective view.

Referring to Fig. 1, 10 indicates a supporting frame upon which the casing or housing 11 is mounted, this casing being of substantially the shape shown in the figure and having at its upper end and at one side thereof a feed opening 12 for charging the material to be disintegrated in the casing 11. The lower walls 13 of the casing 11 are oppositely inclined and slope to an outlet 14 provided at the bottom of the casing 11. With the exception of these inlet and outlet openings, the casing 11 is completely walled for providing a close chamber, openings provided in the side walls thereof being closed by flaps 15. Beneath the feed opening 12 an inclined sieve 16 is provided within the casing 11, the upper end of this sieve adjoining a lateral wall of the casing and being secured by screws 17 to front and rear walls of the casing, while the lower end of the sieve 16 is adjustably applied to these walls by means of screws 18 extending through slots in extensions 19 of the sieve 16. At the lower edge of the inlet part 12, chains 20 are suspended, these chains extending down to the surface of the sieve 16 and forming together a sort of curtain for uniformly passing the charged material.

In the housing 11, a rotary shaft 21 is provided bearing a rotor or impeller 22 that is secured to the shaft 21 and has notches provided at its peripheral surface for receiving striking and slinging impeller blades 23. These blades 23 are of substantially zig-zag-shaped profile, their middle portions being inclined in the direction of rotation. Recesses are provided in the trailing surfaces of the blades adjacent the outer ends thereof. Bolts 24 projecting into these recesses are resiliently carried in bores of the rotor or impeller 22. Covers 25 secured to this rotor by screws 26 hold the bolts 24 in position. Washers 27 of rubber and like elastic material are provided within the bores of the impeller 22 abutting against the bolts 24.

In the casing 11, rods 28 are arranged parallel to the driving shaft 21 and respectively carrying supports 29 and 30 which are suspended from the top wall 33 of the casing 11 by bolts 31 and 32 respectively connected at their bottom ends to supports 29 and 30 and turnably mounted at their top ends on top wall 33. At its lower side the support 29 is lined with rebounding plates 34. Such plates are also secured to both of the arms 35 of the support 30.

Each of the supports 29 and 30 and plates 34 connected thereto form an impact means mounted at top and lower parts, respectively, by the mounting means formed by shaft 28 and bolt 31 or 32, for swinging about the axis of shaft 28. The shaft axis and the axis of impeller 22 are in a common plane. This plane is behind in the direction of impeller rotation, that plane in which the lower part of the flat impinging surface portion of the plate 34 is arranged. This flat surface portion of plate 34 is nearer the rotor blades 23 than shaft 28. Thus, the distance between these blades and the plates quickly and widely enlarges when the impact means are pushed up from their rest position by any piece than may not be disintegrated, and in this way the machine is protected from troubles.

In operation, the charged material enters through the inlet 12 and rolls over the sieve 16 through which dust and fine particles fall. The curtain formed by the chains 20 prevents clumps of material from sliding down the sieve 16 and breaks them. When leaving the sieve 16 the material is met by the blades 23 rotating with utmost velocity. By thus being met, the material is partly disintegrated, its parts being slung against the plates 34 fixed to the support 29. They rebound from these plates 34 and are thrown back into the path of the rotary blades 23 to again be crushed and again projected against the plates 34. In this manner the material reciprocates between the blades 23 and plates 34 till it is so fine that it will not be thrown any longer and escapes to the walls 13 and leaves the casing through the outlet 14. For disintegrating material of great hardness, the blades 23 as well as the plates 34 are made of strongest steel and other metal of hard quality, especially of an alloy containing chrome, manganese, vanadium, and the like. If pieces of extremely hard material are included in foreign bodies falling into the casing 11 the supports 29 and 30 are capable of quickly yielding, and since the distance between the rotary blades 23 and the rods 28 is large, too, such troubling parts at once may escape, neither disturbing thus the disintegrating process for any perceivable time nor compelling the operator to stop the machine for removing the foreign body.

The distance between the rotary impeller blades and the adjoining edge of the plates 34, when the latter are in their operating or rest position, may be controlled by means of the nuts to the top ends of bolts 32 at the exterior of housing 11 (Fig. 1). Thus the degree and capacity of disintegration can be regulated without interrupting the process of breaking. When the blades 23 are worn, the driving shaft 23 is stopped, the flaps 15 are opened, the covers 25 removed, and the bolts 24 withdrawn by hand. In rotation the blades 23 were strongly pressed against the outer walls of the notches of the rotor 22 in radial direction by the centrifugal force. But as soon as the shaft 21 is stopped, the blades 23 lie

rather loose within these notches and may easily be removed. After one end of a blade is worn, it may be removed, inverted, and remounted again in the notch to operate till the other end is worn. Thus, these blades which consist of expensive material can be consumed as far as possible.

In Figs. 2–4, I have shown an embodiment of my invention in which the upper part of the casing or housing **50** is separated from the disintegrating zone. Since the raw material entering through the inlet and met by the rotary blades is chiefly thrown upwards, a good deal of it is flung up to the ceiling of the casing and falls to the upper side of the impact plates. In the disintegrating device of the construction illustrated in these Figs. 2 to 4, I have taken care to prevent such an occurrence. The housing **50** is provided with an inlet **51** and outlet **52**. The sieve provided at the bottom of the inlet **51** consists of two parts **53** and **54**, only the lower part **54** being adjustable. Its regulation may be executed by the operator by means of the spindle **55** without opening the casing **50**. The part **53** of the sieve is fixed within the inlet **51**. The spindle **55** is embraced by a helical spring **56** abutting against the curved plate **57** and pressing the sieve **54** upwards as far as is allowed by the nuts **58** of the spindle **55**.

The impeller blades **59** provided on the rotor or impeller **60** are secured to the latter by means of the centrifugal force as in the first embodiment. This pressing, however, is assisted by the effect of wedges **61** keyed at the bottom of the notches of the body **60** (see Fig. 4). In parallel position to the shaft **62** of the rotor **60**, the rod **63** is fixed in the casing **50** bearing the support **64** provided with impact plates **65** and being yieldingly adjustable by means of screw **66**. Parallel to this rod **63** a second rod **67** for bearing the support **68'** is provided, this rod **67** being secured to disks **68** that are rotatably fitted in the lateral walls of the casing **50** and can be adjusted by means of worm gearings **73** (see Fig. 3).

The supports **64** and **68'** have walls **70** and **71**, respectively, that reach up to the lateral walls of the casing **50**. On a rod **72** parallel to the two rods **63** and **67**, a sheet **74** is rotatably mounted, this sheet **74** bearing a weight **75** and being pressed by it against the walls **70** and **71**. A further sheet **66'** is applied to the support **64** sliding on the sheet **77** that is fixed to the casing **50**. When the supports **64** and **68'** perform a turning movement by yielding to any particle that cannot be disintegrated, the walls **70** and **71** together with the sheets **74**, **66'** and **77** sliding with respect to each other form a closed partition extending through the casing **50** at some distance from its top wall and constantly separating the upper part of the interior from the breaking zone. Walls **70** and **71** have flat impact plates **65** fixed thereto.

At the descending or left side of the rotor **60**, as viewed in Fig. 2, the wall of the casing **50** is lined with additional impact plates **65** applied to the cover **78** closing an opening in the casing. Beneath this opening, a grate **79** is pivoted on a pin **80** carried adjacent the left wall of the casing, as viewed in Fig. 2, by means of brackets **81**. This grate can be controlled from outside of the casing **50** by means of the spindle **82** which is surrounded by a spring **83** pressing at one end against a plate **84** that is shrunk onto the spindle **82**.

The operation of this apparatus is similar to that of the first embodiment of my invention. When a foreign body and the like is not stopped by the chains **85**, but comes to the breaking zone and is slung or pressed against the impact plates **65**, the supports **64** and **68'** at once recede opening a wide space between the impeller and the edges of the plates **65** to let the foreign body pass. Since the grate **79** can yield in the same manner, the foreign body runs through to the outlet **52** to leave the apparatus without causing any trouble. When the supports **64** and **68** perform this movement, the sheets **74** and **76** are pushed back, their curved parts sliding along the wall **71** and the sheet **77**, respectively. After the passing of the foreign body, all these parts return at once, being biassed by gravity, to their operating or rest positions. The open passage through the disintegrating zone thus existing but for a very short time, only a small quantity of material can leave the apparatus without being crushed. Neither trouble nor damage will be caused during this time. Such receding, however, happens only when the pressing forces acting upon the plates **65** and the grate **79** exceed a certain amount. If they do not reach it, the said members are not pushed back, but remain in their operating position as determined by regulating the parts **66** and **82**, respectively.

While two forms of the invention have been illustrated and described it is obvious that those skilled in the art may vary the details of construction as well as the precise arrangements of parts without departing from the spirit of my invention and therefore I do not wish to be limited to the above disclosure except as may be required by the following claims.

What I claim is:

1. In an apparatus for disintegrating asbestos ores and the like, the combination with a casing having openings for charging and discharging material, of a rotor having slinging means, of rebounding plates yieldably arranged in the superior part of said casing and surrounding said rotor, and of sheets resiliently disposed in the superior part of said casing and adjoining the said rebounding plates, said rebounding plates and said sheets being adapted for forming a sort of ceiling separating the superior part of said casing from its lower one.

2. In a disintegrator, in combination, a housing having wall means; rotor means arranged in said housing for rotation relatively thereto about an axis of rotation; a plurality of impact plates mounted in said housing for pivotal movement relative thereto about respective pivot axes which extend substantially parallel to said axis of rotation, said pivot axes being so positioned in said housing and said impact plates being so arranged as to be capable of yielding under the influence of particles impelled thereagainst by said rotor; and shielding plate means also mounted in said housing between adjacent impact plates in such a manner as to be movable therewith during yielding thereof for preventing particles impelled by said rotor from entering said portion of the space within said housing which is between said impact plates and said wall means.

3. In a disintegrator, in combination, a housing having wall means; rotor means arranged in said housing for rotation relative thereto about an axis of rotation; a plurality of impact plates mounted in said housing for pivotal movement relative thereto about respective pivot axes which extend substantially parallel to said axis of rotation, said pivot axes being so positioned in said housing and said impact plates being so arranged as to be capable of yielding under the influence of particles impelled thereagainst by said rotor; and shielding plate means also mounted in said housing for pivotal movement relative thereto about at least one pivot axis also parallel to said axis of rotation, said shielding plate means being arranged between adjacent impact plates in such a manner as to be movable therewith during yielding thereof for preventing particles impelled by said rotor from entering said portion of the space within said housing which is between said impact plates and said wall means.

4. In a breaking apparatus, in combination, a housing; a rotary impeller mounted in said housing for rotation relative thereto about an axis of rotation; impact means having a lower substantially flat impact surface portion against which material to be broken may be projected; and mounting means mounting said impact means in said housing for swinging movement relative thereto about a swinging axis substantially parallel to said axis of rotation, said swinging axis passing through said

impact means at a top part thereof spaced from said impact surface portion thereof, said impact surface portion being located, in the direction of rotation of said impeller during operation of the apparatus, ahead of a plane which includes said axis of rotation and said swinging axis so that a point on the periphery of said impeller will pass during rotation of said impeller first through the latter plane and then through a plane in which said impact surface portion is located, said impact surface portion being spaced in a rest position of said impact means at a predetermined distance from the periphery of said impeller, so that said impact means may, under overload condition, swing about said swinging axis and assume a position where said impact surface portion is spaced from said impeller by a distance greater than said predetermined distance.

5. In a breaking apparatus, in combination, a housing; a rotary impeller mounted in said housing for rotation relative thereto about an axis of rotation; impact means having a lower substantially flat impact surface portion against which material to be broken may be projected, said impeller including an impeller body and a plurality of impeller blades fixedly attached thereto; and mounting means mounting said impact means in said housing for swinging movement relative thereto about a swinging axis substantially parallel to said axis of rotation, said swinging axis passing through said impact means at a top part thereof spaced from said impact surface portion thereof, said impact surface portion being located, in the direction of rotation of said impeller during operation of the apparatus, ahead of a plane including said

axis of rotation and said swinging axis so that a point on the outer tip of each impeller blade will pass during rotation of said impeller first through the latter plane and then through a plane in which said impact surface portion is located, said impact surface portion being spaced in a rest position of said impact means at a predetermined distance from the circular path of the extremities of said impeller blades, so that said impact means may, under overload condition, swing about said swinging axis and assume a position wherein said impact surface portion is spaced at a greater distance from said path than said predetermined distance.

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