United States Patent

Hemesath

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[54] COMMINUTING DEVICE

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[51] **Int. Cl.** **B02c 13/06,** B02c 18/08

[58] **Field of Search** ..... 241/189 R, 189 A, 285 A, 285 B, 241/285 R, 286, 186

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[57] **ABSTRACT**

A rotor is mounted in a housing and has circumferentially distributed contact members. Spaced from the rotor are breaker members against which material to be comminuted and admitted into the housing, is flung by the contact members with resulting break-up of such material. The lower portion of the rotor circumference is surrounded by an arcuately curved shell defining with the rotor a channel for comminuted material which tapers in direction towards an outlet of the housing. The shell is composed of supports which mount a plurality of parallel rods extending lengthwise of the rotor axis. Each rod has associated with it a comminuting bar of polygonal cross-section, formed with a longitudinal slot in which the respective rod is lodged. The bars are connected in abutting relationship so that no material can fall through between them.

9 Claims, 2 Drawing Figures

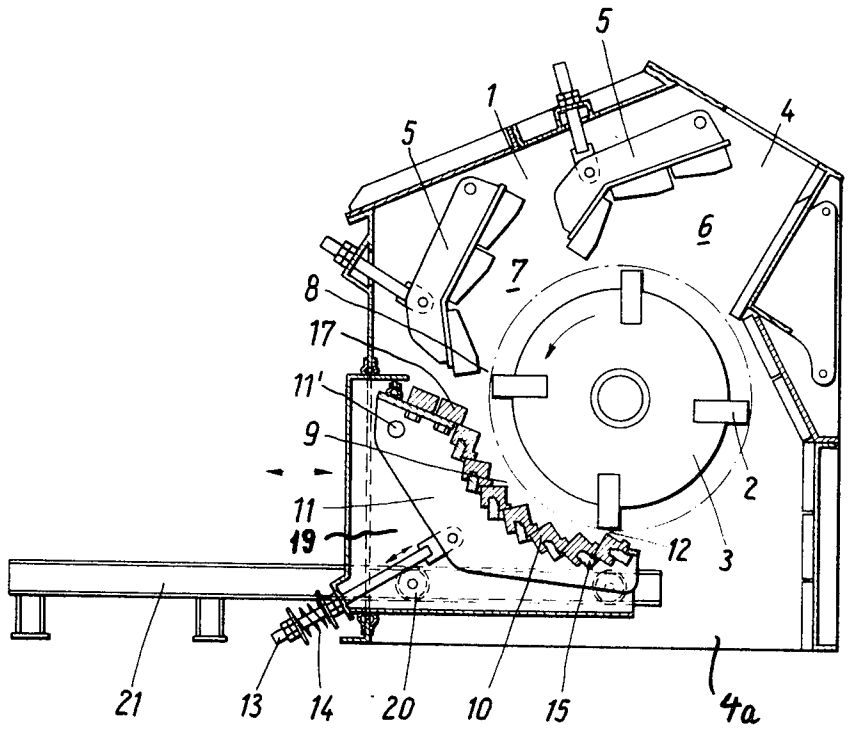


Fig. 1

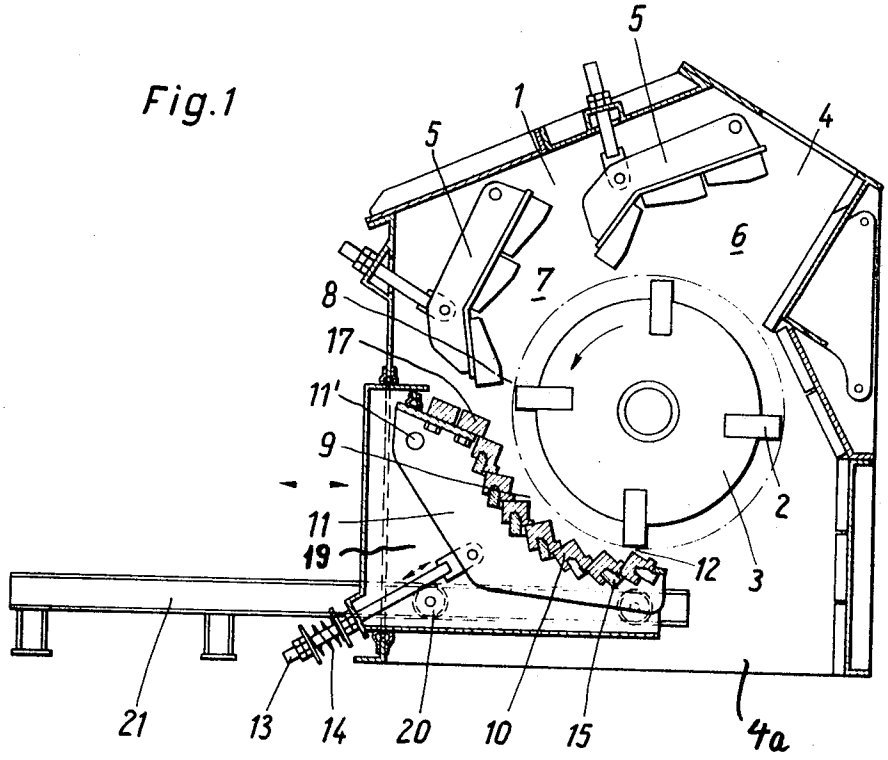
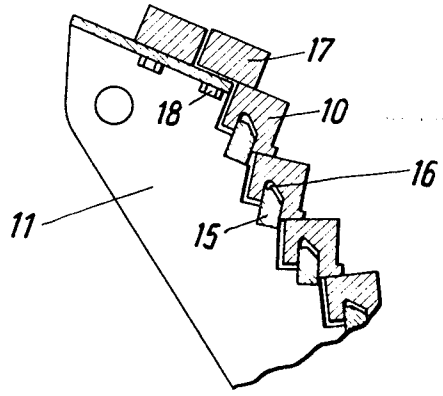


Fig. 2



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COMMINUTING DEVICE

BACKGROUND OF THE INVENTION

The present invention relates to a comminuting apparatus.

It is already well known to comminute certain materials by admitting them into a housing in which a rotor is mounted for rotation, having circumferentially distributed contact members. Upon engagement with these rotating contact members the material is flung forcefully against breaker members which are arranged spaced from the rotor in the path of the material. The impact upon these contact members causes the material to break apart, either along weaker lines or zones, or in accordance with its gain or grains, sometimes releasing internal stresses. The resultant comminuted product has, generally speaking, a more or less cubical grain configuration. This is readily understandable, because unlike other comminuting apparatus the one here under discussion does not forcibly change the grain size by passing the material through a gap between two cooperating comminuting instrumentalities.

Although the type of apparatus under discussion is preferred for certain applications, it does have certain disadvantages. Primarily objectionable is the fact that there is no upper size limitation of the grain in the comminuted product; in other words, the product may and does contain grains of a wide size variety, some of them rather large.

This is evidently undesirable, and attempts have therefore been made to overcome the problem. One such attempt involves the use of classifying devices which receive the product and classify or separate the grains by size. However, this approach is expensive and can do no more than make the best of a basically undesirable circumstance, which is to say that it permits the classification of the various grains but cannot prevent the production of grains having undesirably large dimensions.

Another attempt of the prior art is more advantageous. It involves the use of a shell-like structure which surrounds the lower portion of the rotor periphery and defines therewith a gap or channel which decreases or tapers in direction towards the housing outlet. The comminuted material falls into this gap and advances along the same, being constantly contacted by the contact members on the rotor. This results in further comminution of the material, and the maximum grain size reaching the housing outlet is obviously determined by the narrowest area of the gap, thus assuring a certain maximum grain size. It was found, however, that the contact members tend to simply push the material along the gap if the surface of the structure which defines this gap with the rotor circumference, is smooth. Therefore, the surface is made rough and uneven, for instance of sawtooth-shaped configuration. Whatever provides this roughness, i.e. unevennesses inherent in the surface or separate elements of suitable configuration, it is clear that there is significant wear from contact with the material being cominuted. Thus, projections, edges or the like are worn away quite rapidly and it follows that they must be replaced to maintain the apparatus in proper operating condition.

The necessity for such replacement makes it desirable to utilize separate elements. However, it is then necessary to provide for simple and quick replacement of such elements. A further consideration is that all of these elements should be identical, because of the desired simplicity and also because this simplifies stocking problems. Then again, the material of these elements must be resistant to the substantial wear to which they are exposed, and is usually steel which, because of the required hardness and wear resistance, is brittle. This, therefore, requires that the elements be mounted in such a manner as to withstand the forces acting upon them, and to be protected against excessive forces. Should damage occur nevertheless to one of these elements, such that the element breaks, then it is essential that the element is so mounted that broken portions cannot come loose and start a chain-reaction in which other parts of the apparatus become destroyed.

SUMMARY OF THE INVENTION

It is, accordingly, an object of the present invention to provide a comminuting apparatus of the type under discussion, which has the aforementioned desirable features and characteristics.

More particularly, it is an object of the invention to provide such a comminuting apparatus which is both simple in its construction and reliable in its operation.

In pursuance of the above objects, and of others which will become apparent hereafter, my invention provides a comminuting device one embodiment of which comprises, briefly stated, housing means having an outlet. Rotor means is mounted in the housing means for rotation therein, and has a plurality of circumferentially distributed contact portions adapted to contact material which is to be comminuted and to fling it away from the rotor means.

Also located in the housing means, and positioned in the path of flung-off material, is breaker means upon which the material impinges to thereby break up. The lower portion of the rotor circumference is surrounded with spacing by channelling means which defines with it a gap decreasing in direction towards the outlet. The broken-up material falls into and advances along this gap. The channelling means comprises, in accordance with the invention, a plurality of parallel elongated supports extending lengthwise of the rotor means axis and arranged in an arcuate path in correspondence with the taper of the gap. A corresponding plurality of comminuting bars is provided, and each of these has a slot or groove receiving one of the supports. Adjacent ones of the bars abut one another in pressure-transmitting relationship.

The bars, of course, are made from material which has the desired hardness and resistance to wear, because it is they which together provide that surface of the channelling means between which and the contact members of the rotor the material advances along the gap to the outlet, being further reduced in size by contact with this surface and the contact members until it passes the narrowest area of the gap.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a somewhat diagrammatic cross-section through a device according to one embodiment of the invention; and

FIG. 2 is a fragmentary sectioned detail view, on an enlarged scale, of the device shown in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Discussing the drawing in detail, it will be seen that reference numeral 1 identifies a housing or, more properly, a main housing portion. Mounted in housing portion 1 is a rotor 3 for rotation about its longitudinal axis. Evidently, the rotor 3 will be driven in rotation by suitable means, but details concerning the drive are of no importance in the context of the invention and therefore a drive has not been shown.

Mounted on the rotor 3, distributed circumferentially of the same, is a plurality of contact members 2 whose mounting and configuration is also known and not of importance for the invention. As the rotor 3 rotates, material to be comminuted which has been admitted into the main housing portion 1 via inlet 4, comes in contact with the contact members (or vice versa) and is forcibly flung outwardly by them. It then impinges upon the breaker members 5, which may be slightly yieldable, and by contact with which it becomes broken up or fractured. The device will be seen to have comminuting zones 6 and 7, and it is evident that the material rebounds in these zones repeatedly between the members 2 and 5, becoming

progressively more comminuted until it leaves zone 7 through the clearance 8 which is defined between the lower edges of the members 5 on the one hand and the radially outermost edges of the members 2 on the other hand.

From clearance 8 the material enters a channelling region 9, where a channelling arrangement arcuately surrounds the lower circumference of the rotor 3 to define therewith a gap or channel which decreases or tapers in direction towards the outlet 4*a*. The side of the channelling arrangement which faces towards the rotor 3 is constituted by comminuting bars 10 which are arranged in step-like manner, as illustrated.

Supports 11 are provided—at least two, which are spaced axially of the rotor 3—on which there are mounted elongated elements 15 of desired cross-section which extend axially of rotor 3 and carry comminuting bars 10. The supports 11 are pivoted at 11', and at least one screw-spindle 13—or analogous means—is provided which engages the supports 11 and a stationary part of the device with its opposite end portions, and which permits displacement of supports 11 about pivot 11' to thereby adjust the width of the narrowest portion 12 of the channelling gap, such width being determinative of the largest particle or grain size of comminuted material which can reach the outlet 4*a*. To prevent breakage or blockage in the event the material contains oversize foreign bodies, an elastically yieldable member—here a helical spring 14—is interspersed in known manner between screwspindle 13 and the illustrated adjusting nut provided for the latter.

As mentioned before, the comminuting edges of the bars 10 are subject to stray wear. This requires that the bars be exchanged for new ones, heretofore necessitating the provision of large lateral openings in the housing to afford access. Evidently, such openings weaken the housing and make the mounting of auxiliary elements, such as hydraulic cylinders, control consoles, and the like, more difficult. Also, the removal of the bars 10 and the installation of new ones was often made difficult and time-consuming by accumulated dirt and other contaminants.

This is avoided by the present invention in that each of the bars 10 has its underside provided with a longitudinally extending slot or groove 16 in which a corresponding member 15—which are rigid with supports 11, as by welding—is lodged. The bars 10 are so arranged that they form a stepped surface directed towards the rotor 3, with the lower front edge of each bar 10 resting upon the upper rear edge of the next-following bar 10, seen in direction from the clearance 8 towards the gap 12. The bars 10 maintain one another in position by pressure transmission, with the pressure originating at the pressure bar 17 which is pressed by means of screws 18 or analogous means against the uppermost bar 10 which transmits the pressure to the next-following bar 10 and so forth.

The bars 10 are all identical, thus facilitating both their replacement and the stock-keeping problems involved in having replacement bars on hand.

Also according to the invention, the components which constitute the channelling arrangement, such as elements 10, 11, 11', 13, 14, 15, 17 and 18, are advantageously all mounted in an auxiliary housing portion 19. Rails or the like 21 are provided, and rollers, wheels or the like 20 roll on them so that the housing portion 19 and these aforementioned components can be readily withdrawn from and inserted into the main housing portion 1 in toto. This eliminates the need for weakening lateral openings and affords such unhindered ready access to the bars 10 that the same can be exchanged simply and with great ease and dispatch. Also, this arrangement permits a further adjustment of the gap 12 in accordance with the desired grain or particle size, and also to compensate for wear of the members 2 and/or 10.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the types described above.

While the invention has been illustrated and described as embodied in a comminuting device, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting featues that, from the standpoint of prior art fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is:

1. A comminuting device, comprising housing means having an outlet; rotor means mounted in said housing means for rotation and having a plurality of circumferentially distributed contact portions adapted to contact material which is to be comminuted and fling it away from said rotor means; breaker means and in said housing means in the vicinity of said rotor means and positioned in the path of material flung away by said contact portions, so that such material impinges upon said breaker means and breaks up in consequence of such impingement; channelling means surrounding a lower portion of the rotor means circumference and defining therewith a gap which decreases in direction towards said outlet, said channelling means comprising a plurality of parallel elongated members constituting supports extending lengthwise of the rotor means axis and arranged in an arcuate path, and a corresponding plurality of other members constituting comminuting bars adjacent ones of which abut one another and each of which has at least one comminuting edge exposed to the material being comminuted, the members of one plurality each having a longitudinally extending groove and the members of the other plurality each being in part loosely received in one of said grooves; and pressure means operative for maintaining each of said comminuting bars in interlocked pressure engagement with the comminuting bar adjacent to it

2. A comminuting device as defined in claim 1, wherein said comminuting bars are of polygonal cross-section.

3. A comminuting device as defined in claim 1, wherein said pressure means engages a terminal one of said comminuting bars and effects pressure via the same upon all of said bars.

4. A comminuting device as defined in claim 3; further comprising mounting means mounting said supports; and wherein said pressure means is rigid with said mounting means.

5. A comminuting device as defined in claim 4, said mounting means comprising at least two mounting members arranged in at least substantial parallelism spaced axially of said rotor means; and further comprising pivot means mounting said mounting means for pivotal movement about an axis paralleling the axis of rotation of said rotor means, whereby said channelling means is pivotably adjustable as a whole with reference to said rotor means.

6. A comminuting device as defined in claim 5; further comprising at least one screw spindle cooperating with said mounting means for effecting pivotal adjustment of the same to a desired extent.

7. A comminuting device as defined in claim 5, said housing means comprising a main housing portion including said rotor means, and an auxiliary housing portion surrounding said channelling means and separable from said main housing portion.

8. A comminuting device as defined in claim 7; further comprising path-defining means extending from the interior to the exterior of said main housing portion, and roller means provided on said auxiliary housing portion and cooperating with said path-defining means, for enabling withdrawal of said auxiliary housing portion with said channelling means from said main housing portion.

9. A comminuting device as defined in claim 1, wherein all of said bars are of identical configuration.

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