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ROTARY BEATER AND DISCHARGE STRUCTURE THEREFOR FOR REDUCING STICKY MATERIALS

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Fig. 1

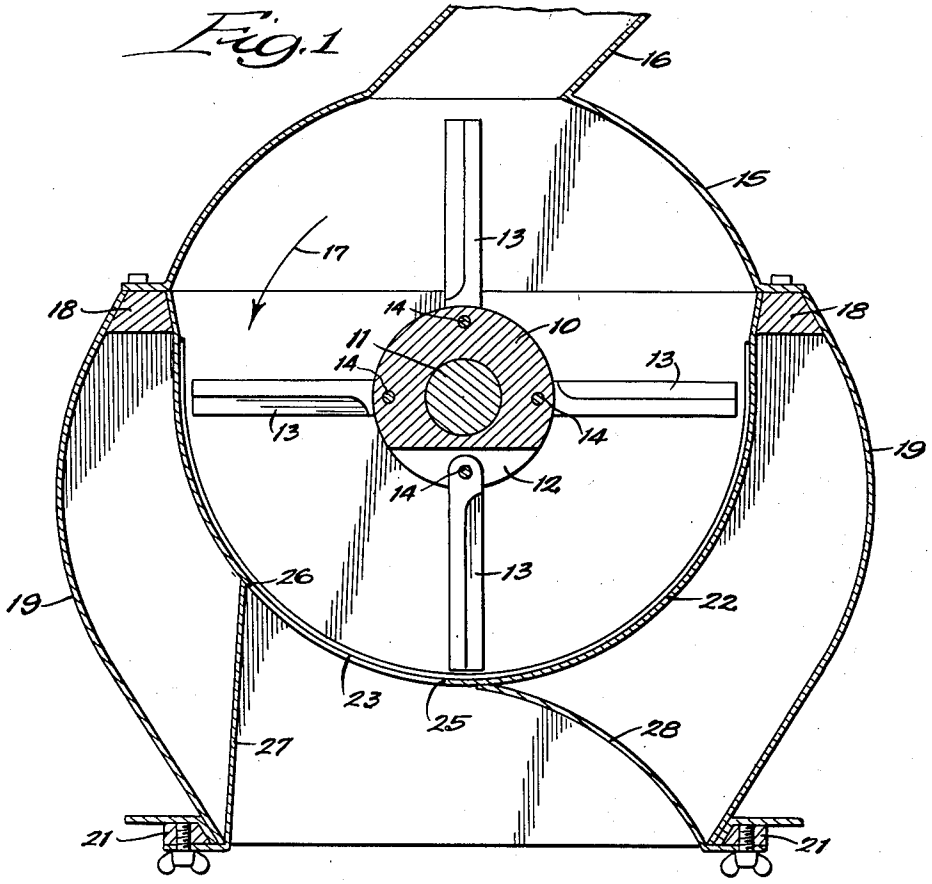
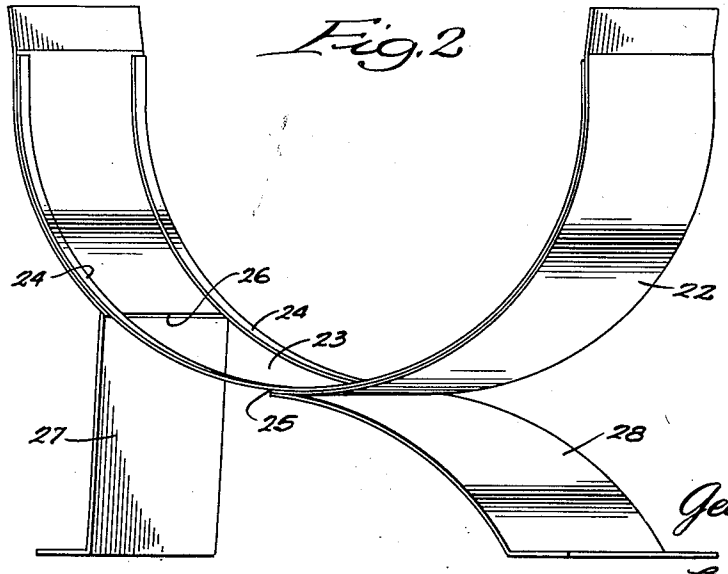


Fig. 2



INVENTOR:
George M. Kovac,
BY
E. A. Booth.
ATTORNEY.

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ROTARY BEATER AND DISCHARGE STRUCTURE THEREFOR FOR REDUCING STICKY MATERIALS

George M. Kovac, Lincolnwood, Ill., assignor to The W. J. Fitzpatrick Company, Chicago, Ill., a corporation of Illinois

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2 Claims. (Cl. 241—186)

This invention relates to apparatus for reducing moist materials, and more particularly to apparatus for reducing various types of food materials having a relatively large moisture or oil content to fine particles.

In reducing materials by grinding or comminuting no difficulty is encountered with materials having less than about 15 per cent liquid content or more than 50 per cent liquid content. With material whose liquid content is between 15 to 50 per cent, a great deal of difficulty is encountered since they are neither dry enough nor wet enough to pass through conventional types of reducing equipment, and tend to cling to the parts to build up cakes to blind screens, and in other ways to prevent satisfactory and continuous machine operation. Materials containing oils of various types as their liquid content are more difficult to handle than those whose liquid content is made up of water. Such materials are common in the food industry and examples thereof include nutmeg, mace, poppy seed, cheese of various types, vitamin supplements, and similar food products.

It is accordingly one of the objects of the present invention to provide an apparatus for reducing moist material in which moist or oily food materials can be reduced to the desired extent without caking, blinding of screens or otherwise clogging the apparatus in a continuous operation.

Another object is to provide an apparatus for reducing moist material in which the material is reduced by impact type blades, and is discharged through a relatively large outlet opening designed and positioned to eliminate clogging or caking.

According to one feature of the invention, the outlet opening is a rectangular opening in the lower cylindrical wall of the casing extending the full axial length of the casing and positioned in advance of the center thereof relative to the direction of rotation of the rotor.

Still another object is to provide an apparatus for reducing moist material in which baffles are provided to direct the reduced material smoothly from the apparatus with no opportunity for clogging or caking.

According to another feature of the invention the baffle at the trailing edge of the opening lies substantially tangent to the chamber wall to pick up the material smoothly and direct it away from the apparatus.

The above and other objects and features of the invention will be more readily apparent from the following description when read in connection with the accompanying drawing in which:

Figure 1 is a partial transverse section through a reducing apparatus embodying the invention, and

Figure 2 is a partial perspective view of the lower casing wall member and baffles.

The apparatus as shown is broadly of the hammer mill type including a cylindrical casing having a rotor therein with radially projecting blades on the rotor. The rotor as shown, comprises a cylindrical hub **10** which is mounted on a rotatable shaft **11** externally driven by an electric motor or other suitable drive means. At spaced points in its periphery the hub **10** is formed with notches **12** into which the inner ends of blades **13** extend. The blades **13** are pivotally connected to the hub by pins **14** extending through the notched portions of the hub and through openings in the inner ends of the blades. The blades **13** may be shaped in any desired manner to present either dull or sharpened edges to the material and any desired number of blades may be employed depending upon the size of the machine.

The rotor is enclosed at its upper part by an upper cylindrical casing member **15** which is provided at its top portion with an inlet opening **16**. The opening **16** preferably extends at an angle to a radius through it and angles in the direction of rotation of the rotor as indicated by the arrow **17** although this is not essential. The upper casing part **15** may be secured to a mounting framework **18** which carries fixed skirt portions **19** extending downward to lower mounting strips **21** as shown. The inner surface of the casing portion **15** preferably extends relatively close to the tips of the blades **13**.

The casing is completed by a lower plate member **22** which may be detachably supported in the frame and which provides a cylindrical surface lying adjacent to the outer ends of the blades **13**. The casing member **22** may be inserted in guide tracks in the end walls of the casing for easy insertion and removal as more particularly described in the patent to Magnus No. 2,348,916. When so mounted the lower casing part **22** forms a substantial continuation of the upper casing part **15** to define a cylindrical chamber in which the rotor lies.

According to the present invention, the lower casing part **22** is formed with a rectangular outlet opening **23** extending the full axial length thereof. As best seen in Figure 2, the lower casing part may be formed by a pair of arcuate strips connected by relatively narrow edge strips **24** to define the rectangular outlet opening **23**. The opening **23** lies in advance of a vertical plane through the rotor axis relative to the direction of the rotation of the rotor as best seen in Figure 1. Thus the trailing edge of the outlet opening as indicated at **25**, lies closely adjacent to and preferably slightly in advance of the vertical center plane. The leading edge of the opening as indicated at **26**, is spaced in advance of the trailing edge **25**. The exact width of the opening depends upon the type of material being ground and the fineness of the particle size desired, and is preferably varied by design by changing the spacing between the leading and trailing edges of the opening while maintaining the trailing edge in substantially the position shown.

The spaces between the frame side parts **19** and the casing wall part **22** are preferably closed by baffles to prevent the reduced material from entering the space between these parts where it might pack or clog. As shown, a straight baffle **27** is secured to the left-hand frame bar **21** and extends upward therefrom to engage the casing wall part **22** closely adjacent to the leading edge **26** of the otulet opening. At the trailing side a curved baffle **28** is provided anchored at its lower end to the right-hand frame bar **21** and curving upward to terminate near the trailing edge **25** of the outlet opening. At its upper edge where it contacts the wall portion **22** the baffle **28** preferably lies substantially tangent to the wall portion and closely adjacent to the trailing edge **25** of the outlet opening.

In use, material to be reduced such as nutmeg, mace, poppy seed, cheese or the like, is fed into the inlet opening with the rotor turning in the direction of the arrow **17**. As the material enters the chamber it is struck by the blades **13** which are preferably traveling at a relatively high speed on the order of about 7200 R. P. M. In this way, the blades break up the material into fine particles and carry the particles around the interior of the casing until they are discharged through the opening **23**.

As the particles leave the opening **23** they are traveling at a relatively high velocity in a general tangential direction and are picked up by the baffle **28** and directed smoothly away from the apparatus into any suitable container provided therefor.

The baffle in this way direct all of the reduced particles away from the apparatus without offering an opportunity for particles to collect and build up into cakes or the like, and without requiring any fine screen-like members which could readily become blinded.

The size of the opening **23** is varied in accordance with the material to be reduced and the fineness desired. It has been found, for example, that in reducing material such as nutmeg and mace, an opening having a circumferential length between 4 and 4½ inches produces highly satisfactory results whereas with poppy

seed, the opening is on the order of 1 inch in length. It has further been found with a machine constructed according to the invention, that nutmeg can be reduced at the rate of 300 to 400 pounds per hour whereas the maximum production with conventional type machines was about 50 pounds per hour.

For many materials of this type it is preferable to screen the particles after passing from the machine and to return the larger particles for a second grinding operation especially where a very uniform product is desired. In the production of nutmeg for example, material was run through the machine at the rate of about 600 pounds per hour and after screening and returning the tailings to the machine, about 400 pounds per hour of properly reduced nutmeg was obtained. Similar results are obtained with other materials and by selecting the proper size of discharge opening substantially any of the relatively moist or oily materials, which are difficult to reduce, can be handled effectively and with a relatively high production rate.

While one embodiment of the invention has been shown and described in detail, it will be understood that this is illustrative only and is not to be taken as a definition of the scope of the invention, reference being had for this purpose to the appended claims.

What is claimed is:

1. Apparatus for reducing sticky materials comprising a substantially cylindrical chamber having an inlet for material to be reduced in its upper portion, a rotor extending axially through the chamber, a series of blades on the rotor projecting radially therefrom to terminate adjacent to the cylindrical wall of the chamber, a thin arcuate plate formed with an outlet opening for reduced material in the lower cylindrical wall of the chamber, the outlet opening extending substantially the full axial length of the chamber and lying wholly in advance of a vertical axial plane through the chamber relative to the direction of rotation of the rotor, and a baffle extending generally tangentially outward from and engaging the arcuate plate along an axial line adjacent to the edge of the outlet opening at the trailing side thereof relative to the direction of rotation of the rotor the arcuate plate defining a narrow trailing edge for the outlet opening lying closely adjacent to said vertical plane.

2. Apparatus for reducing sticky materials comprising a substantially cylindrical chamber having an inlet for material to be reduced in its upper portion, a rotor extending axially through the chamber, a series of blades on the rotor projecting radially therefrom to terminate adjacent to the cylindrical wall of the chamber, a thin arcuate plate formed with an outlet opening for reduced material in the lower cylindrical wall of the chamber, the outlet opening extending substantially the full axial length of the chamber and lying wholly in advance of a vertical axial plane through the chamber relative to the direction of rotation of the rotor, and baffles extending outward from the leading and trailing sides of the outlet opening, the baffle at the trailing side lying substantially tangent to and engaging the arcuate plate along an axial line adjacent to the trailing side to leave a narrow edge at the trailing side at the opening lying closely adjacent to said vertical axial plane.

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