May 6, 1958 W. T. GOODING, JR 2,833,484

HAMMER MILL AND SCREEN

Filed April 16, 1954

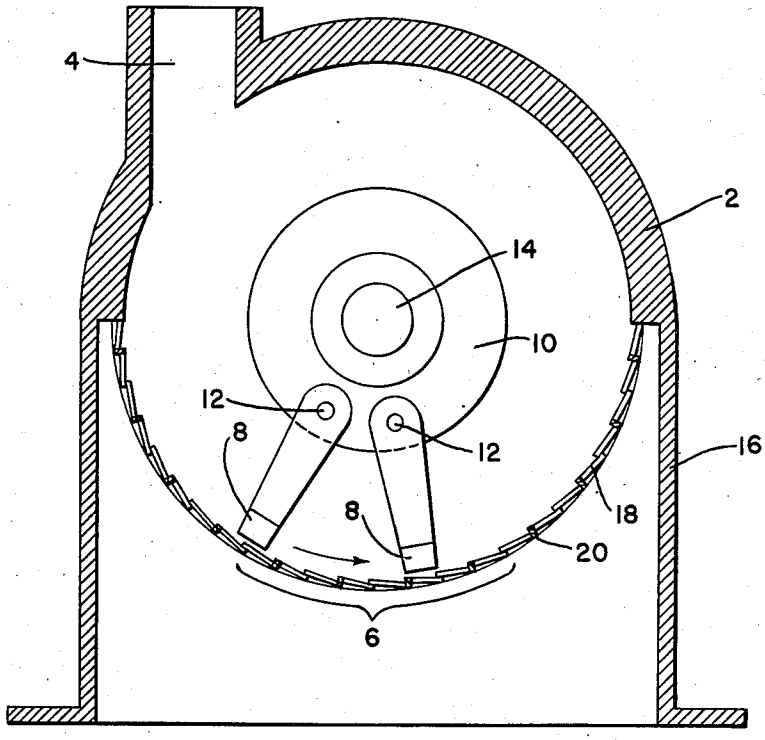


FIG. 1

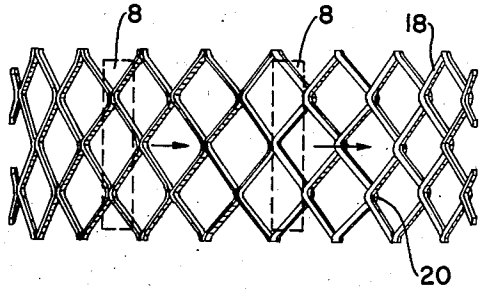


FIG. 2

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HAMMER MILL AND SCREEN

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2 Claims. (Cl. 241—88)

This invention relates to an improvement in hammer mills, and more particularly relates to an improvement in the sizing screens of hammer mills.

Basically, hammer mills are provided with a rotatably mounted shaft, a hub mounted on the end of the shaft, to which hub a series of hammers or beaters are movably attached. The hammers or beaters in general consist of bars which are movably attached to the hub, so as to provide freely swinging movement of the bar upon impact with material to be ground or pulverized. The hammers and parts to which the hammers are attached are mounted within a cylindrical grinding chamber, having means for introducing into the chamber the material to be ground or pulverized. The grinding chamber also includes a peripheral sizing screen, which may be mounted within a supporting cage, for retaining within the chamber the particles of material larger than the size desired, and allowing pulverized material of desired size to leave the chamber.

The screens of hammer mills have heretofore been so constructed as to provide a perforated arcuate plate, with the desired size perforations having a comparatively smooth, uniform surface adjacent the rotational path of the hammers.

In such screens the perforations are provided by punching or drilling operations, and as a result, in such perforations the boundary walls thereof are substantially parallel to the radii of the path of the hammers. When screens of this design become blinded, or plugged, impact of the hammers upon material adjacent the screen produces little or no movement outwardly through the screen because the force of the impact causes reaction or movement in a direction essentially at right angles to the boundary walls of the perforations.

Woven wire screens have not been found suitable for use in hammer mills, particularly where the material to be ground is a comparatively soft noncrystalline material, or moist crystalline aggregates, because of their tendency to become blinded, or plugged. This tendency to plugging apparently arises out of the comparatively large surface area presented by the boundary walls of the openings to the material undergoing treatment in the grinding chamber, as well as the large number of crevices, resulting from the sinusoidal boundary walls of the openings.

It has now been found that if the screen, or perforated peripheral plate, of a hammer mill, instead of presenting a comparatively smooth, uniform surface adjacent the path of the hammers presents a surface which in cross-section is serrated, the force of the impact of the hammers upon the material undergoing treatment in the grinding chamber is imposed upon material which may be adhering to the boundary walls of the perforations in such a manner that the imposed force causes reaction of such material in the perforations in a direction radially of the path of the hammers, and blinding or plugging of the screen is prevented.

Accordingly, one of the objects of the present invention is to provide a hammer mill having a screen by means

of which soft crystalline material, moist crystal aggregates, and soft noncrystalline materials may be subjected to hammer milling without blinding or plugging the screen.

Another object of the invention is to provide a hammer mill having an improved screen so designed that some of the force of the impact of the hammers upon the material adjacent screen is imposed upon material which may be momentarily blinding or plugging the screen openings, such force being imposed in such a manner as to cause reaction of the blinding material in a direction along a radius of the path of the hammers, whereby the blinding material is forced outwardly and away from the screen.

Pursuant to these objects the present invention is directed to an improved hammer mill having a grinding chamber, means to introduce material into said chamber, and means to expell ground material from said chamber, said latter means including a peripheral perforated plate having a plurality of perforations therein and having a substantially serrated cross-section.

Referring now to the drawings, attached hereto and made a part hereof:

Figure 1 represents a vertical cross-section of a hammer mill incorporating a perforated plate fashioned in accordonce with the present invention.

Figure 2 is a view of the screen of Figure 1 in place, from a point above the screen with the hammers in dotted outline.

In the figures, 2 is a housing for the upper portion of the grinding chamber, with means 4, for introducing into the grinding chamber the material to be ground or pulverized, a perforated peripheral plate, or screen, 6, forming the lower portion of the grinding chamber. Hammer bars 8, only two of which are shown for illustrative purposes, are preferably movably mounted upon hub 10 by means of pins 12. The force of the rotational movement of hammers 8 upon the material being ground, as well as the perforated plate or screen, provide means for expelling ground material from the chamber. Hub 10 is attached to rotatable shaft 14. The grinding chamber formed by the housing and screen, 2 and 6 respectively, of the grinding chamber are suitably mounted upon supporting means 16.

In the specific adaptation of the present invention illustrated in the drawings, the perforated peripheral plate of the grinding chamber is an expanded metal screen having polygonal perforations bounded by strands 18, which intersect and overlap to form bridges 20. This type of screen is especially suitable as a peripheral plate for the grinding chamber, where the material is to be ground to a particle size of 10 mesh (0.065 inch) or greater.

It will be noted that the strands of the expanded metal screen extend from the lower portion of one bridge to the upper portion of adjacent bridges, forming a polygon having large and small horizontal axes, whereby the plane of the larger and smaller axes of the perforations is inclined at an angle from the tangent to the arc described by the paths of the hammers at the perforations. The inclination of the plane of the large and small axes of the perforations may be either in the direction of rotation of the hammers or in opposition thereto, but is preferably in opposition to the rotational direction of the hammers as shown in Fig. 1. When the inclination of the plane of the axes of the perforations is substantially greater than 0° and less than 90°, the inclination being measured in a clockwise direction as the angle between the plane of, for example, the large and small axes, and the tangent to the arc of the rotational path of the hammers at the intercept of said plane and tangent, some of the force of the impact of the hammers upon material adjacent the screen will be imposed upon any material adhering to the bridges or strands of the perforated plate 6, and the reaction of such adhering material will be a movement

radially outwardly from the screen, and plugging of the screen is prevented.

While there has been illustrated and described in detail an embodiment of the invention, the described structure is not intended to be understood as limiting the scope of the invention as it is realized that changes therewithin are possible and it is further intended that each element or instrumentality recited in any of the following claims is to be understood as referring to all equivalent elements or instrumentalities for accomplishing substantially the same results in substantially the same or equivalent manner, it being intended to cover the invention broadly in whatever form its principle may be utilized.

What is claimed is:

1. In a hammer mill having hammers rotatably mounted within a cylindrical chamber, means for introducing material into said chamber, and means for expelling ground material from said chamber, said latter means including a perforated peripheral plate substantially paralleling the rotational paths of said hammers and provided with a plurality of polygonal perforations therein, said perforations in cross section comprising a plurality of continuous steps, the risers of said steps being substantially on radii of said cylindrical chamber and said risers opposing the direction of rotation of said hammers, each of said steps in plan view converging to a point at said riser.

2. The apparatus of claim 1 wherein said perforated peripheral plate is an expanded metal screen.

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