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LOUVER PLATE SCREEN FOR MILLS

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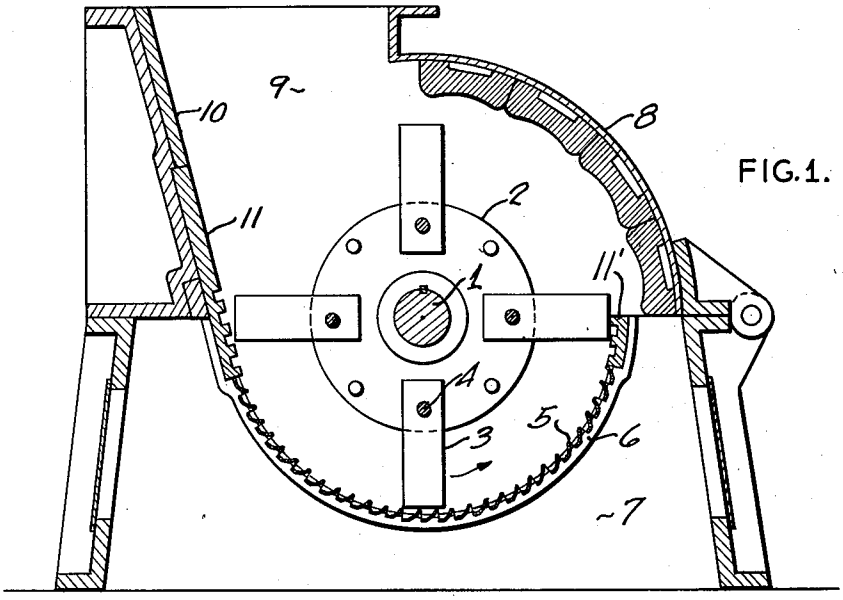


FIG. 1.

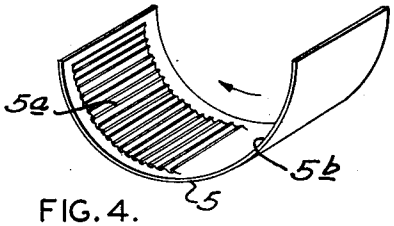


FIG. 4.

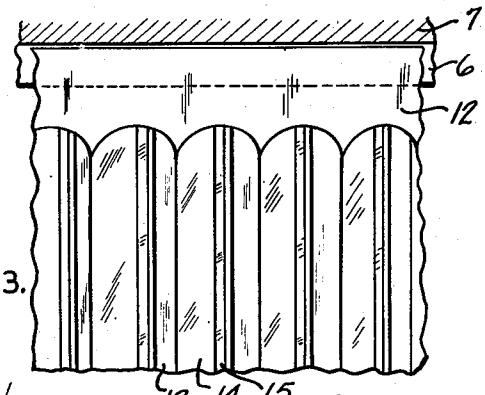


FIG. 3.

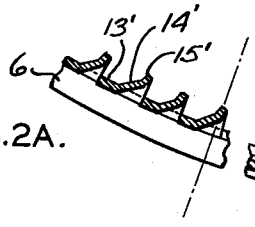


FIG. 2A.

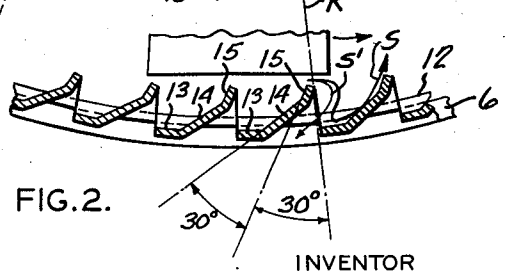


FIG. 2.

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LOUVER PLATE SCREEN FOR MILLS

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2 Claims. (Cl. 83—11)

This invention relates to certain new and useful improvements in louver plates for grinders the peculiarities of which will be hereinafter fully described and claimed.

More specifically this invention has for its main object to provide means first, to increase capacity and lessen the chance of clogging the openings in an arcuate cage than when using the well known perforated metal screen in a grinder; second, to obtain the desired fineness without using such a comparatively thin metal plate as is required for the fine perforations, and by the use of a comparatively thick plate for the same fineness of product increasing the life and durability of the present cage; third, for separating product of different fineness from relatively coarse particles, causing the finer particles to pass outwardly through the cage in a reverse or backward direction with respect to the direction of movement of the whirling product and rotation of the grinding rotor, while deflecting the latter again into the whirling mixed product until it is ground fine enough to pass through the cage openings in said reverse direction; fourth, for checking the outward movement of the relatively coarse particles, starting them slantingly inward and giving them a more radial inward return movement as they leave the inner face of the cage and enter the whirling stream of the mixed product driven rotatably by the hammers of the rotor; and other objects and features of construction hereinafter described and particularly pointed out in the appended claims.

In the accompanying drawings in which like references numerals indicate corresponding parts,

Fig. 1 represents a vertical central sectional elevation of a grinder exemplifying my invention;

Fig. 2, an enlarged fragmental section of the cage of Fig. 1 and the end of an adjacent hammer;

Fig. 2—A, a similar view of a cage having a finer discharge opening than that shown in Fig. 2;

Fig. 3, a plan view of a portion of the cage as shown in Fig. 2, indicating the connection of the side edge portions and adjacent bars forming a louver plate; and

Fig. 4, a perspective view of an arcuate plate cage in which louver bars are formed in a part of the arc while the balance is plain.

Referring to the drawing the numeral 1 indicates a horizontal rotor shaft having spaced discs 2 mounted thereon between which are disposed hammers of flat bar or other suitable shape 3 pivoted on rods 4 mounted in the discs and having their outer ends rotating in a hammer circle in close proximity to an arcuate cage 5 supported in arcuate flanges 6 or otherwise on the inner faces of side walls 7 of a casing 8 having an inlet 9 provided with wear plates 10 and breaker plates 11—11' at the ends of said cage.

This cage has arcuate side portions 12 supported by said flanges 6, and connected by bars parallel to the rotor shaft and having their inner edges disposed in close proximity to the hammer circle of said hammers. These bars are inclined inward and forward in the direction of rotation of the hammers as indicated by the arrow. This inclined bar preferably increases its inclination transversely across the bar from an outer front portion 13 that is radially beyond the side portion 6 in the construction shown in Fig. 2, and is substantially perpendicular to the radius through its front edge. The inner rear edge portion 15 approaches more or less a radial from the rotor shaft, and is shown in Fig. 2 as being substantially 30° to a radius R through its inner edge. The portion 14 joining the said portions 13 and 15, makes an obtuse angle with said portions of the bar, and is shown as being 30° further from the radius R than the inner portion 15. In other words, the inner face of each bar is preferably composed of a segmental curve 13—14—15 in which the outer circumferential portion 13 serves to check the outward movement of the ground product which is then deflected slantingly inward by the slanting portion 14, and is again deflected more directly inward as it slides off the inner rear portion 15 into the path of the hammers as indicated at S. It is the relatively coarse and heavy particles that are thus returned into the path of the hammers for further reduction. The finer and lighter particles are separated from the coarser and heavier particles by the air currents passing outward, and reversely backward, through the slit openings between the outer edge of one bar and the adjacent outer edge of the next bar as indicated by the reversely curved arrow S', Fig. 2. The size of this slit is made to correspond to the desired fineness of the finished product as indicated in the similar fragmental section Fig. 2A, where the smaller segmental curve 13'—14'—15' defines a smaller slit opening. It is evident that a long, fine slit (say $\frac{1}{32}$'') is much less liable to clog than a perforated plate having $\frac{1}{32}$'' round holes, and can be made of comparatively thick metal which increases its durability and life. In a size of slits and bars required for comparatively coarse finished prod-

uct, the side portions 12 of the louver plate are disposed in an arc between arcs through the inner ends and the outer ends of the bar as shown in Fig. 2. In a cage having comparatively small slits for finer product, the side portion 12 to which the bars are connected integrally or otherwise, may have the arc through said side portions as shown in Fig. 2—A, or may be otherwise disposed.

This design of the louver plate forming a grinder cage can be stamped out of a suitable steel plate, or it can be of heavier construction by means of casting, provided that it is on the louver idea and can be used in any impact centrifugal grinder or refiner, whether it is for the grinding of mineral matter such as rock, coal, chemicals, grain, fibrous material such as shavings, pulp stock such as knots and screenings or the actual pulp in news or paper manufacture.

Depending upon the fineness desired, the louver portion of the plate can be of different dimensions with openings as fine as 1/64" or as coarse as 2" if so need to be. These sizes of opening of the fine slits in such louver design would depend upon the fineness of the grinding or refining required in the finished product.

In operation, what actually happens as the products are ground by impact is, the finished material has a reverse discharge through the slit openings due to the internal pressure of the impact rotating members. When the product is subject to suction as produced by an exhaust fan in an exhaust system, the material as it is finished will be sucked through the slit openings in a similar manner to its movement when under a compression system.

The coarser or heavier products do not discharge through these openings until fine enough to do so, but are deflected slantingly into the path of the rotating hammers again by the inclined bars as above described. Thus I can regulate the desired fineness of any product as the coarser particles will continue in the direction of the rotation until completely reduced.

It has been proven by operating an impact mill with this louver plate for a sufficient time that the product will all be ground up and discharged through the louver as finished product; and when the machine is opened up, it is relatively clean, substantially no product being left in the machine, nor is there any appreciable clogging whatsoever in this design which indicates a great advancement over that of the ordinary perforated plate screen or trapezoidal grate bars.

I do not wish to restrict my louver plate cage to use for impact mills only, for it can be used in connection with other mills where its use may be advantageous, which have an internal rotating cylinder causing any product to be reduced into finer particles. The above described construction is characterized by having the discharge through the cage in a direction reverse to the direction of rotating impact members, thus distinguishing it from the usual radial outward discharge through perforated screen openings which are directly vertical to the cylindrical plane of said surfaces.

It will be noted from the drawing and the foregoing description that the flattened bars are curved from their outer edge portions inward and forward to their rear edge portions so that the said rear edge portions are radially nearer the rotating hammer element than are the front edge portions, and that the intervening slit openings are not subject to direct engagement by the forwardly whirling product as is the case with the usual angular or trapezoidal bars which have their surfaces inclined in the opposite direction to that shown and described, and thus have their inner front edge portions radially nearer the hammers than their rear edge portions and thus expose their interposed openings directly to the entrance of product being driven forward by the rotating hammers or other means forming the rotary element.

Instead of such usual prior construction, the inclined upper surfaces of my bars inclined inward and forward as above stated, receive the forwardly moving mixture upon their slanting faces which check its radially outward movement and deflects inward again the coarser product of the mixture, while the finer product is discharged reversely backward through the slit openings adjacent respectively to their outer forward portions under the air compression caused by the rotary element or otherwise, and such finer product is separated from the coarser product and discharged in said reverse direction.

As indicated in Fig. 2, the outer front edges and the inner rear edges of the respective bars, are disposed in cylindrical planes which are respectively on opposite sides radially of the side edge portions 12 of the cage and blend therewith as indicated in the plan view Fig. 3. This construction is especially adapted to the plate form of bars formed according to my invention, but may be followed also in castings embodying the principles above disclosed, in which the transverse inner faces of the bars are formed as shown and described, since these faces deflect the coarse product inward again exclusively while the surfaces on the opposite side of the bars may be parallel to these inner surfaces as when the bars are formed from steel plate, but may be otherwise when formed from casting, since such opposite faces guide the fine product reversely backward through the slit openings formed between these outer surfaces and the next adjacent edge of the portion 13 thus forming the width of the slit opening corresponding to the fineness of the finished product which it is desired to obtain.

The total area of the slit openings in an arcuate cage of my design as above described, for any circumferential portion of the cage, is much greater than the sum of the openings of corresponding size in a perforated plate cage. The discharge of finished product through my cage is accordingly greatly increased as has been demonstrated by actual use. Therefore, I may provide only a portion of the circumference with such slit openings and preferably locate this portion having the bars, in the rear half of the arcuate cage 5a as indicated in Fig. 4. The forward portion 5b of the cage preceeding the bars, is smooth or otherwise without perforations, so that the whirling product leaving the breaker plate 11 or portion of the machine where it is primarily reduced, travels over this smooth portion of the cage with increasing speed under the impact of the rotary hammers, and the coarser particles strike the inclined inner faces of the bars and are deflected inward and forward more readily than the finer particles which seek the discharge openings in a reverse direction as previously described. The unchecked rotary speed of the heavier particles obtained during their passage over the smooth portion 5b of such a plate, increases the tendency to return inward when they are deflected by the slanting faces of the louver bars. The finer particles being less

affected by high rotary speed are effectively discharged through the slit openings corresponding to the fineness of the desired product. In this preferred location of the bars and discharge openings as indicated in Fig. 4, the inner surface of the bars approach more and more a vertical position as they ascend the rear half of the cage, and the intervening slit openings correspondingly assume such an increasing vertical position which facilitates discharge of the finer particles. Also the forward portion 5*b* of the cage being substantially smooth and imperforate, has little tendency to check the rotary speed of the whirling product as it leaves the breaker plate after its primary reduction, and travels unchecked along the smooth portion 5*b* until it strikes the portion 5*a* having the louver bars, whereupon the coarser particles lose their centrifugal tendency and their outward tendency is changed to an inward tendency approaching a centripetal tendency by the inclined faces of the louver bars.

I do not limit myself to the exact construction shown and described herein except by the appended claims, as I may vary my design more or less while still using my louver principle and varying the size of the slit openings as above described.

I claim:

1. In a grinder, the combination with a rotary beater, of a cage cooperating therewith, said cage comprising an arcuate portion formed of transverse bars spaced relatively close together, each of said bars in cross-section having a body portion with the inner surface thereof arranged at an angle of approximately 60° to a line extending radially of the cage and with the rear inner surface of said body portion offset in an inward direction at an angle of approximately 30° relative to a line extending radially of the cage, said body portion having the forward inner surface thereof offset at an obtuse angle to the inner surface thereof and substantially in a curve concentric with the cage.

2. In a grinder, the combination with a rotary beater, of a cage cooperating therewith, said cage comprising an arcuate portion formed of sheet material of uniform thickness and having transverse bars integral therewith and spaced relatively close together, each of said bars being of uniform thickness from edge to edge thereof and having a body portion with the inner surface thereof arranged at an angle of approximately 60° to a line extending radially of the cage, said bar having the rear inner surface of said body portion toward the direction of rotation of the beater offset in an inward direction at an angle of approximately 30° relative to a line extending radially of the cage for deflecting coarser particles inwardly of the cage for further reduction.

ALPHONSE MEYER.