COARSE SCREENING DRY PARTICULATE MATERIALS

Fig. 1.

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The instant invention relates generally to the art of coarse screening dry particulate materials especially as employed in conjunction with a rotary dryer to effect separation of larger sized particles and lumps from the rotary dryer material discharge. More specifically, the invention is directed to apparatus of the grizzly bar type for effecting coarse screening which is mountable on the discharge end of a rotary dryer to effect an active coarse screening operation on the material discharge as the dryer rotates.

As hereinbefore, the term grizzly or grizzly bar screen is employed as best denoting the general character of the screen apparatus forming the subject of the instant invention. As is well recognized, the term grizzly or grizzly bar screen is descriptive of apparatus having a heavy screening surface usually made of spaced parallel straight bars such that a coarse screening operation is effected where bulk particulate material having various sized particles and lumps is discharged onto the screening surface.

Considerin the problem which confronted applicant herein, it was found desirable to provide a means for separating larger particles and lumps of particulate material being discharged from a rotary dryer so that the final product might have a more limited range of particle sizes and be free of large lumps which may build up during drying to be present in the material which is discharged from the dryer. In seeking a solution to this problem, the instant invention was conceived. Generally, the invention may be described as effectively utilizing the rotary movement of a dryer shell to perform an active coarse screening operation and automatically separate lumps or larger particles, carrying them on past the final product chute so that the desired separating action is achieved.

Not only does utilization of the rotary movement of the dryer shell promote the coarse screening operation but also such movement contributes to a self-cleaning of the apparatus used to effect the coarse screening.

Accordingly, it is an object of the instant invention to provide an improved coarse screening apparatus mountable on the end of a rotary dryer to effect, in conjunction with dryer rotation, separation of lumps and larger particles from the final product.

It is a further object of the instant invention to provide for coarse screening of dry particulate materials embodying apparatus of the grizzly bar screen type mounted on the end of a rotary dryer to rotate therewith whereby self-cleaning of the grizzly bar screen apparatus in conjunction with the coarse screening operation to remove lumps and larger particles, is effected.

Another object of the instant invention is to provide a grizzly bar screen which is rotatable on the end of a rotary dryer and incorporates means to retain a minimum bed depth within the dryer.

It is also an object of this invention to provide a rotary grizzly bar screen incorporating lifter elements to promote agitation and removal of lumps and larger particles in conjunction with a coarse screening operation.

The above and other more specific objects of the instant invention will be appreciated by reference to the specific description of a particular embodiment of the instant invention. It is to be understood that the illustrated and described embodiment is by no means to be considered as limiting on the scope of the instant invention, but rather is only illustrative of a structure incorporating the principles of the instant invention. The invention may be best understood by reference to the accompanying drawings in which:

FIGURE 1 is a side elevational view of the invention with parts shown in section taken on line 1—1 of FIGURE 2, and

FIGURE 2 is an end elevational view of the structure shown in FIGURE 1 with parts thereof broken away and shown in section.

Referring to the drawings and specifically to FIGURE 1, a rotary dryer 10 with the end of the dryer shell 11 being shown, has mounted thereon a rotary grizzly bar screen 12 described in more detail hereinafter.

Only the end portion of the dryer shell 11 is shown since the construction of the dryer may take a variety of forms well known in the prior art. The dryer 10 is rotatably mounted as by means of a cylindrical track 13 encircling the shell 11 and rotatably supported on suitable rollers 14 mounted on frame 15. The dryer is driven by suitable means (not shown) to rotate in the direction of arrow A on FIGURE 2, whereby the material M being dried, tumbles within the rotating shell 11 upon rotation of the dryer and progressively moves toward the dryer discharge end on which the grizzly bar screen 12 is mounted.

Grizzly bar screen 12 includes a sectionalized annular ring 20 which is attached at its outer perimeter to the open discharge end of the dryer shell 11. It will be understood that means such as welding, bolting, etc., may be employed to mount ring 20 on the shell 11 and that specific illustrations of the various fastening approaches are not necessary. The radial width of ring 20 determines the bed depth maintained within the dryer 10.

As shown in FIGURE 1, material M accumulates within the dryer shell 11 up to the level of the inner perimeter of ring 20 above which level the rotary action of the dryer spits the material over the lip 31 of ring 20.

The grizzly bar screen 12 is formed from quadrant sections or sub-assemblies as shown in FIGURE 2. Each quadrant section includes an arcuate 90° portion of ring 20 with support members 22 extending outwardly from the outer surface of and at the outer perimeter of each end of each arcuate portion of ring 20. An additional support member 23 is provided for each of the sections of the grizzly bar screen such additional member 23 being disposed midway of the arcuate section length between support members 22.

The outer ends of the support members 22 and 23 are secured to an annular ring 24. Ring 24, like ring 20, is formed in four arcuate 90° portions with each portion of ring 24 having outwardly extending flanges 25 at its opposite ends to facilitate bolting together the quadrant screen section by suitable fasteners 26. Of course, the quadrant sections may be fastened together into a cylindrical configuration by suitable means other than the flanges and bolting shown.

Each of the support members 22 and 23 has secured thereto arcuately curved grizzly bars 30, these bars extending parallel to each other and bridging the space between adjacent support members 22 and 23. The grizzly bars 30 form the conduit by which the material M passes after flowing over lip 21.

The spacing of the bars permits the appropriate sized smaller particles to pass therebetween and discharge as the final product through an appropriate product chute 35. The chute 35 is mounted at the lower portion of the dryer shell and may appropriately extend upwardly along the sides of the grizzly bar screen to collect all particles passing between the grizzly bars 30...
as the dryer 10 with the grizzly bar screen mounted there-in rotates.

The larger particles and lumps which cannot pass between the grizzly bars 30 will collect on the radially inner edges of bars 30 and pass outwardly as the apparatus rotates, eventually passing over the inner periphery of ring 24 to be collected and carried away through a suitable chute 40.

Since the grizzly bar screen 12 rotates with dryer 10, the material M discharged thereinto will be agitated and carried up the side of the screen 12 in the direction of rotation. Since the screen 12 continues to rotate, there will be in effect a self-cleaning action as the bars move to the top of their rotary path whereat any material collected or lightly wedged between the bars tends to fall back to the lower portion of the screen 12.

To promote agitation and rapid removal of lumps, and larger particles, there are provided, mounted at circumferentially spaced positions around the interior of annular grizzly bar members, a series of lifter elements 45. These lifter elements are secured, as by welding, to the radially inner edges of grizzly bars 30 to extend diagonally across each group of grizzly bars. In the illustrated embodiment, twelve lifter elements are equally distributed around the annular grizzly bar members with each element being disposed at an angle of 60° to the longitudinal dimension of the grizzly bars 30 to which it is secured.

The lifter elements 45 perform a particular function in conjunction with the coarse screening operation as the grizzly bar screen rotates with the dryer. For those larger particles and lumps that do not readily pass between grizzly bars 30 and into product chute 35, the lifter elements 45 tend to carry such larger particles and lumps up the side of the screen in the direction of rotation. The inclination of the lifter elements relative to the grizzly bars and to the direction of rotation of the dryer shell 11, which would be counterclockwise as shown by arrow A on FIGURE 2, is such that the material carried up the side of the screen as it rotates, tends to flow along the inclined lifter elements toward the outer end of screen 12 to pass over the inner periphery of ring 24. This agitates the material to make for more effective screening and speeds up removal of the lumps and larger particles from the dryer discharge material.

Although I have shown and described a certain embodiment of my invention, it will be understood that I do not wish to be limited to the exact construction shown and described, but that various changes and modifications may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. Apparatus for effecting coarse screening of dry particulate materials comprising a tubular dryer shell mounted to be rotatable about its longitudinal axis and having a discharge aperture at one end thereof, an annular ring mounted on said one end and having a radial width to restrict said discharge aperture and retain a predetermined bed depth of material within said dryer shell, a series of generally annular grizzly bar members mounted outwardly of said ring with the centers of curvature of said annular members coinciding with said longitudinal axis, said members being parallel to one another to provide spaces between adjacent members for passage of smaller particles radially outwardly through said spaces while larger material particles and lumps are retained on the radially inner edges of said members, a plurality of lifter elements secured at circumferentially spaced positions to extend generally transversely of said radially inner edges of said members and diagonally relative to the planes of the parallel grizzly bar members, said annular ring providing at the inner periphery thereof an opening for material flowing from said dryer shell into one end of said series of grizzly bar members, and outlet means at the opposite end of said series of grizzly bar members for discharge of said larger material particles and lumps from said radially inner edges of said members.

2. A grizzly bar screen adapted to be mounted on the discharge end of a rotary dryer for rotation therewith comprising a series of generally annular grizzly bar members, means interconnecting said members into a generally cylindrical assembly and said members parallel to one another to provide spaces between adjacent members for passage of smaller material particles radially outwardly through said spaces while larger material particles and lumps are retained on the radially inner edges of said members, a plurality of lifter elements secured at circumferentially spaced positions to extend generally transversely of said radially inner edges of the members in said assembly and diagonally relative to the planes of the parallel grizzly bar members, means at one end of said assembly for connecting said screen to the discharge end of a rotary dryer, and outlet means at the opposite end of said assembly for discharge of said larger material particles and lumps from said radially inner edges of said members.

3. A grizzly bar screen adapted to be mounted on the discharge end of a rotary dryer for rotation therewith comprising groups of accurately curved grizzly bars, means connecting the bars of each group parallel to one another to form a sub-assembly with accurately extending spaces between adjacent bars for passage of smaller material particles radially outwardly through said spaces while larger material particles and lumps are retained on the radially inner edges of said bars, a plurality of lifter elements secured at spaced positions along said radially inner edges of the bars in each sub-assembly to extend generally transversely of the bars in each sub-assembly and diagonally relative to the planes of the parallel grizzly bars, means connecting adjoining ends of said sub-assemblies together to provide an assembly having a cylindrical configuration with parallel spaced generally annular grizzly bar members, with circumferentially extending spaces between adjacent members, an annular ring at one end of said assembly for connecting said screen to the discharge end of a rotary dryer, said ring having a radial width to retain a predetermined bed depth of material within the rotary dryer shell with the inner periphery of said ring forming an inlet for material to said assembly from the dryer, and outlet means at the opposite end of said assembly for discharge of said larger material particles and lumps from said radially inner edges of said bars.

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