

[54] **WEAR PLATE IN AN APPARATUS FOR
CONDITIONING A GRANULAR MATERIAL**

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[22] Filed: **Jan. 31, 1973**

[21] Appl. No.: **328,171**

[52] U.S. Cl. **241/275; 241/DIG. 10**
[51] Int. Cl. **B02c 13/09**
[58] Field of Search **241/DIG. 10, 275, 285 R,
241/293-295**

[56] **References Cited**

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Primary Examiner—Granville Y. Custer, Jr.

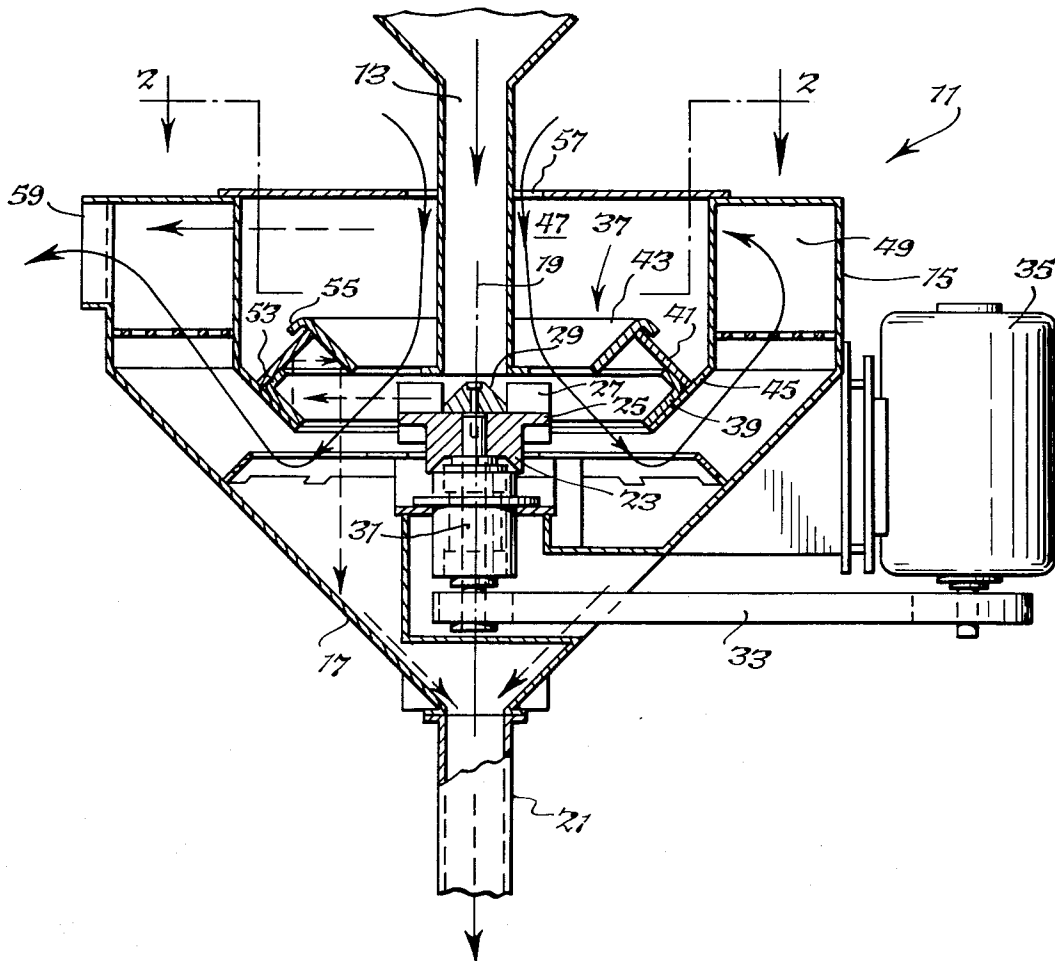
Assistant Examiner—Howard N. Goldberg

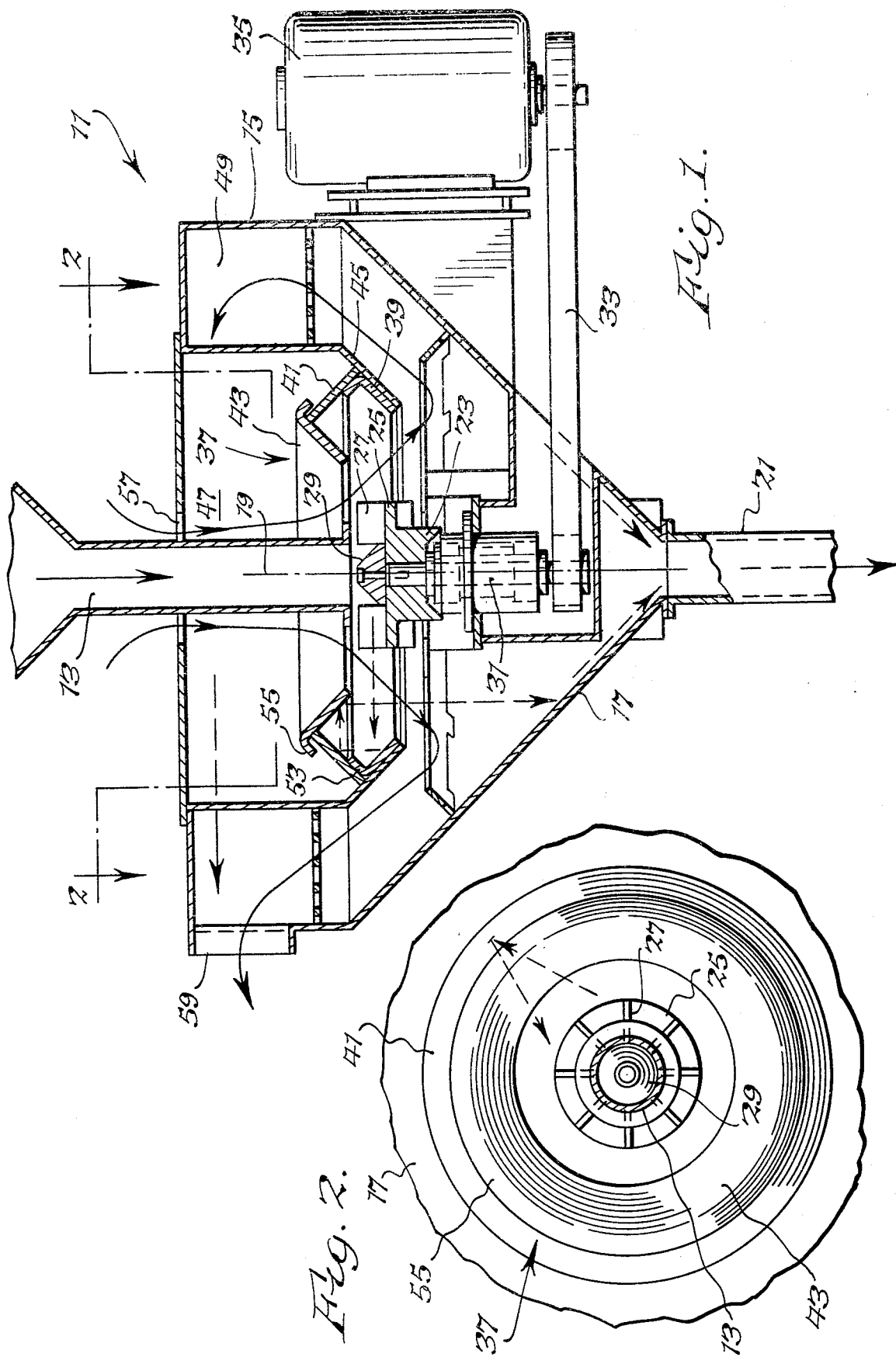
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[57] **ABSTRACT**

A centrifugal throwing wheel projects the material radially against an impact surface which completely surrounds and is spaced from the periphery of the wheel. The impact surface comprises a plurality of wear plates or walls spaced from a central axis. Each wall is shaped like a frustrum with one end having a larger opening than the other end. When the wear plates or walls are stacked, the material projected by the throwing wheel is rebounded and deflected by the walls so that the thrown particles are scoured.

11 Claims, 6 Drawing Figures





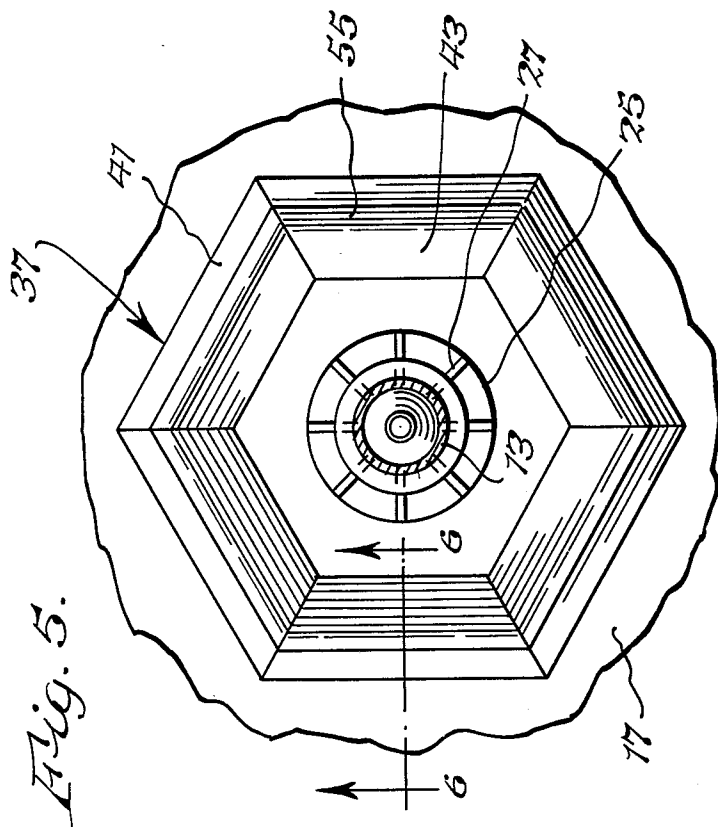


Fig. 6.

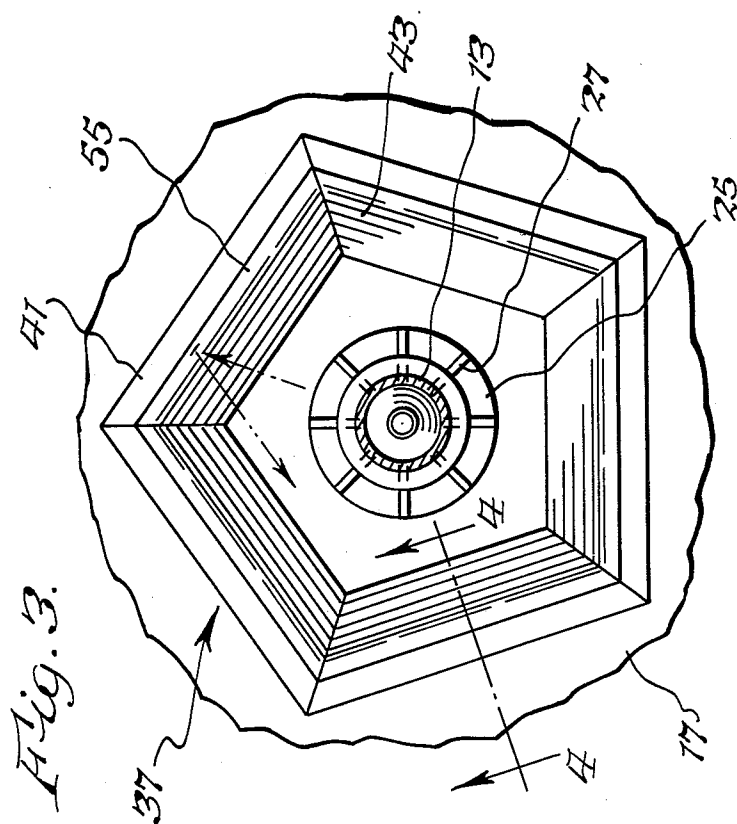
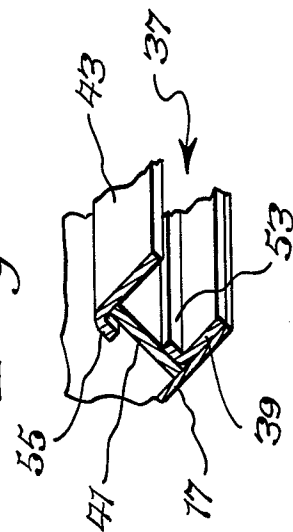
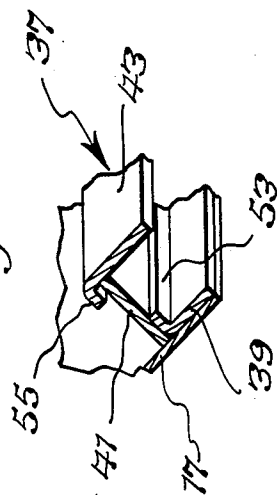


Fig. 4.



WEAR PLATE IN AN APPARATUS FOR CONDITIONING A GRANULAR MATERIAL

BACKGROUND OF THE INVENTION

This invention relates to apparatus for conditioning granular material, especially sand for reclamation.

Reconditioning of used sand involves reducing used core elements and molded sand lumps into individual grains. The quality of reclaimed sand must be comparable to that of new sand so that it may be satisfactorily substituted for new sand in core and molding sand mixtures. Thus, it is usually necessary to remove accumulated coatings from around individual sand grains. The accumulated coatings may be inorganic, such as clay minerals for grain molding sand, organics such as pitch, cereals and resins, or combinations such as clay used in conjunction with sea coal, pitch and cereals.

Reclamation systems of the prior art have generally crushed lumps of molded sand in a hammermill, ring crusher, jaw or roll crusher. The coatings on the sand grains are then removed by one of several methods known in the prior art. The wet method of reclamation consists of mixing the sand with water with a mechanical scrubbing action. A considerable portion of the coating on the sand grains may be removed depending upon the efficiency of the scrubbing and the type of coating. In the thermal method of reclamation, the sand is heated at a temperature of about 1,200°F. to about 1,500°F. This treatment completely removes the carbonaceous matter. In another method, pneumatic sand scrubbers utilize low pressure air to make used sand grains sandblast each other. The disadvantages of this latter system are the high power requirements necessary to generate the high velocity air stream and the necessity for having the sand in a free-flow condition. To a certain extent, these disadvantages have been corrected by methods described in a British patent specification No. 1,195,226. A method for removing coatings on sand is described wherein the sand is thrown against a target by a mechanical throwing means with sufficient force to free contaminants from the particles of sand. However, this latter system does not effectively minimize power requirements of achieve adequate removal of contaminants from the conditioned particles.

SUMMARY OF THE INVENTION

According to the present invention there is provided an impact surface for use in an apparatus of the type having a centrifugal throwing wheel mounted for rotation and adapted to project a stream of material against the impact surface, said impact surface comprising a closed wall spaced from a central axis and shaped like a frustrum with one end having a larger opening than the other end.

Also provided is an impact surface comprising a first, second and third closed wall, each wall being spaced from a central axis and shaped like a frustrum with one end being larger than the other end, said first, second and third walls being in coaxial stacked relationship.

It has been found that the particles thrown from a centrifugal throwing wheel rapidly wear the surfaces upon which they are projected. These surfaces become worn and need replacement many times during the useful life of the entire machine. The wear surface or impact plate provided by the present invention has a geometric shape which provides for a maximum mix-

ing of projected particles to obtain a good scouring action and at the same time provides a structure that is readily replaceable.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view in section of an apparatus for conditioning granular material;

FIG. 2 is an end elevational view along line 2—2 of FIG. 1;

FIG. 3 is an end elevational view similar to the view of FIG. 2 showing another configuration of wear plates;

FIG. 4 is a sectional view along line 4—4 of FIG. 3;

FIG. 5 is an end elevational view similar to the view of FIG. 2 showing another configuration of wear plates; and

FIG. 6 is a sectional view along line 6—6 of FIG. 5.

DETAILED DESCRIPTION

Although the detailed description of the present invention is primarily directed to the reclamation and conditioning of sand, it should be realized that the apparatus and process of this invention can be conveniently used to condition and scour particles of various materials other than sand.

Sand which has been pulverized into granular sized particles but still retains coatings of resin or other material is fed into the conditioner 11 through a passage 13. The conditioner 11 subjects the sand in the mixture to a scouring treatment thereby removing accumulated coatings. The conditioner 11 includes an outer housing which is cylindrically shaped with a conical bottom 17. The side walls 15 of the housing are radially spaced from central axis 19. The passage 13 can serve as an inlet conduit for the input of material to be conditioned. The inlet conduit or passage 13 is in the top portion of the housing. An outlet conduit 21 is connected to the conical bottom 17 for the output of conditioned sand. The inlet conduit 13 and the outlet conduit 21 are coaxial with the central axis 19 of the housing. When in operation, the conditioner 11 is placed so that the central axis 19 is vertically aligned so that the material to be treated falls through the inlet conduit 13 and exits via the outlet conduit 21.

A centrifugal throwing wheel 23 is disposed intermediate the inlet conduit 13 and the outlet conduit 21. The throwing wheel 23 has an axis of rotation coaxial with the axis 19 and is disposed in the path of feed material falling through the inlet conduit 13. The feed material passing through the conduit 13 is projected radially outwardly by the throwing wheel 23.

The throwing wheel 23 includes a runnerhead 25 with a plurality of radially directed vanes 27. A distribution head 29 is cone shaped with the base of the cone contacting the central portion of the runnerhead 25 in the space in the center of the throwing wheel 23 between the vanes 27.

The runnerhead 25 is removably journaled on a spindle 31 and includes a square axially aligned opening which matches the similarly shaped end of the spindle 31 so as to provide a positive drive engagement. The distribution cone or head 29 is secured by bolting in place at the end of the spindle 31. This attachment also serves to keep the throwing wheel 23 in place.

The spindle 31 is axially aligned and mounted between spaced bearings for rotation. A pulley at the lower end thereof is driven by an endless belt 33 which is trained around another pulley which is connected to

the shaft of a motor 35. The motor 35 is mounted exterior to the housing by suitable bracket.

The feed material is projected radially outwardly from the axis of rotation of the throwing wheel 23 so as to give a 360° coverage of project particles. An impact surface 37 is radially spaced from the axis of rotation of the throwing wheel 23. From a top view the impact surface 37 as illustrated in FIG. 2 is circular in shape so that the thrown particles travel a given distance before striking the impact surface 37.

The impact surface 37 as illustrated in detail in FIG. 4 and 6 has a cross section which is shaped like a tilted U-shaped channel member. The impact surface 37 includes an impact plate or wear plate or wall 39 which is directed directly in the path of the projected particles and angularly disposed, preferably at about 45° angle so as to direct the projected particles upwardly after rebounding. A ricochet plate or wall 41 is connected to the impact plate or wall 39 at an angle, preferably about 90° angle thereto, so as to deflect rebounding particles from the impact plate 39 back toward the throwing wheel. A second ricochet plate or wall 43 is connected to and at about 90° angle to the first ricochet plate 41. The second ricochet plate or wall 43 deflects particles downwardly toward the blast stream emanating from the centrifugal throwing wheel 23. This path is shown in FIG. 1 by a dotted line having arrows. The path is such that the collisions of the particles are maximized so that a scoured action is achieved. The particles fall into the conical bottom 17 where they exit via the conduit 21.

The impact surface 37 is rigidly mounted in place to an inner wall 45. The inner wall 45 is connected with the outer wall 15 so as to form an inner chamber 47 and an outer chamber 49.

Each wear plate or wall 39, 41 or 43 is a closed or continuous wall having a central axis. Preferably the wall 39, 41 or 43 is arcuate in shape and is generated by rotating a line at an angle to the central axis about the central axis. If the wall 39, 41 or 43 is not arcuate preferably the general shape approaches that of a circle. In this latter case, the wall 39, 41 or 43 preferably has at least about three straight sides symmetrically arranged about the central axis. In this case, the side portions of each wall 39, 41 or 43 are at an angle to the central axis to give a resulting pyramidal shape.

The general shape of a wall 39, 41 or 43 is that of a frustrum with two parallel planes intersecting the pyramid or cone shaped sides. Both ends of a wall 39, 41 or 43 as described by the intersecting planes are open with one end being larger than the other end. Each plate or wall 39, 41 or 43 is preferably at an angle of about 45° with respect to the central axis. It has been found that this angle maximizes the scouring action.

The walls 39, 41 and 43 are stacked so that the impact plate or wall 39 has its larger end facing upwardly so as to project rebounding particles in that direction. The first ricochet plate or wall 41 has its larger end facing downwardly and engaging the larger end of the impact plate 39. This construction results in the particles being deflected back toward the centrifugal throwing wheel 23. Preferably, the second ricochet plate 43 has its larger end facing upwardly and engaging the smaller end of the first ricochet plate 41 so that the rebounding particles are projected downwardly through the blast stream. When the walls 39, 41 and 43 are in stacked relationship, the impact plate, the first and second rico-

chet plates are concentric and coaxial with the central axis 19.

The weight of the plates 39, 41 or 43 which are generally made from steel or other ferrous alloy is sufficient to hold the plates in position. To aid in positioning the plates 39, 41 or 43, a peripheral flange 53 is provided at the larger end of the impact plate 39 for engaging the larger end of the first ricochet plate 41. Also, a peripheral flange 55 is provided at the larger end of the second ricochet plate 43 for overlapping the smaller end of the first ricochet plate 41. The flanges 53 and 55 aid in obtaining the proper alignment of the plates 39, 41 and 43 when they are installed in the conditioner 11.

The particles projected from the throwing wheel 23 are immediately subjected to an air stream which flows through the projected and falling particles. The air stream flows through an opening 57 in the top of the conditioner 11 and follows the path of the solid lines with arrows as illustrated in FIG. 1. The air stream flows through the inner chamber 47 and downwardly through the projected particles and upwardly toward the outer chamber 49. The air stream is drawn through the outer chamber 49 to an outlet 59 or several outlets which can be employed to evenly distribute the air flow. The outlet 59 is connected to a low pressure source and a dust collector (not shown). The lighter particles such as dust or fines which are airborne are drawn through the outlet 59 and into the dust collector. The heavier particles continue to fall toward the bottom of the conditioner 11 or to be projected against the impact surface 37. This arrangement results in a ricocheting particle being subjected to the air stream immediately after leaving the throwing wheel 23 prior to ricocheting and then again before falling into the conical bottom 17. Subjecting the particles to the air stream while in the free fall state effectively minimizes re-adherence of contaminants to the particles.

The height of the impact plate 39 or the first and second ricochet plates 41 and 43 is measured along the central axis between the base and the intersecting plane of the frustrum forming the sides of the respective plate 39 or first and second ricochet plates 41 and 43. With the impact plate 39, it is preferable that the height of the plate 39 be at least equal to the width of the blast stream of projected particles. Similarly, it has been found that the height of the first ricochet plate 41 and second ricochet plate 43 should approximate the height of the impact plate 39 to obtain a proper rebounding action. Furthermore, to obtain a proper contacting of the rebounding particles with the air stream, it has been found that the distance from the central axis to the inside surface of the impact plate 39 at the larger end thereof should be at least about three times the height, and preferably at least about five times the height. This relationship holds true for the first ricochet plate or wall 41. For the second ricochet plate or wall 43, it is preferable that the inside surface of the wall at the smaller end be one less height measurement than the impact plate or wall so that the particles are deflected downwardly passed the impact plate or wall 39.

While the impact surface configurations may be arcuate, as previously indicated, alternative configurations are possible, and in some instances are preferable. FIGS. 3 and 5, for example, illustrated impact surfaces having 5 and 6 segments, respectively. Such configurations permit the ready replacement of a single segment

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of a given wall, thus allowing rapid and economical repair of an unevenly worn or otherwise damaged wall.

Preferred embodiments of this invention having been described and illustrated, it is to be realized that modifications thereof may be made without departing from the broad spirit and scope of the present invention as described in the appended claims.

What is claimed is:

1. An impact surface for an apparatus of the type having a centrifugal throwing wheel mounted for projecting a stream of material against the impact surface, said impact surface comprising a first, second and third closed wall, each wall being spaced from a central axis and shaped like a frustrum with one end being larger than the other end, said first, second and third walls being in coaxial loosely stacked relationship, said first wall having its larger end facing upwardly, said second wall having its larger end facing downwardly, and said third wall having its larger end facing upwardly.

2. An impact surface according to claim 1 wherein the larger end of said first wall loosely engages the larger end of said second wall, and the smaller end of said second wall loosely engages the larger end of said third wall.

3. An impact surface according to claim 2 wherein said first, second and third walls are conically shaped and are substantially coaxial.

4. An impact surface according to claim 1 wherein said apparatus is of the type having a centrifugal throwing wheel mounted for rotation about a vertical axis for projecting a stream material in a 360° arc, and wherein said first, second and third walls are coaxially aligned with the axis of rotation of said centrifugal throwing wheel.

5. An impact surface according to claim 1 wherein

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said first, second and third walls are pyramidally shaped and are substantially coaxial.

6. An impact surface according to claim 1 wherein each of said walls forms an angle of about 45° with respect to the central axis.

7. An impact surface according to claim 1 wherein said first wall includes a peripheral flange at the larger end thereof for loosely engaging the larger end of said second wall.

8. An impact surface according to claim 1 wherein said third wall includes a peripheral flange at the larger end thereof loosely engaging the smaller end of said second wall.

9. An impact surface according to claim 1 wherein each of said first, second and third walls comprises a plurality of segments symmetrically arranged about the central axis.

10. An impact member for use in an apparatus of the type having a centrifugal throwing wheel mounted for rotation and adapted to project granular material against said impact member, said impact member comprising a series of separate plate members loosely stacked in superposed cooperative relationship, said series of separate plate members comprising an impact plate and at least a first ricochet plate, the improvement comprising said ricochet plate being separate from said impact plate for providing ready replacement of one of said separate plate members without necessarily replacing the other.

11. An impact member as defined in claim 10 wherein said series of separate plate members are comprised of a plurality of segments disposed for forming an enclosure spaced outwardly from and in surrounding relationship to said throwing wheel.

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