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2,814,527

CENTRIFUGAL ATOMIZER

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FIG. 1

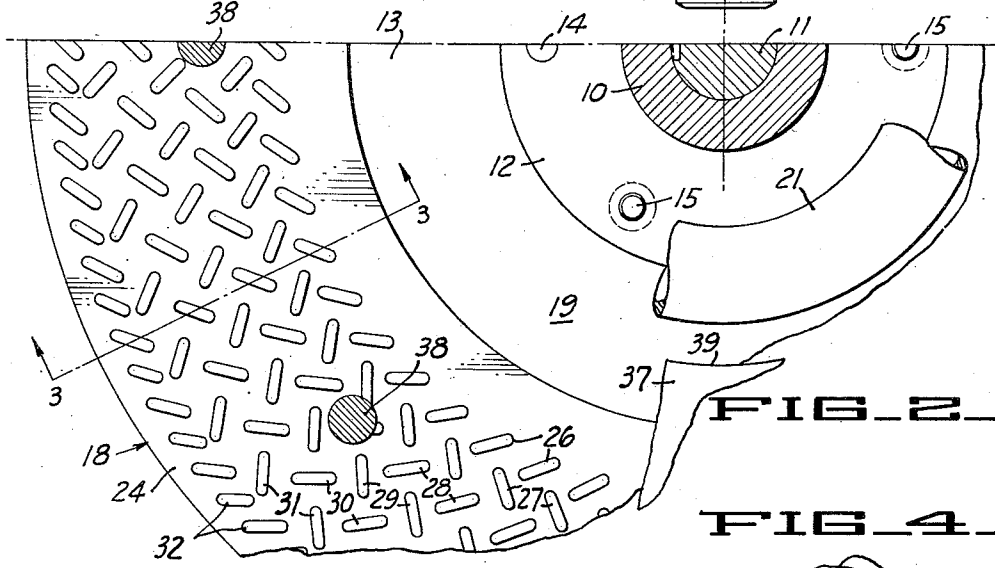
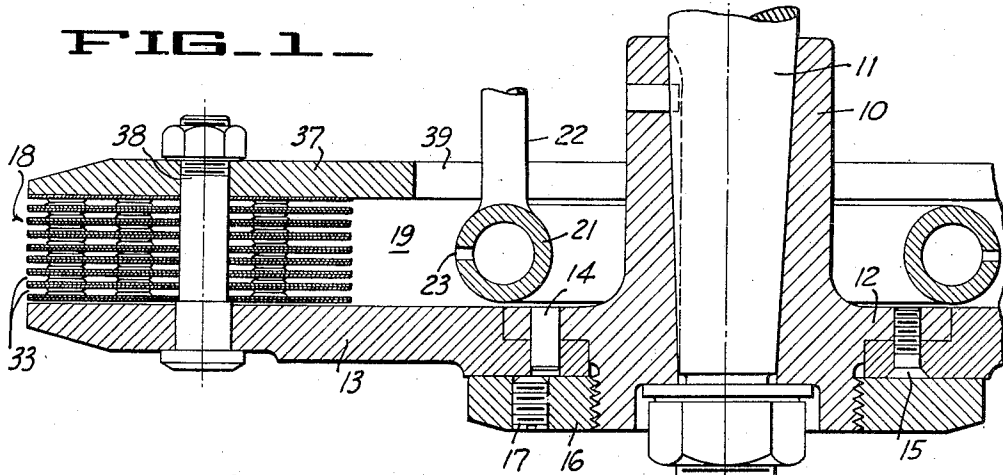


FIG. 2

FIG. 4

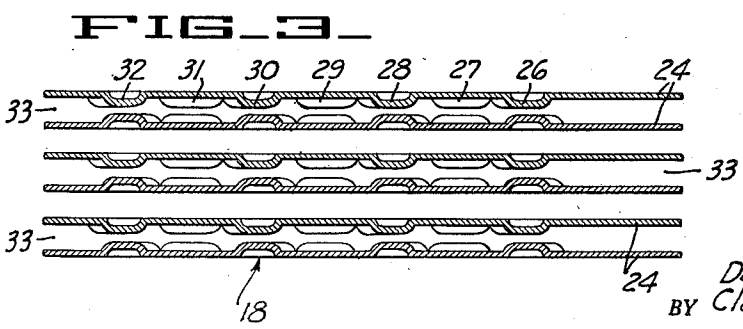
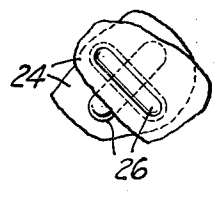


FIG. 3



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CENTRIFUGAL ATOMIZER

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6 Claims. (Cl. 299—63)

This invention relates generally to centrifugal atomizing devices such as are used in conjunction with spray driers and is a continuation-in-part of our co-pending application Serial 381,004, filed September 18, 1953, now abandoned.

Centrifugal atomizers such as have been used with spray driers employ an atomizer head which is rotated at a relatively high speed, and to which the feed material is supplied. The head is provided with impact elements whereby the feed material is broken up into small droplets or fragments which are discharged outwardly for suspension in a drying gas. One particular type of atomizer head has been widely used, employs spaced upper and lower plates which are secured to a vertical shaft, and which are connected by circumferentially spaced atomizing bars. The feed material is delivered into a space in the central portion of the head, and as it moves outwardly between the upper and lower plates, it is ultimately impacted and atomized by the spaced bars.

Conventional atomizing devices of the type described above are subject to certain disadvantages. While the atomization obtained is suitable for many commercial operations, it is difficult to maintain a relatively uniform degree of atomization, particularly for different types of feed material. Uniform atomization is desirable because it greatly facilitates proper operation of the spray drier. It avoids objectionable discharge of oversize particles against the side walls of the drier, it facilitates operation of the drier at a desired high capacity, and it tends to produce a final product having uniform moisture content. Another disadvantage is that the impact elements are subject to wear. Any attempt to repair the worn parts is troublesome and expensive, and generally the principal parts of the head must be discarded and replaced. The cost of repairing or replacing such worn parts adds considerably to the expense of spray drying operations.

In general it is an object of the present invention to provide a relatively simple centrifugal atomizer which is capable of producing uniform atomization with a wide variety of feed materials.

Another object of the invention is to provide an atomizer which can be readily repaired when parts have become worn through use.

Another object of the invention is to provide an atomizer in which the principal parts are inexpensive and easy to replace.

Additional objects and features of the invention will appear from the following description in which the preferred embodiment of the invention has been set forth in detail in conjunction with the accompanying drawing.

Referring to the drawing:

Figure 1 is a side elevational view in section illustrating an atomizer in accordance with the present invention.

Figure 2 is a cross sectional detail taken along the line 2—2 of Figure 1.

Figure 3 is an exploded view illustrating the series of

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discs which make up the principal working parts of the atomizer.

Figure 4 is a detail showing the relationship between adjacent dimples.

The atomizer as illustrated in the drawing consists of a hub 10 which is adapted to be mounted upon the lower end of the rotating shaft 11. As is well known to those familiar with spray drying equipment, this shaft extends vertically through the top of the spray drying chamber, and is connected with suitable driving means. The hub is provided with a flange 12 adapted to seat the mounting plate 13. The mounting plate is angularly located with respect to the hub by means of dowel 14, and is secured by screws 15 and the threaded nut 16, the latter being locked in place by the setscrew 17.

A nest or basket 18 of discs is mounted upon the plate 13, and surrounds a central space 19 into which feed material can be introduced. As suitable means for introducing feed material into this space, we have shown an annular hollow member 21 which is connected to the feed pipe 22 and is provided with a plurality of openings or slots 23, for discharge of liquid material or slurry.

The individual discs 24 making up the basket 18 are preferably formed of suitable sheet metal, such as stainless steel, and are formed to provide struck out projections or dimples. The discs are stacked in pairs, with the dimples of each disc of a pair being faced toward each other and in contact.

The shaping and pattern of dimples illustrated for each disc 24 can be best understood by referring to Figure 2. Thus each disc is provided with several series of projections or dimples 26—32 inclusive. Each dimple is elongated and the dimples of each series are spaced circumferentially and inclined to radii extended from the axis of the shaft 11. In a typical instance this inclination can be of the order of about 45°. All of the dimples can be formed and positioned like dimples 26, except that alternate series are inclined in opposite directions.

When stacked in the manner shown in Figure 3, the dimples are brought into direct physical contact, and the discs of each pair are thereby separated by the spacing 33. As shown in Figure 4 adjacent engaged dimples are disposed substantially at right angles to each other.

As is illustrated particularly in Figure 2 the projections 26 to 32 inclusive form in effect a maze of oppositely inclined surfaces which interrupt the spaces 33 and which are distributed in such a manner that outwardly moving feed material is necessarily acted upon by a plurality of such surfaces before being discharged. Such actions serve to progressively break up the feed material whereby when the particles or droplets are finally discharged by the last row of dimples 32, they are relatively finely divided and of uniform size.

As suitable means for locating and clamping all of the discs together, we provide an annular clamping member 37, which engages the uppermost disc 24. Clamping member 37 is secured to the plate 13 by means of the circumferentially spaced bolts 38. The discs are provided with aligned holes in which the bolts are accommodated. When the discs are stacked and clamped together in the manner illustrated in Figure 1, their inner peripheries generally embrace the feed receiving space 19.

In operation the atomizer is driven at a relatively high speed, as for example from 4000 to 6000 R. P. M. The feed material, such as milk or whey concentrate, is supplied by a suitable pump to pipe 22, and is delivered into the feed space 19. The feed space is opened to the interior of the spray drier through the annular opening 39 surrounded by the clamping member 37. Therefore a certain amount of air or other atmosphere from the interior of the spray drier is drawn into the feed space 19, where

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it intermixes with the liquid being atomized, and passes outwardly through the spaces 33 between the discs. Such "windage," and also impact of feed material with the dimples, breaks up the liquid feed into a spray, and this spray becomes well distributed about the basket of discs, with relatively uniform flow distribution through the spaces between the discs. In other words, the feed material is well distributed both circumferentially and vertically over the height of the basket of discs. As the feed material passes outwardly through the spaces 33 between the discs, it is repeatedly acted upon by the oppositely inclined projections, whereby the material is progressively broken up into atomized droplets, which are finally discharged from the periphery of the basket.

A desirable characteristic of our atomizer is that the atomizing action is relatively uniform. In other words the atomized droplets which are discharged do not vary greatly as to size, and as previously pointed out this is conducive to efficient spray drier operation. The uniformly atomized droplets are more readily suspended in the drying gas, to form a final powdered product which is relatively uniform as to moisture distribution. A drier equipped with such an atomizer can be more readily adjusted for optimum drying efficiency.

A further desirable characteristic is that when the discs become worn, it is a simple matter to remove them from the plate 13, and apply a new stack. Such a replacement is not an expensive operation, because the discs are inexpensive to manufacture, and because a replacement can be made quickly without difficult mechanical operations.

We claim:

1. In a centrifugal atomizer, a circular mounting plate adapted to be secured to rotating shaft, and an atomizer basket removably secured to said plate, said basket comprising a plurality of pairs of sheet metal discs, the discs of each pair being provided with oppositely elongated struck out elements which are spaced both radially and circumferentially, the projections of the discs of each pair being in direct contact and adjacent contacting projections being crossed at an angle to each other, said pairs of discs providing a plurality of spaces between the same for passage of material being atomized, said discs as viewed in plan being contoured to surround a central feed receiving space.

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2. An atomizer as in claim 1 in which the projections formed upon each disc are in alternately inclined series.

3. An atomizer as in claim 1 in which the projections for each disc of said pairs are formed in radially spaced concentric rows and are elongated, the projections for the outermost row being inclined in one direction, and the projections for the rows located between the innermost and the outermost rows being inclined in opposite directions.

4. In a centrifugal atomizer, a circular mounting plate adapted to be secured to a rotating shaft, and an atomizer basket removably secured to said plate, said basket comprising a plurality of concentric sheet metal discs stacked one upon the other, said discs being provided with elongated impact elements spaced radially and circumferentially and serving to retain said discs in spaced relationship, said elements being each inclined at an angle less than 90° to radii extended through the same from the axis of the shaft, said discs as viewed in plan being contoured to surround a feed receiving space.

5. In a centrifugal atomizer, a circular mounting plate adapted to be secured to a rotating shaft, and an atomizer basket removably secured to said plate, said basket comprising a plurality of concentric sheet metal discs stacked one upon the other, said discs being provided with elongated struck out impact elements spaced radially and circumferentially and serving to retain said discs in spaced relationship, said elements being each inclined at an angle less than 90° to radii extending through the same from the axis of the shaft, said discs as viewed in plan being contoured to surround a feed receiving space.

6. An atomizer as in claim 5 in which some of said impact elements are inclined at angles opposite to other elements.

References Cited in the file of this patent

UNITED STATES PATENTS

888,091	Kestner	May 19, 1908
1,731,924	Engelke	Oct. 15, 1929
2,308,353	Bowen	Jan. 12, 1943
2,661,984	Peebles et al.	Dec. 8, 1953

FOREIGN PATENTS

666,341	Great Britain	Feb. 13, 1952
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