United States Patent [19]

Gibbons

[11] **3,842,888**

[45] **Oct. 22, 1974**

[54] **APPARATUS FOR INTRODUCING INGREDIENTS INTO A SPRAY DRYING TOWER**

[75] Inventor: **Edward J. Gibbons,** Fanwood, N.J.

[73] Assignee: **Colgate-Palmolive Company,** New York, N.Y.

[22] Filed: **Feb. 1, 1973**

[21] Appl. No.: **328,750**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 885,079, Dec. 15, 1969, abandoned.

[52] **U.S. Cl.** ..... **159/4 CC**

[51] **Int. Cl.** **B01d 1/16**

[58] **Field of Search** ..... 159/4 CC, 4 B, 4 R, 48 R, 159/4 C, DIG. 3; 34/10, 57 A; 99/203

[56] **References Cited**

UNITED STATES PATENTS

1,157,935	10/1915	Gray	99/199
1,634,640	7/1927	Zizinia	159/4 R
2,004,840	6/1935	Suchtelen	159/4 S
2,900,256	8/1959	Scott	99/56
3,143,428	8/1964	Reimers et al.	159/4 CC X
3,354,933	11/1967	Wengeler	159/48 R
3,547,179	12/1970	Hussmann	159/4 CC
3,626,672	12/1971	Burbidge	159/4 CC
3,629,951	12/1971	Davis	159/4 CC X

FOREIGN PATENTS OR APPLICATIONS

118,692	7/1944	Australia	159/4 C
982,521	2/1965	Great Britain	159/48 R

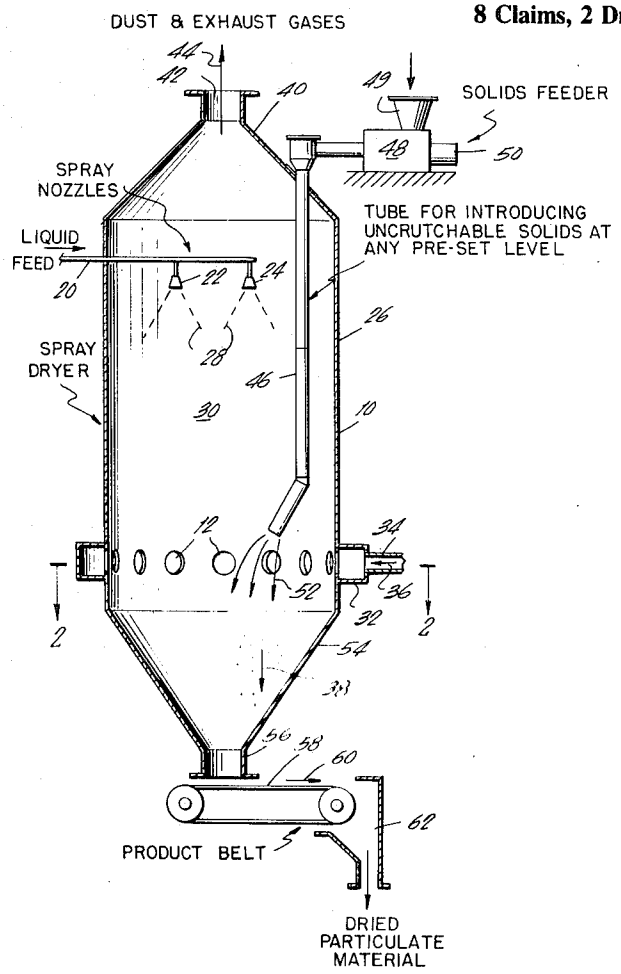
Primary Examiner—Jack Sofer

Attorney, Agent, or Firm—Herbert S. Sylvester, Esq.; Murray M. Grill, Esq.; Kenneth A. Koch, Esq.

[57] **ABSTRACT**

An apparatus for introducing ingredients into a spray tower for producing adjustable density products having uncrutchable solids comprising a drying body having sides provided with a plurality of holes, spray nozzles connected to a pipe extending through the sides of the drying body for spraying hydrated liquid material into the drying body, and a substantially circular conduit having arms that attach and circumscribe the outside of the drying body with at least one inlet where hot drying gas enters to be effused through the holes in the drying body to flow either countercurrently or concurrently to the hydrated liquid material and dry it to form dry particulate matter. A cylindrical tube extends through the top of the drying body and provides for the introduction of uncrutchable solids. A top connects to the drying body and includes at least one aperture within the drying gas exits. The dry particulate material having uncrutchable solids is recovered through an outlet in the bottom of the body.

8 Claims, 2 Drawing Figures



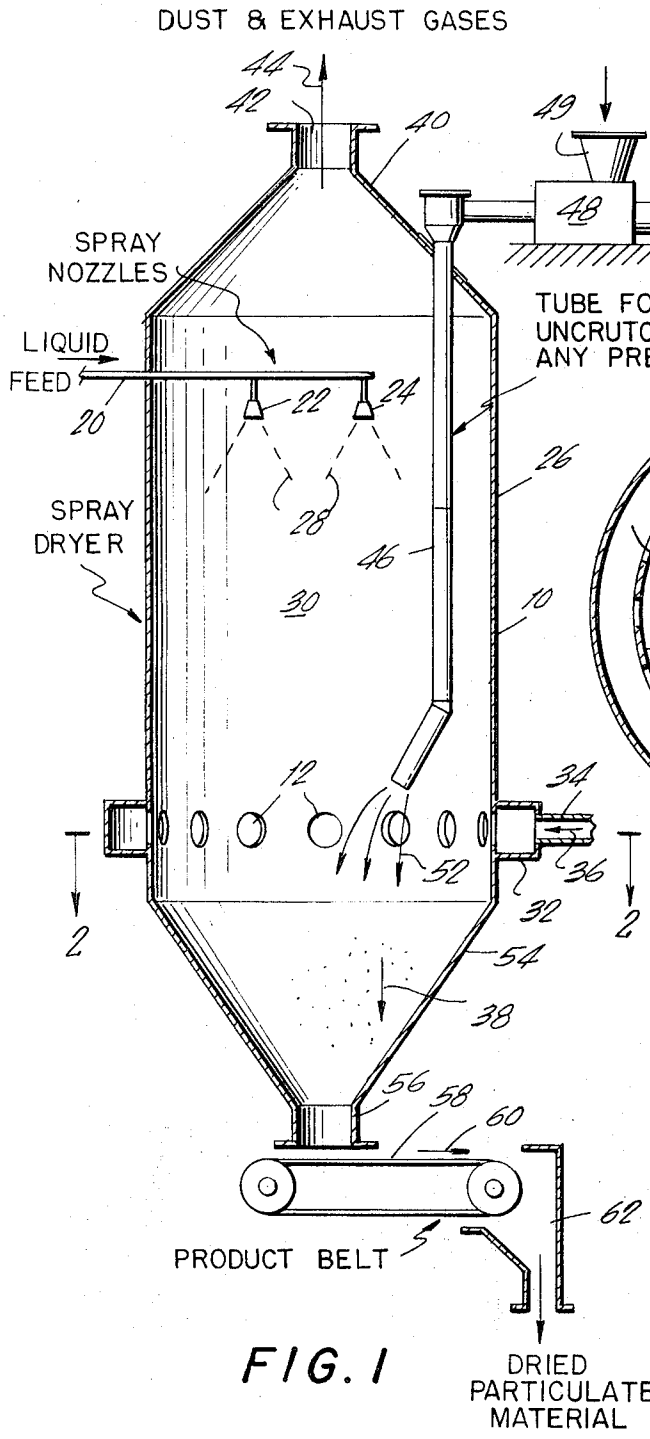

DUST & EXHAUST GASES
44
42
40
49
SOLIDS FEEDER
48
50
SPRAY NOZZLES
TUBE FOR INTRODUCING UNCRUTCHABLE SOLIDS AT ANY PRE-SET LEVEL
LIQUID FEED
20
22
24
26
28
SPRAY DRYER
46
30
10
12
34
36
52
32
2
54
38
56
58
60
62
PRODUCT BELT
DRIED PARTICULATE MATERIAL

FIG. 1

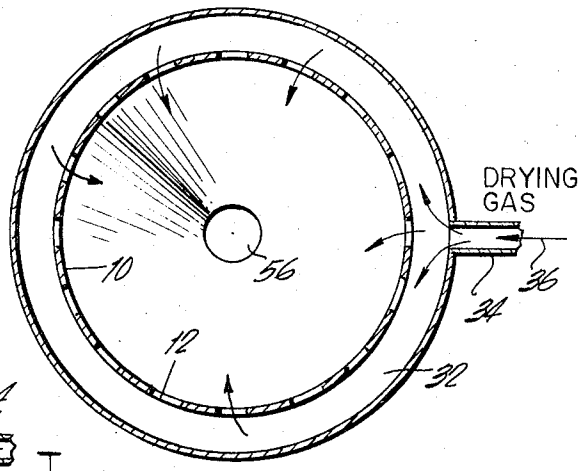

DRYING GAS
10
56
36
34
12
32

FIG. 2

APPARATUS FOR INTRODUCING INGREDIENTS INTO A SPRAY DRYING TOWER

RELATED APPLICATIONS

This application is a continuation-in-part of copending application Ser. No. 885,079 filed Dec. 15, 1969, now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an apparatus for producing adjustable density products. More specifically, this invention provides an apparatus for introducing ingredients into a spray drying tower that produces a low density product having uncrutchable solids.

2. Description of the Prior Art

Conventional devices for dehydrating and producing low density particulate matter, for example, borax particles, utilize rapidly moving heated gas with the entrained particulate matter which is to be dehydrated. These devices are undersirable because they cause calcination and breakage of the product. They also require use of a tremendous amount of heat, are expensive and highly inefficient. The conventional devices are also not versatile because they require special modification to the basic apparatus for modification of the basic process. Various devices, e.g., Kilns, roasting pans, and fluidized beds, have been suggested for effecting dehydrating, puffing and decrepitation of particulate matter, e.g., borax particles, without the foregoing deficiencies. But these devices have also been unsuccessful in attempting to dehydrate solid particulate matter crystals, and for drying liquid solutions into dry particulate matter. What is needed and what has been invented is a novel spray tower having means for introducing ingredients thereinto to produce adjustable density products having uncrutchable solids without the foregoing deficiencies.

SUMMARY OF THE INVENTION

The present invention accomplishes its desired objects by broadly providing a spray tower for producing adjustable density products having uncrutchable solids comprising a drying body having sides defining a plurality of holes, means for spraying hydrated liquid material into said drying body, and means for effusing hot drying gas through the holes to countercurrently flow against the hydrated liquid material to dry the liquid material to form dry particulate material. Also provided are means for introducing the uncrutchable solids into the drying body so as to produce the dry particulate material having the uncrutchable solids, and a top connected to the drying body having at least one aperture wherein the drying gas exits. A bottom is attached to the drying body and has at least one outlet wherefrom the dry particulate material having uncrutchable solids is recovered.

It is therefore an object of the invention to provide a spray tower for producing adjustable density products that doesn't utilize rapidly moving heated gas with the entrained particulate matter which is to be dehydrated.

It is another object of the invention to provide a spray tower for producing adjustable density products having uncrutchable solids that doesn't cause calcination and breakage of the product; and is inexpensive, highly efficient, and requires a relatively small amount of heat.

It is yet another object of the invention to provide a versatile means for introducing ingredients into a spray tower requiring no special modification when the height of introduction of uncrutchable solids is varied.

These, together with various ancillary objects and features which will become apparent as the following description proceeds are obtained by this novel spray tower, a preferred embodiment is shown in the accompanying drawing, by way of example only, wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic vertical sectional view of the apparatus used in the invention; and

FIG. 2 is a horizontal sectional view taken along the plane of line 2—2 in FIG. 1.

DETAILED DESCRIPTION OF THE INVENTION

Referring now in detail to the drawing, wherein like reference numerals designate similar parts throughout the views, and in particular to FIG. 1, drying body 10 is of cylindrical shape with circular holes 12 having centers which are essentially equidistant from the axis of drying body 10. Pipe 20 extends through the sides of drying body 10 and spray nozzles 22 and 24 are connected to it for spraying hydrated liquid material 28, or the like, into drying zone 30. In a preferred embodiment of the invention, pipe 20 is situated in the upper portion of drying body 10. A substantially channel shaped conduit 32 has inlet 34 where hot drying gases 36 enter. Conduit 32 is of dimensions greater than the diameters of holes 12, and attached to and circumscribe the outside of drying body 10, enclosing holes 12 where gases 36 effuse to countercurrently flow against hydrated liquid material 28 to form dry particulate material 38.

A top 40 is essentially a truncated cone and is integrally connected to the drying body 10 and includes mouth 42 where drying gases 36 exit in the form of dust and exhaust gases 44. Mouth 42 is circular with a center essentially positioned on the axis of drying body 10.

A cylindrical tube 46 extends through the top 40, and a worm feeder 48, driven by motor 50 introduces uncrutchable solids in the direction of arrows 52 to be mixed with the dry particulate material 38. The tube 46 is adjustable at any pre-set height level within drying body 10. A bottom 54 is provided with an outlet 56. The bottom 54 is of conical shape and outlet 56 is substantially circular with a center situated essentially on the axis of drying body 10, and dry particulate material 38 with uncrutchable solids 52 leave bottom 54 through outlet 56 to be initially deposited on the produce belt 58 which is driven by driving pulleys 60 and 62, in the direction of arrow 60 and finally deposited through funnel member 62.

In a preferred embodiment for operation of the invention, a particulate material (e.g. detergent composition or other hydrated liquids or solids material that is in need of dehydrating) is prepared as an aqueous suspension or paste in a suitable mixer (not shown). It is then pumped by a pump (not shown) through pipe 20 to spray nozzles 22 and 24 from which it is sprayed into the interior of spray tower body 20. In falling through the tower body 10, spray 28 is dried to solid particles

38 by hot air 36 entering the tower at inlet 34 and exiting through outlet 42 in the form of dust and exhaust gases 44. The hot air is usually produced by burning either fuel oil or gas in a burner (not shown). Also, these dust fines 44 being removed save on the need for dust collecting equipment on the spray tower 10.

Uncrutchable solid materisl 52, such as solid hydrated borax, which can be dehydrated and expanded is fed to feeder 48 (driven by motor 50) from hopper 49 through pipe 46 into drying zone 30. Pipe 46 maybe adjusted so that the introduction may be done at such a place and in such a manner that advantage can be taken of the physical effect that the temperature/time relationship in the tower may produce. Thus, the time of dwell of the borax hydrate particles in a heated area 30 can be controlled by controlling the height at which they are fed into the spray tower 10 by tube 46. Solid borax and detergent composition are recovered through outlet 56.

While the present invention has been described herein with reference to particular embodiments thereof, a latitude of modification, various changes and substitutions are intended in the foregoing disclosure, and in some instances some features of the invention will be employed without a corresponding use of other features without departing from the scope of the invention as set forth.

I claim:

1. A spray tower for producing adjustable density products comprising a drying body having sides provided with a plurality of holes, nozzle means for spraying hydrated liquid material into said body, means for effusing hot drying gas through said holes to countercurrently flow against said hydrated liquid material to dry said liquid material into dry particulate form, said body having a top provided with a mouth wherein said drying gas exits, a bottom provided with an outlet wherefrom said dry particulate material is removed, a cylindrical tube extending through said top and having a discharge opening that is adjustable to any pre-set height level within said body between said holes and said nozzle means and a feeding means for feeding dry solids into said cylindrical tube.

2. The spray tower of claim 1 wherein said feeding means includes a worm feeder for supplying said solids to said tube and a motor operatively connected to said worm feeder for driving said feeder.

3. The spray tower of claim 1, wherein said body is cylindrically shaped and said holes are circular with centers essentially equidistant from the axis of said body.

4. The spray tower of claim 3, wherein said means for effusing hot drying gas through said holes is a substantially channel shaped cofferdam having at least one inlet, said cofferdam surrounding and enclosing said holes, whereby said hot drying gas enters said inlet to be effused through said holes.

5. The spray tower of claim 1, wherein said means for spraying hydrated liquid material comprises at least one spray nozzle, a pipe extending through the sides of said body and connected to said spray nozzle for conducting said liquid material to said spray nozzle, and said pipe being situated in the upper portion of said body.

6. The spray tower of claim 5, wherein said top, is essentially an upright truncated cone, and said aperture is circular with a center essentially positioned on said axis of said body.

7. The spray tower of claim 1, wherein said bottom is an inverted frusto-cone.

8. The spray tower of claim 7, wherein said outlet of said bottom is substantially circular with a center situated essentially on an axis of said body.

* * * * *