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METHOD AND APPARATUS FOR PREPARING VERY
SOLUBLE FINE POWDERS FROM LIQUIDS
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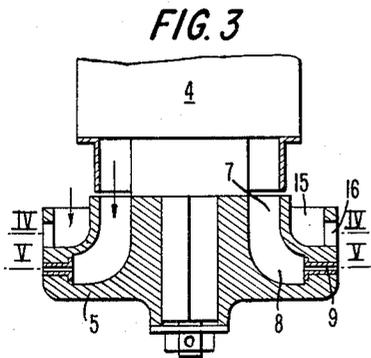
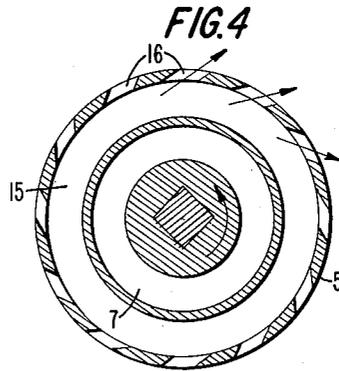
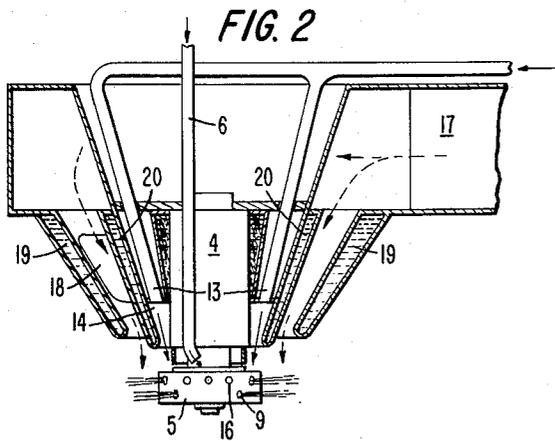
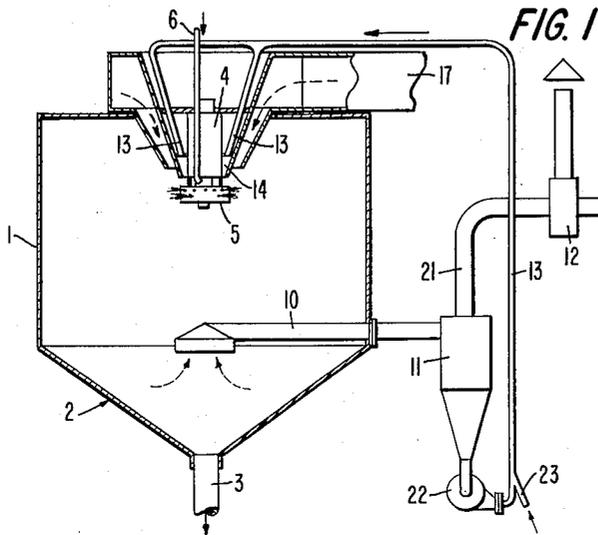
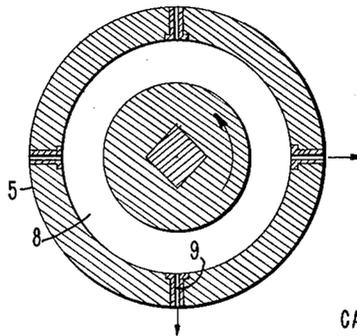


FIG. 5



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METHOD AND APPARATUS FOR PREPARING VERY SOLUBLE FINE POWDERS FROM LIQUIDS

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3 Claims. (Cl. 159-4)

It is known that when a liquid containing solid substances in suspension or dissolved therein is projected at high speed by the action of centrifugal force in the upper portion of a drying tower, a thin horizontal sheet is formed and that if a gaseous stream of sufficient temperature is then caused to flow through this sheet, an instantaneous evaporation of the liquid is effected, and that the powder subsequently collected consists of relatively coarse particles that are partly moderately sintered to one another.

The powder obtained with this known method consists of considerable coarser particles and dissolves much better in the liquid than that obtained through the method wherein the liquid is projected in jet form from fixed nozzles at a more or less high pressure.

These known advantages are reinforced and improved in installations of the types known and developed in the last twenty years or so, wherein the speed of the centrifugal atomizer is adjustable continuously, and experience teaches that the size of the grain thus obtained increased as the speed of the centrifugal atomizer decreased.

Now it has been found, according to the present invention, that it is possible to further increase the rate of dissolution of this powder by extracting the finest particles from the aforesaid tower and projecting them again into said tower at very high speed, with the assistance of centrifugal force, in the form of a substantially horizontal sheet located at a level slightly above that of the liquid sheet, and to stir these two sheets by means of drying gas fed from the tower top.

The finest particles are collected in the lower half-portion of the tower by means of a duct connected thereto, these particles being submitted to the action of a cyclone extractor separating from the outflowing gas stream the fine solid particles, and reintroduced with one portion of this gas without introducing ambient air from the top of the tower and on said centrifugal atomizer.

To this end, the centrifugal atomizer comprises two superposed discs, the upper disc acting as a fan on which the fine re-cycled powder is poured, whereas the lower one is used for atomizing the liquid.

The installation for carrying out this method comprises an atomizing drying tower incorporating a device for separating the coarse-grained powder from the fine powder, a duct connecting the zone where the coarse-grained powder is separated from the fine powder to the top of the tower, a cyclone extractor for separating the outcoming gas from the fine powder and a fan mounted with said cyclone extractor in this duct, and a centrifugal atomizer having two discs lying in two spaced horizontal planes mounted in the upper portion of the tower below the inlet end of said duct.

With the foregoing and other objects in view, the invention resides in the novel arrangement and combination of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed may be made within the scope of what is claimed without departing from the spirit of the invention.

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Other objects and advantages will become apparent from the following description taken in conjunction with the accompanying drawing wherein:

FIGURE 1 is a diagrammatical axial section of the apparatus.

FIGURE 2 is another axial section showing on a larger scale details of the upper portion of the tower.

FIGURE 3 shows on a still larger scale and also in axial section the rotary centrifugal two-stage disc; and

FIGURES 4 and 5 are horizontal sections taken along the lines IV-IV and V-V of FIG. 3 respectively.

The tower 1 illustrated in the drawing comprises a funnel-shaped or conical lower portion 2 provided with a discharge duct 3 through which the coarse-grained product is evacuated.

Mounted in the upper portion of the tower is a motor 4 coaxial with the tower and adapted to drive the centrifugal atomizer 5 at a relatively high speed, said centrifugal atomizer having two discs lying in two spaced horizontal planes.

The liquid is fed through a pipe 6 to the annular cavity 7 merging into a lower annular space 8 of the lower disc of the centrifugal atomizer 5, the lateral wall of this disc being perforated and provided with a number of radial nozzles 9.

A duct 10 draws from the lower portion of the tower the finest particles by means of an exhauster or suction fan 12; in the cyclone 11 these particles are separated from the outflowing gas stream and subsequently re-cycled by the fan 22 together with a moderate quantity of gas through the pipe 13 leading to the annular hopper 14 from which they flow on the disc of the upper plane 15 of the centrifugal atomizer 5; means for introducing steam or mist are provided in the form of a nozzle 23 mounted in the pipe 13. This disc of the upper plane is provided with a number of orifices 16 inclined to the radius; by virtue of this inclination this upper disc acts as a fan impeller for drawing the particles from the discharge hopper 14 and projecting them in the form of a horizontal sheet into the tower.

A heated gas stream, for example at a temperature of from 150° to 180° C., is fed through the duct 17 surrounding with its lower frusto-conical box portion the atomizer 5 so that, in the vicinity of this disc, the sheet of fine particles is stirred together with the liquid sheet; in order to facilitate and extend the contact between the particles of these two sheets the stream of hot gas is preferably inclined by means of baffle plates 18; preferably, jackets 19 and 20 in which a cooling fluid is circulated are provided to prevent any abnormal or overheating of the upper central zone of the tower wherein the atmosphere is constantly kept for example at a temperature of from 80° to 90° C.

In the absence of an atomizer having two discs it was hitherto observed that in certain cases the hot gas flowing directly against the atomizer having a single disc was a cause of local overheating of the disc material, this entailing coagulations at the contact and deposits with certain liquids, so that more frequent cleaning operations are required for the machine.

According to this invention, there is collected through the sole outlet orifice 3 of the tower 1 a powder of which the overheating has thus been avoided, its density and moisture content being substantially the same as those obtained without the aforesaid re-cycling, but this powder displays the property of dissolving much more rapidly in the liquid because the fine powder particles have more or less sintered or expanded.

This method is applicable to the preparation not only of powders of any description but also of a milky powder as well as powders obtained by mixing milk with other products.

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Of course, various changes and variations may be brought to the present invention without departing from the spirit and scope thereof as set forth in the appended claims.

What I claim is:

1. A method of treating a liquid mixture containing solid matter dissolved or suspended therein in order to recover the solid matter in divided form, very soluble in a liquid, consisting in projecting this liquid mixture at very high speed with the assistance of centrifugal force and in the form of a thin horizontal sheet in the upper portion of a hot-atmosphere drying tower, and to collect the powdered product at the bottom of said tower, according to which the finest particles of the powdered product are extracted by suction in said tower below the horizontal sheet of liquid mixture and are projected at very high speed with the assistance of centrifugal force and in the form of a thin horizontal sheet at a level higher than that of said sheet of liquid mixture and a gas is blown through these sheets in order to blow the sheet of the finest particles of the powdered product against the sheet of liquid mixture.
2. A method as set forth in claim 1, in which the main gas is blown in an inclined direction from top to bottom and from the periphery toward the axis.
3. An apparatus for preparing a powder very soluble in liquids from a liquid containing solid substances suspended or dissolved therein, which comprises a tower,

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a centrifugal atomizer having two discs lying in two spaced horizontal planes in the upper portion of said tower, means for rotatably driving said centrifugal atomizer at a relatively high speed, an inlet for the liquid and a duct for delivering same to the disc of the lower plane of the centrifugal atomizer, means for blowing a hot gas into said tower in a downward inclined direction, and above said centrifugal atomizer, a discharge orifice at the lower portion of said tower for discharging the soluble powdered finished product thus produced, and means for withdrawing from the central part of the tower the finest particles thus produced and delivering them to the disc of the upper plane of said atomizer.

References Cited in the file of this patent

UNITED STATES PATENTS

1,157,935	Gray -----	Oct. 26, 1915
1,823,844	Riley -----	Sept. 15, 1931
2,559,989	Nyrop -----	July 10, 1951
2,561,394	Marshall -----	July 24, 1951
2,584,973	Andermatt -----	Feb. 12, 1952

FOREIGN PATENTS

695,266	Germany -----	Aug. 21, 1940
530,613	Great Britain -----	Dec. 16, 1940
748,698	Germany -----	Nov. 8, 1944
481,786	Canada -----	Mar. 18, 1952