United States Patent [19]

Putterlik

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[54] **METHOD AND AN ARRANGEMENT FOR DRYING OF DISPERSIONS BY ATOMIZING**

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[52] **U.S. Cl.** **34/8,** 34/17, 34/58, 34/60

[51] **Int. Cl.** **F26b 5/08**

[58] **Field of Search** 34/8, 17, 19, 58, 34/60

[56] **References Cited**

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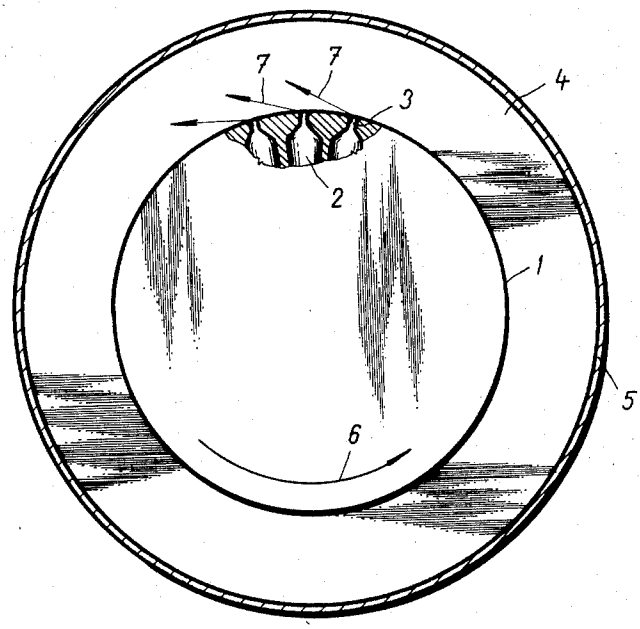
[57] **ABSTRACT**

A dispersion of fine material in a liquid is first concentrated in a centrifuge to a paste like consistence. It is subsequently atomized by ejecting it under centrifugal force with a high overpressure into a stream of hot gas, where it is dried and supplied together with the drying gas to a separator.

8 Claims, 2 Drawing Figures



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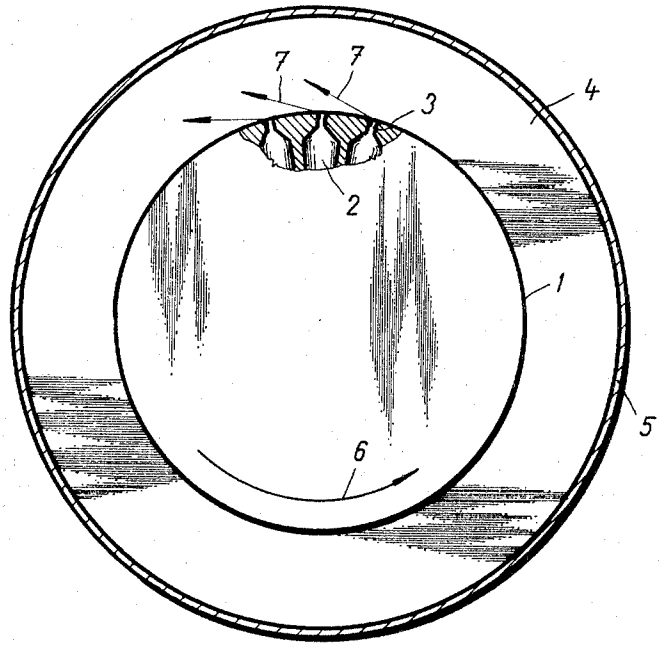

FIG. 1

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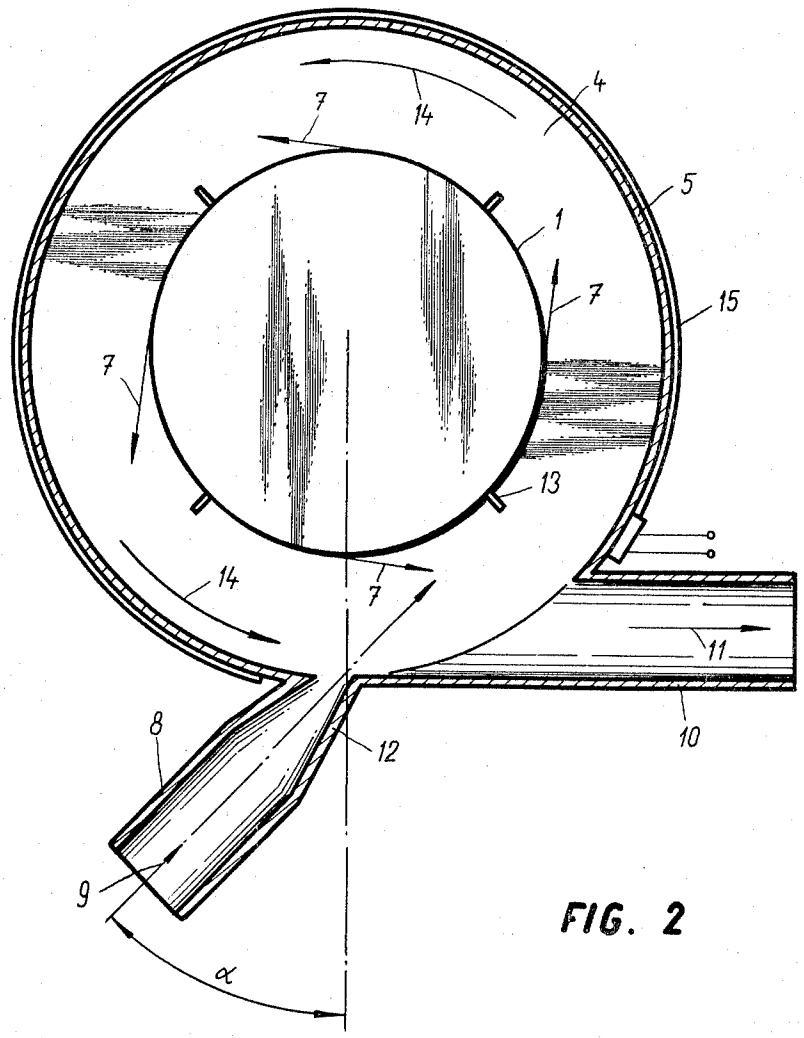

FIG. 2

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METHOD AND AN ARRANGEMENT FOR DRYING OF DISPERSIONS BY ATOMIZING

BACKGROUND OF THE INVENTION

This invention relates to a method and to apparatus for the drying of dispersions by atomizing the same, using a combination of a centrifuge and of a drying device combined in a unit.

A large number of methods and of arrangements for concentrating suspensions is known. Recently centrifuges were preferred for this purpose, as they enable a continuous and economic operation. The centrifuges of course do not provide as do concentrating devices a product which would be entirely free of the dispersion medium used and the material therefore has to be subsequently dried. One of the most advanced methods for drying suspensions is by atomizing the suspension and a number of different arrangements have because known, which apply this method. Atomizing is preferred because it enables a dried material to be obtained from a liquid suspension in the shape of a fine powder having high grade properties, and at relatively high output levels.

Atomizing drying as actually used has the drawback, however, that the processed suspension must be sufficiently fluid to enable it to be pumped and atomized. That means, that it must contain a relatively high content of liquid, which must be evaporized in the drying device. As a result the efficiency of the whole arrangement is thus reduced. Under these conditions the suspension cannot be mechanically concentrated to a high degree prior to its supply to the atomizing drying devices and the drying process must still include a final drying step employing devices customary for other drying methods. As a result a final product is provided which does not have the consistency and high grade as is normally expected from the atomizing driers.

SUMMARY OF THE INVENTION

It is an object of this invention to provide a method and an arrangement, which greatly reduces mechanically the amount of dispersion liquid required in the dispersion prior to its supply for atomizing drying.

It is another object to increase to overall efficiency for the drying plant of dispersions.

It is still another object of this invention to provide a process and an arrangement, which would operate continuously and with the least requirements for attendance.

Bearing these and other objects in mind, the present invention provides a process wherein the dispersion is first concentrated in a centrifuge to a paste like consistency and the thus concentrated dispersion is ejected under a pressure generated by centrifugal force by atomizing means from the circumference of the centrifuge drum directly into a stream of hot drying gas.

DESCRIPTION OF DRAWINGS

An examplery embodiment of an arrangement operating according to this method is shown schematically in the accompanying drawings, where

FIG. 1 is an axial view of a part of a centrifuge drum in cross section and

FIG. 2 indicates the drying space provided around the centrifuge drum.

DESCRIPTION OF PREFERRED EMBODIMENT

With reference to FIG. 1 a centrifuge drum 1 rotating in the direction of the arrow 6 is provided on its circumference with jets 3. By means of the jets 3 the concentrated suspension is in the course of rotation of the centrifuge drum 1 either periodically, continuously, or in dependence on the amount of the concentrate collected around the jet 3 injected at high pressure into the substantially annular space 4 at the circumference of the centrifuge drum 1 limited by the stator shell 5. Hot air or some other hot gas is introduced by way of a supply tube 8 into the space 4. A correct and efficient operation of the whole unit supposes, that only a fraction concentrated to a predetermined high degree is injected at substantial overpressure over the jets 3 into space 4. A similar centrifuge is used where the jets releasing the concentrated suspension are only opened, if a certain amount of concentrate has collected in the neighborhood of the jet and are closed again if most of this concentrate has been ejected. As the centrifuge drum 1 rotates at high speed and its circumferential speed is equally high the material ejected by the jets 3 is atomized upon leaving the jets 3 and forms a mist which with the increased surface of the atomized particles, is instantaneously dried. The method according to this invention has with respect to actually used methods the advantage, that due to a previous high concentration in the centrifuge a substantially smaller amount of liquid has to be evaporated. It requires therefore rather less heat energy, maintaining all other advantages, particularly a dry and powderous product obtained by a single stage process. The described method enables the creation of a complex aggregate comprising a concentrating centrifuge acting simultaneously as atomizing device an a drying unit comprising a heat source, a circulating system and a separator of the dried material. The drying unit can be arranged differently to meet different requirements of the used material. The gas stream in the annular space 4 can be supplied for instance in the same direction as the rotation of the centrifuge drum 1 or in counter-current, or the gas can be introduced in the axial direction of the centrifuge drum, or if desired in mutually opposite directions.

An exemplary embodiment is indicated in FIG. 2. It shows schematically a centrifuge drum 1, provided at its circumference with radial blades 13. The concentrate is ejected by not shown jets 3 of the centrifuge drum 1 (see also FIG. 1) in direction of arrows 7 into the annular space 4 determined by the stator shell 5. The stator shell 5 has a supply tube 8 for the supply of the drying gas in direction of the arrow 9 and a tangentially attached discharge tube 10 for discharging the used hot gas with the dried material in direction of the arrow 11 to a separator of the dried material. The supply tube 8 terminates with its narrowed extremity 12 into the stator shell in direction of the arrow 9, at the angle α with respect to the centripetal direction.

The whole arrangement operates as follows: by a suitable selection of the angle α and by the action of the blades 13 of the centrifuge drum 1 a quick movement of the drying gas in direction of the arrows 14 is achieved in the annular space 4 of the stator shell 5. The concentrated material is injected in direction of arrows 7 from the centrifuge drum into this stream of drying gas and as it is atomized to mist and its surface increased, it is instantaneously dried. The mixture of

drying gas which has taken over the liquid fraction and the dried loose material are discharged via the discharge tube **10** in direction of the arrow **11** to a not shown separator of the dried solid material. It is advantageous, if the stator shell **5** is additionally heated, for instance by means of an electric resistance wire **15.** Thus even in case of some instantaneous overloading of the drying device or in case of some reduction of the efficiency of the drying device, that is in case of some accidental failure, no sticking of the dried material on the walls of the stator shell **5** is experienced.

The complex solution of concentration and drying to a single aggregate according to this invention represents a fully automized arrangement for concentration of fine dispersions up to a dry state.

I claim:

1. A method for drying fine material dispersed in a liquid comprising the steps of supplying said dispersion to a centrifuge, rotating said centrifuge at a speed sufficient to concentrate said dispersion into a paste like consistency, atomizing said concentrated paste and ejecting said atomized paste from said centrifuge under pressure into an annular path, and supplying heat to said atomized paste in said annular path until said material in said atomized paste is dried.

2. The method according to claim **1** including the step of introducing a stream of heated gas into said annular path in contact with said atomized paste.

3. The method according to claim **1** wherein the ejection and atomizing of said concentrated paste is effected as a result of the centrifugal action of said centrifuge.

4. Apparatus for drying dispersions of fine material in a liquid comprising:

a centrifuge having a rotating centrifuge drum, adapted to concentrate said dispersion into paste like consistency,

a plurality of jets at the circumference of said centrifuge drum adapted to atomize the concentrated dispersion,

a stator shell surrounding said centrifuge, and defining a substantially annular space around the circumference of the centrifuge drum into which said atomized concentrated dispersion is received,

a supply tube for delivering hot gas terminating into said annular space to dry said atomized concentrated dispersion, and

a discharge tube for the discharge of the mixture of dried material and of said gas from said annular space.

5. The apparatus as set forth in claim **4,** wherein said centrifuge drum is provided on its circumference with a number of blades adapted to promote the rotating movement of the drying gas in said annular space around the circumference of the centrifuge drum.

6. The apparatus as set forth in claim **4,** wherein the stator shell is provided with means for additional heating.

7. The apparatus as set forth in claim **4,** wherein said discharge tube is connected to said shell to extend tangentially therefrom.

8. The apparatus as set forth in claim **4,** wherein said supply tube has a narrow constricting portion terminating at said annular space.

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