United States Patent

Lykov et al.

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[54] DEVICE FOR SPRAY DRYING OF LIQUIDS BY MEANS OF HOT GASEOUS MEDIUM

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[52] **U.S. Cl.** **239/132.3,** 239/424.5, 261/116

[51] **Int. Cl.** **B05b 7/06**

[58] **Field of Search** .....239/128, 132.1, 132.2, 135, 239/137, 139, 423, 424.5, 425; 261/78 A, 116

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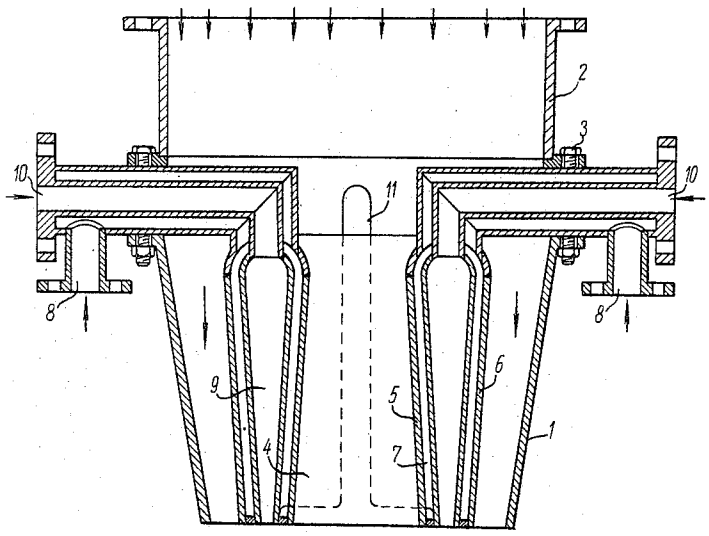
[57] **ABSTRACT**

A device for spray drying of liquids by means of a hot gaseous medium fed to a convergent channel wherein there is a nozzle for a liquid being sprayed. Said nozzle is arranged in a channel formed by the double walls of a hollow body of rotation, said body being placed inside the convergent channel and coaxial with the latter.

3 Claims, 4 Drawing Figures



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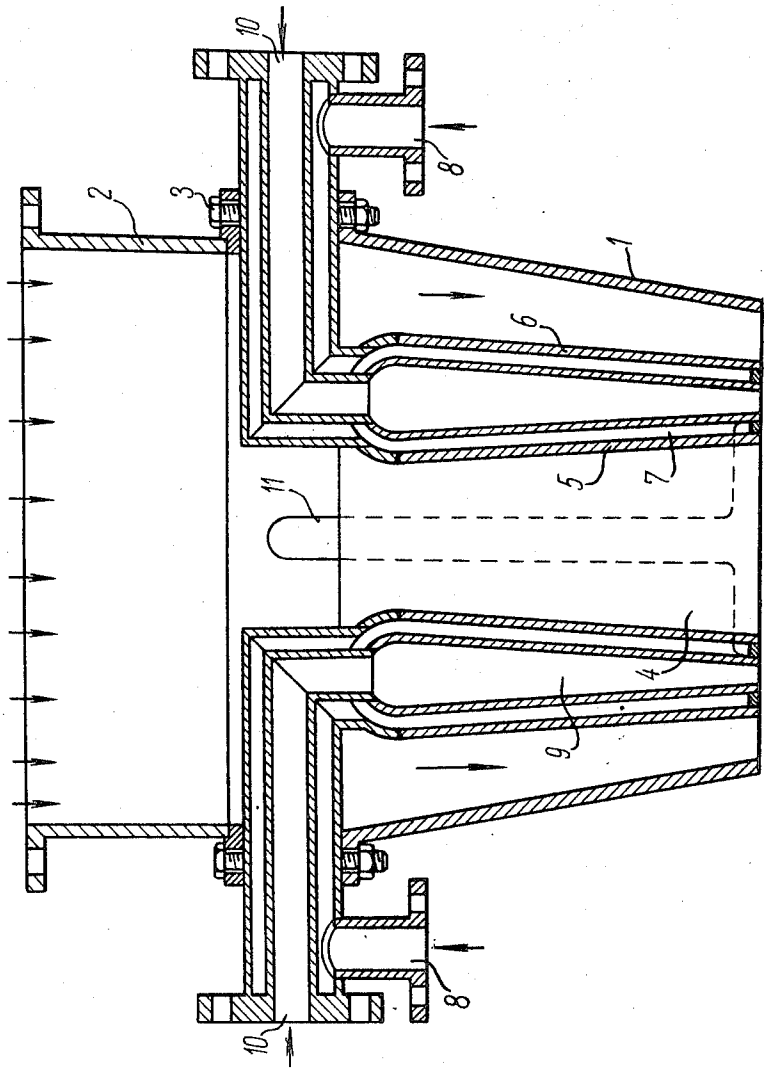

FIG. 1

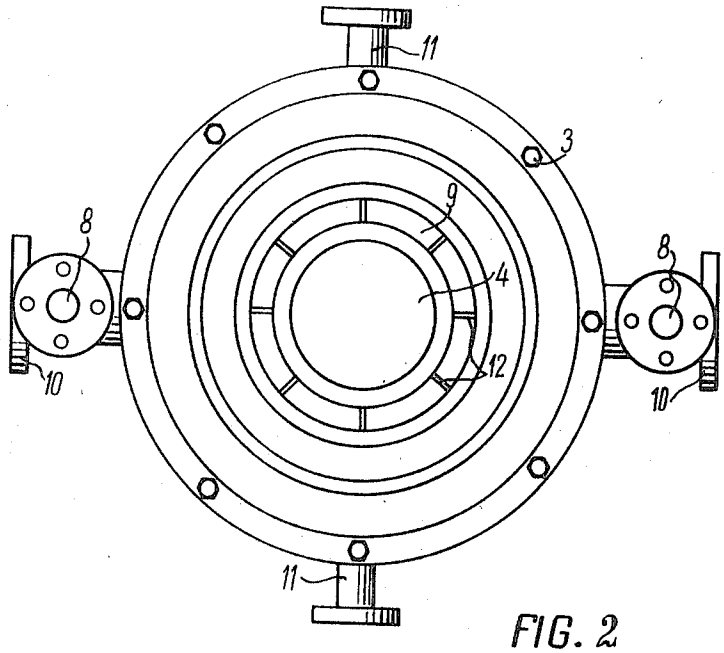

FIG. 2

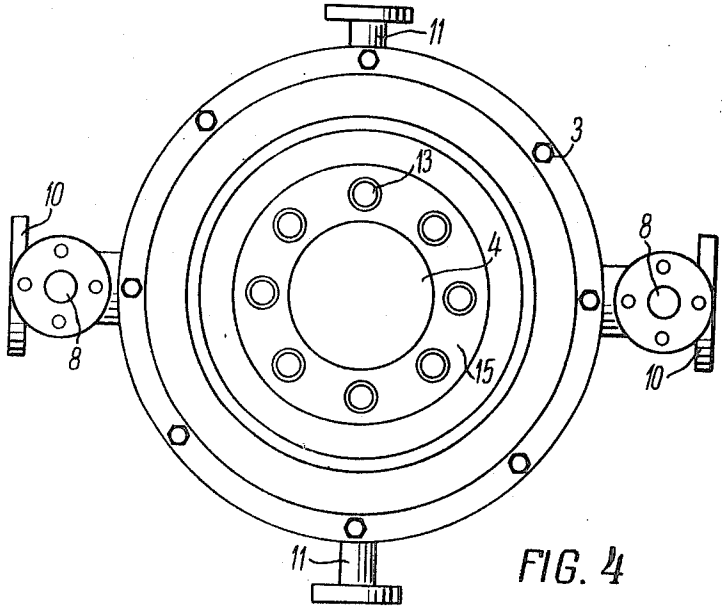

FIG. 4

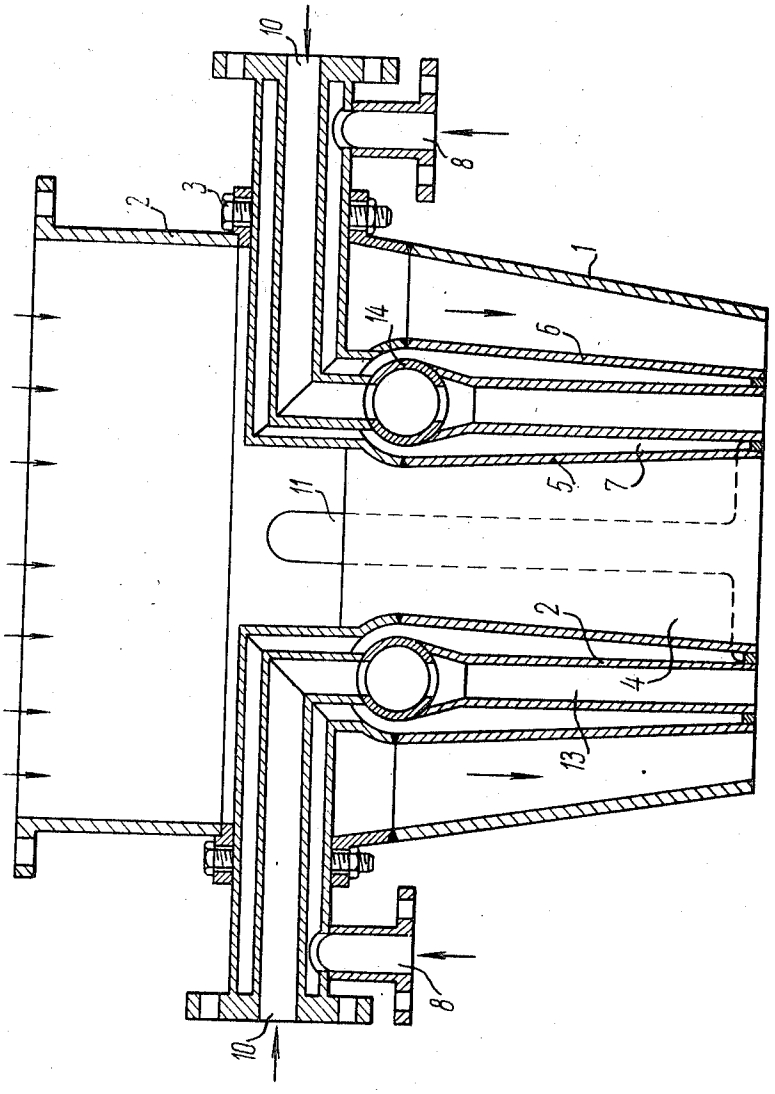

FIG. 3

DEVICE FOR SPRAY DRYING OF LIQUIDS BY MEANS OF HOT GASEOUS MEDIUM

This invention relates to dryers and, more particularly, to devices for spray drying of liquids by means of a hot gaseous medium.

The present invention can be employed for drying substances possessing sufficient fluidity to be conveyed by pumps. These may be pulps of high-analysis mineral fertilizers, solutions of mineral salts, suspensions and solutions of matters in organic solvents, fusions and concentrated liquid polymeric materials.

The proposed device can be utilized in processing oil products, wood, resins, carnallite, bishofite, phosphorites, sewage water, and when producing sodium sulphate.

Conventionally known is the device for spray drying of liquids, comprising a convergent channel terminating in a cylindrical capping, coaxially with which a nozzle is arranged; the nozzle outlet is arranged within the capping limits with the possibility of an axial movement about it. A spraying gaseous medium is fed to the convergent channel, a liquid to be sprayed being supplied to the nozzle.

The nozzle is protected against the high-temperature gas environment by means of an air jacket (cf. USSR Author's Certificate No. 157,279, Cl. 82*a*, 40/10, 1963).

Still, the capacity of such a device does not exceed 1.5–2.0 tons of liquid per hour.

The primary object of the invention is to provide a device for spray drying of liquids by means of a hot gaseous medium, the nozzle and the parts channeling said medium being so shaped as to ensure larger contact of the liquid drops with said medium.

According to the invention, the object of the invention is achieved by positioning the nozzle, through which a liquid to be treated is fed, in a channel formed by the double walls of a hollow body of rotation, said body being arranged inside the convergent channel and coaxial to the latter.

This enables a two-side treatment of the liquid stream by means of the hot gaseous medium, facilitating the dispersion and drying of the liquid.

In an exemplary embodiment of the invention, it is expedient that the channel in the device be made tapered toward the nozzle shear, which helps make more stable the motion of the hot gaseous medium at the place of effusion of the liquid being treated.

The nozzle can be shaped as a ringlike slot, which permits to increase the capacity of the device appreciably, the dispersion of the liquid being treated remaining satisfactory. The nozzle can be separated by longitudinal partitions so as to disperse the flow of the gaseous medium.

Whenever a smaller capacity is allowed, several nozzles can be provided in the channel. These can be made cylindrical.

An advantage offered by this invention is a far greater capacity of the new device for spray drying of liquids, which exceeds that of the conventional devices not less than tenfold, at a slight increase of the dimensions of said device being slightly bigger.

The inventional will be more apparent from a detailed description of the exemplary embodiments of the device for spray drying of liquids by means of a hot gaseous medium, reference being had to the appended drawings, wherein:

FIG. 1 is the longitudinal section of the device of the invention (first variant);

FIG. 2 ditto, bottom view;

FIG. 3 is another embodiment of the device of the invention (longitudinal section), and

FIG. 4 ditto, bottom view.

The device for spray drying of liquids by means of a hot gaseous medium comprises a convergent channel 1 (FIGS. 1 and 2) attached to a cylindrical pipe 2 by means of bolts 3. Provided inside the convergent channel 1 and coaxial with the latter is a hollow body 4 of rotation, whose double walls form a

channel 7 tapered in longitudinal section. The channel 7 communicates with receiver pipes 8. There is a nozzle 9 shaped as a ringlike slot in the channel 7. Said nozzle 9 has connection with a receiver pipe 10. Annular clearances at the shear of the nozzle 9 between the nozzle walls and those of the cylinder 4 are to be welded.

A spraying gaseous medium is fed to the pipe 2 from which it flows to the convergent channel 1, wherein it steams both outside and inside the hollow body 4 of rotation.

A liquid to be sprayed is fed to the receiver pipe 10, from which it goes to the nozzle 9 and further toward its shear, wherein it is picked up by the flow of the gaseous medium, escaping from the convergent channel 1 and the body 4. The dispersion of the liquid takes place.

In the case of dispersion of a relatively viscous liquid, as well as in the case of drying a liquid in a gaseous medium, the latter is heated to a required temperature. However, in the case of drying a thermosensitive liquid, a liquid or gaseous cooling medium should be fed to pipes 8, said medium travelling in clearances between the nozzle 9 and the walls of the body 4. The cooling medium is branched from said clearances through pipes 11.

The positioning of the body 4 inside the convergent channel 1 permits to increase the contact of the gaseous spraying medium with the liquid being dispersed and, consequently, to carry out the process of drying the liquid being dispersed (even the thermosensitive one) under a temperature higher than that required in the conventional devices. This temperature may exceed 1,000° C., not causing the overheating of the liquid, for in this case much heat is consumed to evaporate the moisture within a relatively short period of time.

The nozzle 9 can have longitudinal partitions 12 (FIG. 2) separating the slot formed by the nozzle walls. Such is the case when it is necessary to disperse the flow of the liquid being sprayed and thus obtain a required size of drops beyond the nozzle shear.

Whenever a relatively smaller capacity of the device of the invention is allowed, the channel 7 can accommodate several cylindrical nozzles 13 (FIGS. 3 and 4) welded to a distribution manifold 14 with which the receiver pipes 10 are communicating. A flat bottom 15 is provided from below between the double walls of the body 4.

In all exemplary embodiments of the device of the invention, it is expedient to mount this device so that the nozzle or the nozzles be positioned vertically, the shear of the nozzle looking downwards.

The hollow body 4 of rotation should be best shaped as a hollow chamfered cone having double walls.

What is claimed is:

1. A device for spraying and drying liquids by means of a hot gaseous medium, comprising:

a. hollow cones of identical length arranged coaxially one inside the other, the inner cone having double walls and forming a channel converging toward the outlet of the liquid being sprayed;

b. a nozzle for supplying the liquid being sprayed, comprising a series of pipes arranged in a circular manner within said channel;

c. means for protecting the nozzle walls against the hot gaseous medium, made as two annular slots formed by the walls of said inner cone, said pipes and an annular lid attached to the walls of said inner cone and said pipes at the outlet of the liquid being sprayed;

d. means for supplying the liquid being sprayed into the nozzle at one or several points, and

e. means for supplying cooling water or air into the inner cone.

2. A device as claimed in claim 1, wherein said nozzle is made as an annular slot.

3. A device as claimed in claim 2, wherein said nozzle is divided by longitudinal partitions.

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