

[54] **DEVICE FOR SPRAYING LIQUID PRODUCTS AND MELTS**

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[22] Filed: **July 24, 1973**

[21] Appl. No.: **382,181**

[52] U.S. Cl. .... **239/102, 239/519, 239/524, 239/553, 239/567**

[51] Int. Cl. .... **B05b 3/14**

[58] Field of Search ..... **239/101, 102, 517, 519, 239/524, 553-553.5, 567**

[56]

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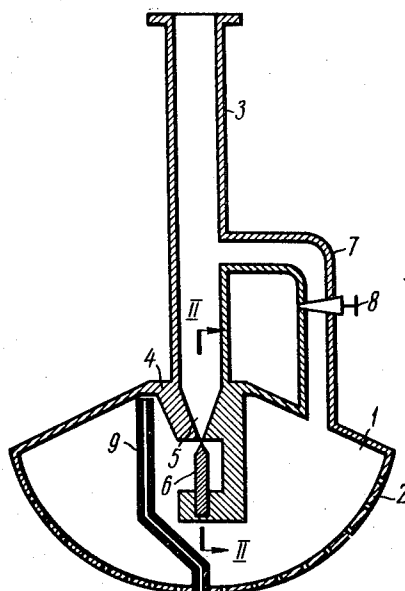
*Attorney, Agent, or Firm*—Waters, Roditi, Schwartz & Nissen

[57]

**ABSTRACT**

A device for spraying liquid products and melts comprising a chamber with a perforated bottom wherein a pressurized product to be sprayed is introduced into the chamber through a branch pipe. The branch pipe is equipped with a nozzle opposite which in the chamber there is an elastic member set in oscillatory motion under the effect of the flow of product which is admitted through the nozzle, the elastic member imparting acoustic oscillations to the product.

**8 Claims, 7 Drawing Figures**



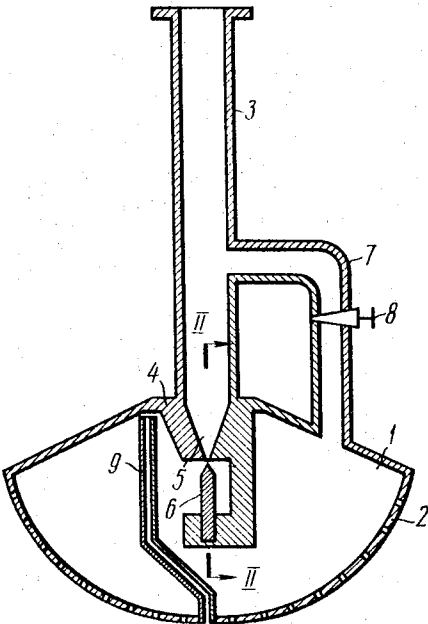


FIG. 1

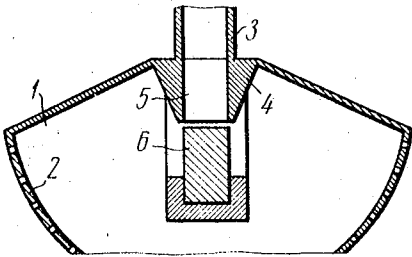


FIG. 2

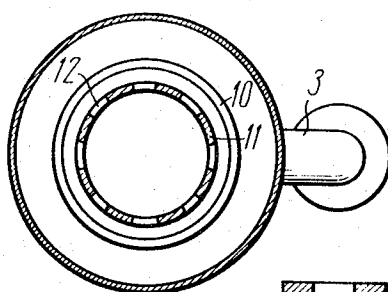


FIG. 4

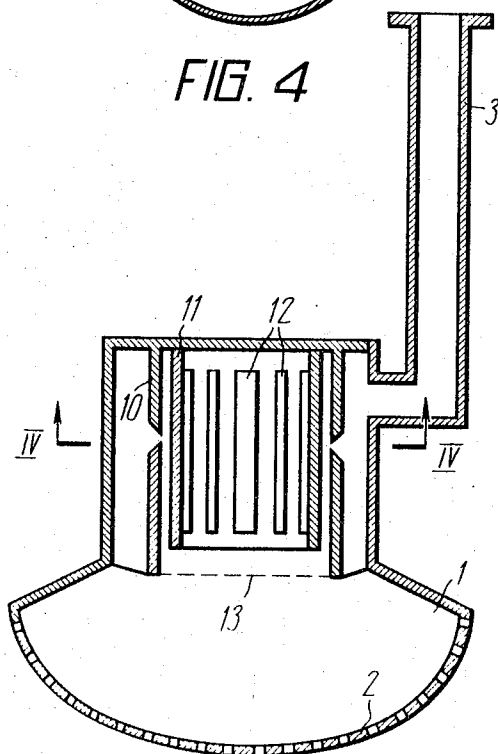


FIG. 3

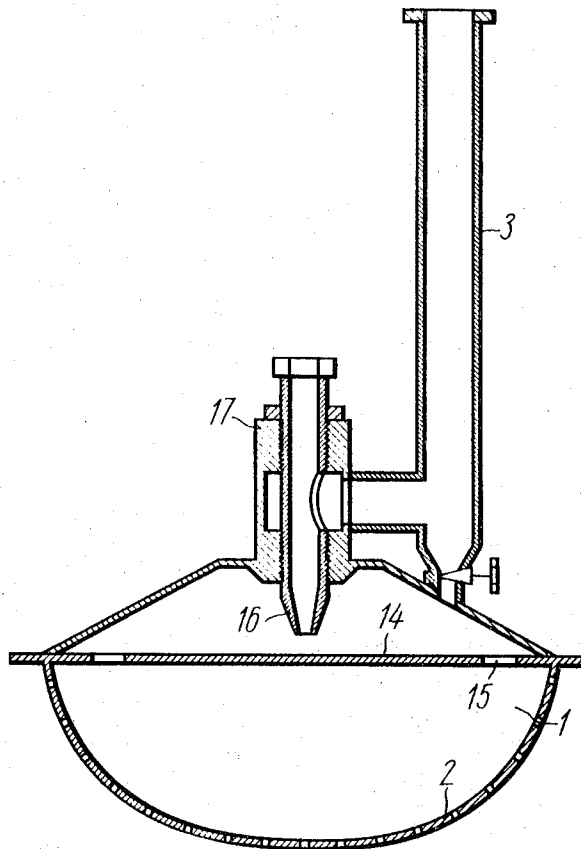


FIG. 5

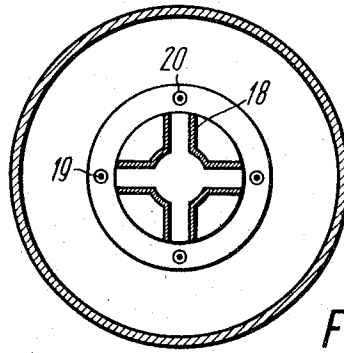


FIG. 7

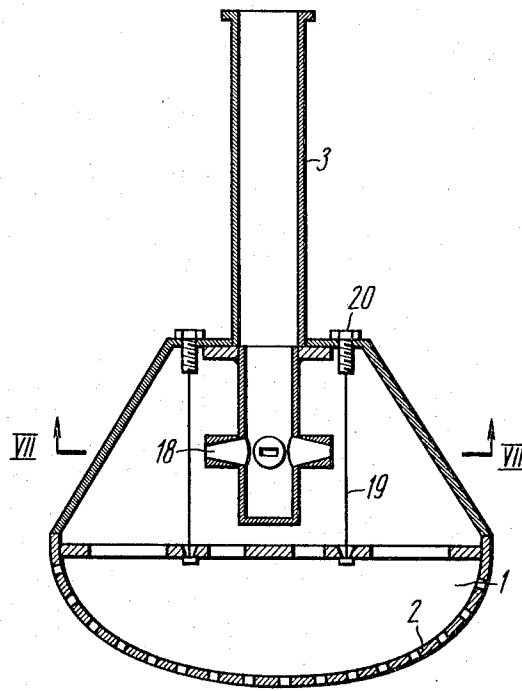


FIG. 6

# DEVICE FOR SPRAYING LIQUID PRODUCTS AND MELTS

The invention relates to equipment for carrying out physical and chemical processes involving the spraying of liquid products and melts and, more particularly, to devices for spraying liquid products and melts. The device of the present invention can be employed in mass-exchange and heat-exchange apparatus for granulating melts, for drying products, for carrying out heat and mass exchange processes in scrubbers and for various other processes for which mono-dispersed drops of liquid or melt are required.

Known in the prior art is a device for spraying liquid products and melts, comprising a chamber with a perforated bottom having a means for introducing therein the product to be sprayed, the means being constructed in the form of a distribution chamber above and adjacent the chamber with the perforated bottom and communicating with the latter through an opening in a common wall thereof. The device also incorporates a means for imparting acoustic oscillations to the product to be sprayed, the latter means being essentially a vibrator mounted on the distribution chamber and connected to a diaphragm located inside the distribution chamber.

Liquid product or melt is supplied under pressure from the distribution chamber to the chamber with the perforated bottom and issues therefrom in the form of a spray. In so doing, the vibrator acts on the diaphragm imparting, in turn, acoustic oscillations to the sprayed product.

The acoustic oscillations contribute to the breakage of streams issuing from the chamber with the perforated bottom into drops of similar dimension.

However, the inclusion of the vibrator in the known device complicates its design and, moreover, does not allow the device to be used with hazardous explosive products.

An object of the invention is to provide a device for spraying liquid products and melts ensuring reliable operation with hazardous explosive products.

Another object of the invention is to provide a device which is simple in construction and low-cost in operation, being at the same time durable and easy to maintain.

The above and other objects are accomplished in a device for spraying liquid products and melts comprising a chamber with a perforated bottom, a means for introducing therein a pressurized product to be sprayed, and a means for imparting acoustic oscillations to the product introduced into the chamber, wherein, according to the invention the device for introducing the product into the chamber comprises a branch pipe, and the means for imparting acoustic oscillations to the product is constructed in the form of a nozzle fastened to said branch pipe, and an elastic member located opposite the nozzle and set in oscillatory motion under the effect of the flow of the product to be sprayed which is admitted through the nozzle.

The nozzle may have an opening in the form of a slot, and the elastic member may be a plate installed opposite the slot.

The elastic member may also comprise a cylindrical sleeve with longitudinal grooves in its walls, and the nozzle may be an annular jet embracing the cylindrical sleeve so that the flow coming out of the annular jet is

directed approximately perpendicular to the walls of the cylindrical sleeve.

The elastic member may also have the form of a diaphragm clamped along its periphery, and the nozzle may have the form of a cylindrical jet located opposite the central portion of the diaphragm and directed towards the plane of the diaphragm.

The nozzle may also be constructed in the form of at least one slotted jet, and the elastic member may be in the form of a taut string stretched along the outlet opening of the slotted jet.

The disclosed device employing the energy of the moving product to be sprayed to provide acoustic oscillations is simple in design and maintenance, durable and can be utilized for spraying hazardous explosive products. The device provides finely dispersed drops whose sizes differ in diameter by only  $\pm 10$  per cent.

The invention is further illustrated by the description of specific embodiments with reference to the accompanying drawings, wherein:

FIG. 1 is a longitudinal cross-section of the device for spraying liquid products and melts according to the invention;

FIG. 2 is a cross-section taken on line II—II in FIG. 1;

FIG. 3 is a longitudinal cross-section of another embodiment of a device for spraying liquid products and melts, according to the invention;

FIG. 4 is a cross-section taken on line IV—IV in FIG. 3;

FIG. 5 is a longitudinal cross-section of a third embodiment of a device for spraying liquid products and melts, according to the invention;

FIG. 6 is a longitudinal cross-section of another embodiment of a device for spraying liquid products and melts, according to the invention and

FIG. 7 is a cross-section taken on line VII—VII in FIG. 6.

The device for spraying liquid products and melts comprises a chamber 1 (FIG. 1) with a perforated bottom 2.

The device is provided with a means for introducing pressurized product to be sprayed into the chamber 1, said means essentially comprising a branch pipe 3 and a further means for imparting acoustic oscillations to the product being introduced into the chamber, the further means essentially comprising a nozzle 4 having an opening 5 (FIGS. 1, 2) in the form of a slot, with an elastic member in the form of a plate 6 mounted in the chamber 1 opposite the slot.

The branch pipe 3 is also connected to the chamber 1 by means of a by-pass pipe 7 (FIG. 1) closed by a valve 8. The chamber 1 contains a pipe 9 for diverting gas.

The nozzle may be constructed in the form of an annular jet 10 (FIG. 3) embracing the elastic member which is in the form of a cylindrical sleeve 11 (FIGS. 3, 4) with longitudinal grooves in its walls. The annular jet 10 is supported by the support grid 13 (FIG. 3). The annular jet 10 embraces the cylindrical sleeve 11 so that the flow coming out of the annular jet 10 is directed almost perpendicularly against the walls of the cylindrical sleeves 11.

The elastic member may be constructed in the form of a diaphragm 14 (FIG. 5) clamped along its periphery with openings 15 formed therein for passage of the product to be sprayed. In this case, the nozzle com-

prises a cylindrical jet 16 mounted opposite the central portion of the diaphragm 15 and directed towards the plane of the diaphragm 15. The position of the jet 16 with respect to the diaphragm 14 can be controlled in height by means of threading formed on the jet 16 engaged with threading in the housing 17.

The nozzle may comprise slotted jets 18 (FIGS. 6, 7), with an elastic member 19 mounted opposite each one of the jets, the elastic member being constructed in the form of a string stretched along the outlet opening of the slotted jet 18. Screws 20 are used to control the tensioning of the strings 19.

The disclosed device for spraying liquid products operates in the following manner.

The product to be sprayed is supplied under pressure through the branch pipe 3 (FIG. 1) into the chamber 1, from which it flows through the perforated bottom 2. In the course of its travel, the liquid product passes through the nozzle 4 and acts on the elastic member, in the form of plate 6 making it oscillate. The oscillations of the plate 6 produce acoustic oscillations of the product in the chamber 1 resulting in breaking the stream that issues from the perforated bottom 2 into drops of equal size.

The production rate of the device can be changed by directing a portion of flow along the by-pass pipe 7, to by-pass the nozzle 4 and the plate 5.

Any gas that may be liberated from the liquid product is diverted from the chamber 1 through the pipe 9.

The devices constructed according to the invention with nozzles and elastic members shown in FIGS. 3, 5 and 6 operate in a similar manner.

What is claimed is:

1. A device for spraying a liquid product, comprising a chamber, a perforated bottom for said chamber, a branch pipe for introducing pressurized product to be sprayed into said chamber, a nozzle on said branch pipe and adapted to supply the liquid product into said chamber, an elastic member mounted in said chamber opposite the nozzle to undergo oscillatory motion under the effect of the flow of liquid product from said nozzle, said elastic member imparting acoustic oscillation to the liquid product, said elastic member comprising a cylindrical sleeve including a wall with longitudinal grooves therein, said nozzle comprising an annular member embracing said cylindrical sleeve with a jet opening therein facing said sleeve so that liquid flow

from said jet opening is directed substantially perpendicularly towards said wall of said cylindrical sleeve.

2. A device as claimed in claim 1 wherein said jet opening is annularly arranged in said annular member.

3. A device for spraying a liquid product, comprising a chamber, a perforated bottom for said chamber, a branch pipe for introducing pressurized product to be sprayed into said chamber, a nozzle on said branch pipe and adapted to supply the liquid product into said chamber, an elastic member mounted in said chamber opposite the nozzle to undergo oscillatory motion under the effect of the flow of liquid product from said nozzle, said elastic member imparting acoustic oscillation to the liquid product, said elastic member comprising a diaphragm having a peripheral edge clamped in said chamber, said nozzle comprising a cylindrical jet member located opposite a central solid portion of said diaphragm and directed perpendicularly thereto, said diaphragm having openings offset from said jet member to permit liquid product to flow towards said perforated bottom after acoustic oscillation has been imparted to the liquid product.

4. A device as claimed in claim 3 comprising a by-pass pipe extending from said branch pipe directly into said chamber.

5. A device as claimed in claim 4 comprising a regulable valve in said by-pass pipe.

6. A device as claimed in claim 3 comprising means for adjusting the distance between said jet member and said diaphragm.

7. A device for spraying liquid product, comprising a chamber, a perforated bottom for said chamber, a branch pipe for introducing pressurized product to be sprayed into said chamber, a nozzle on said branch pipe and adapted to supply the liquid product into said chamber, an elastic member mounted in said chamber opposite the nozzle to undergo oscillatory motion under the effect of the flow of liquid product from said nozzle, said elastic member imparting acoustic oscillation to the liquid product, wherein said nozzle comprises at least one slotted jet with an outlet opening, said elastic member comprising a taut string stretched in front of said outlet opening of the slotted jet transversely thereof.

8. A device as claimed in claim 7 comprising means for controlling the tension in said taut string.

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