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Remarks:
A request for correction to add the missing page containing Figure 1 has been filed pursuant to Rule 88 EPC. A decision on the request will be taken during the proceedings before the Examining Division (Guidelines for Examination in the EPO, A-V, 3.).

(54) Dispensing nozzle

(57) A dispensing nozzle 1 comprises a hollow body 2 through which a material or liquid can be passed, and one or more fine gas jets 2. The dispensing nozzle is adapted for attachment to a dispensary apparatus, and is particularly suitable for dispensing a viscous material or liquid.

EP 1 371 557 A1

Description

[0001] The present invention relates to a novel dispensing nozzle. Specifically, the present invention relates to a dispensing nozzle which has particular application in dispensing high viscosity liquids and fluids.

[0002] Liquid dispensing equipment is used to accurately dispense a wide range of liquids. These can vary from low viscosity, mobile liquids to high viscosity, thixotropic or cohesive liquids. Such equipment may be used when filling a wide range of vessels, from large bottles with abundant space at the filling station to very small containers such as liquid filled capsules. In the latter, small volumes must be accurately dispensed at speed, into a restricted space.

[0003] High viscosity liquids such as syrups or resins, thixotropic materials such as paints and cohesive (elastic, tenuous) liquids can be difficult to dispense accurately and quickly because the liquid stream does not cut easily. In order to overcome this problem, conventional techniques have relied on reducing the filling speed to allow the flow time to break, or using external air jets or physical blades to cut the flow. In most applications, reducing the filling speed is not desirable. In addition the use of external air jets or physical blades also has disadvantages. The jets or blades require sufficient space around the dispensing nozzle and thus make it difficult to fill small containers such as capsules. In addition the use of external jets can result in contamination of the equipment or the product. Failure to cut the flow satisfactorily may result in the product being deposited on the edges of the vessel being filled, or outside the vessel as it is moved along the filling line or through the filling machine.

[0004] It is an object of the present invention to provide apparatus which can be used to dispense a material or liquid. In particular, it is an object of the present invention to provide an improved dispensing nozzle, which is particularly well suited for the dispensal of a viscous material or liquid.

[0005] It is a further object of the present invention to provide apparatus which can be used to quickly and reproducibly dispense a quantity of material or liquid, including viscous materials or liquids.

[0006] It is a yet further object of the present invention to provide apparatus which is suitable for dispensing a material or liquid into a vessel of a very small size.

[0007] According to a first aspect of the present invention, there is provided apparatus for dispensing a material or liquid, said apparatus comprising a hollow body having an outlet through which the material or liquid can be dispensed, and one or more gas jets, wherein the one or more gas jets can be used to eject gas into the hollow body.

[0008] The apparatus may be used to dispense a viscous material or liquid.

[0009] Preferably the one or more gas jets eject gas into the hollow body at a location distant from the outlet. Advantageously this results in the liquid being dispensed cleanly and reproducible from the apparatus. Preferably the gas jet is located several millimetres back from the outlet.

[0010] The one or more gas jets are preferably located within the hollow body.

[0011] The one or more gas jets may eject air. Alternatively the one or more gas jets may eject a gas such as nitrogen or carbon gas.

[0012] The apparatus can be attached to a capsule filling machine.

[0013] The gas ejected by the one or more gas jet cuts the material or liquid stream. The gas ejected by the one or more gas jets also drives the cut material or liquid stream from the apparatus via the outlet.

[0014] Preferably the diameter of the hollow body tapers such that the diameter of the hollow body is smallest near the outlet.

[0015] Typically the hollow body takes the form of a nozzle.

[0016] The apparatus may be manufactured from any suitable material, but preferably is manufactured from stainless steel.

[0017] Optionally the apparatus may comprise heating means. The heating means permits the body of the nozzle to be heated. Advantageously where highly viscous, thermosofting materials are being dispensed, the application of heat will aid flow of the viscous material or liquid through the nozzle.

[0018] Typically the apparatus also comprises a control mechanism. The control mechanism will allow the amount of gas ejected from the one or more gas jets to be controlled. The control mechanism will also allow the regularity in which gas is ejected to be controlled.

[0019] Optionally the apparatus is unitary in structure. Alternatively the apparatus is multi-part.

[0020] In order to provide a better understanding of the present invention, an example will now be described by way of example only and with reference to the accompanying Figure, in which:

Figure 1 is an illustration of the dispensing apparatus of the present Application.

[0021] Referring firstly to Figure 1, the dispensing apparatus of the present invention is generally depicted at 1 and takes the form of a nozzle. The dispensing nozzle comprises a hollow body 2 through which a material or liquid can be passed, and one or more fine gas jets 3.

[0022] In the depicted embodiment, one jet is incorporated into the apparatus and runs into the hollow body, ending at a position 5 several millimetres away from outlet 6. A second "back-up" jet may also be included. Most, if not all of the fine gas jet 3 is located within the nozzle 1. A gas is ejected by the gas jet into the hollow body 2. It will be appreciated that the type of gas ejected from the nozzle is not restricted and any suitable gas may be used. For example, air may be

ejected, or alternatively, if an oxidisable material or liquid is being dispensed a gas such as nitrogen may be ejected. Alternatively in other applications, a carbon gas such as carbon dioxide or monoxide may be ejected. Mixtures of one or more gases may also be ejected.

[0023] The dispensing nozzle is adapted for attachment to a dispensary apparatus 7. In a particular envisaged embodiment the nozzle is adapted for use with a capsule filling machine, of the type commonly used to fill pharmaceutical capsules. An advantage of the present invention lies in the fact that the nozzle can be manufactured in a very small scale and is therefore suitable for precision dispensing into small containers such as capsules. The size of the nozzle is kept to a minimum by the inclusion of gas jets within the body of the apparatus. The nozzle can be mechanically fitted onto the machine. The nozzle may be of a one, two or multi-part construction.

[0024] The nozzle can be manufactured from any suitable material, such as plastic or stainless steel. Stainless steel has the particular advantage of being a good conductor of heat. The nozzle may be associated with, or contain a heating mechanism or source, which allows the body of the nozzle to be heated, and the contents pumped at temperature. This is particularly advantageous where highly viscous, thermosofting materials are being dispensed, as the application of heat will allow the material to flow through the nozzle. The use of stainless steel also minimises contamination and renders the apparatus easy-clean.

[0025] The fine gas jet 3 is directed towards the outlet 6 of the hollow body 2 and ejects gas into the body at a position which is located a distance 5 behind or back from the nozzle tip. In a preferred embodiment this may be several millimetres back from the outlet itself to ensure that the material or liquid being dispensed is done so in a clean, reproducible manner, and is not sprayed. Dimensions and positioning of the air jet tip varies depending on the liquid used and volume pumped.

[0026] At the end of the pump stroke, air is pumped through the internal gas jet. This cuts the liquid stream and drives the liquid from the nozzle tip in a reproducible quantity. In other words, as the air jet is in a fixed position it drives exactly the same quantity of liquid from the nozzle tip each time. The nozzle may also comprise control mechanisms which allow the amount of gas ejected, and thus the quantity of liquid or material being dispensed, to be altered. The control mechanism may also be used to control the speed of dispensing, i.e. the number of time gas is ejected from the gas jet.

[0027] The position of the gas jet, near to and pointing towards the outlet of the hollow body ensures that the gas jet tip is in a relatively low pressure region. This, and the small dimensions of the jet, stop liquid being forced up the jet on the liquid delivery stroke.

[0028] The ouput end 7 of the air jet is positioned some distance back from the outlet, so that when ejected by the jet, the gas pushes a "slug" of liquid down the body in the direction shown by the arrow. This builds up momentum in the liquid, ensuring that the desired quantity leaves the nozzle tip at outlet 6 cleanly. Positioning the air jet at or beyond the end of the liquid nozzle end would result in an effect like a paint spray gun, with liquid being sprayed rather than cleanly delivered to the receiving vessel.

[0029] The nozzle is tapered in design such that the diameter is smallest near outlet 6. This ensures that the emerging liquid stream builds up speed, and adds shear to help liquefy thixotropic materials. This also ensures that the injected air drives a "slug" of material before it rather than bubbles through the liquid.

[0030] The apparatus cuts the viscous material or liquid stream cleanly, quickly and reproducibly. A further important advantage is that the nozzle is small in size and therefore has minimal space requirements. This is possible as the one or more gas jets are positioned within the body of the apparatus. Accordingly the apparatus herein described can be used to dispense materials and liquids into very small containers, such as capsules. The apparatus of the present invention will also permit viscous material or liquid stream to be cut before the dispensing nozzle is withdrawn from the liquid's container. This minimises the risk of contamination and spillage.

[0031] The apparatus of the present invention has many applications in the field of liquid dispensing.

[0032] While the above description is of the preferred embodiment of the invention, this is only illustrative of the principles and not exhaustive as to the uses and modifications of the invention.

Claims

1. Apparatus for dispensing a material or liquid, said apparatus comprising a hollow body having an outlet through which the material or liquid can be dispensed, and one or more gas jets, wherein the one or more gas jets eject gas into the hollow body.

2. Apparatus as claimed in Claim 1 used to dispense a viscous material or liquid.

3. Apparatus as claimed in Claims 1-2 wherein the one or more gas jets eject gas into the hollow body at a location distant from the outlet.

4. Apparatus as claimed in any one of the preceding Claims wherein the one or more gas jets are located several millimetres back from the outlet.

5. Apparatus as claimed in any one of the preceding Claims wherein the one or more gas jets are located within the hollow body.

6. Apparatus as claimed in any one of the preceding Claims wherein the one or more gas jets eject air.

7. Apparatus as claimed in any one of the preceding Claims wherein the one or more gas jets eject nitrogen.

8. Apparatus as claimed in any one of the preceding Claims wherein the one or more gas jets eject a carbon gas.

9. Apparatus as claimed in any one of the preceding Claims wherein the one or more gas jets eject a mixture of gases.

10. Apparatus as claimed in any one of the preceding Claims attached to a capsule filling machine.

11. Apparatus as claimed in any one of the preceding Claims wherein the gas ejected by one or more gas jets cuts the material or liquid stream.

12. Apparatus as claimed in any one of the preceding Claims wherein the gas ejected by the one or more gas jets drives the cut material or liquid stream from the apparatus via the outlet.

13. Apparatus as claimed in any one of the preceding Claims wherein the diameter of the hollow body tapers such that the diameter of the hollow body is smallest near the outlet.

14. Apparatus as claimed in any one of the preceding Claims wherein the hollow body takes the form of a nozzle.

15. Apparatus as claimed in any one of the preceding Claims manufactured from stainless steel.

16. Apparatus as claimed in any one of the preceding Claims comprising heating means.

17. Apparatus as claimed in any one of the preceding Claims comprising a control mechanism.

18. Apparatus as claimed in Claim 17 wherein the control mechanism allows the amount of gas ejected from the one or more gas jets to be controlled.

19. Apparatus as claimed in any one of the preceding Claims wherein the control mechanism allows the regularity in which gas is ejected to be controlled.

20. Apparatus as claimed in any one of the preceding Claims wherein the apparatus is unitary in structure.

21. Apparatus as claimed in any one of Claims 1 to 19, wherein the apparatus is multi-part in structure.

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EUROPEAN SEARCH REPORT

Application Number
EP 03 25 2951

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	15 September 2003	Jagusiak, A

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 03 25 2951

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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