VACUUM DEAERATOR FOR VISCOS CONDUCTING LIQUIDS

Applicant: Durward Fryar, Burlington, Ky.

Assignee: The Procter & Gamble Company, Cincinnati, Ohio

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Primary Examiner—Thomas G. Wyse
Assistant Examiner—Richard W. Burks
Attorney, Agent, or Firm—Ronald L. Hemingway; George W. Allen; Richard C. Witte

ABSTRACT

A centrifugal vacuum deaerator including a rotor which comprises a flange adapted to receive the material which is being deaerated after it is accelerated by centrifugal force, said flange being unperforated in the area where the material impinges on said flange, and said flange being distinguished by the absence of any flow-impeding means which would substantially impede the spreading of said material when it is deposited upon said flange.

6 Claims, 3 Drawing Figures
VACUUM DEAERATOR FOR VISCOUS LIQUIDS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to centrifugal vacuum deaerators to be used for deaerating viscous liquids such as toothpastes and to a process of deaerating said viscous liquids utilizing said deaerator.

2. Prior Art


BRIEF DESCRIPTION OF THE DRAWINGS

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter regarded as forming the present invention, it is believed that the present invention will be better understood from the following description taken in connection with the accompanying drawings in which:

FIG. 1 is a sectional plan view of the deaerator of this invention;

FIG. 2 is a fragmentary sectional elevation of the deaerator taken along the line 2—2 in FIG. 1; and

FIG. 3 is a sectional elevation view of a deaerator having a rotor with multiple perpendicular flanges.

SUMMARY OF THE INVENTION

The present invention relates to a centrifugal vacuum deaerator comprising a rotor which comprises a flange positioned to receive the material to be deaerated after it is accelerated by centrifugal force, said flange being distinguished by being unperforated in the area where the material impinges, and said flange being further distinguished by the absence of any flow-impeding means which would impede the spreading of said material into a thin film when it is deposited on said flange and the presence of an edge on said flange over which said thin film of said material can be sheared by centrifugal force.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, and particularly to FIG. 1 thereof, a centrifugal vacuum deaerator 10 is illustrated. The deaerator comprises enclosed chamber 11 which may or may not be mounted on a base. The chamber 11 is connected to a source of vacuum (not shown) which permits one to create a vacuum of from about 10 to about 30 inches of Hg, preferably from about 10 to about 20 inches of Hg, inside the chamber 11 and maintain said vacuum. The primary reason for the vacuum inside chamber 11 is to avoid retrapping air. Inlet means 12 are provided whereby the product to be deaerated can be introduced into the vacuum chamber 11.

Inlet 12 is positioned so as to enable the product to be introduced into the rotor assembly 13 which comprises a shaft 14. To the shaft 14 is attached either unitarily or removably a bowl 15 which receives the material to be deaerated. The bowl 15 has sides adapted to retain the material to be deaerated when the bowl is rotated by a power means coupled to the shaft 14. The sides of the bowl 15 contain a series of small holes 16 which are from about 1/64 inch to about 1/4 inch in diameter, preferably from about 1/16 inch to about 1/8 inch in diameter.

The rotor also comprises a flange 17 which in FIG. 1 is a tapered straight flange which receives the material to be deaerated as it is accelerated through the holes 16. When the material to be deaerated impinges on the flange 17, it is moved by centrifugal force down the flange, around the braces 18 which hold the flange 17 in proper position with respect to the shaft 14, to the bottom edge of the flange 17 where centrifugal force again accelerates the material to be deaerated, thereby throwing it against the side of the chamber 11 from whence it falls by gravity to the bottom of chamber 11. The deaerated material can be removed in any convenient manner, e.g., continuously removed through a hole (not shown) at the bottom of the chamber 11. It will be evident from FIG. 3 that a similar mode of operation is envisioned for this embodiment which simply provides multiple flanges. In FIG. 3, like reference numerals denote similar structural aspects to those of the apparatus of FIG. 1.

The process of this invention is distinguished by making use of centrifugal force to create a thin film which is then sheared over an edge which is preferably sharp, but which can also be rounded. The preferred embodiment of the process of this invention also includes a step in which the fluid to be deaerated is thrown through holes by centrifugal force. This step gets rid of the largest bubbles. The material then impinges against the flange where it is spread into a very thin film which permits the escape of small bubbles, and finally, when the thin film of the viscous liquid reaches the edge of the flange, it is sheared which elongates and ruptures the walls of even smaller bubbles.

The rotor speed can be varied widely depending upon the strength of the materials used in the fabrication of the deaerator. Rotor speeds of from about 500 to about 10,000 RPM can be used. Slower rotor speeds will normally be used with larger rotors, for example, rotors having an OD of about two feet, and faster rotor speeds will normally be used with smaller rotors, i.e., those with an OD of about one-half of a foot.

As previously indicated and as shown in FIG. 3, a series of flanges provides even greater deaeration.

The advantages of the process of the present invention include simplicity, economy and ease of maintenance, especially cleaning. The process also deaerates well at low vacuums (10–20 in. of Hg) which decreases the loss of volatile material from the viscous liquid. The process can be used over a wide temperature range and can be either a batch or continuous process.

What is claimed is:

1. A centrifugal vacuum deaerator comprising an enclosed chamber connected to a source of vacuum for
creating a vacuum within said chamber, and a rotor disposed within said chamber, said rotor comprising a flange positioned to receive the material to be deaerated after it is accelerated by centrifugal force, said flange being distinguished by being unperforated in the area where the material impinges, and said flange being further distinguished by the absence of any flow-impeding means which would substantially impede the spreading of said material into a thin film when it is deposited on said flange, and the presence of an edge on said flange over which said thin film of said material can be sheared by centrifugal force.

2. The deaerator of claim 1 wherein the rotor additionally comprises a centrally mounted bowl having a plurality of small apertures around its circumference, said bowl being adapted to receive the material to be deaerated and in spaced relationship to said flange, whereby when the rotor is rotated, centrifugal force accelerates said material through said apertures to impinge upon said flange.

3. The deaerator of claim 2 wherein said aperture has a diameter of from about 1/64 inch to about ¼ inch.

4. A method of deaerating a viscous liquid comprising the step of centrifuging said liquid in a bowl having a plurality of holes of a diameter of from about 1/64 to ¼ inch in its sides, thereby causing said liquid to be forced through said holes in the form of droplets and to impinge upon a flange which is rotating coaxially and outwardly of said bowl and which is characterized by the absence of any flow-impeding means, whereby the liquid is formed into a thin film which spreads over said flange and which is sheared as it passes over the edge of said flange, said method being conducted under a pressure of from about 10 to about 30 inches of mercury.

5. The process of claim 4 wherein the holes in the bowl are from about 1/16 to about ½ inch in diameter.

6. The process of claim 5 wherein the pressure is from about 10 to about 20 inches of mercury.