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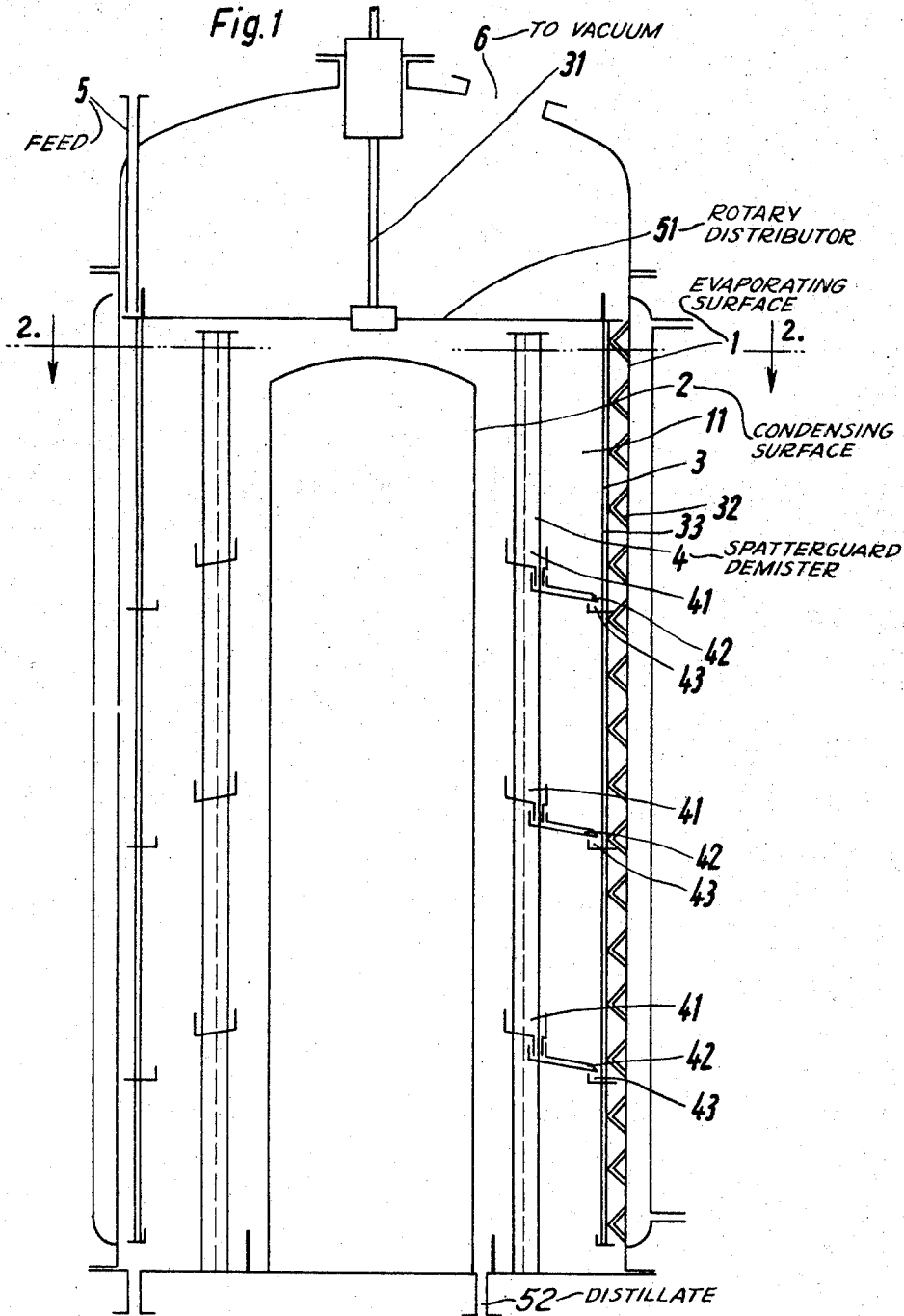
R. HABENDORFF ET AL

3,434,935

APPARATUS FOR VACUUM AND SHORT-PATH DISTILLATION

Filed March 29, 1968

Sheet 1 of 2



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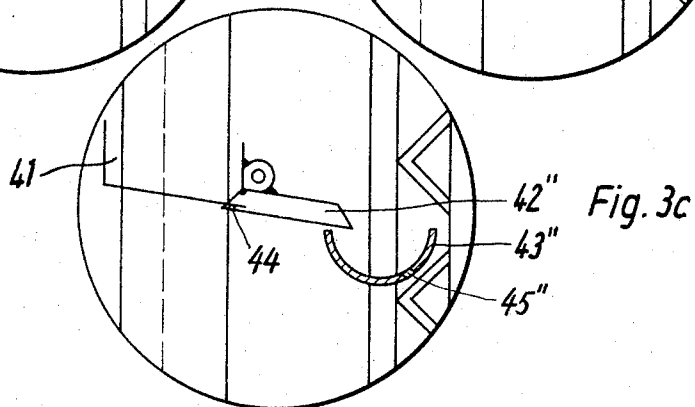
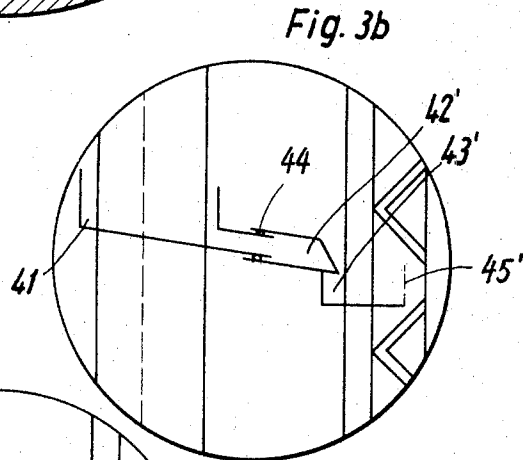
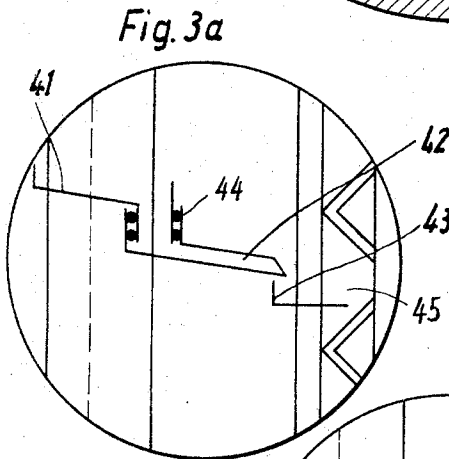
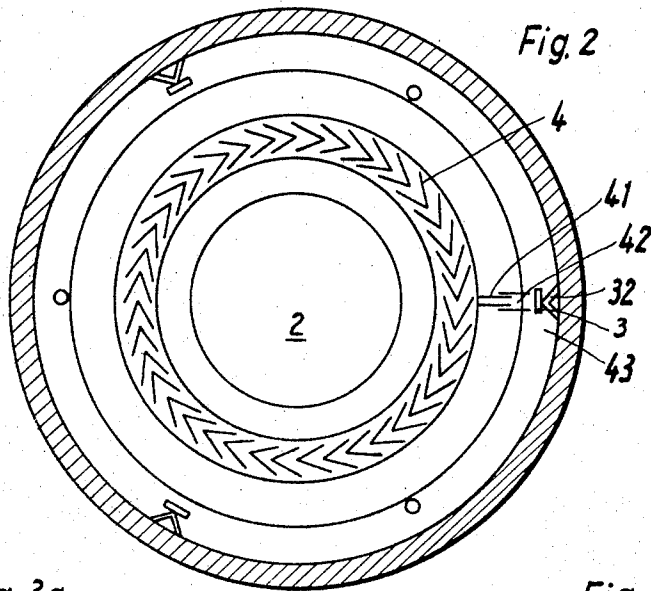
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APPARATUS FOR VACUUM AND SHORT-PATH DISTILLATION

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7 Claims

ABSTRACT OF THE DISCLOSURE

An improved arrangement for vacuum and short-path distillation apparatus wherein stationary, angled, spatterguard members are provided between a rotating means for spreading distilland on an evaporating surface, and a condensing surface whereon distilland vapors from the evaporating surface are condensed. The stationary spatterguard members are provided with a trough for collecting spattered distilland material. Means are also provided for delivering the spattered material back to the means for spreading, whereby the spattered material is spread onto the evaporating surface.

Background of the invention

The present invention relates to an apparatus for vacuum and short-path distillation. More particularly, the present invention relates to such apparatus having spatterguard members disposed within the distillation chamber of the apparatus in the vicinity of the condensing surface in such a manner that the evaporating surface is optically obstructed with respect to the condensing surface.

In the type of apparatus with which the present invention is concerned, a thin layer of distilland is spread onto an evaporating surface by a spreading or distributing means and is condensed on a cool condensing surface especially provided for that purpose.

Vacuum and short-path distillation is commonly practiced and widely employed throughout the chemical industry. Various devices and apparatus for the practice of this process are known. In the practice of vacuum and short-path distillation, it has been found advantageous, particularly for distillations in the ranges of fine and high vacuums, to spread the distilland in a thin layer, for example in the form of a film, over an evaporating surface. In such an arrangement, the thin layer spread on the evaporating surface is evaporated and condensed on a condensing surface oppositely disposed with respect to the evaporating surface. The distilland film is usually applied to the evaporating surface by distributing means especially designed for this purpose.

Various types of wipers, brushes, rollers and other suitable devices have been used for this purpose. It should be noted that the distillation arrangement, just described, has advantageously been employed, not only in the high vacuum range, but also in the fine and coarse vacuum ranges. One result of using the distillation process, as here described, in these ranges is that bubbles are formed on the evaporating surface. This is true particularly when materials of very different vapor pressures are used as the distilland in the distillation process. The bubbles formed by the distilland cause spatters on the evaporating surface, which leads to a contamination of the distillate material.

In order to eliminate this problem, previously designed apparatus for use in such processes have made use of rotating spatterguard members disposed between the evaporating and condensing surfaces, which rotate with

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the distilland distributing means, and which optically obstruct the condensing surface from the evaporating surface. In such arrangements vapors from the distilland are passed through slits or openings, provided therefor, through the spatterguard members to the condensing surface. In this type of an arrangement, the spattered distilland materials are interrupted before reaching and contaminating the condensing surface and are thrown back to the evaporating surface with the help of centrifugal forces created as the spatterguard members are rotated. This arrangement does have the advantage that spattered distilland material caught by the spatterguard members is prevented from coming into contact with the condensing surface. However, this arrangement has the important disadvantage that considerable technical effort and expenditure is required where structurally large chambers characterized by large diameters and great heights are employed. Moreover, such large arrangements require solutions to special problems caused by the relatively large rotating mass involved.

Summary of the invention

It is therefore an object of the present invention to improve the vacuum and short-path distillation apparatus in order to eliminate the above-described disadvantages.

According to the present invention, it is therefore proposed to provide a series of stationary, angled spatterguard members, and at least one collecting trough at the stationary spatterguard members for collecting spattered distilland material stopped by the spatterguard members. The collecting trough is provided with at least one drain pipe through which the collected spattered distilland material is carried to a collecting channel provided on the rotating distributing means. The collecting channel on the distributing means, being open or perforated on its side facing the evaporating surface, returns the spattered material delivered by the drain pipe to the evaporating surface with the help of centrifugal forces the distributing means creates as it rotates. The collecting channel on the rotating distributing means can be a ring-shaped member which is horizontally disposed or inclined toward the evaporating surface. The collecting channel can also be a rectangularly shaped, or semi-circularly shaped member.

In order to facilitate the installing of the rotating distributing means, it is preferred to construct the means connecting the drain pipe to the collecting trough in such a manner that the drain pipe is laterally pivotal with respect to the collecting trough. Thus, when a plurality of collecting troughs are provided at the stationary spatterguards, one above the other, in a stacked arrangement, the drain pipes can be uniformly moved, if necessary, by an appropriate device provided for that purpose.

According to another preferred arrangement, the drain pipe of the collecting trough is connected to the collecting trough by a means which allows the drain pipe to be displaceable in its longitudinal direction.

In yet another advantageous arrangement, the drain pipe of the collecting trough is connected to the collecting trough so that the drain pipe is foldable from a relatively horizontal position to a relatively vertical position and vice versa.

In order to prevent the spattered distilland material collected in the collecting troughs from reaching the condensing surface and to flow off downwardly, it is advantageous to seal the collecting trough drain pipe from the collecting trough in any known manner using any suitable sealing device or material.

Brief description of the drawings

FIGURE 1 is a view of a longitudinal section of the distillation process apparatus according to the present invention.

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FIGURE 2 is a cross-sectional view taken along the line 2—2 of FIGURE 1.

FIGURES 3a through 3c are partial views of the apparatus according to the invention showing various embodiments of the collecting trough-drain pipe-collecting channel arrangement of parts.

Description of the preferred embodiments

Referring first to FIGURE 1, a longitudinal section taken through a distillation chamber according to the present invention is shown therein. Distilland material is spread onto an evaporating surface 1 by spreading or distributing means mounted on the distributing means rotor 3 and driven by a shaft 31. Distributor elements 32 of the distributing means are disposed on appropriate suspension devices 33 positioned between the evaporating surface 1 and the condensing surface 2 within the interior of the distillation chamber shown. Also located within the distillation chamber are stationary, spatterguard members 4. The spatterguard members 4 are angle-shaped and are arranged one behind the other. The inside surface of the angle of each spatterguard member 4 faces the outside surface of the angle of the preceding spatterguard member 4. In addition, the spatterguard members 4 are positioned between the condensing surface and the condensing surface side of the distributing means in such a manner that the spatterguard members 4 provide an optical obstruction between the evaporating surface 1 and the condensing surface 2.

Three collecting troughs 41, each having at least one drain pipe 42 connected thereto, are disposed in vertical series on the spatterguard members 4. At the end of the drain pipe 42 away from the collecting trough 41, a channel 43 is provided which is connected to the distributing means rotor 3. By this arrangement spattered distilland material collected in the collecting trough 41 passes through the drain pipe 42 and is delivered to the channel 43. From there the spattered distilland material is returned to the evaporating surface 1 by centrifugal forces created by the rotation of the distributing means rotor 3.

Again, as shown in FIGURE 1, distilland material first enters the distillation chamber by way of inlet pipe 5 which delivers the distilland material to the rotating distributor plate 51. The distributor plate 51 in turn delivers the distilland to the evaporating surface 1. The distillate formed on the condensing surface 2 is collected and drawn off at 52. The interior 11 of the distillation chamber is evacuated through the exit connection 6 by an evacuating device not shown.

Referring now to FIGURE 2, shown therein is a cross section of the distillation apparatus according to the invention, as viewed along the line 2—2 of FIGURE 1. The spatterguard members 4 are illustrated to be in series arrangement. As clearly depicted, the inside surface of each spatterguard member 4 faces the outside surface of each preceding angled spatterguard member 4 in the series arrangement.

Referring to FIGURES 3a-3c, enlarged views of the collecting trough-drain pipe-collecting channel arrangement of parts are illustrated.

In particular, referring to FIGURE 3a, the drain pipe 42 is shown to be connected to the collecting trough 41 by means which allows drain pipe 42 to be pivoted laterally in position.

Referring next to FIGURE 3b, in the arrangement of parts shown therein, the drain pipe 42' is provided with means which allows it to be displaced in the direction of its long dimension.

Referring next to FIGURE 3c, in the arrangement of parts shown therein, the drain pipe 42'' is provided with means which allows it to be folded from a relatively horizontal position to a relatively vertical position and vice versa.

Furthermore, various embodiments of the collecting channel positioned on the distributing means rotor 3 are

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shown in the FIGURES 3a through 3c. Referring again to FIGURE 3a, the channel 43 is shown to be open on its side facing the evaporating surface 1 at 45, as in the apparatus of FIGURE 1.

Referring again to FIGURE 3b, the channel 43' consists of a rectangularly-shaped member which is open on its side facing the evaporating surface 1 by means of perforations 45' provided therefor.

Referring again to FIGURE 3c, the channel 43'', shown therein, is constructed so as to have a semi-circular cross section and an opening 45''.

In order to avoid the possibility of spattered distilland material flowing back to the condensing surface a seal 44 is provided in each of the embodiments, FIGURES 3a-3c, between the collecting trough and collecting trough drain pipe.

It will be understood that the above description of the present invention is susceptible to various modifications, changes and adaptations, and the same are intended to be comprehended within the meaning and range of equivalents of the appended claims.

We claim:

1. In apparatus for vacuum and short-path distillation having a vacuum chamber, an evaporating surface with a thin layer of distilland material spread thereon, rotating distributing means for spreading the distilland onto the evaporating surface, a cooled condensing surface, spatterguards provided between said evaporating surface and said condensing surface which form an optical obstruction between the evaporating surface and the condensing surface, the distilland being condensed onto the condensing surface after passing as a vapor through openings, provided therefor, between the spatterguards, the improvement wherein

- (a) said spatterguards are stationary, angled members being arranged in series, one behind the other, to collect spattered distilland material, and being disposed between said rotating distributing means and said condensing surface;
- (b) at least one collecting trough disposed at said stationary spatterguards for collecting spattered distilland material from said stationary spatterguards;
- (c) at least one drain pipe leading from said collecting trough whereby collected spattered distilland material is returned to said rotating distributing means;
- (d) a collecting channel provided on the rotating distributing means for receiving spattered distilland material from said drain pipe; and
- (e) said collecting channel being provided at least one opening on its evaporating surface side whereby spattered distilland material can be returned to the evaporating surface.

2. Apparatus as defined in claim 1 wherein said drain pipe is connected to said collecting trough by means which allows the drain pipe to be displaced in a longitudinal direction.

3. Apparatus as defined in claim 1 wherein said drain pipe is pivotally connected to said collecting trough by means which allows the drain pipe to be displaced laterally in its connected position.

4. Apparatus as defined in claim 1 wherein said drain pipe is pivotally connected to said collecting trough by means which allows the drain pipe to be folded from a relatively horizontal position to a relatively vertical position.

5. Apparatus as defined in claim 1 wherein said collecting channel has a semicircular shape in cross section.

6. Apparatus as defined in claim 1 wherein said evaporating surface side of said collecting channel has a wall member provided with a plurality of perforations.

7. Apparatus as defined in claim 1, said apparatus further defined by means providing a seal between said drain pipe and said collecting trough.

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159—6; 202—197, 205, 236