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(54) **STEAM GENERATION SYSTEM WITH A SEPARATOR CIRCUIT**

(57) A separator circuit (26) for a steam generation system (10A, 10B). The separator circuit (26) comprises a steamer connection tube (44) and a liquid bin tube (48) that extends vertically between a steam outlet for providing steam to a cavity of a cooking appliance and a recirculation tube for routing condensation back into the provided steam generation system (10A, 10B). A slide tube (46) is sloped downwardly from the steamer connection tube (44) to the liquid bin tube (48) for gravitationally accelerating condensation from the steamer connection tube (44) through the liquid bin tube (48) and into the recirculation tube. A vortex section (56) is located between the slide tube (46) and the liquid bin tube (48) and includes a choke wall (62). The choke wall (62) extends from a first end (72) decreasing a cross-sectional flow path of the vortex section (56) to a second end (74) in a direction of the liquid bin tube (48).

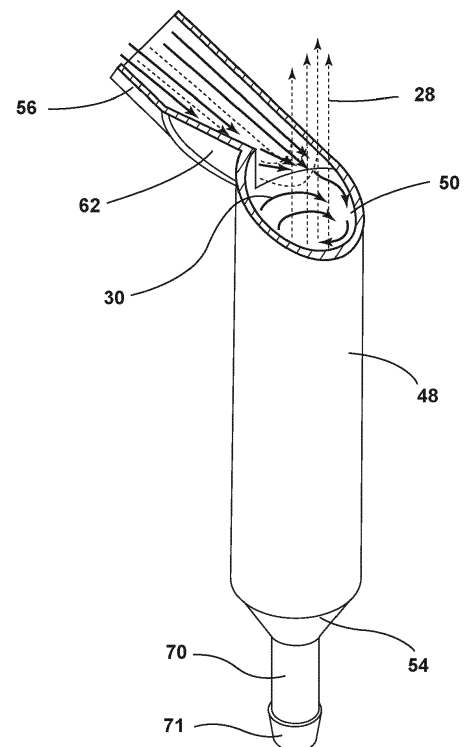


FIG. 5

Description

FIELD OF THE DISCLOSURE

[0001] The present disclosure generally relates to a steam generation system, and, more specifically, to a steam generation system with a separator circuit for separating steam and condensation.

BACKGROUND

[0002] Cooking appliances, particularly stoves, ovens, microwaves, steamers, and the like, are provided with steam generator assemblies. Cooking with steam, or at least partially with steam, is generally regarded as a healthier and, oftentimes, faster alternative than many other cooking means. As a result, various steam generator assemblies have become a popular addition to cooking appliances. These steam generator assemblies typically include a liquid circuit that includes a water reservoir, a heating element, and a steam outlet. In operation, water from the water reservoir is routed into the heating element whereat it at least partially turns to steam. The steam is then released through the steam outlet and into a cooking cavity to heat and cook foodstuff within the cooking cavity.

[0003] Some steam generator assemblies also provide recirculation routes in the liquid circuit, such that heated water that condenses from steam prior to exiting the steam outlet can be recirculated. Inefficiencies arise at the point steam and liquid are mixed prior to the steam being routed into the cavity and the water being recirculated. More particularly, the mixture of liquid and steam accelerates the condensation of the steam. In addition, condensation can exit the steam outlet causing undesirable effects on the foodstuff and cooking appliance.

[0004] Accordingly, the present disclosure relates to a steam generation system including a separator circuit that separates the steam and the heated liquid and recirculates the heated liquid in a manner to maximize steam generation and minimize a volume of heated liquid exiting the steam outlet.

SUMMARY OF THE DISCLOSURE

[0005] According to one aspect of the present disclosure, a separator circuit for a steam generation system is provided. The separator circuit comprises a steamer connection tube, a liquid bin tube, and a slide tube. The slide tube is sloped downwardly from the steamer connection tube to the liquid bin tube for gravitationally accelerating condensation from the steamer connection tube. A vortex section is located between the slide tube and the liquid bin tube and includes a choke wall. The choke wall extends from a first end decreasing a cross-sectional flow path of the vortex section to a second end in a direction of the liquid bin tube.

[0006] According to another aspect of the present dis-

closure, a separator circuit for a steam generation system is provided. The separator circuit comprises a liquid bin tube and a vortex section connected to the liquid bin tube that includes a choke wall. The choke wall extends from a first end decreasing a cross-sectional flow path of the vortex section to a second end in a direction of the liquid bin tube. The liquid bin tube includes an interior wall defining a first circumference, and the vortex section includes an inner wall defining a second circumference. The first circumference and the second circumference each share a coextensive circumference surface.

[0007] According to yet another aspect of the present disclosure, a separator circuit for a steam generation system is provided. The separator circuit comprises a steamer connection tube and a liquid bin tube that extends vertically between a steam outlet for providing steam to a cavity of a cooking appliance and a recirculation tube for routing condensation back into the provided steam generation system. A slide tube is sloped downwardly from the steamer connection tube to the liquid bin tube for gravitationally accelerating condensation from the steamer connection tube through the liquid bin tube and into the recirculation tube. A vortex section is located between the slide tube and the liquid bin tube and includes a choke wall. The choke wall extends from a first end decreasing a cross-sectional flow path of the vortex section to a second end in a direction of the liquid bin tube.

[0008] These and other features, advantages, and objects of the present disclosure will be further understood and appreciated by those skilled in the art by reference to the following specification, claims, and appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] In the drawings:

FIG. 1 is a schematic view of a first embodiment of a steam generation system for a cooking appliance according to an aspect of the present disclosure;

FIG. 2 is a schematic view of a second embodiment of the steam generation system for a cooking appliance according to another aspect of the present disclosure;

FIG. 3 is a top perspective view of a separator circuit for the first and second embodiments of the steam generation system according to an aspect of the present disclosure;

FIG. 4 is a side perspective view of a vortex section and a liquid bin tube of the separator circuit according to an aspect of the present disclosure;

FIG. 5 is a top perspective view of the vortex section and the liquid bin tube illustrating a choke wall therein according to an aspect of the present disclosure;

FIG. 6 is a top cross-sectional view of the vortex section and the liquid bin tube illustrating the choke wall according to an aspect of the present disclosure;

FIG. 7 is a front cross-sectional view of the vortex section illustrating the choke wall in FIG. 6 according to an aspect of the present disclosure;

FIG. 8 is a front cross-sectional view of the vortex section illustrating the choke wall in accordance with a first alternative construction according to an aspect of the present disclosure;

FIG. 9 is a front cross-sectional view of the vortex section illustrating the choke wall in accordance with a second alternative construction according to an aspect of the present disclosure; and

FIG. 10 is a front cross-sectional view of the vortex section illustrating the choke wall in accordance with a third alternative construction.

[0010] The components in the figures are not necessarily to scale, emphasis instead being placed upon illustrating the principles described herein.

DETAILED DESCRIPTION

[0011] The present illustrated embodiments reside primarily in combinations of method steps and apparatus components related to a steam generation system. Accordingly, the apparatus components and method steps have been represented, where appropriate, by conventional symbols in the drawings, showing only those specific details that are pertinent to understanding the embodiments of the present disclosure so as not to obscure the disclosure with details that will be readily apparent to those of ordinary skill in the art having the benefit of the description herein. Further, like numerals in the description and drawings represent like elements.

[0012] For purposes of description herein, the terms "upper," "lower," "right," "left," "rear," "front," "vertical," "horizontal," and derivatives thereof shall relate to the disclosure as oriented in FIG. 1. Unless stated otherwise, the term "front" shall refer to the surface of the element closer to an intended viewer, and the term "rear" shall refer to the surface of the element further from the intended viewer. However, it is to be understood that the disclosure may assume various alternative orientations, except where expressly specified to the contrary. It is also to be understood that the specific devices and processes illustrated in the attached drawings, and described in the following specification are simply exemplary embodiments of the inventive concepts defined in the appended claims. Hence, specific dimensions and other physical characteristics relating to the embodiments disclosed herein are not to be considered as limiting, unless the claims expressly state otherwise.

[0013] The terms "including," "comprises," "comprising," or any other variation thereof, are intended to cover a non-exclusive inclusion, such that a process, method, article, or apparatus that comprises a list of elements does not include only those elements but may include other elements not expressly listed or inherent to such process, method, article, or apparatus. An element preceded by "comprises a ..." does not, without more constraints, preclude the existence of additional identical elements in the process, method, article, or apparatus that comprises the element.

[0014] Referring initially to FIG. 1, reference numeral 10A generally designates a steam generation system 10A for a cooking appliance according to a first embodiment. The steam generation system 10A includes a liquid reservoir 12, which may include a water-containing body, a connection to a plumbing system of a building, or a combination thereof. The liquid reservoir 12 fluidically connects to a steamer 14 via a first fluid line 16. The steamer 14 heats liquid from the liquid reservoir 12 at least partially converting the liquid into a steam. The liquid reservoir 12 may include a pressure control unit 18, which may be configured to both generate and reduce a pressure within the liquid reservoir 12. For example, the pressure control unit 18 may include a pressure generator, a pressure release valve, and/or a pressure meter to maintain a pressure within the liquid reservoir 12 (e.g. an equilibrium with a pressure inside the steamer 14 and/or an atmospheric pressure as indicated by reference numeral 19). The liquid reservoir 12 may include a liquid level sensor (not shown) for determining a level of liquid in the liquid reservoir 12. A flow valve 21 may be located along the first fluid line 16 and controls liquid exiting the liquid reservoir 12.

[0015] With continued reference to FIG. 1, a port 20 may be located between the liquid reservoir 12 and the steamer 14 for filling and draining the steam generation system 10A as illustrated by the arrow with reference numeral 22. For example, the port 20 may be located between the flow valve 21 and the steamer 14. The steamer 14 includes a housing 24 with one or more heating elements (not shown) located therein. The steamer 14 may route and heat fluid through a space within the housing 24. For example, the space within the housing 24 may be a channel, a manifold of channels, and/or the like, that routes the fluid to pass over or adjacent to the heating elements heating the liquid and converting at least a portion of it into steam. The steamer 14 then routes the heated converted steam and condensated liquid mixture to a separator circuit 26 that separates the steam from the liquid, routes the steam into a cooking cavity of a cooking appliance as indicated by reference numeral 28, and routes the heated liquid back into the steam generation system 10A as indicated by reference numeral 30. The steamer 14 may further include a temperature sensor 31. The separator circuit 26 will be described in greater detail in reference to FIGS. 3-6. As indicated by reference numeral 32, the liquid on the left side of the

steam generation system 10A is substantially colder than the liquid on the right side of the steam generation system 10A that is indicated by reference numeral 34. In some embodiments, the liquid on the left side of the steam generation system 10A is cool or below 80° Celsius and the liquid on the right side of the steam generation system 10A is heated to a temperature high enough to form steam.

[0016] FIG. 2 is a schematic view of a second embodiment of the steam generation system 10B for a cooking appliance. Unless otherwise indicated, the steam generation system 10B in accordance with the second embodiment includes all the same features, functions, constructions, and materials as the first embodiment. More particularly, the steam generation system 10B includes a liquid reservoir 12, which may include a water-containing body, a connection to a plumbing system of a building, or a combination thereof. The liquid reservoir 12 fluidically connects to a steamer 14 via a first fluid line 16. The steamer 14 heats liquid from the liquid reservoir 12 at least partially converting the liquid into a steam. The liquid reservoir 12 may include a pressure control unit 18, which may be configured to both generate and reduce a pressure within the liquid reservoir 12. For example, the pressure control unit 18 may include a pressure generator, a pressure release valve, and/or a pressure meter to maintain a pressure within the liquid reservoir 12 (e.g. an equilibrium with a pressure inside the steamer 14 and/or an atmospheric pressure as indicated by reference numeral 19). The liquid reservoir 12 may include a liquid level sensor (not shown) for determining a level of liquid in the liquid reservoir 12. A flow valve 21 may be located along the first fluid line 16 and controls liquid exiting the liquid reservoir 12.

[0017] With continued reference to FIG. 2, rather than having a port 20 for filling and draining the steam generation system 10B, the steam generation system 10B includes a fill inlet 36 for adding liquid to the steam generation system 10B as indicated by reference numeral 38 and a drainage outlet 40 for removing liquid from the steam generation system 10B as indicated by reference numeral 42. For example, the fill inlet 36 and the drainage outlet 40 may be located between the flow valve 21 and the steamer 14. The steamer 14 includes a housing 24 with one or more heating elements (not shown) located therein. The steamer 14 may route and heat fluid through a space within the housing 24. For example, the space within the housing 24 may be a channel, a manifold of channels, and/or the like, that routes the fluid to pass over or adjacent to the heating elements heating the liquid and converting at least a portion of it into steam. The steamer 14 then routes the heated converted steam and condensed liquid mixture to a separator circuit 26 that separates the steam from the liquid, routes the steam into a cooking cavity of a cooking appliance as indicated by reference numeral 28, and routes the heated liquid back into the steam generation system 10B as indicated by reference numeral 30. The steamer 14 may further

include a temperature sensor 31. The separator circuit 26 will be described in greater detail in reference to FIGS. 3-6. As indicated by reference numeral 32, the liquid on the left side of the steam generation system 10B is substantially colder than the liquid on the right side of the steam generation system 10B as indicated by reference numeral 34. In some embodiments, the liquid on the left side of the steam generation system 10A is cool or below 80° Celsius and the liquid on the right side of the steam generation system 10A is heated to a temperature high enough to form steam.

[0018] It should be appreciated that the first and second embodiments of the steam generation system 10A, 10B may be substantially vertical with respect to the cooking appliance. As such, the steam entering the cooking cavity of a cooking appliance as indicated by reference numeral 28 may be routed substantially upward whereas the heated liquid routed back into the steam generation system 10B as indicated by reference numeral 30 is substantially downward. Accordingly, both the steam output and the heated liquid recirculation is assisted by gravity.

[0019] FIGS. 3-5 illustrate the separator circuit 26 for the first and second embodiments of the steam generation system 10A, 10B. As best illustrated in FIG. 3, the separator circuit 26 includes a steamer connection tube 44 that may extend substantially vertically from the steamer 14. The steamer connection tube 44 extends from the steamer 14 to a slide tube 46 that is sloped downwardly from the steamer connection tube 44 to a liquid bin tube 48. The slide tube 46 is sloped downwardly (for example, at an acute angle relative to the steamer connection tube 44) to gravitationally accelerate condensation from the steamer connection tube 44. The liquid bin tube 48 extends between a steam outlet 50 that directs steam into the heating cavity and a recirculation tube 52 that transfers condensation back towards the steamer 14. In some embodiments, the liquid bin tube 48 defines a diameter and the recirculation tube 52 defines a diameter that is less than the diameter of the liquid bin tube 48. In these embodiments, a funnel section 54 may be located between the liquid bin tube 48 and the recirculation tube 52 that tapers from the liquid bin tube 48 to the recirculation tube 52.

[0020] A vortex section 56 is located between the slide tube 46 and the liquid bin tube 48. As best illustrated in FIG. 4, the vortex section 56 directs heated liquid (i.e. condensation from the steam) into a downward vortex within the liquid bin tube 48 as indicated by reference numeral 56, thus separating the condensation from the steam via centrifugal forces to prevent and/or reduce condensation from exiting the steam outlet 50. The centrifugal forces accelerate the condensation such that a reduced volume of condensation is formed and steam can exit the steam outlet 50 as indicated by reference numeral 28. The vortex section 56 includes a choke wall 62 (FIG. 5) that funnels the condensation onto an interior wall 64 of the liquid bin tube 48 at an acute angle to form the downward vortex. The choke wall 62 defines a de-

creasing cross-sectional area of the vortex section 56. The choke wall 62 concentrates the condensation so that it can be directed in a smaller stream onto the interior wall 64 to prevent splashing into the heating cavity and disturbances to the downward vortex, thus reducing an overall condensation exiting the steam outlet 50. At the same time, the choke wall 62 also increases the speed of the condensation and steam such that less steam condensates.

[0021] The components of the separator circuit 26 may be integral or non-integral. For example, in some embodiments, the steamer connection tube 44 and the slide tube 46 may be a first integral part. The liquid bin tube 48, the funnel section 54, and the vortex section 56 may be a second integral part. The recirculation tube 52 may be a third integral part. In some embodiments, the choke wall 62 is integrally formed with the vortex section 56. In other embodiments, the choke wall 62 may not be integral and located in the vortex section 56 as an insert. As best illustrated in FIG. 3, the first integral part may form a first connection 66 with the second integral part and the second integral part may form a second connection 68 with the third integral part. One or both of the first connection 66 and the second connection 68 may be a press fit, a sealant, and/or the like. In some embodiments, the first connection 66 is defined by the vortex section 56 being inserted into the slide tube 46. In some embodiments, the second connection 68 is defined by a tubular section 70 with an annular ridge 71 at the end of the funnel section 54 being inserted into the recirculation tube 52.

[0022] As best illustrated in FIGS. 5 and 6, the choke wall 62 may be integrally defined by the vortex section 56 or provided as an insert. The choke wall 62 may extend between a first end 72 located at a position along the vortex section 56 and a second end 74 located at or adjacent to the interior wall 64 of the liquid bin tube 48. The interior wall 64 defines an output diameter "B.D.", the vortex section 56 includes an inner wall 76 that defines an input diameter "A.D.", and the choke wall 62 reduces the cross-sectional area of the vortex section 56 as defined by the input diameter A.D. or $A = \pi (A.D./2)^2$. More particularly, at the first end 72 of the choke wall 62, the cross-sectional area of the vortex section 56 is defined by the input diameter A.D., but the area becomes progressively smaller towards the second end 74. In some embodiments, a portion of the input diameter A.D. is aligned with a portion the output diameter B.D. such that a flow path between the vortex section 56 and the liquid bin tube 48 is substantially coextensive. More particularly, as best illustrated in FIG. 6, a circumference defined by the output diameter B.D. and a circumference defined by the input diameter A.D. each share at least one coextensive circumference surface designated by reference numeral 78. In some embodiments, the choke wall 62 is at least partially located on a surface of the circumference defined by the input diameter A.D. that is opposite the coextensive circumference surface 78. For example, the choke wall 62 may be centered on an opposite surface

from the coextensive circumference surface 78. As such, when liquid (i.e. condensation) is routed through the vortex section 56, a first portion of the liquid 80 travels along or in close proximity to the coextensive circumference surface 78 and a second portion of the liquid 82 is deflected by the choke wall 62 substantially towards the coextensive circumference surface 78. More particularly, using an axis A through a center of the output diameter B.D. as a reference, the second portion of the liquid 82 is deflected by the choke wall 62 within 30° or less of the coextensive circumference surface 78, for example, within 20° or less, 15° or less, 10° or less, or 5° or less. In some embodiments, the input diameter A.D. is smaller than the output diameter B.D. Using the circumference defined by the output diameter B.D. as a reference, in some embodiments, the second end 74 of the choke wall 62 is within 100° or less of the coextensive circumference surface 78. For example, the second end 74 is within 90° or less of the coextensive circumference surface 78, 80° or less, or between 80° and 100°.

[0023] With continued reference to FIG. 6, the choke wall 62 defines an angle of deflection indicated by a1 with respect to the inner wall 76 of the vortex section 56. In some embodiments, the angle of deflection a1 is acute. For example, the angle of deflection a1 may be 50° or less, 40° or less, 30° or less, or 20° or less. As such, the second portion of the liquid 82 that is deflected travels along the angle of deflection a1 and contacts the interior wall 64 of the liquid bin tube 48 defined by an angle of contact indicated by a2 with respect to the interior wall 64 of the liquid bin tube 48. In some embodiments, the angle of contact a2 (i.e., contact angle) is obtuse relative to a direction of travel of the second portion of the liquid 82. As such, splashing into the heating cavity and disturbances to the downward vortex are minimized because the first portion of the liquid 80 travels along the coextensive circumference surface 78 and the second portion of the liquid 82 travels at an obtuse angle relative to the interior wall 64 of the liquid bin tube 48 when it makes contact therewith such that disturbances to the momentum of the liquid is abated.

[0024] With reference now to FIGS. 7-10, various constructions of the choke wall 62 are illustrated with cross-sectional views along the vortex section 56 and looking into the liquid bin tube 48. With reference initially to FIG. 7, the choke wall 62 from FIG. 6 is illustrated. The choke wall 62 may be substantially planar and extend between an upper end 84 and a lower end 86. The upper end 84 and the lower end 86 may be disposed vertically, such that the planar surface is parallel to the axis A. With reference now to FIG. 8, the choke wall 62A is illustrated in accordance with a first alternative construction. The choke wall 62A may be substantially planar and extend between an upper end 84A and a lower end 86A. The upper end 84A and the lower end 86A may be disposed at an angle relative to vertical, such that the planar surface is oblique to the axis A. With reference now to FIG. 9, the choke wall 62B is illustrated in accordance with a

second alternative construction. The choke wall 62B may be substantially non-planar and extend between an upper end 84B and a lower end 86B. For example, a surface of the choke wall 62B between the upper end 84B and the lower end 86B may be curved. In some embodiments, the curve may be defined by a single radius. In other embodiments, the curve may be defined by a changing radius. The upper end 84B and the lower end 86B may be relatively disposed substantially parallel to the axis A. With reference now to FIG. 10, the choke wall 62C is illustrated in accordance with a third alternative construction. The choke wall 62C may be substantially non-planar and extend between an upper end 84C and a lower end 86C. For example, a surface of the choke wall 62C between the upper end 84C and the lower end 86C may be curved. In some embodiments, the curve may be defined by a single radius. In some embodiments, the curve may be defined by a changing radius. The upper end 84C and the lower end 86C may be relatively disposed substantially oblique to the axis A.

[0025] According to another aspect of the present disclosure, a separator circuit for a steam generation system is provided. The separator circuit comprises a steamer connection tube, a liquid bin tube, and a slide tube. The slide tube is sloped downwardly from the steamer connection tube to the liquid bin tube for gravitationally accelerating condensation from the steamer connection tube. A vortex section is located between the slide tube and the liquid bin tube and includes a choke wall. The choke wall extends from a first end decreasing a cross-sectional flow path of the vortex section to a second end in a direction of the liquid bin tube.

[0026] According to another aspect, the liquid bin tube includes an interior wall defining a first circumference and the vortex section includes an inner wall defining a second circumference, wherein the first circumference and the second circumference each share a coextensive circumference surface.

[0027] According to yet another aspect, the choke wall is at least partially located on a surface of the second circumference that is opposite the coextensive circumference surface.

[0028] According to another aspect, the choke wall defines an angle of deflection relative to the inner wall of the vortex section that is acute.

[0029] According to yet another aspect, the angle of deflection is positioned relative to the interior wall of the liquid bin tube such that liquid traveling at the angle of deflection contacts the interior wall at a contact angle and the contact angle is obtuse relative to a direction of travel of the liquid.

[0030] According to another aspect, the second end of the choke wall is positioned within 90° or less of the coextensive circumference surface relative to the second circumference.

[0031] According to yet another aspect, the first circumference is smaller than the second circumference.

[0032] According to another aspect, the choke wall is

substantially planar.

[0033] According to yet another aspect, the choke wall extends between an upper end and a lower end and wherein a surface of the choke wall between the upper end and the lower end is parallel with an axis extending through a center of the second circumference.

[0034] According to another aspect, the choke wall extends between an upper end and a lower end and wherein a surface of the choke wall between the upper end and the lower end is oblique with an axis extending through a center of the second circumference.

[0035] According to yet another aspect, the choke wall is substantially non-planar.

[0036] According to another aspect, the choke wall extends between an upper end and a lower end and wherein a surface of the choke wall between the upper end and the lower end defines a curved surface.

[0037] According to yet another aspect, the upper end and the lower end are relatively disposed substantially parallel to an axis extending through a center of the second circumference.

[0038] According to another aspect, the upper end and the lower end are relatively disposed substantially parallel to an axis extending through a center of the second circumference.

[0039] According to yet another aspect, the upper end and the lower end are relatively disposed substantially oblique to an axis extending through a center of the second circumference.

[0040] According to still yet another aspect, a steam generation system includes a separator circuit.

[0041] It will be understood by one having ordinary skill in the art that construction of the described disclosure and other components is not limited to any specific material. Other exemplary embodiments of the disclosure disclosed herein may be formed from a wide variety of materials, unless described otherwise herein.

[0042] For purposes of this disclosure, the term "coupled" (in all of its forms, couple, coupling, coupled, etc.) generally means the joining of two components (electrical or mechanical) directly or indirectly to one another. Such joining may be stationary in nature or movable in nature. Such joining may be achieved with the two components (electrical or mechanical) and any additional intermediate members being integrally formed as a single unitary body with one another or with the two components. Such joining may be permanent in nature or may be removable or releasable in nature unless otherwise stated.

Claims

1. A separator circuit (26) for a steam generation system (10A, 10B), the separator circuit (26) comprising:
 - a steamer connection tube (44);
 - a liquid bin tube (48);
 - a slide tube (46) sloped downwardly from the

steamer connection tube (44) to the liquid bin tube (48) for gravitationally accelerating condensation from the steamer connection tube (44); and

a vortex section (56) located between the slide tube (46) and the liquid bin tube (48) and including a choke wall (62),

wherein the choke wall (62) extends from a first end (72) decreasing a cross-sectional flow path of the vortex section (56) to a second end (74) in a direction of the liquid bin tube (48).

2. The separator circuit (26) of claim 1, wherein the liquid bin tube (48) includes an interior wall (64) defining a first circumference and wherein the slide tube (46) and/or the vortex section (56) includes an inner wall (76) defining a second circumference.
3. The separator circuit (26) of claim 2, wherein the first circumference and the second circumference each share a coextensive circumference surface (78).
4. The separator circuit (26) of claim 3, wherein the choke wall (62) is at least partially located on a surface of the second circumference that is opposite the coextensive circumference surface (78).
5. The separator circuit (26) of claim 3 or claim 4, wherein the second end (74) of the choke wall (62) is positioned within 90° or less of the coextensive circumference surface (78) relative to the second circumference.
6. The separator circuit (26) of any one of claims 2 to 5, wherein the choke wall (62) defines an angle of deflection (α_1) relative to the inner wall (76) of the vortex section (56), wherein the angle of deflection (α_1) is acute and/or is positioned relative to the interior wall (64) of the liquid bin tube (48) such that liquid traveling at the angle of deflection (α_1) contacts the interior wall (64) at a contact angle (α_2) and the contact angle (α_2) is obtuse relative to a direction of travel of the liquid.
7. The separator circuit (26) of any one of claims 2 to 6, wherein the first circumference is smaller than the second circumference.
8. The separator circuit (26) of any one of claims 1 to 7, wherein the choke wall (62) is substantially planar.
9. The separator circuit (26) of claim 8, wherein the choke wall (62) extends between an upper end (84, 84A) and a lower end (86, 86A) and wherein a surface of the choke wall (62) between the upper end (84, 84A) and the lower end (86, 86A) is parallel or oblique with an axis extending through a center of

the second circumference.

10. The separator circuit (26) of any one of claims 1 to 7, wherein the choke wall (62) is substantially non-planar.
11. The separator circuit (26) of claim 10, wherein the choke wall (62) extends between an upper end (84B, 84C) and a lower end (86B, 86C) and wherein a surface of the choke wall (62) between the upper end (84B, 84C) and the lower end (86B, 86C) defines a curved surface, optionally wherein the upper end (84B, 84C) and the lower end (86B, 86C) are relatively disposed substantially parallel or substantially oblique to an axis extending through a center of the second circumference.
12. A steam generation system (10A, 10B) for a cooking appliance including:
 - a steamer (14) configured to heat a liquid and to at least partially converting the liquid into a steam;
 - a recirculation tube (52) transferring condensation back towards the steamer (14); and
 - a separator circuit (26) according to any one of claims 1 to 11,

wherein the steamer connection tube (44) extends from the steamer (14) and wherein the liquid bin tube (48) extends between a steam outlet (50) and the recirculation tube (52).

13. The steam generation system (10A, 10B) of claim 12, wherein the vortex section (56) is configured to direct condensation into a downward vortex within the water bin tube (48) and to separate the condensation from the steam via centrifugal forces to prevent condensation from exiting the steam outlet (50).
14. The steam generation system (10A, 10B) of claim 12 or claim 13, further comprising a funnel section (54) located between the liquid bin tube (48) and the recirculation tube (52).
15. A cooking appliance, in particular a stove or a baking oven or a microwave oven, comprising:
 - a cooking cavity; and
 - a steam generation system (10A, 10B) according to any one of claims 12 to 14,

wherein the steam outlet (50) of the liquid bin tube (48) is configured to provide steam to the cooking cavity.

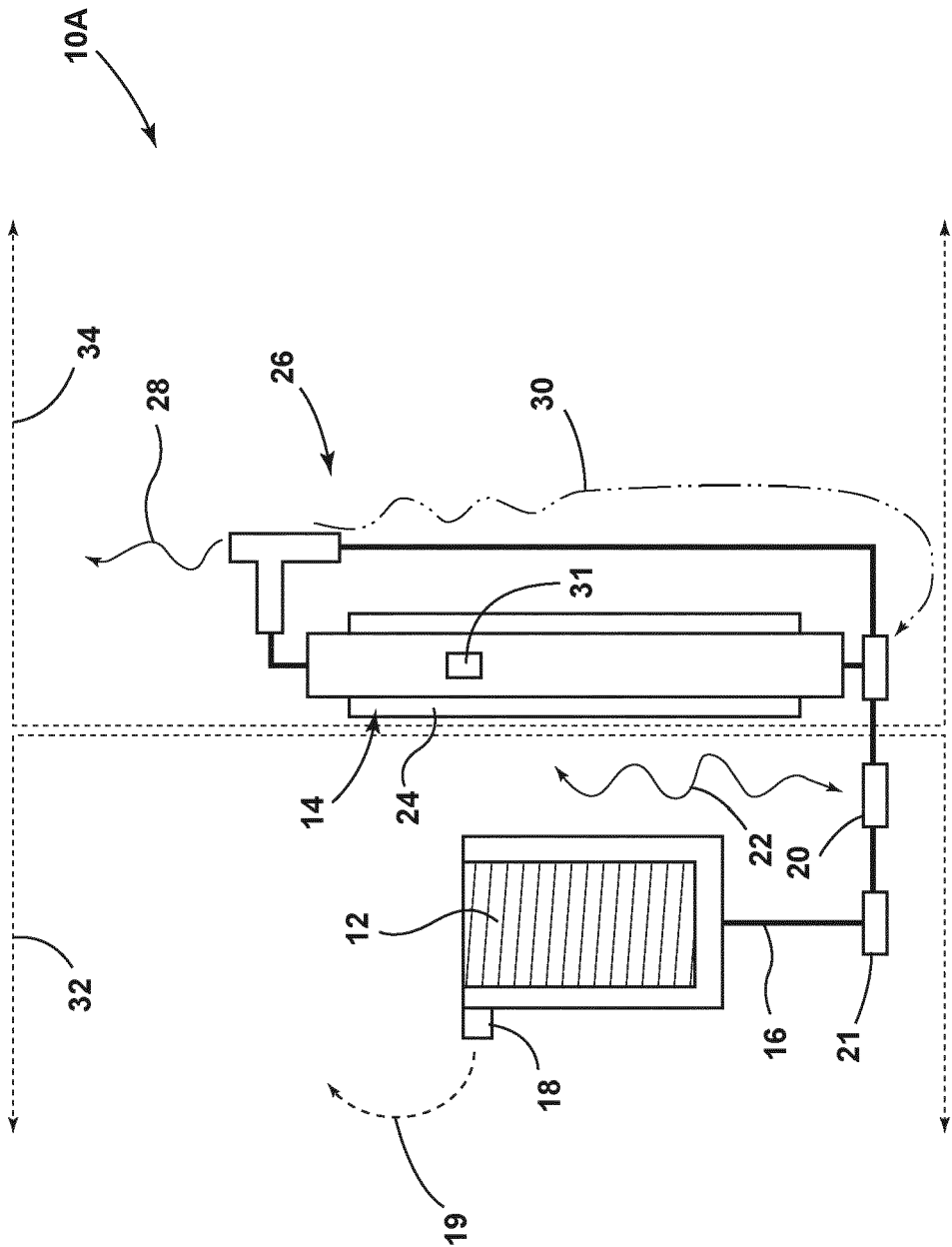


FIG. 1

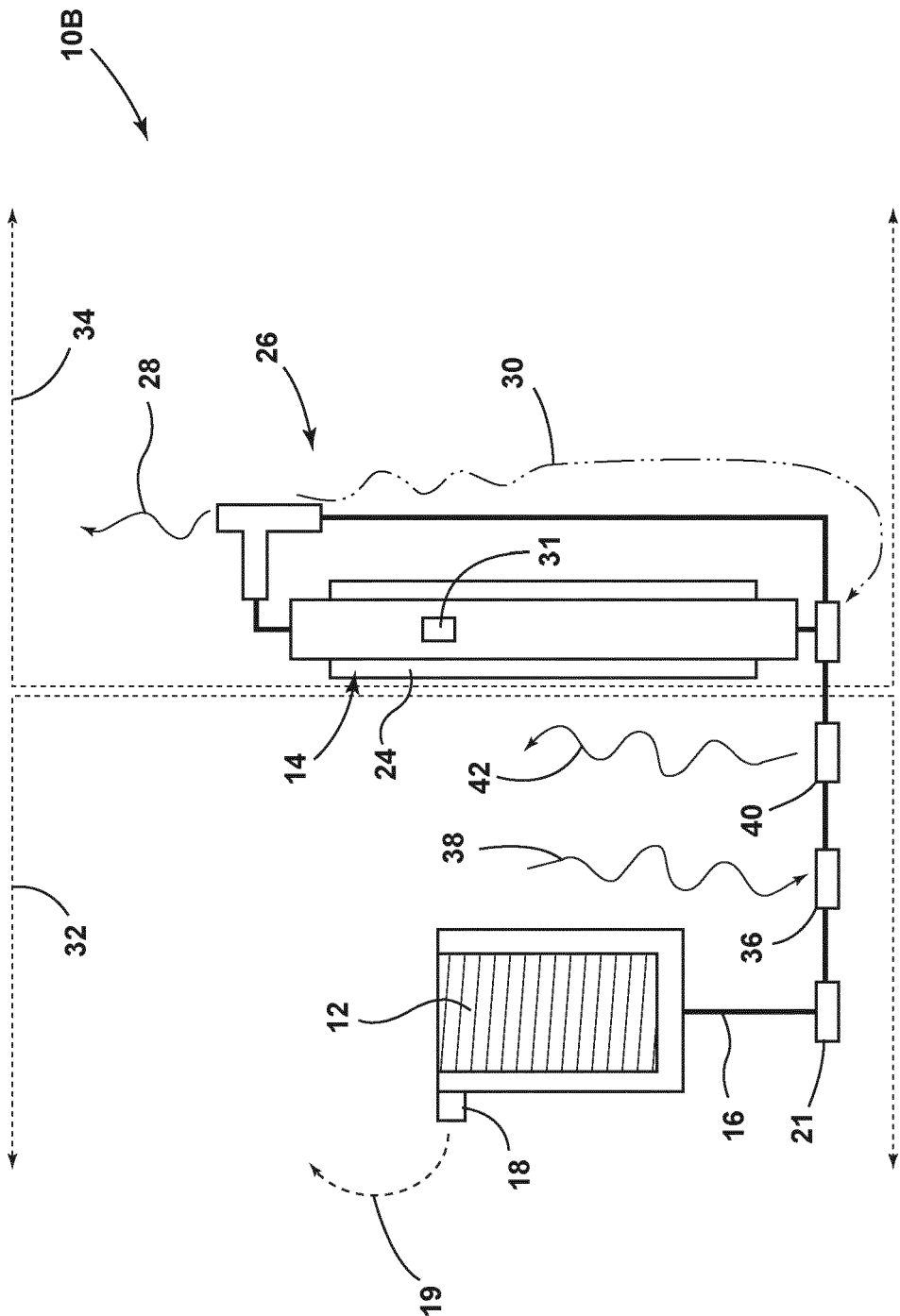


FIG. 2

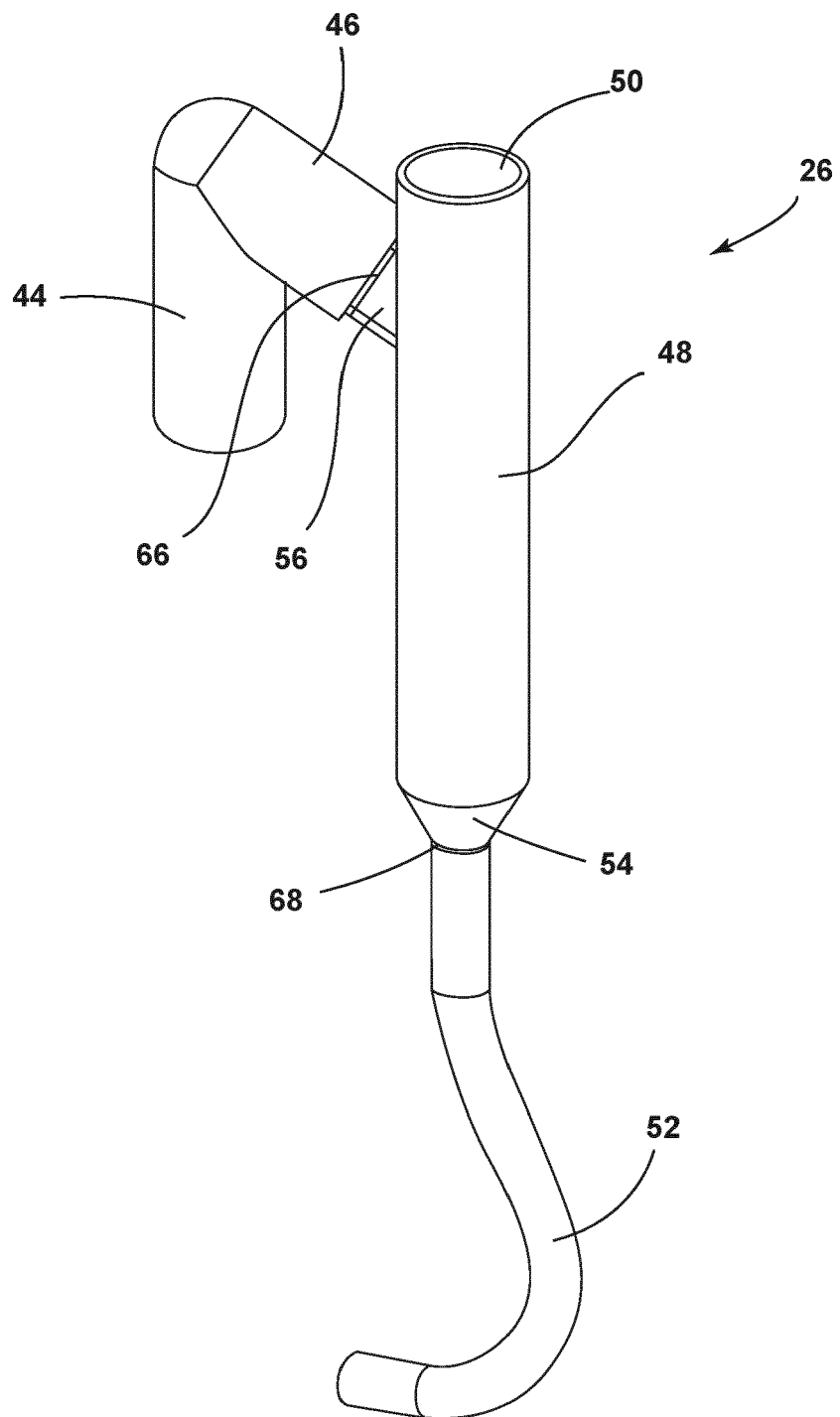


FIG. 3

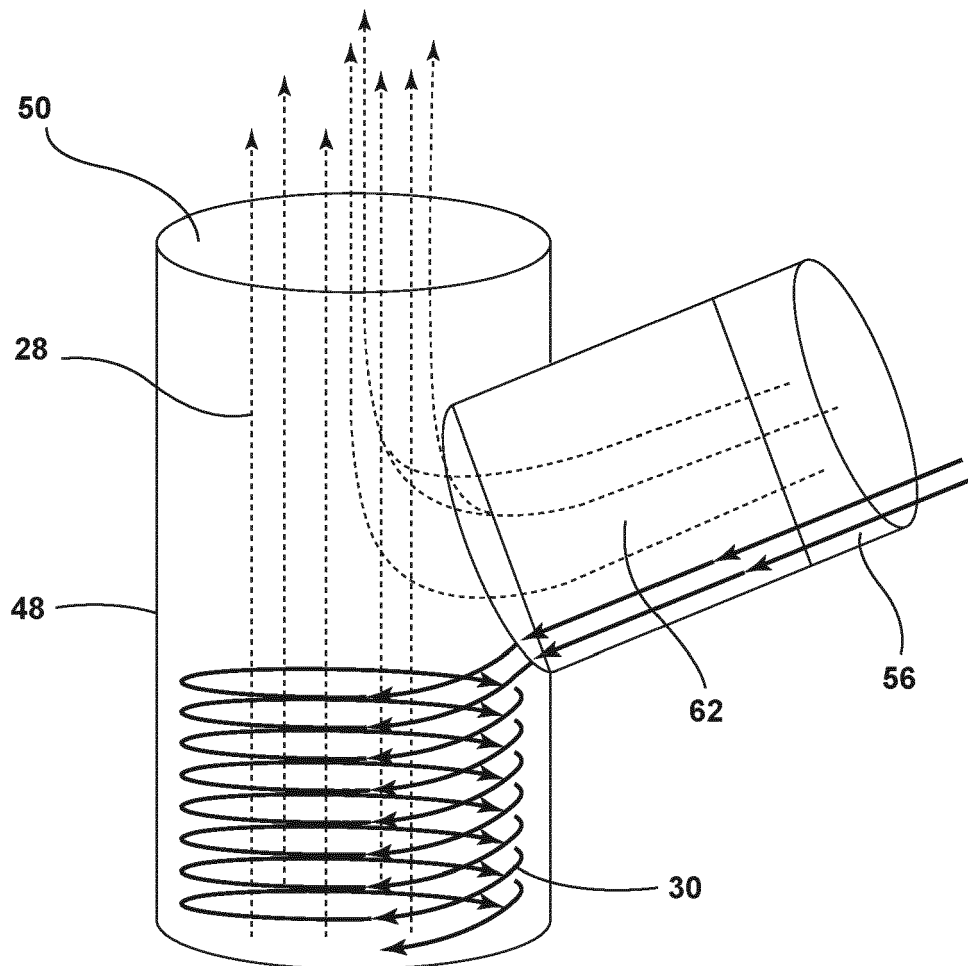


FIG. 4

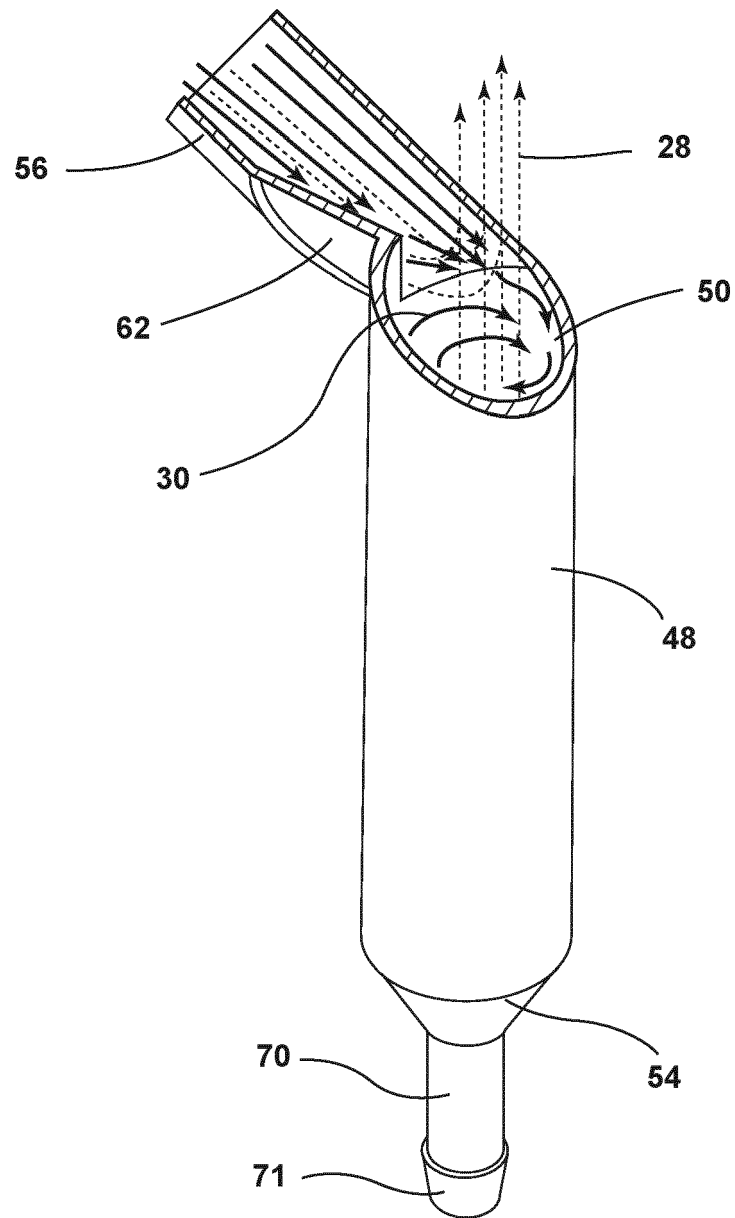
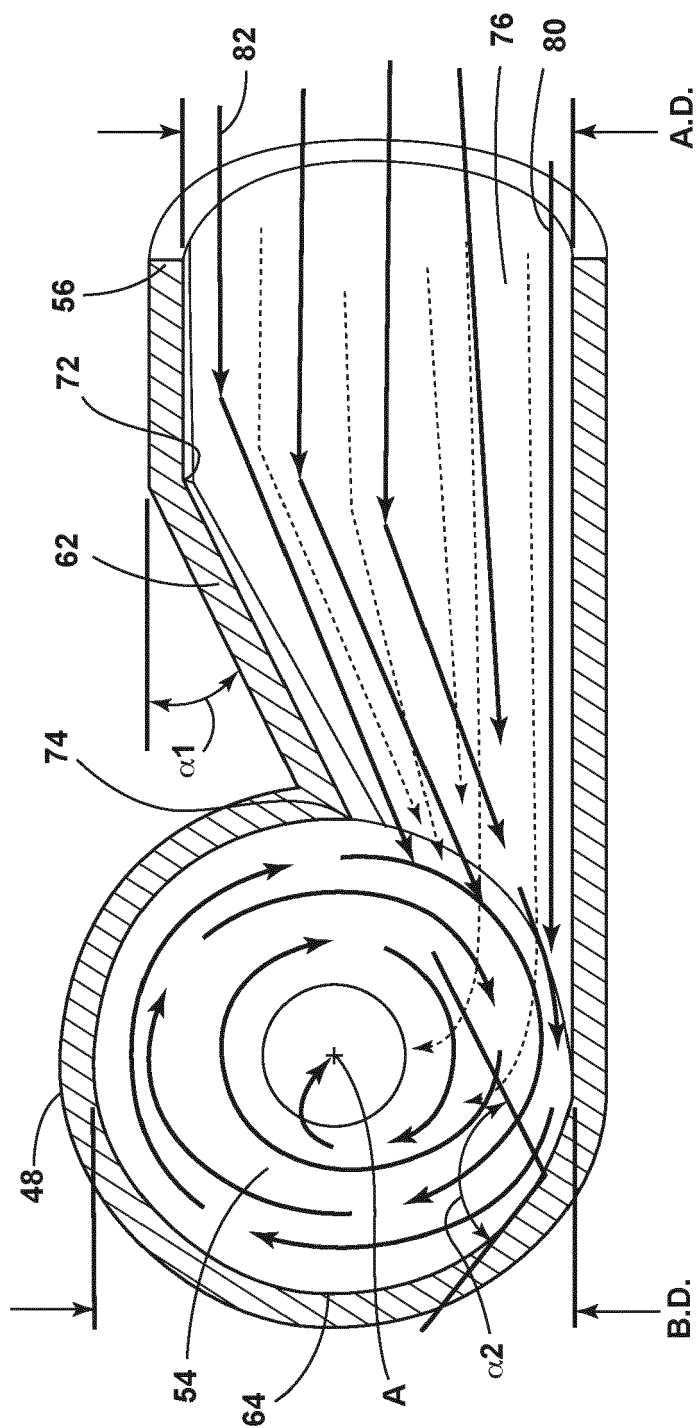


FIG. 5



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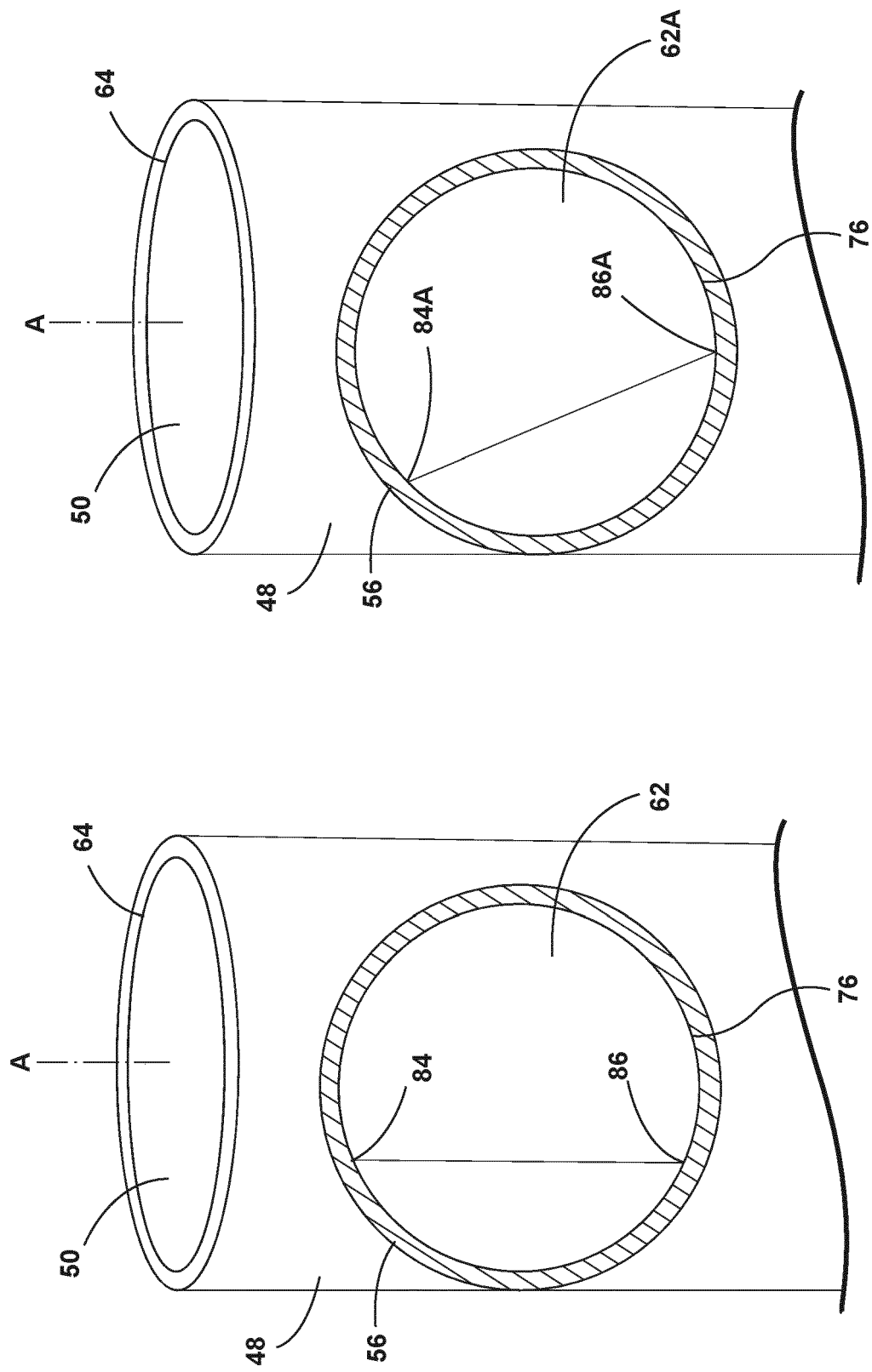


FIG. 8

FIG. 7

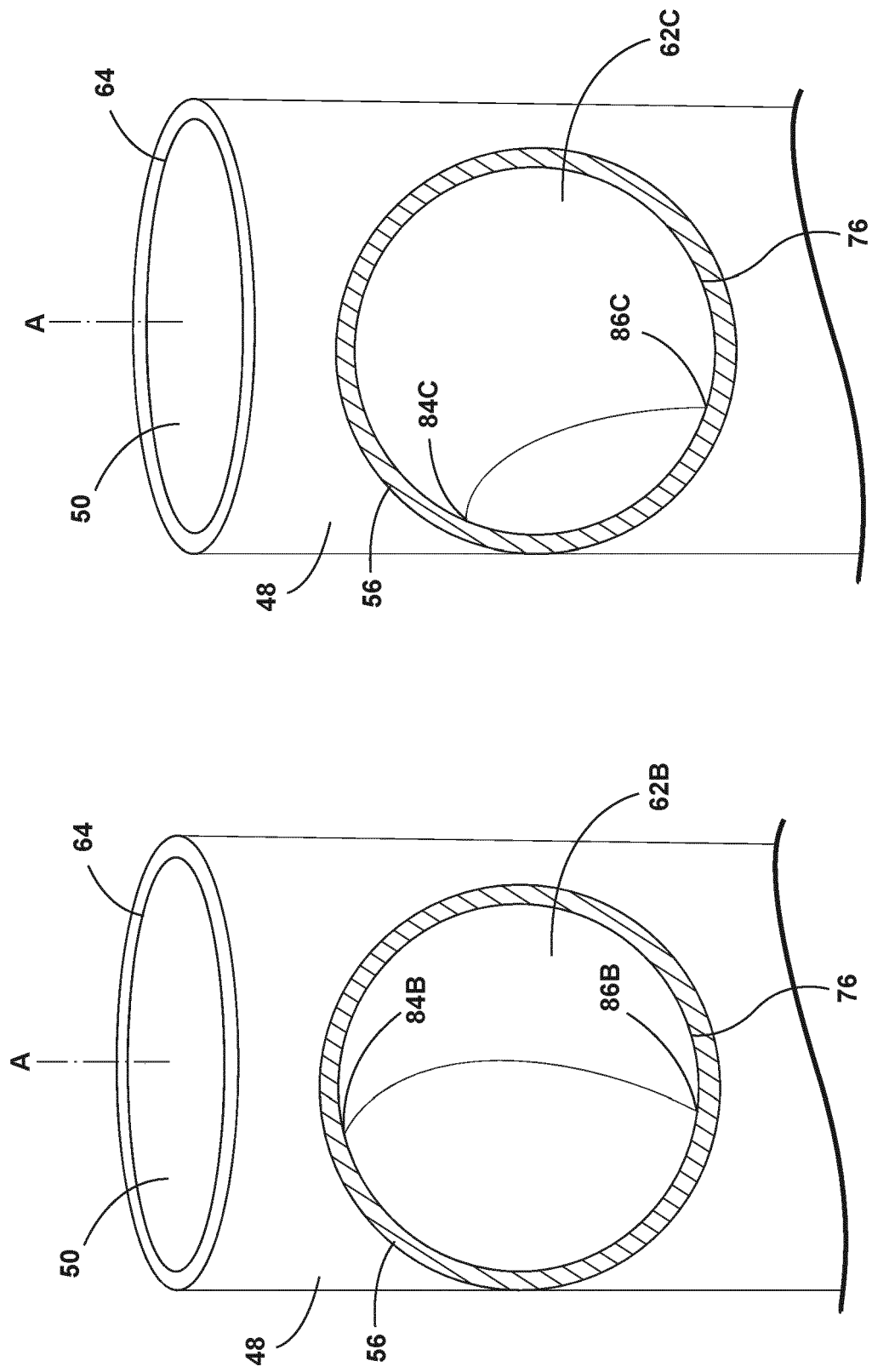


FIG. 9

FIG. 10



EUROPEAN SEARCH REPORT

Application Number

EP 23 18 0416

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			F22B
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Place of search Munich		Date of completion of the search 31 October 2023	Examiner Varelas, Dimitrios
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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