(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 396 597 B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
18.03.2020 Bulletin 2020/12

(21) Application number: **10704172.5**

(22) Date of filing: **21.01.2010**

(51) Int Cl.:
F23D 14/26 *(2006.01)* ***F23G 7/06*** *(2006.01)*

(86) International application number:
PCT/GB2010/050085

(87) International publication number:
WO 2010/092364 (19.08.2010 Gazette 2010/33)

(54) BURNER COMPRISING A PILOT

BRENNER UMFASSEND EINEN PILOT

BRÛLEUR COMPRENANT UN PILOTE

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR

(30) Priority: **11.02.2009 GB 0902221**

(43) Date of publication of application:
21.12.2011 Bulletin 2011/51

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Description

[0001] The present invention relates to a burner comprising a pilot for igniting a combustible fluid stream.

[0002] Burners are known for the combustive destruction of noxious substances in a fluid stream. The combustion can be performed in a combustion chamber by an open flame arrangement or a radiant burning arrangement.

[0003] In an open flame burner 50 as shown partially in Figure 6, a fluid stream 52 is introduced through an inlet 54 of a combustion chamber 56 as a mixture with a fuel gas 58. The mixture is ignited by a pilot flame 60 of a pilot 62 and burns as an open flame 64 combusting the noxious substances. The pilot 62 comprises an injection tube 66 having an end proximate the inlet of the combustion chamber for introducing a fuel gas which is ignited by igniter 68 and which in turn ignites the mixture as it is introduced to the combustion chamber through the inlet 54.

[0004] A number of problems exist with the burner 50. The pilot flame 60 is located at only one position relative to the flame 64 and therefore burning of the flame is more readily achieved in the region close to the pilot flame and may not be achieved, or not fully achieved, at a region remote from the pilot flame. Consequently, mixture entering the combustion chamber may not be completely combusted resulting in noxious substances being exhausted from the burner. Further, the injection tube of the pilot is typically relatively narrow and therefore the fuel gas is injected through the tube in a narrow concentrated jet which has a propensity to disrupt the flame 64 causing incomplete combustion of the mixture. If more than one inlet is provided (not shown in Figure 6), for instance for introducing a fluid stream from more than one source of noxious substances, a pilot is required for each of the inlets causing additional expense in addition to the problems identified above.

[0005] In a radiant burner 70 as shown in Figure 7, a combustion chamber 72 is formed by a surrounding porous generally cylindrical wall 74. Fuel gas 76 is introduced to an outer chamber 78 through inlet 80 and passes through the porous wall 74. A pilot 82 produces a pilot flame 84 for igniting fuel gas at the inner surface of the wall producing a high temperature reaction zone 86. A weir arrangement 88 produces a weir of cold liquid 90 (typically water) for dissolving constituents of the combusted fluid stream and for washing away particulate matter. The cold liquid also cools fluid exhausted from the burner so that it can be conveniently disposed. A fluid stream 92 containing at least one noxious substance is introduced into the combustion chamber 72 through inlet 94 and is combusted by contact with the gases from the high temperature reaction zone 86 near the surface of the wall 74. Combustion is also achieved by the heat which is generated and reflected from an opposing surface of the wall 74. A radiant burner is shown in more detail in EP 0694735.

[0006] The burner 70 suffers from a number of problems. First, the flame 86 when fully ignited is cylindrical and as the pilot flame 84 is located at only one position the high temperature reaction zone 86 ignition is assured in this region. The flame 86 may not burn or may not burn fully at areas of the wall 74 which are remote from the pilot. Areas of the wall surface at which a high temperature reaction zone is not maintained may be susceptible to depositing of particulates which causes damage to the porous wall. Further, the proximity of the cooling column cools the surface of the wall 74 particularly at the lower part of the wall. Also, heat is not reflected from the cooling water which further acts to cool the combustion chamber 72. Consequently, complete combustion of the fluid stream 92 may not be achieved along with incomplete combustion of the fuel / air mix 76. Additionally, the provision of a single relatively high energy concentrated flame can damage the delicate porous wall of the burner requiring expensive replacement.

[0007] It is know to provide discontinuous annular burner arrangements from GB2136557; US3501255; and FR2546273.

[0008] The present invention provides a burner according to Claim 1.

[0009] Other preferred and/or optional aspects of the invention are defined in the accompanying claims.

[0010] In order that the present invention may be well understood, embodiments thereof, which are given by way of example only, will now be described with reference to the accompanying drawings, in which:

Figure 1a shows a section through a pilot taken along line I-I in Figure 2;
Figure 1b shows a section through a pilot taken along line J_J in Figure 2;
Figure 2 shows an elevation of the pilot indicating the lines of section I-I and J-J;
Figure 3 shows an open flame burner comprising the pilot shown in Figure 1;
Figure 4 shows a radial burner comprising the pilot shown in Figure 1Figure 5 shows a further open flame burner comprising the pilot shown in Figure 1;
Figure 6 shows a prior art open flame burner;
Figure 7 shows a prior art radial burner;
Figures 8 and 9 show a further pilot made integrally with a weir arrangement of a burner.

[0011] Referring to Figures 1a, 1b and 2, a pilot 10 is shown for igniting a combustible fluid stream. The pilot comprises an inlet 12, which may comprise a venturi arrangement, for receiving a fuel gas 14, including a fuel and air/oxygen mixture, into the pilot. Ignition means 16, for example a spark igniter or an ignition electrode, are provided for igniting the fuel gas 14. A generally annular conduit 18 is open along an annular extent forming a circumferential aperture 20. The conduit 18 conveys fuel gas from the inlet to the circumferential aperture. When the fuel gas flowing out of the circumferential aperture 20 is ignited a continuous annular pilot flame is generated radially of the conduit.

[0012] The annular conduit as shown is circular, but may be formed of other shapes such as a square, rectangle or hexagonal. In this regard, the annular conduit conveys fuel gas from the inlet through 360° and allows the gas to flow from the inlet so that when it is ignited an annular flame is generated. Likewise, the annular flame generated need not be ring-shaped, but instead corresponds generally to the shape of the conduit. For example, if the conduit is rectangular then a generally rectangular flame is generated.

[0013] The conduit as shown in Figures 1a, 1b and 2 is open along its annular extent by the circumferential aperture 20. The aperture extends through 360° to allow fuel gas to flow from the conduit approximately equally about its circumference. The aperture is determined in size to ensure that an equal flow of fuel gas is distributed around the circumference generating a consistent flame.

[0014] The fuel gas typically contains a mixture of fuel such as a hydrocarbon and oxygen or air.

[0015] As shown in Figures 1 and 2, the conduit 18 is open along a radially inner annular extent so that the circumferential aperture 20 faces radially inwardly. When the fuel gas 14 is ignited by the igniting means 16 the annular pilot flame is generated radially inwardly of the conduit for surrounding a fluid stream to be ignited.

[0016] Although the pilot flame generated is annular only a single igniter 16 is required since once the flame is ignited in the region of the igniter it readily spreads around the circumference of the pilot. Therefore, the ignition means 16 as shown is disposed at a single location in the circumference of the pilot and in use ignites the fuel gas to form the continuous annular pilot flame. The pilot flame may not be fully annular at all times after ignition as the flow of fuel gas may not be distributed completely equally about the circumference or the fluid stream may occasionally extinguish part of the annular flame. However, generally in use the pilot is capable of generating a continuous annular pilot flame.

[0017] Monitoring or sensing means may be placed at intervals around the pilot for monitoring or sensing characteristics of the pilot, such as the presence of a flame, or the flow or pressure of fuel gas. Such sensing means may feed back to a control for the pilot which may be connected to a fuel gas supply valve or the igniting means.

[0018] The generally annular conduit 18 in Figures 1a, 1b and 2 comprises a plenum chamber 22 for receiving fuel gas from the inlet 14 and a circumferential channel 24 for channelling fuel gas from the plenum chamber to the circumferential aperture 20 for forming the continuous annular pilot flame. In use the plenum chamber 22 distributes the fuel gas generally equally around the annular extent of the conduit 18 at an equal pressure so that when ignited the continuous annular pilot flame burns generally evenly at approximately the same intensity and size about the annular extent of the conduit. This arrangement promotes the generation of a pilot flame which is annular and unbroken.

[0019] The pressure of gas in the conduit 18 may be greatest in the region proximate the inlet 12. Accordingly, the amount of gas exiting the circumferential aperture 20 may be greatest near the inlet and hence the annular flame may be largest near the inlet 12. The plenum chamber arrangement as described above serves to distribute the gas equally around the conduit. Additionally it will be seen that inlet 12 is not aligned with channel portion 24. Instead gas entering through the inlet must flow along a tortuous path prior to exiting the pilot through the circumferential aperture. In this way, the surface of the plenum chamber opposed to the inlet and the upper surface of the baffle as shown in Figures 1a and 1b act as baffles to the flow of fuel gas.

[0020] The pilot may be moulded from a metallic material in a single piece or two or more pieces which are subsequently fixed together. The channel portion 24, or other portion of the pilot which is in contact with or closely adjacent to the pilot flame, may be formed from a heat or flame resistant material, such as a ceramic material or a metal such as stainless steel. It is preferable to avoid a metal surface in contact with the pilot flame since this may generate undesirable nitrogen oxide compounds.

[0021] In use, fuel gas is introduced to the conduit 22 and conveyed around the conduit so that it can flow out of the circumferential aperture 20. When the flow through the aperture is established the ignition means 16 ignites the fuel gas generating a pilot flame which extends radially inwardly from the aperture and in a generally annular configuration. The rate at which fuel gas is introduced to the conduit and the size of the aperture are selected to reduce the possibility of flash back into the plenum chamber 22. In this regard, the flame speed should be less than forward velocity of the fuel gas. The flame speed is the speed a flame passes back towards its source fuel and oxidant. The forward velocity is the speed at which gas is conveyed through the aperture in a generally radially inwards direction and should be greater in velocity than the flame speed. As the gas mixture leaves the aperture, it will spread out (fan like), thereby reducing the forward velocity. The anchor region at which the forward velocity equals flame speed is consequently just beyond the exit of the aperture. If the material from which the main portions of the pilot is made is metallic, flame resistant portions, made for instance of ceramic, may be disposed in the region of the aperture 20.

[0022] The pilot is formed in this example by a first, or lower, pilot plate 116, which together with a second, or upper, pilot plate 117 forms the plenum chamber 22, the channel portion 22 and circumferential aperture 20. The first and second pilot plates may be fixed together by any suitable means such as by bolts. Spacers 121 are placed at intervals around the pilot plate for spacing the first pilot plate from the second pilot plate. The spacers ensure that the channel portion 24 and circumferential aperture 20 are sized correctly and uniformly around the pilot. Ignition means 16 which in this example is an ignition electrode extends through the wall of the first pilot plate and is made gas tight by means of a swageing system. The ignition electrode extends into the circumferential aperture to provide an ignition source when the fuel gas is flowing through the aperture. Inlet 12 is formed in the first pilot plate 116 which may be sealed with a Swagelok component.

[0023] An open flame burner 27 comprising pilot 10 is shown partially in Figure 3. The pilot 10 is not shown in detail in Figure 3 for simplicity.

[0024] A fluid stream 29 is introduced through an inlet 31 of the combustion chamber 33 as a mixture with a fuel gas 35. The mixture is ignited by a pilot flame 37 of the pilot 10 and burns as an open flame 39 combusting the noxious substances. Although only a semi-circular portion of the flame 37 is shown in Figure 3, the pilot flame 37 is annular and therefore surrounds the fluid stream and fuel gas mixture as it enters the combustion chamber 33 through the inlet 31. The term "horizontal pilot" as used herein is used to describe the arrangement shown in that the pilot extends generally perpendicularly to the direction of flow of gases entering the burner. Usually a burner is upright as shown and in this case the pilot is generally horizontal. Accordingly, the mixture is exposed to the pilot flame laterally from all sides ensuring relatively complete combustion of the mixture. This arrangement constitutes an improvement over the prior art described above in which only the portion of the fluid stream proximate the pilot flame is consistently burnt. Additionally, as the circumferential aperture 20 is relatively large and the flame is therefore a distributed low energy flame the fuel gas flowing through the aperture does not significantly disrupt the main flame 39. Referring to Figure 4, a radial burner 26, comprising pilot 10, is shown for removing noxious substances from a fluid stream 28. The burner 26 comprises a combustion region in which a fuel gas can be burnt for combusting the fluid stream. In this arrangement the combustion region is formed by a chamber 30 surrounded by a generally cylindrical wall 32. The wall 32 is porous to allow passage of fuel gas through it into the combustion chamber for burning on the inner surface of the wall. Fuel gas 34 is introduced to an outer chamber 36 through inlet 38 and passes through the wall 32. The wall may form a right circular cylinder, elliptic cylinder, parabolic cylinder, or hyperbolic cylinder such that the wall forms a surface on which fuel gas 34 can burn radiating hear radially inwardly and combusting the fluid stream. It will also be understood that the pilot 10 is located away from the top, or head, of the burner where space is limited.

[0025] A weir arrangement 44 produces a weir of cold liquid 46 (typically water) for dissolving constituents of the combusted fluid stream and for washing away particulate matter. The cold liquid also cools fluid exhausted from the burner so that it can be conveniently disposed.

[0026] The pilot 10 is shown in simplified form in Figure 4 and is located below the wall 32 and between the combustion chamber 30 and the weir arrangement 44. In use the pilot 10 generates an annular flame 40 although only a semi-circular portion of which is shown in Figure 4. The pilot flame 40 ignites fuel gas at the inner surface of the wall producing a flame 42. The fluid stream 28 containing at least one noxious substance is introduced into the combustion chamber 30 through inlet 48 and is combusted by contact with the hot reaction zone 42 near the surface of the wall 74.

[0027] The pilot 10 is located so that when ignited the continuous annular pilot flame 40 and the generally cylindrical wall 32 are adjacent along their respective annular extents such that the fuel gas 34 passing through the generally cylindrical wall can be efficiently ignited and a flame at the surface maintained. As the annular pilot flame 40 ensures that the full circumferential extent of the lower portion of the flame 42 is ignited and maintained alight, combustion of the fuel gas 34 over the full inner surface of the wall 32 is increased.

[0028] Additionally, the pilot 10 is located so that when ignited the continuous annular pilot flame 40 thermally insulates the base of the main combustor reaction zone 42 from chilling effect generated by the relatively cold liquid 46 passing over the weir arrangement. Accordingly, heat is more efficiently generated at the base of the reaction zone 42, thereby improving the emissions from the combustor at the base nearest the weir, for example carbon monoxide and hydrocarbon emissions (CxHy). Table 1 shows the improvement observed in testing the embodiment of the invention.

Table 1

Conditions	Residual oxygen	Carbon monoxide	CxHy
Prior Art shown in Figure 7	5.2%	196 ppm	0.34%
Embodiment shown in Figure 4 with horizontal pilot	5.0%	100 ppm	0.17%

[0029] The improvement is due to a numbers of aspects of the embodiment. For example, heating the base of the radiant burner pad improves the combustion at the base.

[0030] Powders tend to form at the base of the combustor due to reduced temperature of the combustor pad 32 / reaction zone at the base. The provision of a horizontal pilot thermally insulates the base of the pad increasing efficiency of the pad allowing it to sustain hotter temperatures. Additionally, the horizontal pilot decreases the propensity for powder to adhere to the delicate porous structure of the pad 32. The problem of powder deposition still occurs but in the embodiment it occurs downstream of the pad 32. However, the pilot plates are relatively robust and the deposition of powder on the pilot is not considered a significant problem. The solids may include silica which is easily removed by light agitation of the surface of the pilot by compressed air or water flows. Further, the pilot can be cleaned by washing with water in an in situ cleaning method (described in more detail below with reference to Figures 8 and 9)

[0031] Advantageously, the pilot 10 provides a low energy distributed flame surface which has less propensity to damage the delicate porous wall 32.

[0032] Although not depicted, the radial burner shown in Figure 4 can be used in combination with the open flame burner shown in Figure 3 for combusting certain types of noxious substances in the fluid stream. In this arrangement, the inlet upstream of the combustion chamber 30 shown in Figure 4 is adapted for introducing the fluid stream and a fuel gas as a mixture into the combustion region as shown in WO2006/013355. The mixture at the inlet can be ignited by the flame 42 formed at the surface of the generally cylindrical wall which is itself ignited by pilot 10 at the base of the cylindrical wall. Alternatively, the pilot 10 is located between the wall 32 and the inlet (at the top of the wall as shown in Figure 4) for igniting both the mixture at the inlet and the fuel gas at the surface of the wall.

[0033] Figure 5 shows a modification of the open flame burner shown in Figure 3. The burner 45 is suitable for removing noxious substances from a plurality of fluid streams 47, for instance, from a respective plurality of semi-conductor wafer processing chambers. Burner 45 comprises an inlet 41, 43 for each fluid stream 47. Although only two inlets are shown the burner may comprise more than two inlets. The inlets 41, 43 introduce the plurality of fluid streams 47 and fuel gas 49 as respective mixtures into the combustion chamber 33. The pilot 10 is located so that when ignited the continuous annular pilot flame 37 surrounds mixtures to be burned so that all of the mixtures can be ignited by a single pilot.

[0034] Typically, cleaning of the pilot 10 requires removal of the burner arrangement 26 and this removal is labour intensive and results in significant tool downtime.

[0035] However, in-situ cleaning of the pilot plate can be performed Cleaning is performed by pumping pressurized fluid, such as water or air, through inlet 12 of the pilot, through the plenum chamber and out of the circumferential aperture 20. Advantageously, tthe fluid is a liquid, as a liquid falls under gravity removing particulates from the outer wall of the lower pilot plate 116.

[0036] Further, the pilot plate 10 may be integrated with the weir 44. As shown in Figures 8 and 9, a passage 112 is machined between the pilot plate plenum 105 and the weir volume 107. A bung 106 is moveable from a first position in which it blocks the passage 112 and a second position in which the passage is open. When the passage is open, water injected through inlet 12 of the pilot can flow into the pilot plenum 105 and out through the circumferential aperture 109, running down the entirety of the outer wall of the lower pilot plate 102, removing solid residue by physical and chemical (dissolving) action. After cleaning the water is switched off and the plenum chamber allowed to drain. Once drained, the bung 106 is then reengaged. The pilot is dried by blowing air through the inlet. Once dry, the pilot can be ignited. It will be appreciated that the process described for in-situ cleaning is more efficient and less time intensive than disassembling the burner, disconnecting various pipes, cleaning the pilot and subsequently re-assembling the burner and reconnecting the pipes. Further, in-situ cleaning reduces the possibility of the operator coming into contact with potentially dangerous combustion byproducts (ie oxides of Arsenic on AsH3 processes).

[0037] Accordingly, a method of cleaning pilot 10 in situ in a burner comprises: disconnecting a source of fuel from an inlet to the pilot; connecting a source of cleaning fluid to the inlet; and cleaning the pilot with said fluid.

Claims

1. A burner for removing noxious substances from a fluid stream, the burner comprising:
   a combustion region in which a fuel gas can be burnt for combusting the fluid stream; and **characterized in that** the burner comprises:
   a pilot (10) for igniting a combustible fluid stream, the pilot (10) comprising an inlet (12) for receiving a fuel gas (14) into the pilot; means (16) for igniting the fuel gas; and a generally annular conduit (18) comprising a plenum chamber extending through 360 degrees for conveying fuel gas from the inlet to a radially inwardly facing circumferential aperture (20) formed along an annular extent of the conduit and extending through 360 degrees, the inlet (12) being misaligned with the circumferential aperture for distributing fuel gas through 360 degrees at a generally equal pressure about the annular conduit so that when the fuel gas is ignited an annular pilot flame is generated.

2. A burner as claimed in claim 1, the ignition means (16) comprises a spark igniter.

3. A burner as claimed in claim 1 or 2, wherein the ignition means comprises a single igniter configured to ignite the fuel gas to form the annular pilot flame.

4. A burner as claimed in any preceeding claim, wherein the combustion region is formed by a chamber (33) having

a surrounding generally cylindrical wall for introducing therethrough into the combustion chamber a fuel gas for burning on a surface of said wall when ignited by the pilot so that a fluid stream passing through said chamber can be combusted.

5. A burner as claimed in claim 4, wherein the pilot is located so that when ignited the annular pilot flame and the wall are adjacent along their respective annular extents such that the fuel gas passing through the wall can be efficiently ignited and a flame at the surface maintained.

6. A burner as claimed in claim 5, comprising a weir arrangement positioned downstream of the combustion chamber for receiving the combusted fuel stream, wherein the pilot is located so that when ignited the annular pilot flame thermally insulates the generally cylindrical wall from relatively cold liquid passing over the weir arrangement (44).

7. A burner as claimed in any of claims 1 to 6, said combustion region comprising an inlet upstream of the combustion chamber for introducing the fluid stream and a fuel gas as a mixture into the combustion region.

8. A burner as claimed in claim 7, wherein said burner is configured such that said mixture is ignited at said inlet by the flame formed at the surface of the generally cylindrical wall.

9. A burner as claimed in claim 8, wherein said pilot is located between the generally cylindrical wall and the inlet for igniting mixture at the inlet and the fuel gas at the surface of the generally cylindrical wall.

10. A burner as claimed in claim 1, wherein said combustion region comprises an inlet upstream of the combustion chamber for introducing the fluid stream and a fuel gas as a mixture into the combustion region and said pilot is located so that when ignited the annular pilot flame surrounds the mixture to be burned.

11. A burner as claimed in claim 9, further comprising a plurality of inlets to the combustion chamber for introducing a plurality of fluid streams and fuel gas as respective mixtures into the combustion chamber and said pilot is located so that when ignited the annular pilot flame surrounds mixtures to be burned so that all of the mixtures can be ignited by said pilot.

12. A burner as claimed in claim 6 or 7, in which a portion of the weir arrangement is integral with the pilot and wherein the pilot comprises a closeable passage which when open water used to clean the pilot flows through the passage and over the weir, and when closed the pilot can form said annular flame.

Patentansprüche

1. Brenner zum Entfernen schädlicher Substanzen aus einem Fluidstrom, wobei der Brenner aufweist:
einen Brennbereich, in welchem ein Brennstoffgas verbrannt werden kann, um den Fluidstrom zu verbrennen, und **dadurch gekennzeichnet, dass** der Brenner aufweist: einen Pilotbrenner (10) zum Zünden eines brennbaren Fluidstroms, wobei der Pilotbrenner (10) einen Einlass (12) zur Aufnahme eines Brennstoffgases (14) durch den Pilotbrenner, Mittel (16) zum Zünden des Brennstoffgases, und eine etwa ringförmige Leitung (18) aufweist, die eine Sammelkammer umfasst, die sich über 360° erstreckt, um Brennstoffgas vom Einlass zu einer radial einwärts weisenden umfangsmäßigen Öffnung (20) zu fördern, die entlang einer ringförmigen Ausdehnung der Leitung gebildet ist und sich über 360° erstreckt, wobei der Einlass (12) nicht mit der umfangsmäßigen Öffnung fluchtet, um das Brennstoffgas über 360° bei einem etwa gleichen Druck um die ringförmige Leitung zu verteilen, so dass, wenn das Brennstoffgas gezündet wird, eine ringförmige Pilotflamme erzeugt wird.

2. Brenner nach Anspruch 1, wobei die Zündmittel (16) einen Funkenzünder aufweisen.

3. Brenner nach Anspruch 1 oder 2, wobei die Zündmittel einen Einfachzünder aufweisen, der dafür konfiguriert ist, das Brennstoffgas zur Bildung der ringförmigen Pilotflamme zu zünden.

4. Brenner nach irgendeinem vorhergehenden Anspruch, wobei der Brennbereich durch eine Kammer (33) gebildet ist, die eine umgebende, etwa zylindrische Wand aufweist, um ein Brennstoffgas durch sie hindurch in die Brennkammer einzuleiten, um es auf einer Oberfläche dieser Wand zu verbrennen, wenn es durch den Pilotbrenner gezündet wird, so dass ein Fluidstrom, der durch die Kammer gelangt, verbrannt werden kann.

5. Brenner nach Anspruch 4, wobei der Pilotbrenner so angeordnet ist, dass, wenn er gezündet wird, die ringförmige Pilotflamme und die Wand entlang ihrer jeweiligen ringförmigen Ausdehnungen aneinander angrenzend sind, so dass das durch die Wand gelangende Brennstoffgas wirksam gezündet und eine Flamme auf der Oberfläche aufrechterhalten werden kann.

6. Brenner nach Anspruch 5, mit einer stromab der Brennkammer positionierten Wehranordnung zur Aufnahme des verbrannten Fluidstroms, wobei der Pilotbrenner so lokalisiert ist, dass, wenn er gezündet ist, die ringförmige Pilotflamme die etwa zylindrische Wand gegenüber relativ alter Flüssigkeit thermisch isoliert, die über die Wehranordnung (44) gelangt.

7. Brenner nach einem der Ansprüche 1 bis 6, wobei der Brennbereich einen Einlass stromauf der Brennkammer zum Einleiten des Fluidstroms und eines Brennstoffgases als Gemisch in den Verbrennungsbereich aufweist.

8. Brenner nach Anspruch 7, wobei der Brenner so konfiguriert ist, dass das Gemisch an dem Einlass durch die Flamme gezündet wird, die auf der Oberfläche der etwa zylindrischen Wand gebildet wird.

9. Brenner nach Anspruch 8, wobei der Pilotbrenner zwischen der etwa zylindrischen Wand und dem Einlass angeordnet ist, um das Gemisch an dem Einlass und das Brennstoffgas an der Oberfläche der etwa zylindrischen Wand zu zünden.

10. Brenner nach Anspruch 1, wobei der Brennbereich einen Einlass stromauf der Brennkammer zum Einleiten des Fluidstroms und eines Brennstoffgases als ein Gemisch in den Brennbereich aufweist und der Pilotbrenner so angeordnet ist, dass, wenn er gezündet ist, die ringförmige Pilotflamme das zu verbrennende Gemisch umrundet.

11. Brenner nach Anspruch 9, der weiter eine Mehrzahl von Einlässen zur Brennkammer zum Einleiten einer Mehrzahl von Fluidströmen und eines Brenngases als jeweilige Gemische in die Brennkammer aufweist, und wobei der Pilotbrenner so angeordnet ist, dass, wenn er gezündet ist, die ringförmige Pilotflamme zu verbrennende Gemische umrundet, so dass sämtliche der Gemische durch die Pilotflamme gezündet werden können.

12. Brenner nach Anspruch 6 oder 7, wobei ein Teil der Wehranordnung integral mit dem Pilotbrenner ausgebildet ist, und wobei der Pilotbrenner einen verschließbaren Durchgang aufweist, so dass, wenn er geöffnet ist, zum Reinigen des Pilotbrenners benutztes Wasser durch den Kanal und über das Wehr fließt, und, wenn er geschlossen ist, der Pilotbrenner die ringförmige Flamme bilden kann.

Revendications

1. Brûleur permettant d'enlever des substances nocives d'un flux de fluide, le brûleur comprenant :
une région de combustion dans laquelle un gaz combustible peut être brûlé pour la combustion du flux de fluide ; et **caractérisé en ce que** le brûleur comprend :
un pilote (10) pour l'allumage d'un flux de fluide pouvant être brûlé, le pilote (10) comprenant une entrée (12) pour recevoir un gaz combustible (14) dans le pilote ; des moyens (16) pour l'allumage du gaz combustible ; et un conduit généralement annulaire (18) comprenant une chambre pressurisée s'étendant à 360 degrés pour transporter un gaz combustible de l'entrée jusqu'à une ouverture circonférentielle faisant face radialement vers l'intérieur (20) formée le long d'une étendue annulaire du conduit et s'étendant à 360 degrés, l'entrée (12) étant désalignée avec l'ouverture circonférentielle pour la distribution de gaz combustible à 360 degrés à une pression généralement égale le long du conduit annulaire de sorte que, lorsque le gaz combustible est allumé, une flamme pilote annulaire soit générée.

2. Brûleur selon la revendication 1, dans lequel les moyens d'allumage (16) comprennent un allumeur par étincelle.

3. Brûleur selon la revendication 1 ou 2, dans lequel les moyens d'allumage comprennent un allumeur unique configuré pour allumer le gaz combustible afin de former la flamme de pilote annulaire.

4. Brûleur selon l'une quelconque des revendications précédentes, dans lequel la région de combustion est formée par une chambre (33) ayant une paroi d'enceinte généralement cylindrique pour l'introduction, à travers celle-ci, dans la chambre de combustion, d'un gaz combustible à brûler sur une surface de ladite paroi lorsqu'il est allumé par le pilote de manière à permettre la combustion d'un flux de fluide traversant ladite chambre.

5. Brûleur selon la revendication 4, dans lequel le pilote est situé de sorte que, lorsqu'elle est allumée, la flamme de pilote annulaire et la paroi soient adjacentes le long de leurs étendues annulaires respectives afin que le gaz combustible traversant la paroi puisse être efficacement allumé et qu'une flamme soit maintenue à la surface.

6. Brûleur selon la revendication 5, comprenant un agencement de déversoir positionné en aval de la chambre de combustion pour recevoir le flux de combustible brûlé, dans lequel le pilote est situé de sorte que, lorsqu'elle est allumée, la flamme de pilote annulaire isole thermiquement la paroi généralement cylindrique d'un liquide relativement froid passant sur l'agencement de déversoir (44).

7. Brûleur selon l'une quelconque des revendications 1 à 6, ladite région de combustion comprenant une entrée en amont de la chambre de combustion pour l'introduction du flux de fluide et d'un gaz combustible en tant qu'un mélange dans la région de combustion.

8. Brûleur selon la revendication 7, dans lequel ledit brûleur est configuré de sorte que ledit mélange soit allumé à ladite entrée par la flamme formée à la surface de la paroi généralement cylindrique.

9. Brûleur selon la revendication 8, dans lequel ledit pilote est situé entre la paroi généralement cylindrique et l'entrée pour l'allumage d'un mélange à l'entrée et du gaz combustible à la surface de la paroi généralement cylindrique.

10. Brûleur selon la revendication 1, dans lequel ladite région de combustion comprend une entrée en amont de la chambre de combustion pour l'introduction du flux de fluide et d'un gaz combustible en tant qu'un mélange dans la région de combustion et ledit pilote est situé de sorte que, lorsqu'elle est allumée, la flamme de pilote annulaire entoure le mélange à brûler.

11. Brûleur selon la revendication 9, comprenant en outre une pluralité d'entrées dans la chambre de combustion pour l'introduction d'une pluralité de flux de fluide et d'un gaz combustible en tant que mélanges respectifs dans la chambre de combustion et ledit pilote est situé de sorte que, lorsqu'elle est allumée, la flamme de pilote annulaire entoure des mélanges à brûler afin que tous les mélanges puissent être allumés par ledit pilote.

12. Brûleur selon la revendication 6 ou 7, dans lequel une portion de l'agencement de déversoir est solidaire avec le pilote et dans lequel le pilote comprend un passage fermable permettant, lorsqu'il est ouvert, à de l'eau utilisée pour nettoyer le pilote de s'écouler à travers le passage et sur le déversoir, et, lorsqu'il est fermé, au pilote de former ladite flamme annulaire.

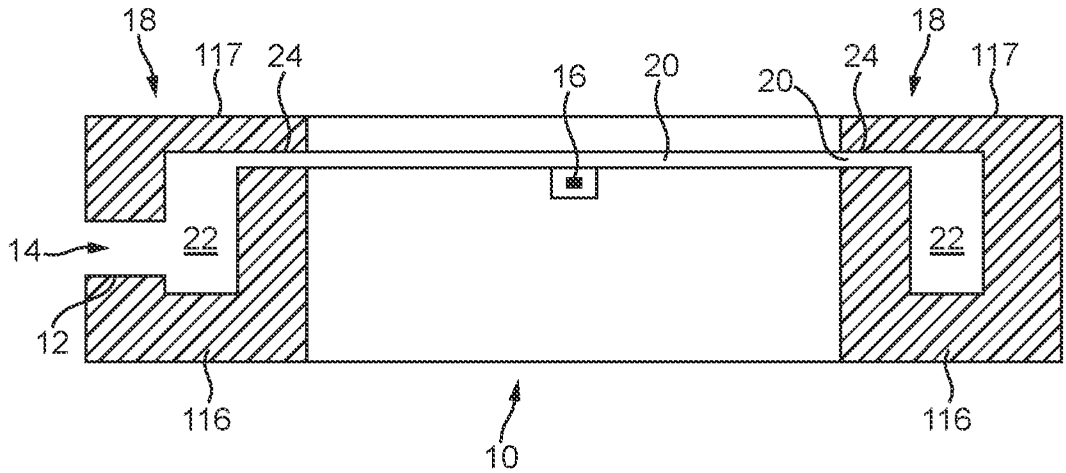
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FIG.1a

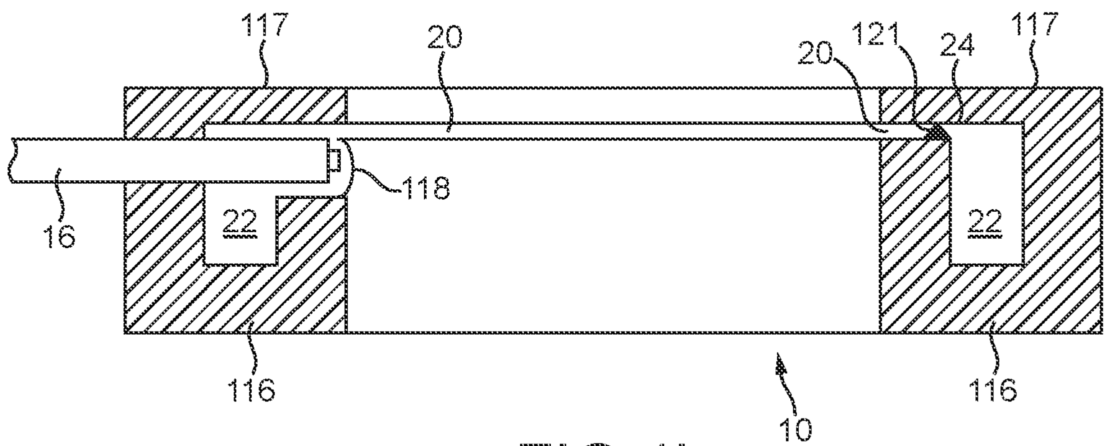
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FIG.1b

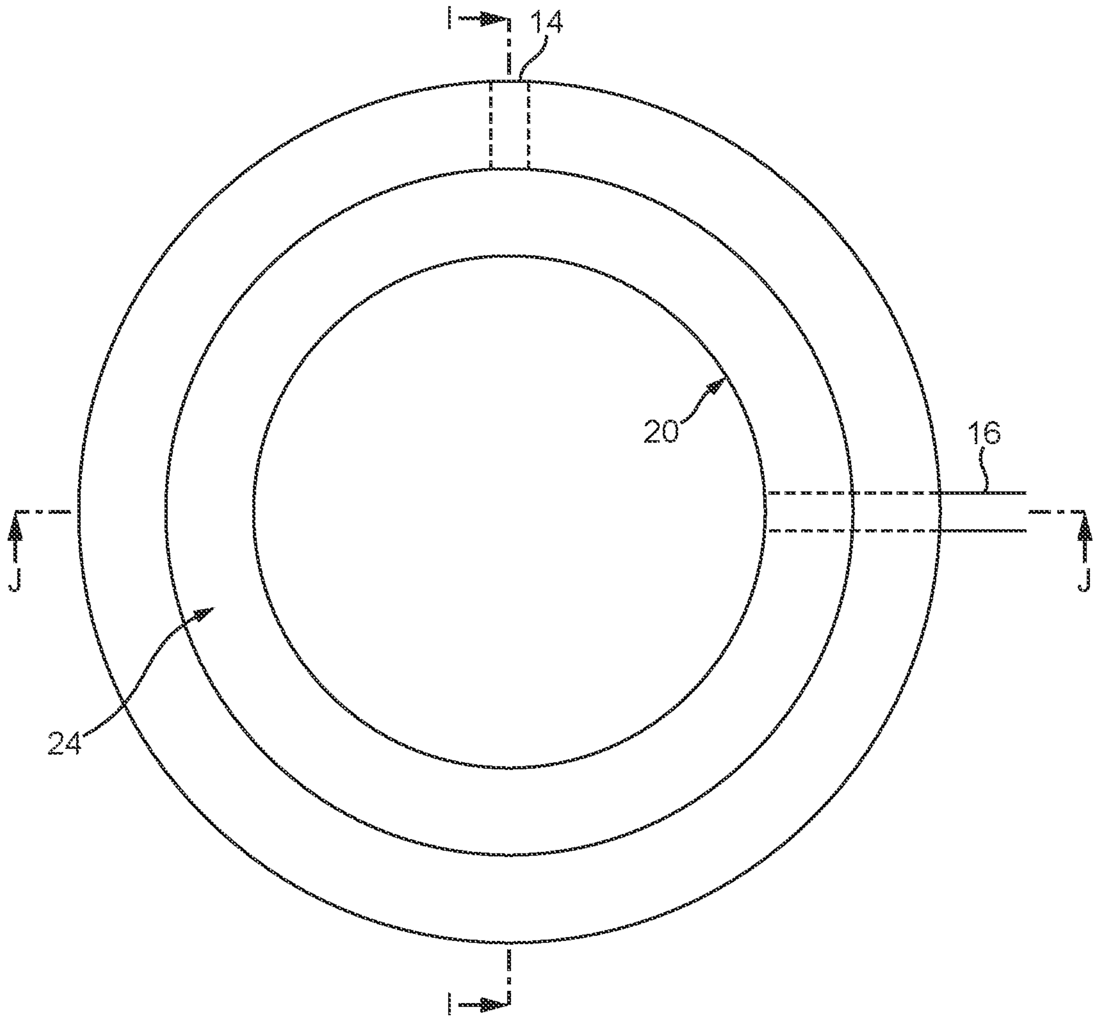


FIG. 2

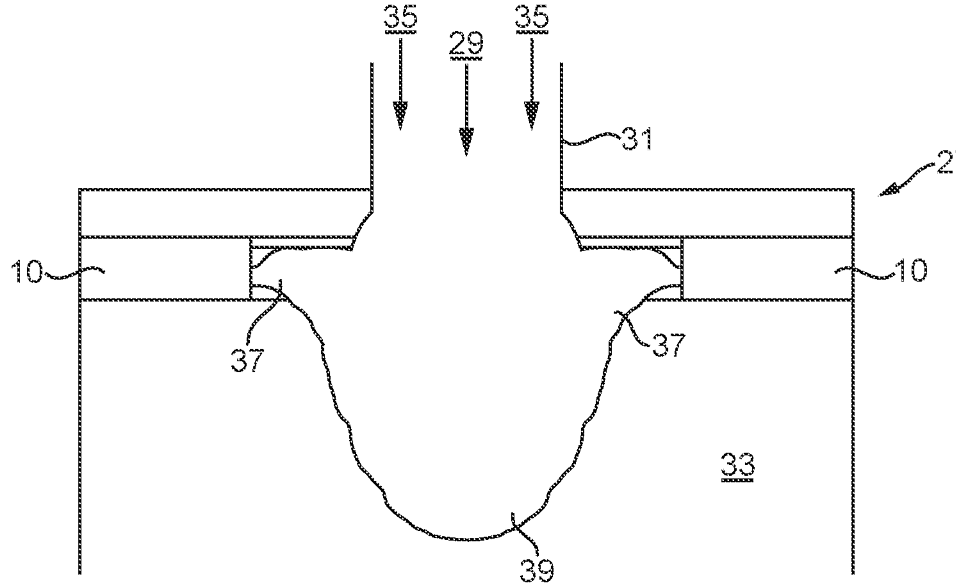
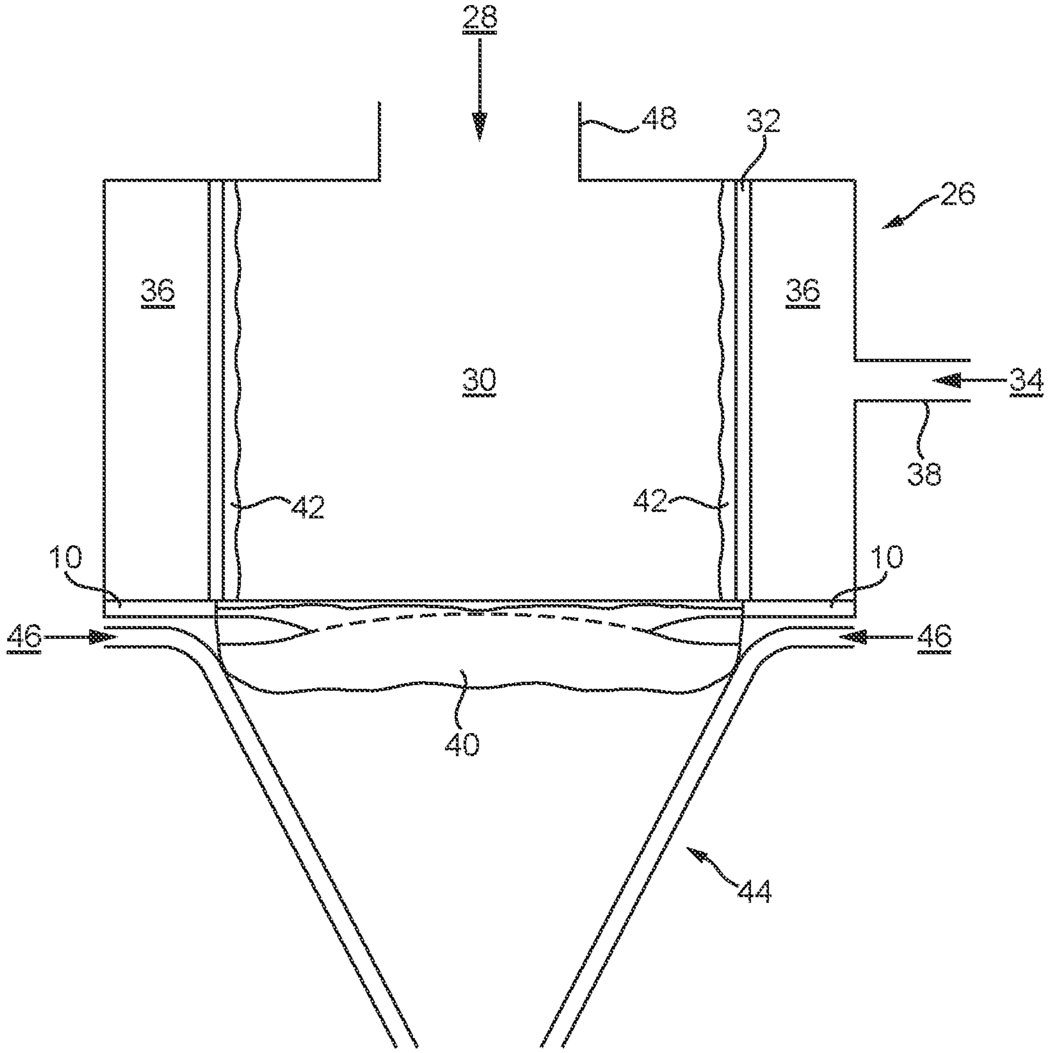


FIG. 3



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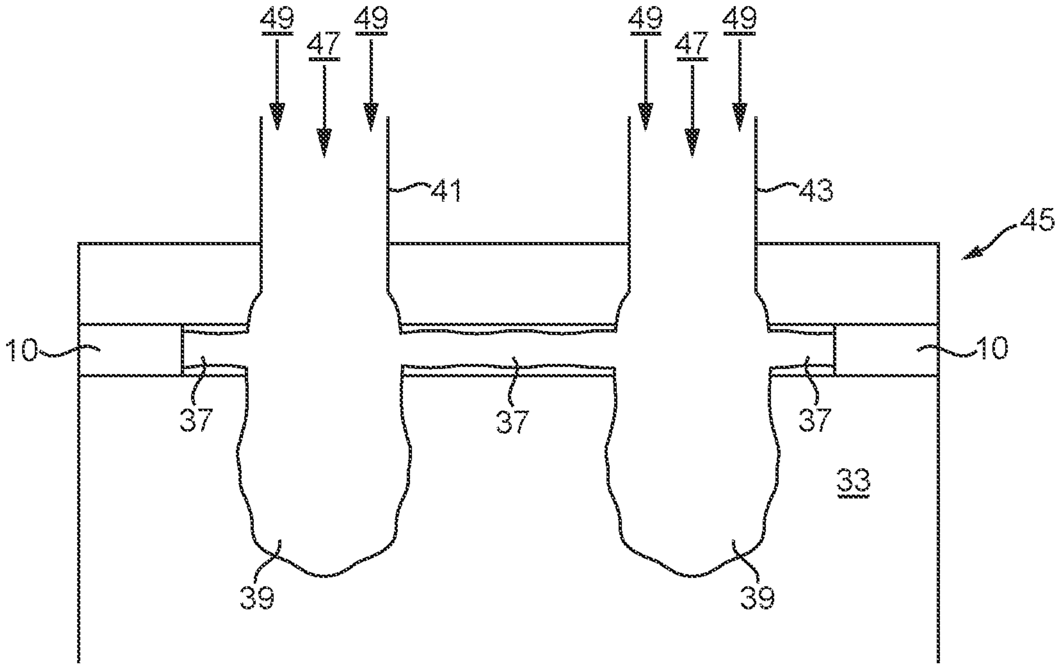
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FIG. 5

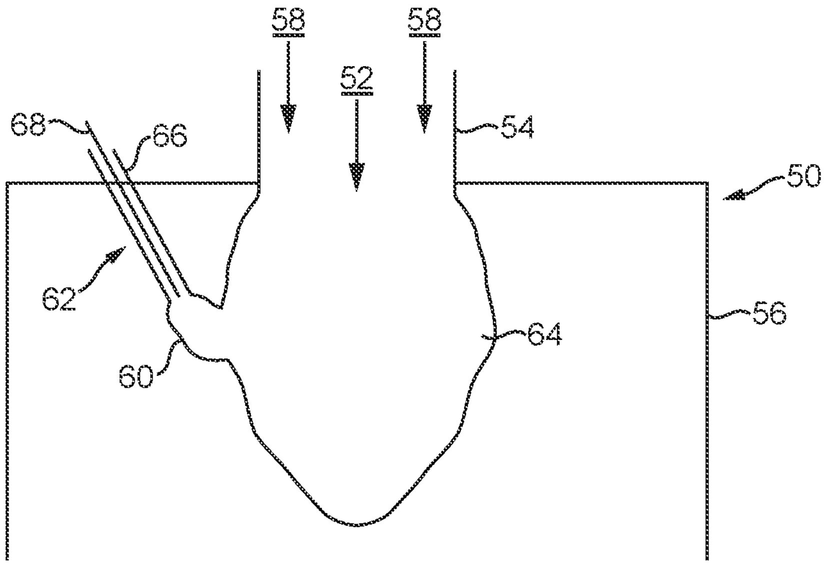
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FIG. 6

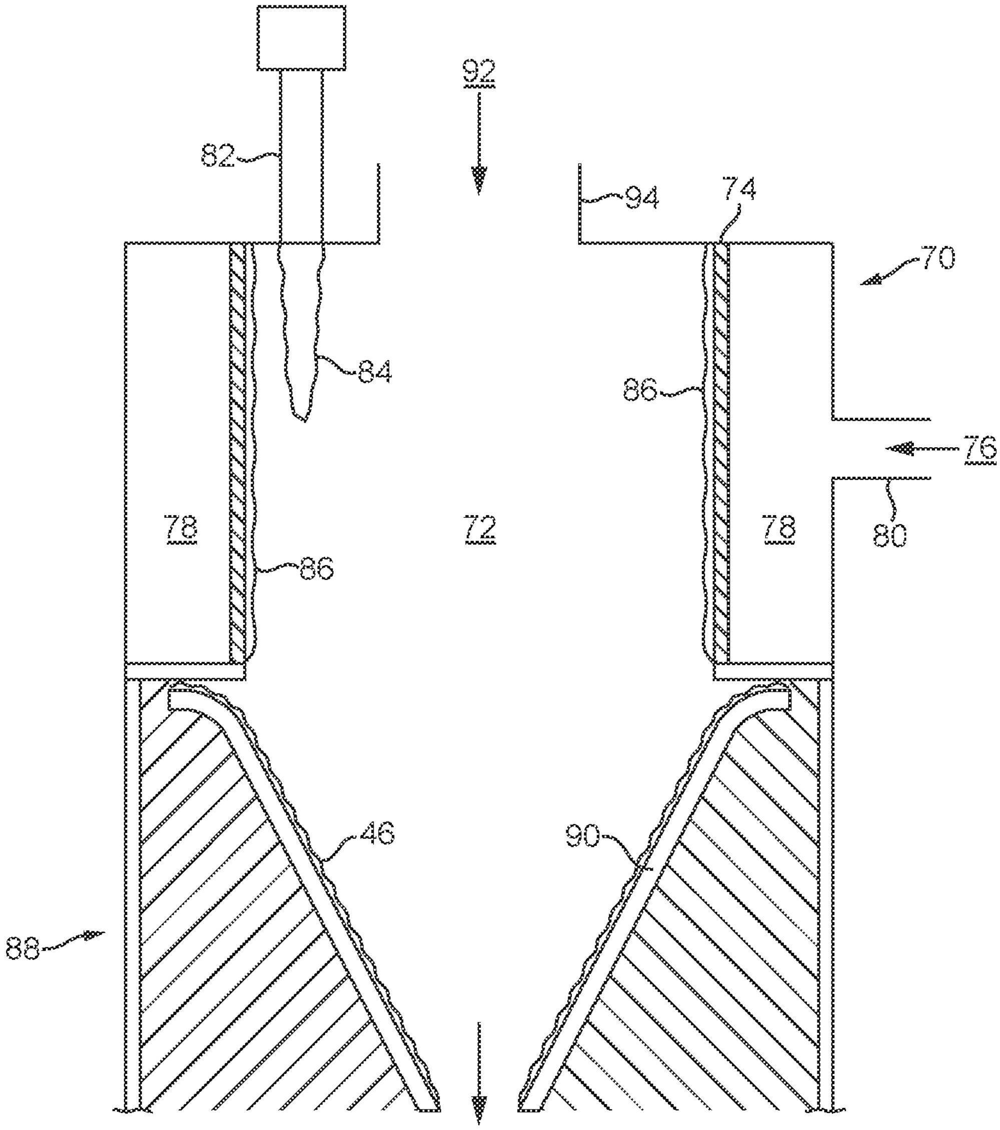

FIG. 7

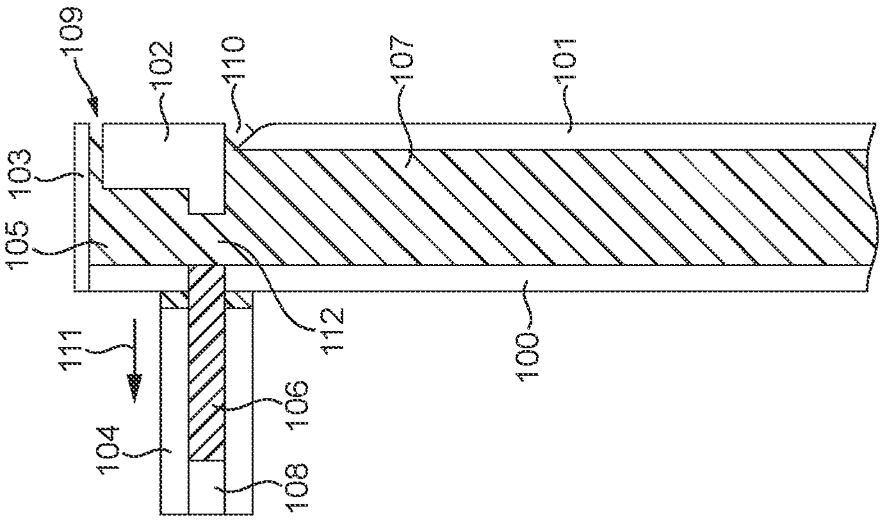
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FIG. 9

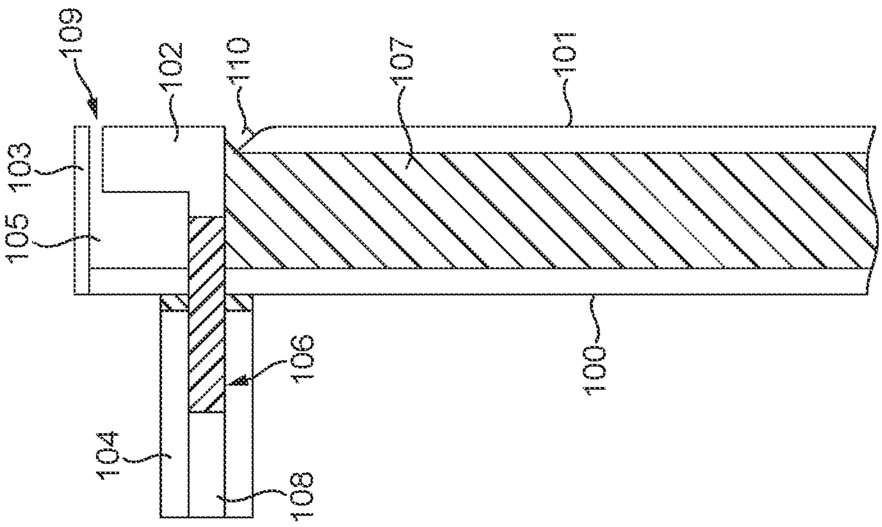
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FIG. 8

REFERENCES CITED IN THE DESCRIPTION

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