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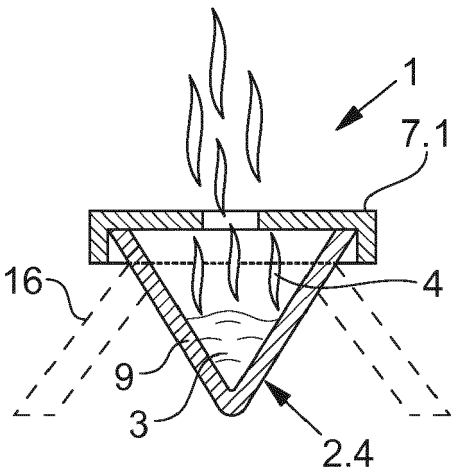
(54) BURNER FOR FIREPLACES WORKING WITH LIQUID OR GELLED FUEL

(57) The present invention concerns a burner operated by combustion of a liquid or gelled fuel, preferably ethanol. The burner of the invention comprises a container for containing the liquid or gelled fuel which is subjected to combustion during the use of the fireplace. Preferably, at least part of the container comprises a transparent and/or translucid material, allowing the perception, by an external observer, of a flame created inside the container across a wall of the container. In a preferred embodiment, the burner is for a fireplace, preferably an ethanol fireplace. Preferably, the burner can be used indoors and outdoors.

Fig.8



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Description

Technical Field

[0001] The present invention relates to the domain of fireplaces operating with liquid or gelled fuel, such as ethanol, and in particular ethanol fireplaces. The invention relates to a burner, in particular for such fireplaces and to covers, walls or plates and lids of burners.

Background Art and Problems Solved by the Invention

[0002] Fireplaces using a liquid or gelled fuel, such as ethanol fireplaces, have become very popular in the recent years. Since many people live in an apartment or in a house lacking a chimney pipe, setting up a classic chimney is not easy to accomplish. A chimney using a liquid fuel provides the warm ambiance of a classical chimney without requiring the installation of pipes. An ethanol fireplace, for example, can be attached to a wall, can be placed on a table, in a frame, and can also be placed on the floor. The combustions of ethanol is considered clean and more complete compared to the combustion of wood or coal, which is why a pipe for evacuating gases and soot particles is not required or only if relatively large amounts of ethanol are burned.

[0003] Besides the well appreciated aesthetic and decorative characteristics, the combustion of ethanol releases a considerable amount of heat, rendering the ethanol fireplaces suitable for heating. Contrary to classical fireplaces, ethanol fireplaces can be realized in any size, and the combustion can be easily controlled by the opening through which air is allowed to access the burner and by the opening through which the flames created by the combustion escape the burner.

[0004] The central parts of a liquid or gelled fuel fireplace, such as the burner containing the liquid fuel, the cover or lid of the burner thereof but also the support frame of the fireplace, are generally made of metal, such as stainless steel, due to the heat resistance of stainless steel and its aesthetic properties. Furthermore, stainless steel is a material that is accepted by norms for use in the pharmaceutical and food areas. Despite of the heat resistance of stainless steel, the latter expands, delates and deforms under the effect of heat, and it is generally necessary to add reinforcing structures. One problem is that a temperature gradient may occur within the material of the burner, with higher temperatures at the open surface of fuel, where the combustion takes place and flames are created, and lower temperatures at the bottom of the burner, where the liquid fuel is at some distance from the place of combustion. This temperature gradient may lead to important distortions, which need to be counteracted by reinforcing structures. It is noted that the larger the ethanol fireplace, the more important the problem of distortion becomes. According to the knowledge of the present inventors, this problem is at the origin of the size limitation of ethanol chimneys. The burners of ethanol chimneys currently available commercially do generally not exceed a length of about 1 meter (1m). Longer burners need to be equipped with complex reinforcing structures. It is an objective of the invention to avoid the problem of distortion of the burner of a liquid or gelled fuel fireplace during operation and to be able to provide larger burners for larger liquid or gelled fuel fireplaces than those that are currently available.

[0005] It is an objective of the invention to provide burners that exhibit less thermal expansion and/or dilation during operation. It is noted that the frames and supports for burners need to provide for extra space in order to take thermal expansion into account. It is an objective to provide burners that can be used in fireplaces with narrower fabrication tolerances, for example burners that can be more precisely fit in their support, such as in the overflow container. The latter has the purpose of collecting the fuel in case of damage to the burner and is thus used for increasing safety. Less thermal expansion of the burner means that the burner can be more fittingly placed in the overflow container.

[0006] It is an objective of the invention to provide a burner that is resistant to temperature shocks. In particular, it is an objective to provide a burner and/or fireplace that can be operated outdoors, at extreme temperature conditions, such as at any temperature in the range of -50 to 60°C, for example. When operated at cold temperatures, the burner itself will be cold before operation and will be exposed to a heat shock upon lightening. Preferably, the burner of the invention is capable of supporting such conditions and being operational under such extreme conditions. It is also an objective to provide a burner for a liquid or gelled fuel fireplace, wherein the burner is constructed in such a manner that pre-heating of the liquid or gelled fuel is not required before lightening the fireplace comprising the burner. For example, in the state of the art devices, heating of the liquid fuel is sometimes required, for example in order to have a clean combustion.

[0007] It is another objective of the invention to provide alternative materials for the fabrication of a burner for a liquid fuel fireplace, in particular materials exhibiting properties of resistance to heat and to temperature gradients.

[0008] The importance of the aesthetic and decorative aspects of a liquid fuel fireplace have been mentioned above. It is another objective of the invention to provide additional, unexpected and unprecedented aesthetic effects in the area of liquid or gelled fuel fireplaces such as ethanol fireplaces.

[0009] It is also an objective of the invention to provide a liquid or gelled fuel fireplace that operates in a natural manner, that is to say, that produces a nice flame even in the absence of any pumps for providing air or for actively pushing the fuel out of the burner. Such equipment is sometimes used in order to control the combustion, such as the rate of combustion and the aspect of the

flames that are created. It is noted that such equipment often relies on electronics, which is sensitive to heat and which may thus either be damaged during operation of the fireplace or may force switch off the fireplace if a threshold temperature is reached. In this context, the problem that the person skilled in the art encounters is the one of controlling the combustion in such a manner so as to produce a flame as desired. This problem involves, amongst other aspects, assuring an equilibrium between the air (in particular, the oxygen thereof) that is capable of accessing the place of combustion in or on the burner and the amount of fuel that is consumed. Many ethanol fireplaces suffer from insufficient provision of air, such that the combustion is not complete, undesired soot is generated, and bad odor along with it. The generation of soot particles frequently leads to aching eyes with the persons in vicinity of the fireplace.

[0010] In view of the above, the present invention also addresses the problem of controlling the combustion in such a manner so as to avoid the occurrence of undesired odor and soot, and to improve the efficacy of combustion, preferably in the absence of actively controlled air, oxygen or fuel transport, such as air or fuel pumping or pushing, and the like.

[0011] Yet another problem is related to controlling and optimizing combustion in a liquid fuel fireplace, namely the creating of flames having desired shapes and movement behavior. It is generally preferred, again for esthetic reasons, to produce flames resembling that of a classical wood-burning chimney. More specifically, it is desirable to provide "dancing" flames, that is, relatively large flames that appear and disappear and/or that displace along the burner. Flames having a constant and/or small size and being at a fixed position on the burner are less appreciable. The latter flames are produced, for example, by burners in which the fuel is pushed out through an opening in the burner and combustion takes place above the opening instead of inside the burner. Generally, the fuel is pushed out if the fuel in the container containing the fuel is under pressure or if a pump is used to push out the fuel. The invention seeks to provide a burner system which produces dancing flames as depicted above, preferably in the absence of electronics prone to heat or any external energy requiring propelling means for controlling amount of fuel and oxygen availability at the combustion site. It is an objective of the invention to control combustion and/or the shape behavior of the flames by the geometric design of the burner and other structural constituents of the fireplace.

Summary of the Invention

[0012] Remarkably, the present inventors provide a burner comprising a container, which comprises at least a part that is transparent and/or translucid. The burner and/or the fireplace comprising the burner is preferably set up in such a manner that an external observer can perceive the flame as it is generated inside the container during the operation of a fireplace comprising the burner. In some embodiments, the invention provides containers made from quartz and/or borosilicate for use as burners.

[0013] In an aspect, the present invention provides a burner operated by combustion of a liquid or gelled fuel, the burner comprising a container comprising at least one part comprising a transparent and/or translucid material.

[0014] In an aspect, the present invention provides a burner operated by combustion of a liquid or gelled fuel, the burner comprising a container comprising and/or consisting essentially of a material selected from quartz and glass resistant to temperatures and/or temperature gradients within the glass in the range of -50-350°C or more, preferably -30 to 300°C, most preferably - 20 to 300°C.

[0015] In an aspect, the present invention provides a burner operated by combustion of a liquid or gelled fuel, the burner comprising a container comprising and/or consisting essentially of a material selected from quartz and borosilicate.

[0016] In an aspect, the present invention provides a burner operated by combustion of a liquid or gelled fuel, the burner comprising a container comprising and/or consisting essentially of a material selected from quartz and glass comprising B_2O_3.

[0017] In an aspect, the present invention provides a burner operated by combustion of a liquid or gelled fuel, the burner comprising a container comprising at least a side wall or part thereof consisting essentially of a material selected from quartz and glass comprising B_2O_3.

[0018] In an aspect, the present invention provides a lid, cover or wall of a burner operated by combustion of a liquid or gelled fuel, wherein the lid, cover or wall comprises an opening, through which a flame generated by combustion of the liquid or gelled fuel can exit the burner and air from the environment can enter the inside of the container, wherein said opening comprises one or several air access zones, where said opening is enlarged.

[0019] In an aspect, the present invention provides a lid, cover or wall of a burner operated by combustion of a liquid or gelled fuel, wherein the lid, cover or wall comprises an opening, through which air from the environment can enter the inside of the container, wherein said opening is defined by an edge comprising one or several curved and/or rounded portions. Preferably, said opening is circular or elliptical, said edge preferably defining a circle.

[0020] In an aspect, the invention provides the use of borosilicate and/or quartz in manufacturing a burner, in particular for a liquid or gelled fuel fireplace, and to a method of producing the burner by using such materials.

[0021] In an aspect, the invention provides a fireplace operated by combustion of a liquid or gelled fuel, wherein the fireplace comprises the burner of the invention.

[0022] In an aspect, the invention provides a burner, which can be lighted and can operate without the need of preheating the liquid or gelled fuel.

[0023] In an aspect, the invention provides a shutter

or damper plate for covering partially an opening of a burner, the damper plate comprising a recess comprising a curve and/or a recess comprising an edge following the line of a curve.

[0024] Further aspects and preferred embodiments of the invention are defined herein below and in the appended claims. Further features and advantages of the invention will become apparent to the skilled person from the description of the preferred embodiments given below.

Brief Description of the Drawings

[0025]

Figures 1 to 6 are perspective views of different embodiments of containers for providing burners of the invention.

Figure 7 is a front elevational view to a burner of an embodiment of the invention during operation.

Figure 8 is a side elevational view of the burner shown in Fig. 7.

Figure 9 is a perspective view of the burner shown in Figs 7 and 8.

Figure 10 perspective view of a burner according to another embodiment of the invention.

Figures 11 to **15** are top-down views of openings in a lid, wall or cover plate of a burner according to different embodiments of the invention.

Figures 16A, **16B**, **17**, and **18** are top-down views of openings in a lid, top wall or cover plate of a burner according to further embodiments of the invention.

Detailed Description of the Preferred Embodiments

[0026] The present invention relates to burners operated by combustion of a liquid or gelled fuel. In an embodiment, the liquid or gelled fuel is selected from liquid or gelled alcohol (e.g. methanol, ethanol, propanol), hydrocarbons, benzine, petroleum, and oils. Preferably, said fuel is an alcohol, such as methanol, ethanol or propanol, or an alcohol gel. Preferably, the liquid fuel is selected from fuels that are liquid at ambient pressure (such as 1 bar) and room temperature (25°C), preferably liquid in a temperature range of at least 0 to 30°C. For example, in case of a gelled fuel, the fuel may comprise the liquid fuel and a gelling agent. In a preferred embodiment, the fuel is ethanol.

[0027] The burner is preferably for a fireplace operated by combustion of a liquid or gelled fuel, preferably an ethanol fireplace.

[0028] The burner of a fireplace burning a liquid or gelled fuel generally comprises a container or chamber which contains and/or retains the fuel. The fuel is preferably burned inside the container or chamber. A flame generated at or above the fee surface of the fuel preferably exits the container through an opening provided on the container. The container of the invention may be of any geometrical form.

[0029] Preferably, the liquid or gelled fuel in the container is present at ambient pressure. Preferably, the fuel is not significantly present at above-ambient pressure in the container. Indeed, the opening in the burner preferably allows for pressure equalization between the inside of the burner and the environment. Accordingly, when the fireplace is not operated and thus not producing a fire, at ambient pressure and with the opening being open, the liquid or gelled fuel preferably substantially remains inside the container, with the exception of evaporation taking place at the pressure and temperature of the environment of the fireplace.

[0030] **Figures 1** to **6** show various embodiments of containers **2.1-2.6** that may be used for the purpose of the present invention. It is noted that the container is preferably tight and/or water proof towards the bottom part, where the liquid fuel is stored, so as to safely retain the liquid fuel inside the container. Preferably, the bottom plate **9.1** lacks any hole or opening, and the same preferably applies to the bottom half of the later or side walls **9** of the container. For example, the containers shown in Figs 1 and 2 have a rectangular general outline, the container **2.3** in Fig. 3 has a cylindrical outline, the container **2.4** in Fig. 5 has a V-shaped cross section, and the container **2.5** shown in Fig. 6 has an essentially tubular outline.

[0031] The invention also encompasses a substantially tubular container forming a closed loop, for example an annular ring. The closed loop tube preferably comprises a longitudinal slot forming an opening on top through which flames can exit the container. For example, the invention encompasses a container comprising a ring formed by curving and closing a tube as shown in Fig. 6.

[0032] The container **2.6** shown in Fig. 4 comprises the form a partial sphere, in particular a sphere of which a portion on the top of the sphere is removed so as to form a border **6** defining a top opening **6.** Substantially, the container **2.6** is or comprises a spherical cap. Furthermore, the container **2.6** comprises openings **11.1**, which are provided in the side or lateral walls **9** of the spherical cap, preferably at a level above the center (above the equator) of the sphere on which the spherical cap is based. Preferably, the openings **11.1** are circular, elliptical, or comprise at least a curved portion. The openings **11.1** operate as air access zones, which improve the access of air to the surface of the liquid fuel in the container. The top border **6** forming the top opening of the container, comprises structures **15** that are outwardly bulged portions of the border **6.** These structures have the form of a spout lip or pouring spout **15.** The purpose of the spout lips is to improve the behaviour and shape

of the flame exiting the container **4.** Preferably, the container **2.6** comprises a plurality of said air access zones **11.1** in the wall of the container and a plurality of outwardly bulged border portions **15.** Preferably, the air access zones **11.1** are arranged at equal distances from each other. Preferably, the outwardly bulged border portions **15** are arranged at equal distances from each other. Preferably, the outwardly bulged border portions **15** and the air access zones **11.1** are offset, that is, they are preferably not aligned on a same meridian of the sphere. Preferably, the distances between an air access zone **11.1** and the two neighbouring bulged border portions **15** are equal. With the air access zones **11.1** and the bulged border portions **15** being projected on the equator circle plane, the distance between the air access zones **11.1** and the bulged border portions **15** are preferably equal, that is at equal angles when measured from the center of the equator circle. It is noted that the container **2.6** shown in Fig. 4 is preferably operated without a top wall and/or top lid, such that the top opening defined by the top border **6** corresponds preferably to the opening through which the flames exit the container during operation.

[0033] Preferably, the container has at least one or more side walls **9** and, depending on the shape of the container, a bottom or base **9.1**, which side walls and/or bottom are preferably arranged so as to form a container suitable to retain the fuel in such a manner so as to allow the fuel to have a free or open surface on the top of the fuel. The side walls may extend vertically from the base **9.1** to the top of the container, or may be skewed, as shown in Fig. 5. In some embodiments, the container **2.1-2.4**, may be open toward the top, that is, having side walls **9** ending on the top and providing a top border **6** defining a general top opening. In the present specification, reference numeral **6** refers to both, the top border and the opening in the container defined by the border. As will be described in more detail herein below, the top of the burner is preferably covered at least partially by a cover, lid or top plate comprising a specifically defined opening **8.** Indeed, the present invention is not limited with respect to the particular form, shape or outline of the container, and the invention may be put in practice with a container having any desired form. This leaves the skilled person a vast number of design options for putting into practice a particularly designed fireplace and/or burner.

[0034] In an embodiment, the container **2.1-2.6** comprises at least one part comprising a transparent and/or translucid material. In an embodiment, the container **2.1-2.6** comprises at least a wall or a window, for example a side wall comprising a part that comprises a transparent and/or translucid material.

[0035] It is noted that the transparent and/or translucid material may be coloured or may be devoid of any color. The addition of color to the materials disclosed below is as such known to the skilled person and encompassed by the present invention. In an embodiment, the color is added in such a manner that the material remains transparent and/or translucid to at least some light of the spectrum of visible light.

[0036] In an embodiment, the transparent and/or translucid part of the container is provided in such a manner so as to allow the perception, by an external observer, of a flame **4** created inside the container. In an embodiment, the container and or burner comprises a transparent and/or translucid material provided so as to allow the perception, during combustion of said liquid or gelled fuel **3** in the inside of the burner, of a flame **4** generated in the inside of the burner on or above the open surface **5** of the liquid fuel **3.** This preferably also applies to the situation where the transparent material is coloured. The flame **4** may thus preferably be seen by an observer while the flame is still inside the container and may preferably be seen through a wall of or through a window in the container, as illustrated, for example, in Figs. 7, 8 and 10, wherein the wall or window preferably comprises or is made from the materials disclosed in the present specification.

[0037] In other embodiments, the invention encompasses containers comprising several materials, such as parts made from quartz and/or borosilicate and other parts made from stainless steel. The quartz and/or borosilicate may be provided to form a window or wall of a container, for example.

[0038] It is noted that viewing the flame inside the burner provides a novel aesthetic effect in that the flame is visible across the burner and as it forms and moves on the top of the fuel. Furthermore, the size of the flame as seen by the observer is increased. In burners that do not comprise any transparent material, the flame becomes visible only as it exits the burner through a top opening. The present invention allows the visualisation of the entire flame from the surface of the fuel including the part that exits and emerges from the top of the burner.

[0039] In an embodiment, said container **2.1-2.5** comprises at least part of a wall, in particular a lateral or side wall **9** that is made entirely from said transparent and/or translucid material. In an embodiment, an entire side wall **9**, several or all side walls of the container **2.1-2.5** may be made from said transparent and/or translucid material.

[0040] In an embodiment, said container **2.1-2.5** consists and/or is made entirely of said transparent and/or translucid material. Indeed, the containers shown in Figs. 1-5 are preferably made from quartz and/or borosilicate glass.

[0041] The present inventors surprisingly found that certain transparent and/or translucid materials, preferably the materials disclosed in the present specification, can be used for producing containers of burners of liquid fuel fireplaces. The use of these materials provides manifold advantages. For example, such materials are less prone to deformation due to high temperature, temperature shocks and temperature gradients occurring across the material. Therefore, such materials provide much more possibility with respect of the design of burners and

remove the requirement of reinforcing structures. Thanks to the resistance to temperature shocks, the fireplaces can be provided next to or in vicinity of swimming pools, since the burner of the invention supports temperature shocks related to contact of the operating burner with splashing water, for example. Prior art burners made from stainless steel are likely to burst under such conditions. For example, the invention allows producing an effect of fire emerging from the water ("burning water"), if the burner is placed on a same level as the surface of the water of the pool, or if the surface of the fuel in the burner is at the same level as the surface of the water in the pool. The burner of the invention may also be placed to be in contact with snow or ice.

[0042] Preferably, the burner and/or fireplace of the invention can be used indoors and outdoors, or can be adapted to indoor and/or outdoor applications, as desired.

[0043] Without wishing to be bound by theory, the present inventors suppose that heat can rapidly spread within the materials disclosed in the present specification, such that temperature gradients may not exists for a long time within the material once the fuel in the burner is lighted. This would also explain the surprising observation that, with the burners and fireplaces of the invention, the fuel requires little or no pre-heating when the fire is lighted. It is speculated that thanks to rapid spreading of heat within the material of the container, temperature gradients within the liquid or gelled fuel inside the container may be rapidly eliminated.

[0044] Another advantage of the materials disclosed in the present specification is that they allow the creation of thinner walls of the recipients compared to burners made from stainless steel with comparable size and nominal volume. Thanks to the thinner walls, heat spreads more rapidly within the material and the advantages related to the resistance to heat shocks is further increased, besides the fact that less material is used.

[0045] Another important advantage of the use of such materials in burners is that new visual effects can be created, since the materials allow the visualization of a flame already inside the burner and not only when the flame exits the burner, as is the case in prior art burners. A particular visual effect may be the shape of the flame on the surface of the fuel. In some cases, the flame forms like a layer on the surface (not shown), which layer is spaced apart from said surface so as to float on said surface.

[0046] In addition to aesthetic advantages, the present invention allows the creation of larger burners, for example longer burners than those made from steel without the need of reinforcing structures for compensating deformational forces. After a length of about 1m, the forces and effects of deformation and bending during operation of burners made from steel become uncontrollable, which is why larger burners made from stainless steel need reinforcing structures.

[0047] The present invention allows producing burners without any particular limitation with respect to the longitudinal extension. Accordingly, the invention encompasses burners having a longitudinal extension of 1 meter (m) or more, 1.2 m or more, 1.3m or more, 1.4m or more, 1.5 m or more, for example 2m or more. In an embodiment, a burner having a longitudinal extension of 3 meters or more is provided. Of course, smaller burners may be made, too. These lengths apply in particular also to the container of the burner, which contains the fuel during the operation (that is during burning). In particular, the above lengths apply to the extension of the continuous receptacle for fuel contained in the container of the burner. In accordance with these embodiments, the fuel is preferably not placed in a sequence of separate containers that are connected in series to each other.

[0048] It is noted that thanks to the absence or very low thermal expansion of the materials disclosed in the present specification, the present invention provides the possibility of providing a line or arc comprising a plurality of burners one after the other, in particular juxtaposed burners. This allows again the creation of novel aesthetic effects. It is not necessary to provide for a gap between juxtaposed burners as would be the case with burners made from stainless steel, which exhibit important thermal expansion.

[0049] The transparent and/or translucid material is preferably selected from quartz and glass that supports the temperature gradients and the high temperatures generally occurring in liquid fuel fireplaces, such temperatures and temperature gradients may be in the range from -50 to 350°C. For example, if the fireplace is used outdoors, the temperature gradient that need to be supported may reach from -40° (or -25°C, depending on the outside temperature) up to 300°C, preferably up to 350°C, which is the heat generated by the combustion of the liquid fuel in the burner of the fireplace. The present inventors observed, surprisingly, that there are translucid and/or transparent materials, which resists such temperatures and temperature gradients, and that the materials are preferably not broken due to such conditions and/or do not experience a deformation and/or thermal expansion that would render the material unsuitable for producing a liquid or gelled fuel fireplace.

[0050] In a preferred embodiment, the fuel container of the burner consists of a material selected from quartz and borosilicate. In an embodiment, said transparent and/or translucid material is selected from quartz and borosilicate. Quartz is preferably characterized by its high content of SiO_2. Preferably, said quartz is composed by at least 90% or more of SiO_2, preferably at least 95%, more preferably at least 98%, even more preferably at least 99% and most preferably at least 99.2%, for example at least 99.5% of SiO_2.

[0051] For the purpose of the present specification, percentages are percent by weight.

[0052] In an embodiment, the said transparent and/or translucid material is selected from quartz and from glass comprising more than 74% of SiO_2, preferably more than

78%, and even more preferably more than 80% of SiO_2.

[0053] In an embodiment, the said transparent and/or translucid material is selected from quartz and from glass comprising trioxide of boron (B_2O_3), preferably comprising 1-50%, 3-30% B_2O_3, more preferably 4-25%, and even more preferably 5-20% B_2O_3.

[0054] The inventors observed that quartz and glass comprising B_2O_3 is suitable for producing burners for liquid or gelled fuel fireplaces. Without wishing to be bound by theory, the inventors suppose that presence of B_2O_3 in glass and/or quartz renders the materials suitable for burners of liquid or gelled fuel fireplaces. It is noted, in this context, that the protective glass used in ethanol fireplaces for shielding an observer from the fire is generally not made from quartz or borosilicate, but from other glass types.

[0055] In some embodiments, borosilicate glass preferably has additional components, in particular metal oxides, which may be selected from one or more selected from the group of sodium carbonate (Na_2CO_3), sodium oxide (Na_2O), aluminium oxide (Al_2O_3) and sodium oxide (K_2O). In an embodiment, said borosilicate glass comprises SiO_2, Na_2O, B_2O_3, and Al_2O_3.

[0056] In an embodiment, said borosilicate glass comprises:

50 % to 90 % silica (SiO_2)
3 % to 30 % boron oxide (B_2O_3).
1 % to 20 % alkali metal oxides (sodium oxide Na_2O, potassium okide K_2O, ...)
1 % to 20 % aluminium oxide (Al_2O_3), and,
0 % to 10 % alkaline earth metal oxides (CaO, MgO, ...).

[0057] In an embodiment, said borosilicate glass comprises:

65 % to 85 % silica (SiO_2)
5 % to 25 % boron oxide (B_2O_3).
2 % to 15 % alkali metal oxides (sodium oxide Na_2O, potassium okide K_2O, ...)
1 % to 12 % aluminium oxide (Al_2O_3), and,
0 % to 5 % alkaline earth metal oxides (CaO, MgO, ...).

[0058] In an embodiment, said borosilicate glass comprises:

70 % to 80 % silica (SiO_2)
7 % to 15 % boron oxide (B_2O_3).
3 % to 8 % alkali metal oxides (sodium oxide Na_2O, potassium okide K_2O, ...)
1.5 % to 7 % aluminium oxide (Al_2O_3), and,
0 % to 5 % alkaline earth metal oxides (CaO, MgO, ...).

[0059] Preferably, the burner of the invention comprises, in a side wall or in the top side or wall, an opening **8** through which flames **4** created during the combustion of the fuel can leave the burner. **Figures 7**, **8**, **9** and **10** illustrate exemplary burners in operation. The burners **1** shown in Figs 7-9 comprise the container **2.4** having a V-shaped cross-section shown in Fig. 5. Fig. 10 shows a burner comprising the container **2.3** shown in Fig. 3.

[0060] The burner **1** in Figs 7-9 comprises a removable lid **7.1**, which is placed onto the open end or opening **6** of the container **2.4.** In this embodiment, the opening **8** specifically designed and provided for allowing the flame to exit the burner and to allow air get into the container is provided in the lid. In contrast, the embodiment shown in Fig. 6 lacks a removable lid, and the container **2.5** is built so as to be closed on the top besides the opening **8**, which opening is thus directly provided in a wall of the container. The container **2.5** shown in Fig. 6 has a particular, tubular form, with the opening **8** being provided in the wall of the tube or hollow cylinder forming the container **2.5.**

[0061] In other embodiments, a removable lid **7.1** comprising a flame-exit opening **8** may be absent. The opening **8** may, in accordance with an embodiment, be provided in a wall, such as a top wall, side wall or top plate of the container. For example, the lid **7.1** may be rigidly fixed and/or undetachably fixed to the container. For example, in an embodiment (not shown), a top plate comprising an opening **8** is welded to the container. In this case, a lid that can be removed by the user is absent.

[0062] In an embodiment, the burner of the invention comprises a container, and optionally a separate lid to be placed on the container, said lid preferably comprising an opening **8.** Optionally, the burner comprises a damper or shutter. The lid may be a separate piece or may be articulated on the container, so as to allow opening and closing of the container with the lid remaining connected to the container. If a lid is absent, the opening **8** is preferably directly provided in the walls of the container, for example the opening defined by the border **6** of the side walls or on the top walls of the container, as illustrated in the embodiments of Figs 4 and 6. A shutter, preferably in the form of a plate, is preferably provided so as to allow closing the opening **8** and thus extinguishing the fire.

[0063] Accordingly, the burner may (and preferably indeed is) equipped with a lid, damper or shutter, in particular provided for closing the opening **8** through which the fire exits the burner **1.** The shutter may be articulated to the entire fireplace or may be provided as a separate plate, for example, such that a user can move the plate and close opening **8** partially or totally, for diminishing or turning of the fire, respectively.

[0064] The present invention is not limited with respect to the materials from which the lid, top wall or top plate is made. In some embodiments, the lid **7.1** is made from steel, preferably stainless steel, or from any other suitable metal or alloys. In other embodiments, the lid **7.1** or top plate connected to the container may comprise or be made from a transparent material as mentioned elsewhere in this specification, for example quartz and/or

borosilicate.

[0065] It is noted that the figures do not show all structural parts of an ethanol fireplace, as these parts may be provided in accordance with the prior art. The present invention is by no means intended to be limited to any particular framework or support for the burner and may indeed be put into practice in combination with any frame. In some embodiments, the fireplace comprises a socket, a support construction on which an overflow container (or retention tank) and the burner are supported, as well as additional protection, for example a protective glass to be placed in front of the flame as it exits the burner for shielding an observer from the flame. For example, in Figs 8 and 9, a support structure **16** is shown with dotted lines, for illustrating the presence of structural parts on in which the burner is placed and supported. The present invention indeed provides manifold design possibilities, given the surprising simplicity of the burner. Given that any liquid or gelled fuel fireplace can be realized using the burner as disclosed herein above, the invention leaves room for creation with respect to the design of the fireplace, its support and/or frame.

[0066] Figures 7-10 illustrate an advantage of the burner of the invention, which is the possibility of perceiving the presence of flames **4** in the inside of the container of the burner, before the flame **4** leaves the opening **8.** For example, in Figs 7, 8 and 10, the containers **2.1** and **2.3** are made from quartz or borosilicate, which means that sidewalls of the containers are transparent. In these figures, the liquid fuel **3** as well as the flames **4** emerging from the open surface **5** of the fuel inside the containers **2.1**, **2.3** can be seen. Referring again to the other structural parts of the liquid- or gelled fuel fireplace, in particular the frame and/or support construction, it is preferred that such structural parts do not cover the entire view to at least a side wall or part of the sidewall of the container, such that the view to at least part of the inside of the container remains free at least from a particular position or viewing angle of the observer. In an embodiment, such support parts, such as support structure **16** may also be made from transparent material, for example from any glass or quartz, including the transparent materials mentioned elsewhere in this specification.

[0067] In a preferred embodiment, the burner of the invention and the fireplace comprising the burner operate "naturally", which means that they do not contain any means for actively propulsing or pumping fuel, oxygen or air so as to control the rate of combustion and/or the size and intensity of the fire. Likewise, the burner and/or fireplace of the invention preferably lacks an entity for heating the fuel, as is done in certain prior art fireplaces. Preferably, the air and/or or oxygen required to conduct the combustion gets into the burner by natural venting, natural pressure compensation and/or diffusional forces. Preferably, the burner and/or elements thereof are designed so as to allow natural operation lacking the need of actively pumping air and/or fuel, and without need of heating the fuel. "Active pumping" means here pumping driven by a motor, pump, actuator and the like. Such devices generally require separate energy supply, in particular electricity, pneumatic or hydraulic energy or pressure, for example. Preferably, the burner and/or fireplace is operational without any electrically driven and/or electronic device. Preferably, the combustion and/or the flame aspect and behaviour is controlled by the design of the burner, and in particular by parameters such as the design of the one or more openings through which air accedes into the burner and flames leave the burner so as to produce the desired aesthetic effects. Other parameters, such as the inner geometry of the burner may also be selected so as to have achieve a desired effect.

[0068] In order to have a fire with a desirable color, aspect, size and moving behaviour, it is necessary to establish a balance between access of air and combustion rate. This point is also relevant for assuring complete combustion. If combustion is not complete, soot and bad odour are produced, besides the fact that the aspect of the flames is less aesthetic. The inventors have observed that several ethanol fireplaces that are commercially available produce such undesired odours and may also result in itching eyes, probably due to particles of soot that are produced when combustion in the fireplace is not complete.

[0069] In some aspects and embodiments, the invention provides burners having openings particularly designed for obtaining optimal air diffusion into the burner compared to evacuation of CO_2 and of the flames, so as to achieve a balanced flow of gases, a substantially complete combustion and flames having advantageous aesthetic properties and moving behaviour. **Figures 11-18** illustrate exemplary and preferred opening geometries in the burner according to embodiments of the invention. In these figures the openings **8.1-8.8** are shown from above. The details of the lid, plate or wall comprising the opening are not shown. The openings **8.1-8.8** may, for example, be provided in a lid **7.1** or **7.2** as shown in Figs 7-10 or in a top wall formed in one piece with, attached to, for example welded to the container of the burner. The invention also encompasses that openings are provided in lateral walls of the container.

[0070] In an embodiment of the burner **1**, **10** of the invention, said container **2.1-2.5** comprises a longitudinal opening **8**, or wherein said burner comprises a cover, lid **7.1**, **7.2**, or wall comprising said longitudinal opening **8**, through which a flame **4** generated by combustion of the liquid or gelled fuel **3** can exit the burner and air from the environment is allowed to enter the inside of the container **2.1-2.5,** wherein said cover, lid or wall **7.1**, **7.2** further comprises one or several air access zones **11**, where said opening **8** is enlarged, in particular where a spacial extension **22** of said opening is enlarged, and/or which are defined by an edge following a curved line **28.**

[0071] In an embodiment, the burner comprises air access openings **11** comprising or defined by curved and/or rounded down edges.

[0072] In an embodiment, said opening **8** is a contin-

uous opening comprising said air access zones **11**, which are distinguished from the remainder of the opening by the contour of the opening at that zone.

[0073] In other embodiments, the opening **8** comprises separate openings of different contours, for example separated by a material bridge provided by the top plate **13** or lid **7.1**, **7.2** of the burner. Accordingly, air access openings **11** may be provided separately from openings consisting essentially of longitudinal portions **12** in said lid or top plate. For example, one or more separate air access openings of substantially circular contour may be provided in proximity of one or both extremities (or close to the center, in analogy of Figs 17 and 18) of a longitudinal opening having the contour, for example, of a longitudinal portion **12** as described in this specification.

[0074] In some embodiments, such as illustrated in Fig. 4, the air access openings **11.1** are provided in the form of separate openings provided in wall, preferably a side or top wall of the container. Such openings may be substantially circular or elliptical, or at least comprising rounded or curved borders or edges. In the container **2.6** shown in Fig. 4, the flames created during operation of the burner will leave the container through the overall opening **6** as defined by the upper border of the container. A specific opening is absent.

[0075] It is noted, in this regard, that the recipients **2.1** to **2.4** shown in Figs 1 to 3 and 5 can also be used as burners as shown in these figures, without requiring any top plate or lid. The lids or top plates, such as shown in Figs 6 to 9, may be used for reasons of security and for reducing and/or controlling combustion. This also applies to the particularly designed openings **8.**

[0076] The opening **8** is preferably the opening provided for allowing the flames **4** of the fire to leave the burner during operation. Depending whether or not the burner comprises a movable and/or detachable lid **7.1**, the opening **8** is provided in the lid or in a upper or top wall of the burner, if the top wall is formed in one piece with the burner, for example if all walls including the top wall are welded together or formed in one piece with the container, as shown, for example, in Fig. 6. Accordingly, the opening **8** may be part of the container, for example as shown in the container **2.5**, where the opening **8** is provided in a tubular container wall. The burners based on containers **2.1-2.4** are conceived so as to contain a lid **7.1**, **7.2**, in which the opening **8** is provided. In other embodiments, containers **2.1-2.4** such as those shown in Figs 1-3, 5, comprise a top plate comprising an opening **8**, the top plate being rigidly and/or undetachably fixed to the container. The opening **8** may be realized as a cut-out, for example by cutting out the corresponding form resulting in an opening in the lid or container, as appropriate. Alternatively, the part of the burner comprising the opening may be generated from the beginning so contain the opening, for example by a molding or other form-shaping process in which the opening, or a part thereof, is part of the mold.

[0077] The opening **8.1** in Fig. 11 is mirror symmetrical with respect to longitudinal axis **17** and with respect to transversal axis **18**, the latter being perpendicular with respect to axis **17.** In the present description, reference numeral **8** may be used to refer not only to the particular longitudinal openings as shown in Figs 6-10, but also to refer to such longitudinal openings in a general manner, encompassing the openings **8.1-8.8** shown in Figs 11 to 18.

[0078] In an embodiment, the opening **8** is provided so as to comprise different parts or zones **11**, **12**, characterized by different geometric contours and/or configurations. The different geometric contours of the opening provide particular functions related to air inlet, into the burner, and outlet of the flame and CO_2 (waste gases in general), so as to balance these parameters.

[0079] In an embodiment, the profile, shape or contour of the opening (as seen in figures 11-15) is such so as to provide different opening sizes, widths and/or lengths. The opening contour is thus preferably not entirely homogenous or regular. One may say that the opening **8** follows and/or comprises different geometrical contours.

[0080] The openings **8.1-8.5** shown in Figs 11-18 preferably comprise a longitudinal portion **12.** In Figs. 11-17 the longitudinal portion **12** is a straight and regular portion, that extends along or in parallel to a straight axis **17.** In Fig. 18, the longitudinal portion **12.1** is bent, and extends along a curve, for example along an arc, such as the arc of an ellipse or a circle. In an embodiment, the opening **8** comprises one or several longitudinal portions **12**, **12.1** where said opening **8** has a substantially constant width **21**, and one or more air access zones **11**, wherein said opening bulges outwardly such that the width of the opening is locally enlarged. In the embodiments shown in Figs. 11-15, the longitudinal portion **12** has the form of a rectangle, such that the opening extends along axis **17.** In these embodiments, the edges **23**, **24** defining the longitudinal portion of the opening **8** follow the outline of a rectangle and/or follow two parallel sides of a rectangle. Accordingly, the "width" **21** is the distance of the opening along an axis parallel to axis **18.** More generally, the width is the shortest possible distance between the opposed edges **23**, **24** of the corresponding portion of the opening (here the longitudinal portion **12**). Preferably, the term "width" is intended to mean the distance between first and second edges **23**, **24** of the opening. Preferably, the "width" is the "average width" of the corresponding zone, in case the width is not constant over the entire zone.

[0081] In a preferred embodiment, the longitudinal portion is substantially regular, that is, has a substantially constant width as it extends along straight axis **17** (Fig. 11) or along a curve, as seen in Fig 18. With respect to the longitudinal portion **12.1** extending along a curve, the width **21** of the opening at a particular position preferably corresponds to the distance of the opening along an axis that is perpendicular to the line **27** that is the tangent with respect to the edge **23** of the longitudinal portion (Fig. 18). Preferably, the width **21** is substantially constant.

"Substantially constant" means that the width **21** varies less than 10% of its length, preferably less than 5%, and most preferably less than about 1%, less than 2% or less than 3% along the longitudinal extension of the longitudinal portion **12.** For illustration, the length **21** of the width of the longitudinal portion **12** in proximity of a first extremity **25** of the opening **8.1** varies less than 10%, preferably less than 3% (as indicated above) from the width of the longitudinal portion **12** in proximity of a second extremity **26** of the opening **8.**

[0082] In other embodiments, the edges **23**, **24** of longitudinal portion of the opening **8** are not in parallel over the all or part of the extension of the longitudinal portion **12.** In an embodiment, the edges **23**, **24** may converge and/or diverge within at least a section of the longitudinal portion **12** of the opening. For example, the edges **23**, **24** may converge towards the center of the opening **8** (for example toward axis **18** in Fig. 11) and diverge toward the extremities of the opening, such that the edges are closest to each other at the center and most distant towards the extremities **25**, **26.** Furthermore, the edges **23**, **24** may follow straight lines or may be curved.

[0083] Preferably, the opening **8** comprises one or more air access openings **11.** The air access openings **11** preferably comprise a part or region where the width **22**, that is the spacial extension of the opening **8**, is enlarged.

[0084] Without wishing to be bound by theory, the inventors suppose that at the enlarged zones **11**, a larger amount of air is allowed to enter the burner compared to the longitudinal zone **12**, and that this locally limited enlargement of the opening **8** improves the quality of the combustion process. The term "air access opening" is not intended to mean that air only accesses through this part of opening **8**, nor that a larger quantity of air indeed enters through this zone of the opening. Accordingly, the term "air access opening" as such is not intended to be limiting and zone **11** could also be termed "increased opening zone" or "locally limited enlargement", and the like.

[0085] Due to the longitudinal portion **12** of the opening **8**, the opening **8** is preferably overall longitudinal and comprises thus first and second extremities **25**, **26.** In a preferred embodiment, as shown in particular in Figures 11-15, air access openings **11** are provided at the extremities or in proximity of the extremities **25**, **26** of the opening **8.** An air access zone **11** may be provided in proximity of one or both extremities of said longitudinal opening **8.**

[0086] The present invention is preferably not limited with respect to the particular geometric contour of the air access opening **11.** In Figs. 11, 16A-18, substantially circular air access openings **11** are shown. In these preferred embodiments, the rim, border or edge **28** defining the contour of the opening **8** follows a curve or arc. The entire air access opening **11** may thus be a circle or ellipse overlapping with the longitudinal portion **12** of the opening, as indicated by the dotted line of the left side of Fig. 11, thereby preferably forming a continuous opening **8** in which the longitudinal portion and the air access zone are merged. A curved, rounded down contour at the air access opening is preferred. In some embodiments, the edge **28** defining the air access opening comprises curved or rounded portions (Figs 11, 13, 14). However, as illustrated in Figs 12 and 15, air access zones **11** having rectangular, triangular and/or trapezoidal contours are also encompassed by the present invention. More generally, the invention is not intended to be limited with respect to the geometric form outlined by the edge **28** so as to form an enlarged opening at the air access zones. In the case of openings **8** following a longitudinal axis **17**, the width **22** of the air access opening preferably corresponds to the maximum extension of the opening along an axis that is perpendicular to the longitudinal axis **17.**

[0087] **Figures 16A-17** and **18** illustrate further embodiments of openings **8** (**8.6-8.8**) in accordance with the invention.

[0088] The opening **8.7** shown in Fig. 17 comprises a single air access opening **11** positioned centrally with respect to the longitudinal zone **12** of the opening. Accordingly, the invention is not limited with respect to the position of the enlarged air access zones **11** at the extremities of the overall opening **8** as shown in Figs 11-15, for example. A single and/or central opening air access zone **11** may be used in embodiments where the lid, top or side wall or cover plate of the burner comprises a plurality of openings **8.7**, which may be distributed at different locations in the lid, wall or plate.

[0089] Accordingly, instead of a single opening as illustrated in the embodiments of Figures 6, and 7 to 10, the invention also encompasses burners comprising a plurality of separate openings **8.**

[0090] The opening **8** may comprise one, two or more air access zones. Figures 16A to 16C illustrate an embodiment of an opening **8.6**, which comprises four air access zones **11.1**, **11.2**, **11.3** and **11.4** distributed along a longitudinal zone **12.** Two of these openings **11.1** and **11.4** are provided at the extremities **25** and **26**, respectively, of the entire opening **8.6.** The remaining two openings **11.2** and **11.3** are more centrally located along longitudinal axis **17**, in particular on left and right sides of the central axis **18** and preferably at equal distance therefrom.

[0091] Generally, ethanol fireplaces are equipped with a shutter or closure actionable by a user for extinguishing the fire at any moment. Figure 16B illustrates a shutter in the form of a damper plate **29**, suitable for covering the extremities of the opening **8.6** shown in Figure 16A. In particular, the shutter **29** comprises a recess or cutout **31.** The position of the recess **31** is preferably central with respect to axis **18.** Instead of a recess, the shutter **29** may also comprise an opening, which can be placed on the opening **8** of the burner so as to diminish the size of the burner's opening **8.**

[0092] The present invention is not limited with respect to the material from which the damper plate is made. The

damper plate may be made, for example, from stainless steel. In other embodiments, the damper plate comprises or consists of a material disclosed in the present specification, for example a material selected from quartz and borosilicate.

[0093] As shown in Fig. 16B, the plate **29** can be positioned in such a manner onto the opening **8.6** that the distal air access zones **11.1**, **11.4** are covered and thus efficiently closed, as well as the part of the longitudinal zone **12** that connects the distal zones **11.1**, **11.4** to the more central air access zones **11.2** and **11.3.** By closing part of the opening **8.6**, the surface of the opening **8** is reduced and the damper plate is suitable to diminish the extent or size of the fire produced by the fireplace. As the skilled person understands, the size of the fire correlates to a large extent positively with the size of the opening through which flames exit the burner and/or air enters the burner. The plate **29** may thus be used to adjust the fire to an appropriate fire intensity as desired by the user. Thanks to the way the recess **31** is provided in damper plate **29**, the advantages associated with the presence of one or more air access zones **11** are maintained, since the part of the opening **8.6** that remains open still comprises two air access zones **11.2**, **11.3.** In particular, the plate **29** only covers some but not all of the air access zones, namely the distal ones **11.1** and **11.4.** Of course, one may envisage damper plates having any form, for covering, for example, specifically the two air access zones on the left or on the right side **11.1/11.2** and **11.3/11.4**, respectively as shown in Figs 16A. The advantage of the damper plate **29** comprising a recess **31** is that after placing the damper plate on the opening **8.6** (as shown in Figure 16B) the (reduced) fire remains positioned centrally with respect to the longitudinal extension of the burner and thus with respect to the fireplace, which is preferred for aesthetic reasons.

[0094] Figure 16C shows a further embodiment of a damper plate **29.1**, in which the recess **32** forms an edge at least part of which follows a curved line, for example a section of an ellipse or of a circle. Thanks to the curved edge **32**, the opening that remains after the damper plate **29.1** has been placed on the original opening **8.6** is formed by edges or rims that are at least partially rounded down. Thanks to the curved edges, the flames exiting the burner have improved aesthetic aspects, color and moving behaviour.

[0095] Figure 18 shows an opening **8.8** comprising a curved longitudinal portion **12.1.** In the embodiment shown, the air access zone **11** is also centrally positioned along the longitudinal extension of the opening **8.8**, such that the longitudinal portion **12.1** is divided in two partial longitudinal sections positions laterally on left and right sides, respectively, of the central air access zone **11.** The opening **8.8** comprising curved portions is particularly suitable in the case of circular or non-longitudinal burners. For example, if the burner comprises a circular (or, more generally, non-longitudinal) top plate or wall, a plurality of openings **8.8** may be provided distributed around the center of the top plate, for example on concentric circles around the center of the top plate. Non-longitudinal burners (for example burners having square or nearly square cover plates) may be designed for being placed on tables, in particular circular tables, in the center of a room, and the like. Overall longitudinal burners may be designed, for example for being placed at or along a wall, or if the fireplace is for outdoors, side-lining a square or a path.

[0096] While certain of the preferred embodiments of the present invention have been described and specifically exemplified above, it is not intended that the invention be limited to such embodiments. Various modifications may be made thereto without departing from the scope and spirit of the present invention, as set forth in the following claims. For example, with respect to the specific design of the openings, in particular of longitudinal portions **12** and air access zone **11**, the invention encompasses various combinations of different embodiments shown. For example, a curved opening as shown in Fig. 18 may comprise air access opening provided at the extremities as shown in Figs 11-15, and openings comprising a plurality of air access zones, as shown in Figs 11-16B, may comprise air access openings having different contours or having identical contours.

Claims

1. A burner (1, 10) operated by combustion of a liquid or gelled fuel (3), the burner comprising a container (2.1-2.5) comprising at least one part comprising a transparent and/or translucid material.

2. The burner (1, 10) of claim 1, wherein said at least one part comprising a transparent and/or translucid material is provided so as to allow the perception, during combustion of said liquid or gelled fuel (3) in the inside of the burner, of a flame (4) generated in the inside of the burner on or above the open surface (5) of the liquid fuel (3).

3. The burner (1, 10) of any one of claims 1 or 2, wherein said container (2.1-2.5) comprises at least part of a wall, in particular a lateral wall (9) that is made entirely from said transparent and/or translucid material.

4. The burner (1, 10) of any one of the preceding claims, wherein said container is made entirely of said transparent and/or translucid material.

5. The burner (1, 10) of any one of the preceding claims, wherein said transparent and/or translucid material is selected from quartz and borosilicate.

6. The burner (1, 10) of any one of the preceding claims, wherein said transparent and/or translucid material

is selected from quartz and from glass comprising more than 74% of SiO_2, preferably more than 78%, and even more preferably more than 80% of SiO_2.

7. The burner (1, 10) of any one of the preceding claims, wherein said transparent and/or translucid material is selected from quartz and from glass comprising trioxide of Bor (B_2O_3), preferably comprising 3-20% B_2O_3, more preferably 4-17%, and even more preferably 5-13% B_2O_3.

8. The burner (1, 10) of any one of the preceding claims, wherein said container (2.1-2.5) comprises a longitudinal opening (8), or wherein said burner comprises a cover, lid, or wall (7.1, 7.2) comprising said longitudinal opening (8), through which a flame (4) generated by combustion of the liquid or gelled fuel (3) can exit the burner and air from the environment is allowed to enter the inside of the container (2.1-2.5), wherein said cover, lid or wall (7.1, 7.2) further comprises one or several air access zones (11), where said opening (8) is enlarged, and/or which are defined by an edge following a curved line (28).

9. The burner (1, 10) of claim 8, wherein said opening (8) comprises one or several longitudinal portions (12), where said opening (8) has a substantially constant width, and said air access zones (11), wherein said opening bulges outwardly so as to locally enlarge said opening (8).

10. The burner (1, 10) of any one of claims 8 and 9, wherein said air access zones (11) are provided in proximity of the extremities (25, 26) of said longitudinal opening (8).

11. The burner (1, 10) of any one of the preceding claims, which is for a fireplace operated by combustion of a liquid or gelled fuel (3), in particular an ethanol fireplace.

12. A cover, lid or wall (7.1, 7.2, 13) of a container (2.1-2.5) for a burner operated by combustion of a liquid or gelled fuel (3), the cover, lid or wall (7.1, 7.2) comprising a longitudinal opening (6, 8), through which a flame (4) generated by combustion of the liquid or gelled fuel (3) can exit the burner and air from the environment is allowed to enter the inside of the container (2.1-2.5), wherein said cover, lid or wall (7.1, 7.2) further comprises one or several air access zones (11), which are zones where said opening (8) is enlarged, and/or which are openings defined by an edge following a curved line (28).

13. The cover, lid or wall (7.1, 7.2) of claim 12, where said opening (8) has a first or longitudinal portion (12) where said opening (8) has a substantially constant width along the longitudinal extension of said first portion (12), and wherein, at said air access zones (11), said opening (8) bulges outwardly so as to locally enlarged the width of said opening (8).

14. The cover, lid or wall (7.1, 7.2) of claim 12 and/or 13, wherein said one or more air access zones (11) are provided in proximity of one or both extremities of said longitudinal opening (8).

15. A fireplace (5) operated by combustion of a liquid or gelled fuel (3) comprising the burner (1, 10) of any one of claims 1-11 and/or the cover, lid or wall (7.1, 7.2) of any one of claims 12-14.

Fig.1

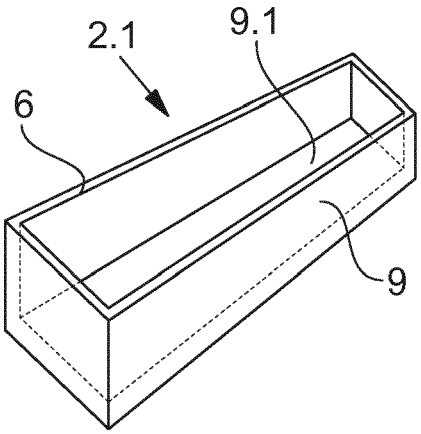


Fig.2

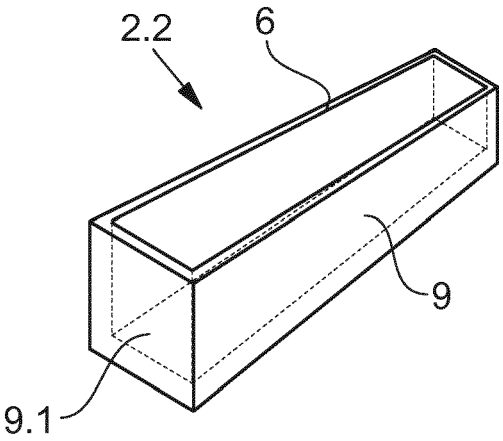


Fig.3

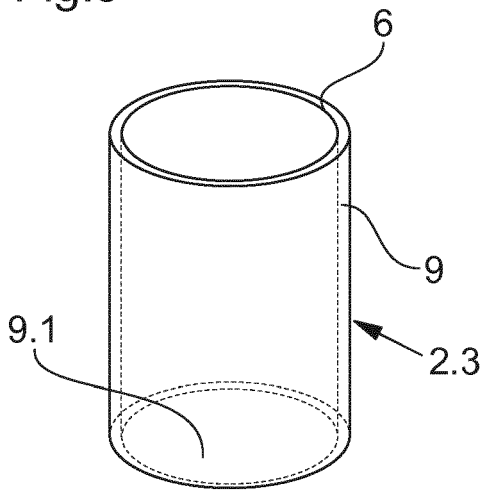


Fig.4

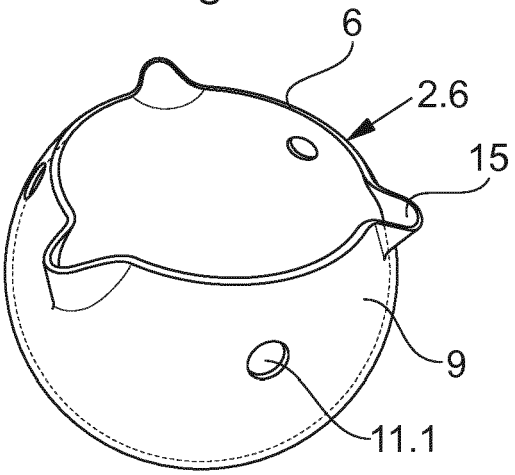


Fig.5

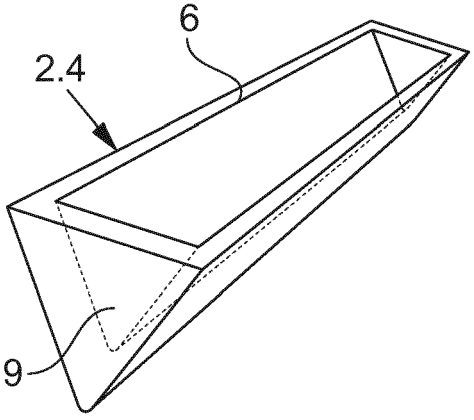


Fig.6

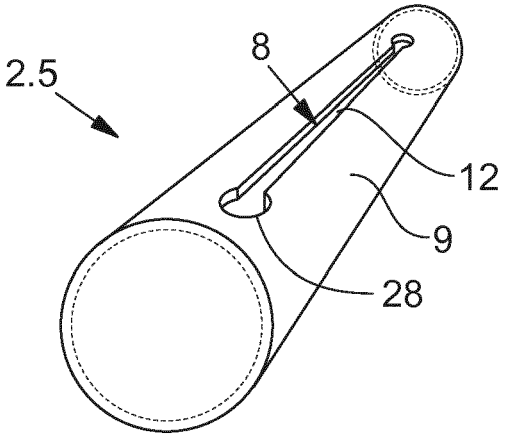


Fig.7

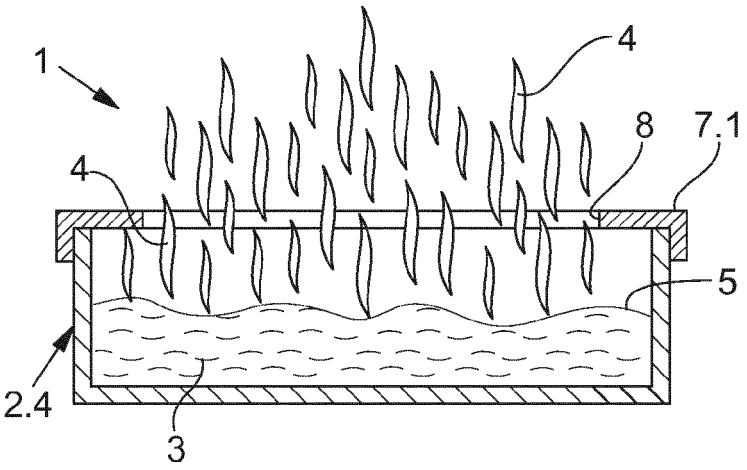


Fig.8

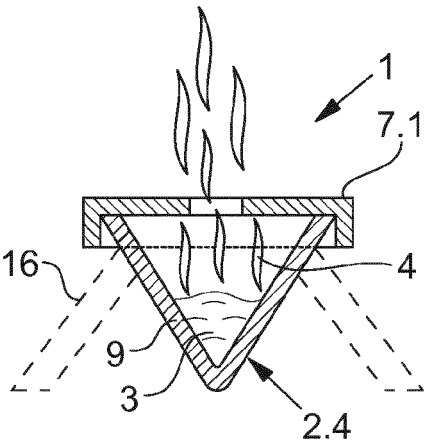


Fig.9

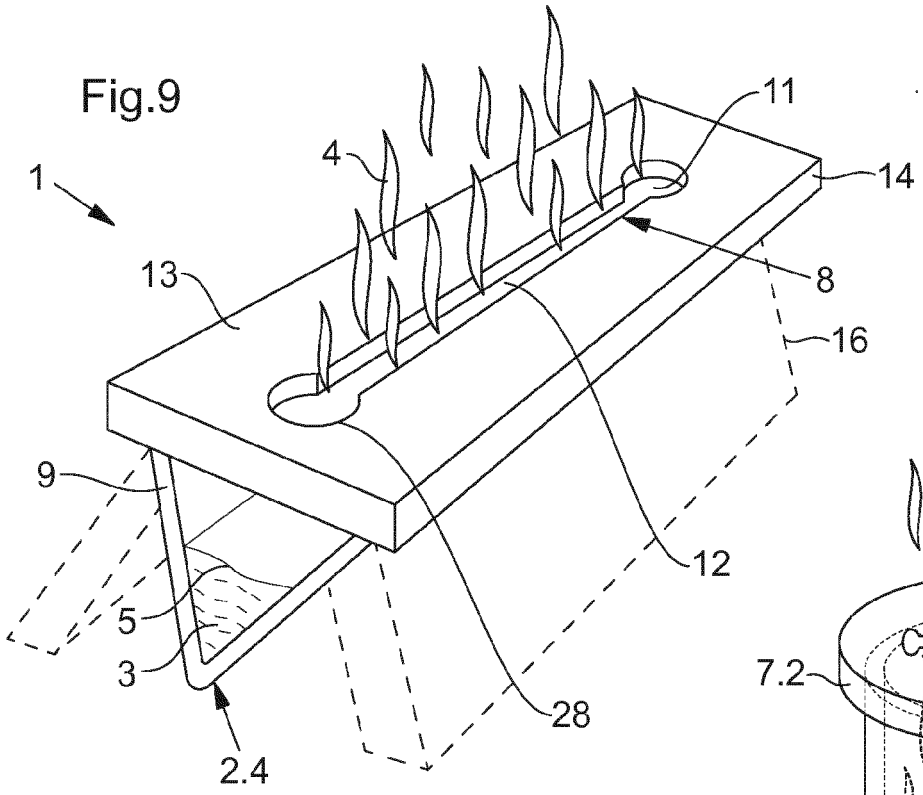


Fig.10

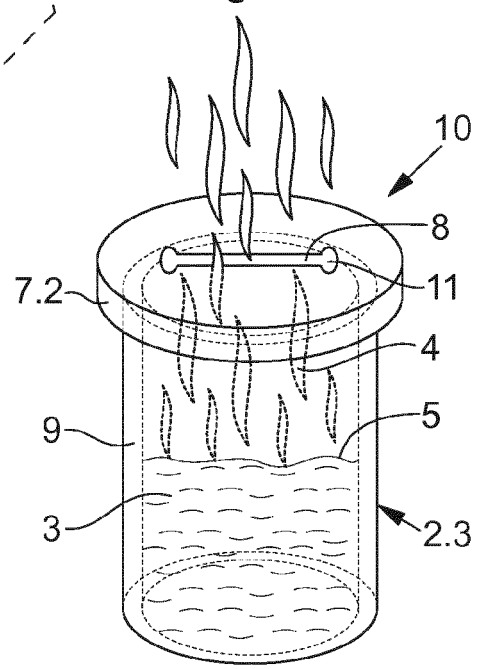


Fig.11

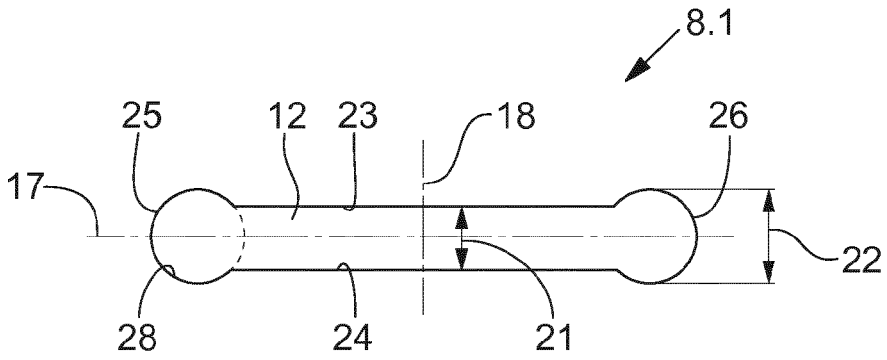


Fig.12

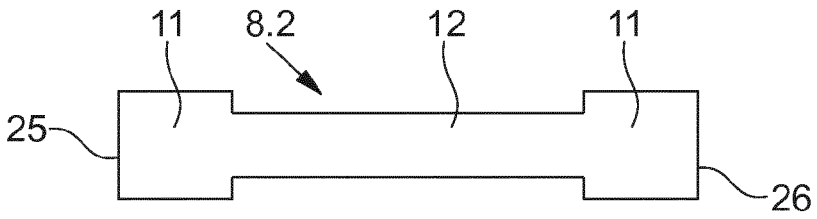


Fig.13

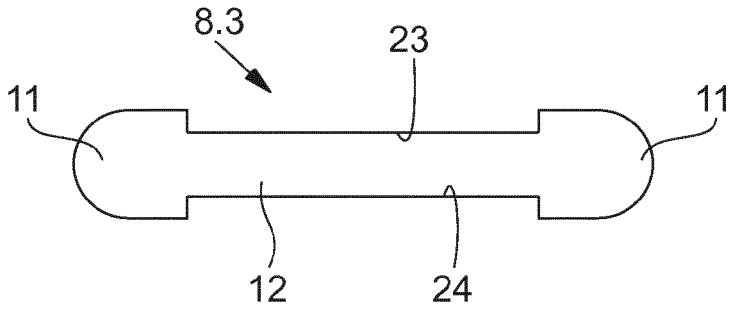


Fig.14

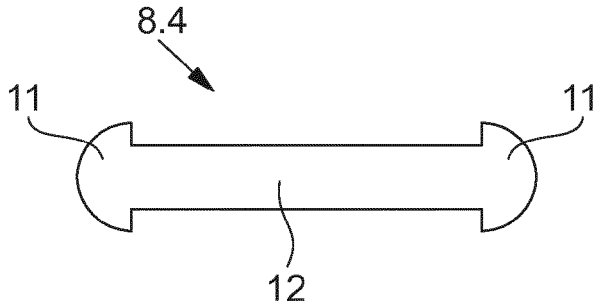


Fig.15

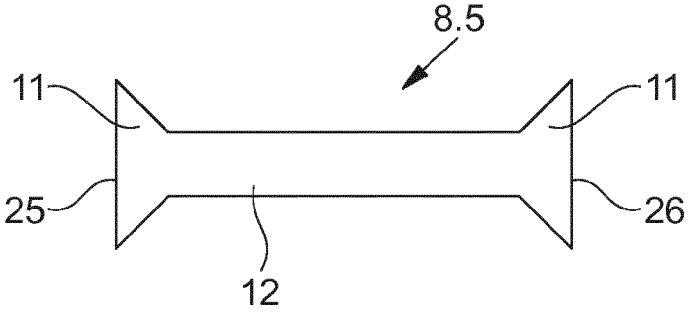


Fig.16A

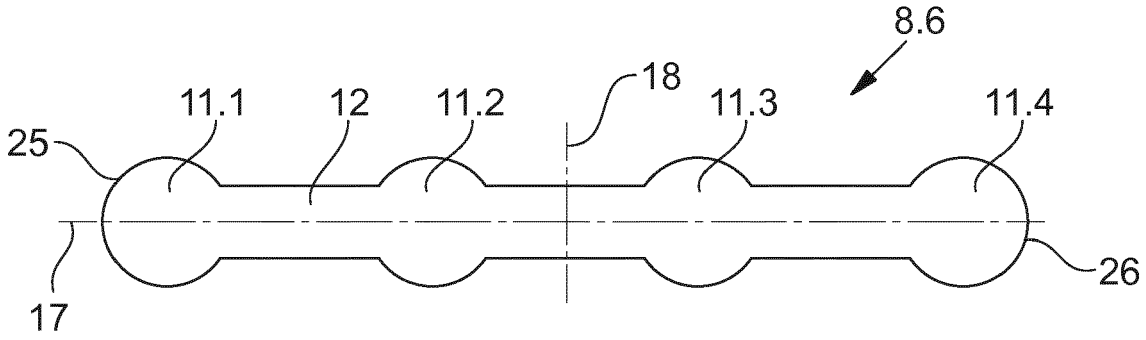


Fig.16B

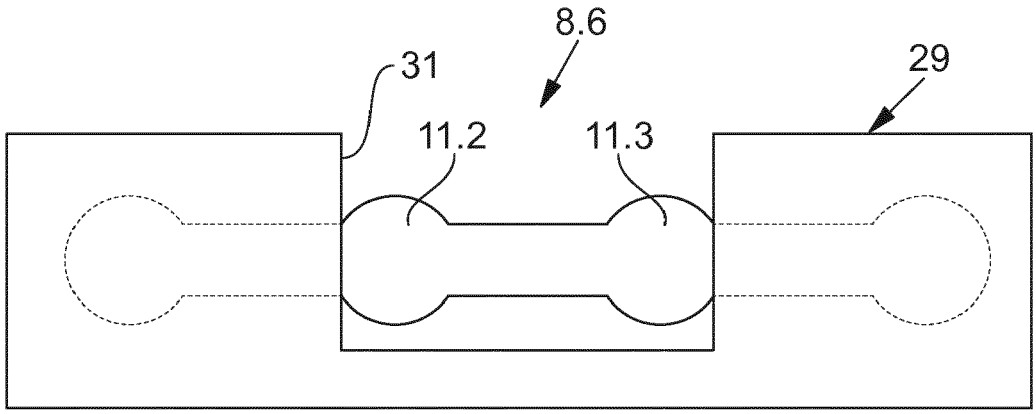


Fig.16C

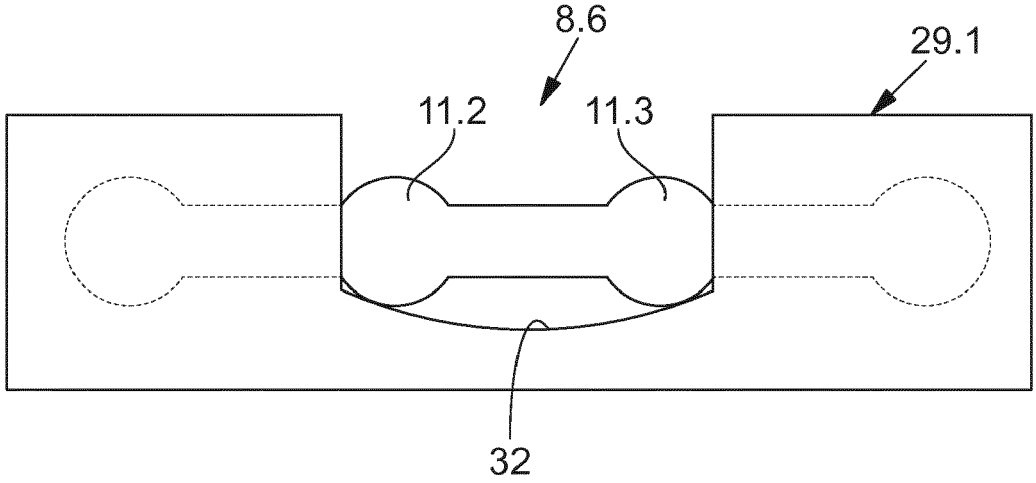


Fig.17

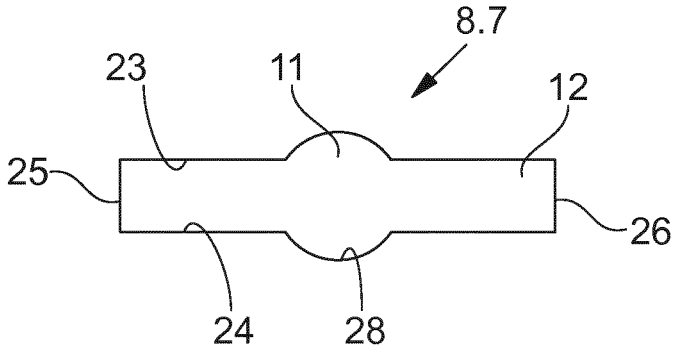
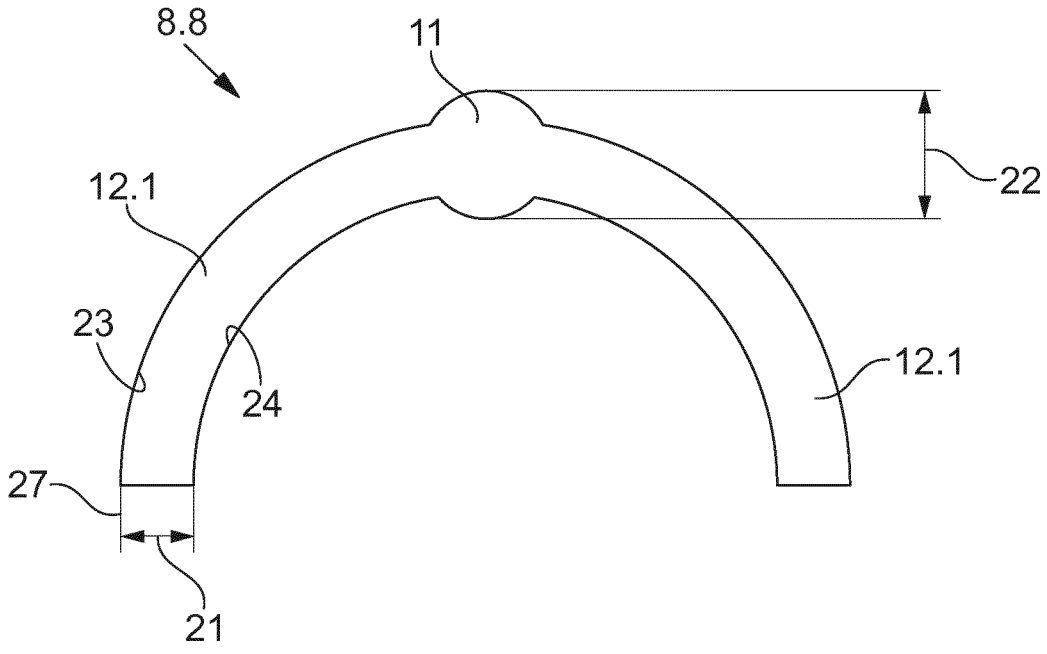


Fig.18



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EUROPEAN SEARCH REPORT

Application Number
EP 18 15 7221

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 20 2011 107672 U1 (WALETZKO UWE [DE]) 13 January 2012 (2012-01-13) * paragraph [0012] * * figure 2 *	1-7,11, 15	INV. F23D5/04
X	N.A.: "Flaming B-52 Shot -Trendybartender", , 18 May 2017 (2017-05-18), pages 1-3, XP055492904, Retrieved from the Internet: URL:https://www.trendybartender.com/bartending/shot-recipes-flaming-b-52-shot/ [retrieved on 2018-07-16] * the whole document *	1-7,11	
X	US 2011/269083 A1 (KING COURTNEY A [US]) 3 November 2011 (2011-11-03) * paragraphs [0025] - [0030] * * figures 1, 2 *	1-7,11, 15	
			TECHNICAL FIELDS SEARCHED (IPC)
			F23D

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
Munich	20 July 2018	Vogl, Paul

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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Application Number
EP 18 15 7221

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-7, 11(completely); 15(partially)

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 18 15 7221

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-7, 11(completely); 15(partially)

   Transparent container of liquid fuel burner

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2. claims: 8-10, 12-14(completely); 15(partially)

   Details of longitudinal opening of liquid fuel burner

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 18 15 7221

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

20-07-2018

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 202011107672 U1	13-01-2012	NONE	
US 2011269083 A1	03-11-2011	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82