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

(11) EP 4 095 438 A1

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
30.11.2022 Bulletin 2022/48

(21) Application number: **21176143.2**

(22) Date of filing: **27.05.2021**

(51) International Patent Classification (IPC):
F23D 14/58 *(2006.01)* ***F23D 99/00*** *(2010.01)*
F23Q 2/16 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
F23D 14/58; F23D 99/00; F23Q 2/16;
F23D 2209/20

(84) Designated Contracting States:
AL 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 RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(71) Applicant: **BIC Violex Single Member S.A.**
14569 Anoixi (GR)

(72) Inventor: **Polygerinos, Panagiotis**
145 69 Anoixi (GR)

(74) Representative: **Peterreins Schley**
Patent- und Rechtsanwälte PartG mbB
Hermann-Sack-Straße 3
80331 München (DE)

(54) **FLAME PRODUCING ASSEMBLIES**

(57) A flame producing assembly is disclosed. The flame producing assembly comprises a fuel container and a fuel nozzle arrangement. The fuel nozzle arrangement is configured to produce a flame. The fuel nozzle arrangement comprises a fuel supply channel and a fuel nozzle having a fuel nozzle opening. The fuel supply channel extends from the fuel container to the fuel nozzle opening of the fuel nozzle. The fuel nozzle opening is oriented along an axis A in a flame direction f. The wind resistant flame producing assembly further comprises a nozzle arrangement, a compressed fluid supply for storing compressed fluid, and a compressed fluid valve. The nozzle arrangement has a nozzle outlet which at least partially encircles the fuel nozzle arrangement. The nozzle arrangement is suppliable with compressed fluid from the compressed fluid supply via activation of the compressed fluid valve. The nozzle arrangement is shaped such that, when being supplied with compressed fluid during operation of the flame producing assembly, an at least partially encircling fluid curtain C is created around the flame F.

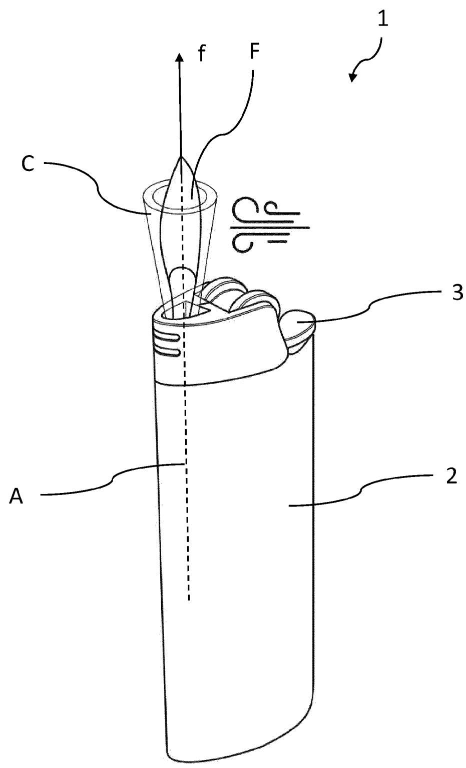

Fig. 1

EP 4 095 438 A1

Description

Technical Field

[0001] The present disclosure relates to the field of flame producing assemblies, more specifically to a flame producing assembly configured to create a protective air curtain around the flame producing assembly's flame.

Background

[0002] Flame producing assemblies such as lighters are typically used for igniting purposes like igniting tobacco, cigars and/or cigarettes have been developed over the past years. Butane lighters, for instance, work by releasing liquid butane, stored in a pressurized chamber, in a narrow stream of gas. A spark, made by striking a flint with steel or by compressing piezoelectric crystal, ignites the gas which burns at about 2000°C (3600°F). Because butane turns liquid quickly when compressed, and just as quickly returns to gas with reduced pressure, it makes butane gas an ideal fuel for use in lighters. Releasing the pressure in the holding tank, and the liquid immediately returns to its gaseous state and shoots out the opening to meet the spark. Butane's flame is similar to that of a burning candle. Therefore, such flame producing assemblies may be referred to as candle-like flame lighters. The fuel tank of most lighters is made of plastic parts ultrasonically welded together to make a low-pressure pressure vessel. A small metal ball may seal the tank after filling. A sub-assembly (of differing designs, depending on the manufacturer) uses the size, i.e. the interior diameter of the fuel gas nozzle, to release a constant level of gas, permitting a steady flame of predetermined height. The spark wheel may be made of serrated and hardened steel wire that, when rotated, creates a spark from the flint. A spring may push the flint upward to keep it in positive contact with the spark wheel. Various plastic and metal parts control the opening and closing of gas coming from the valve at the same turning with which the wheel creates a spark. The flame producing assembly provides the user with a fork-like element that opens and closes the fuel gas nozzle. The fork-like element requires positive pressure to remain open. The fork-like element can be a trigger pulled with a finger (as, for instance, in a pistol-like fire or candle lighter) or a mechanism that is pushed downward as the user spins the spark wheel.

[0003] Several flame producing assembly techniques have been proposed to make a lighter's flame wind resistant. Known techniques include a fluid in a wick flame producing assembly (e.g., zippo type), where the flame is resistant to wind due to its fuel been made of a petroleum distillate that ignites easily and burns cleanly. Other lighter types include turbo/torch/jet lighters where the (compressed) fuel is forced through a nozzle and mixed with air to create a very intense, strong, and hot flame. According to further know approaches battery operated flameless lighters such as electric coil lighters or electric arc lighters, have been developed, where electricity from the battery heats up a coil or creates an arc inside the lighter which can then be used to light up objects.

[0004] Besides the above, a classical approach to light up a lighter in a windy environment is to simply block the block the wind with the user's hand, a nearby wall, or a piece of clothing, e.g. a jacket. Most butane spark wheel or piezoelectric ignited lighters have caps made of steel. The cap can serve as a windshield, as heat protection, and dilutes the butane with a measured amount of air. However, an adequate solution to safeguard from air the lighters that produce candle-like flame is still needed.

[0005] The object of the present disclosure is to provide a flame producing assembly which produces a flame which is more resistant to forced air or wind.

Summary

[0006] The present disclosure relates to a flame producing assembly according to claim 1 and to an air curtain device for a flame producing assembly according to claim 15. The dependent claims depict embodiments of the present disclosure.

[0007] The flame producing assembly comprises a fuel container and a fuel nozzle arrangement. The fuel container fillable with fuel. The fuel nozzle arrangement is configured to produce a flame. The fuel nozzle arrangement comprises a fuel supply channel and a fuel nozzle having a fuel nozzle opening. The fuel supply channel extends from the fuel container to the fuel nozzle opening of the fuel nozzle. The fuel nozzle opening is oriented along an axis A in a flame direction f. The flame producing assembly further comprises a nozzle arrangement, a compressed fluid supply for storing compressed fluid, and a compressed fluid valve. The nozzle arrangement has a nozzle outlet which at least partially encircles the fuel nozzle arrangement. The nozzle arrangement is suppliable with compressed fluid from the compressed fluid supply via activation of the compressed fluid valve. The nozzle arrangement is shaped such that, when being supplied with compressed fluid during operation of the flame producing assembly, an at least partially encircling fluid curtain C is created around the flame F. In other words, a fluid curtain is created at least partially around the flame F. Supplying compressed fluid to the nozzle arrangement leads to making the compressed fluid expand when entering the nozzle arrangement, i.e. when exiting through the nozzle outlet, thereby creating an accelerated fluid stream. The shape of the fluid stream may be determined by the nozzle outlet and is at least partially encircling, i.e. curtain-shaped or wall-shaped. This leads to the curtain serving as a protective wall for the flame. Thereby, the flame may burn, e.g. may be produced and sustained, in the center of the fluid curtain substantially uninterrupted from, e.g. lateral wind gusts. Depending on the shape of the nozzle arrangement and the nozzle outlet, the degree of encirclement of the fluid curtain may be varied. Thus, the fluid curtain may be fully encircling or at least partially encircling.

[0008] In aspects, the nozzle arrangement may be positioned around the axis and below the fuel nozzle opening in a direction opposite to the flame direction f. In some examples, the nozzle arrangement may be positioned below fuel nozzle opening at a predetermined distance. Specifically, the nozzle outlet may be positioned below the fuel nozzle opening at the predetermined distance. In some aspects, the nozzle arrangement, e.g. the nozzle outlet may be arranged below fuel nozzle opening at a minimum predetermined distance 0.1mm to 10mm, specifically 0.5mm to 5.0mm and particularly 1.0mm to 3.0mm. Positioning the nozzle arrangement, e.g. the nozzle outlet below the fuel nozzle opening may lead to the creation of a safer fluid curtain without disturbance of the flame. Furthermore, accidentally enhancing the flame due to additional oxygen and/or fuel in the fluid curtain or dragged with the fluid curtain may be prevented. In specific designs of flame producing assemblies which comprise a hood or a windshield above the fuel nozzle, the nozzle outlet may be arranged below the level of flame detachment, i.e. below a flame opening of the hood or windshield, e.g. a flame detachment opening, through which the flame detaches. Thus, in aspects, the nozzle arrangement, e.g. the nozzle outlet may be arranged below a flame opening of the hood or windshield at a minimum predetermined distance 0.1mm to 10mm, specifically 0.5mm to 5.0mm and particularly 1.0mm to 3.0mm in order to create a safer fluid curtain without disturbance of the flame. In other words, the nozzle arrangement, e.g. the nozzle outlet may be positioned around the axis and below a flame detachment opening in a direction opposite to the flame direction f. Alternatively described, the nozzle arrangement, e.g. the nozzle outlet may be positioned around the axis and below the flame, specifically a flame detachment, in a direction opposite to the flame direction f.

[0009] In aspects, the nozzle arrangement may have one or more openings. The one or more openings may together form the nozzle outlet. Specifically, the nozzle arrangement may have one opening extending circumferentially at least partially around the fuel nozzle.

[0010] In aspects, the nozzle outlet may extend circumferentially at least partially around the fuel nozzle arrangement. In examples, the nozzle outlet may extend at least about 180°, specifically at least about 270°, more specifically at least about 350° or about 360° circumferentially around the fuel nozzle arrangement. Specifically, the nozzle outlet may extend at least partially circumferentially around the fuel supply channel. In examples, the nozzle arrangement, in particular the nozzle outlet, may be arranged coaxially with respect to the fuel nozzle. In examples, the nozzle outlet may be shaped circular, oval, polygonal or may have any other shape suitable to provide a protective fluid curtain around the flame. The shape of the nozzle outlet determines inter alia the shape of the fluid curtain. A nozzle outlet extending, for instance, 360° around the fuel nozzle arrangement may create a fully encircling fluid curtain which surroundingly may protect the flame from all lateral directions. A nozzle outlet extending, for instance, only 350° or less around the fuel nozzle arrangement may be easier to implement and have a lower compressed fluid consumption.

[0011] In aspects, the nozzle outlet may be arranged radially distanced from the axis A by a minimum predefined length. Specifically, the nozzle outlet may be arranged radially distanced from the axis A by a minimum predefined length to reduce or eliminate a disturbance of the flame F by the fluid curtain C. In other words, the nozzle outlet is configured and arranged such that the fluid curtain is created radially distanced from the axis A by the minimum predefined length. In examples, the minimum predefined length may be 0.1mm to 10mm, specifically 0.5mm to 8.0mm and particularly 2.0mm to 5.0mm.

[0012] In aspects, the nozzle arrangement may be shaped such that an outlet direction o of fluid flowing through the nozzle outlet is parallel to the flame direction f.

[0013] In aspects, the nozzle arrangement may be shaped such that an outlet direction o of fluid flowing through the nozzle outlet is inclined outwardly with respect to the flame direction f. In examples, the outlet direction o may be angled with respect to the flame direction f by about 1° to about 85°, specifically about 5° to about 45°, and more specifically about 15° to about 30°.

[0014] In aspects, the nozzle arrangement may comprise an outer cylindrical wall and an inverted cone-shaped element which is arranged distanced from the outer cylindrical wall in the flame direction f such that the nozzle outlet is formed between the outer cylindrical wall and the inverted cone-shaped element. In aspects, the inverted cone-shaped element may be arranged distanced from the outer cylindrical wall in the flame direction f such that a direction of fluid flowing from the nozzle outlet is diverted by the inverted cone shaped element so as to form the encircling fluid curtain. In aspects, the flame producing assembly may comprise an inner cylindrical wall. The inner cylindrical wall may form at least a portion of the fuel supply channel inside the inner cylindrical wall. The outer cylindrical wall may be arranged concentrically to the inner cylindrical wall. In examples, a ring-shaped chamber of the nozzle arrangement may be formed between the inner and the outer cylindrical walls. By the provision of the ring-shaped chamber an improved distribution of compressed fluid may be achieved. In aspects, the inverted cone-shaped element may be arranged concentrically to the fuel nozzle and/or the inner cylindrical wall. The inverted cone-shaped element may be arranged axially between the fuel nozzle and the inner cylindrical wall. In examples, the inverted cone-shaped element may have a central lumen which forms together with the inner cylindrical wall the fuel supply channel to the fuel nozzle.

[0015] In aspects, the flame producing assembly may further comprise a fuel valve and a fuel actuating mechanism for activating and deactivating the fuel valve. The fuel nozzle may be suppliable with fuel from the fuel container via activation of the fuel valve. In aspects, the compressed fluid valve may be operatively coupled to the fuel actuating mechanism (3) such that the compressed fluid valve is activated and deactivated simultaneously with the fuel valve by the fuel actuating mechanism.

[0016] In aspects, the flame producing assembly may further comprise an auxiliary actuating mechanism for activating and deactivating the compressed fluid valve separately of the fuel valve.

[0017] In embodiments, the compressed fluid may be compressed air. The compressed fluid supply may comprise a compressed air container and a compressed air channel via which the compressed air container is coupled to the nozzle arrangement. The compressed air container may be fillable with compressed air. The compressed fluid valve may be a compressed air valve. Thereby, an at least partially encircling air curtain C may be created around the flame F when the nozzle arrangement is supplied with compressed air during operation of the flame producing assembly.

[0018] In aspects, the compressed air container may be embedded in a housing of the flame producing assembly. Thereby, a compact device can be provided without need for additional auxiliary components for achieving full functionality. In examples, the compressed air container may be removably attached to the housing of the flame producing assembly and coupled to the nozzle arrangement via an air inlet valve, in particular an airtight air inlet valve, and one or more compressed air supply channels. Thereby, compressed air containers can be used like disposable and/or exchangeable cartridges, whereby a user may simply exchange a used with a fresh compressed air container.

[0019] In aspects, the compressed air container may be prefilled with compressed air. Specifically, the compressed air container may be prefilled with compressed air during the manufacturing process of the flame producing assembly. In examples, the compressed air container may be prefilled with compressed air immediately before acquisition of the flame producing assembly by a user.

[0020] In aspects, the compressed air container may be refillable with compressed air. Specifically, the compressed air container may be refillable via an embedded air filling device and/or an external filling device. The provision of a refillable compressed air container leads to an improved lifetime cycle and a more sustainable device as there is no need of replacing an empty compressed air container.

[0021] In aspects, the flame producing assembly may comprise an air inlet valve. The air inlet valve may be coupled to the compressed air container. The air inlet valve may be coupleable to an external air filling device to refill compressed air into the compressed air container. In examples, the external air filling device may be a pump. Specifically, the external air filling device may be an electrical pump or a manual pump, e.g. a bicycle pump or a pouch pump. In examples, the external air filling device may be an auxiliary compressed air canister or another kind of compressed air source, e.g. an air pressure line. In examples, the air inlet valve may be arranged on the housing of the flame producing assembly. In examples, the air inlet valve may be airtight. The configuration of the flame producing assembly to be coupleable with an external air filling device reduces the complexity and the cost of the flame producing assembly. Furthermore, a smaller and more light-weight device can be provided.

[0022] In aspects, the flame producing assembly may comprise an embedded air filling device. The embedded air filling device may be coupled to the compressed air container. The embedded air filling device may be adapted to press air into the compressed air container. In examples, the embedded air filling device may be an electrical pump or a manual pump. In examples, the embedded air filling device may be configured to convert mechanical motion to compressed air. In examples, the embedded air filling device may be embedded into the flame producing assembly, particularly into the housing of the flame producing assembly. In examples, the embedded air filling device may be coupled, specifically fluidically coupled, to the compressed air container via an internal valve. The internal valve may be a one-way valve which only allows air to be pumped into the compressed air container. In examples, the embedded air filling device may be coupled, specifically fluidically coupled, to the exterior of the flame producing assembly via an external valve. The external valve may be a one-way valve which only allows ambient air to be drawn in from the environment.

[0023] In aspects, the embedded air filling device may comprise a deformable elastic pouch with a first valve coupled to the compressed air container to pump air into the compressed air container. In examples, the deformable elastic pouch, may comprise a second valve coupled to an exterior of the flame producing assembly to draw in ambient air from the environment into the pouch. In examples, the first valve may be a one-way valve only allowing air to be pumped out of the pouch into the compressed air container. In examples, the second valve may be a one-way valve only allowing air to be drawn into the pouch from the environment. In aspects, the deformable elastic pouch may be configured to be reversibly mechanically deformable by external pressurization such that, when being pressed, air is pumped into the compressed air container via the first valve, and when returning to its unpressed state, ambient air is drawn into the pouch from the environment, particularly via the second valve, if present.

[0024] In aspects, the embedded air filling device may further comprise a button. The button may be mechanically coupled to the deformable elastic pouch and may be arranged to be accessible from outside the housing of the flame producing assembly to mechanically deform the deformable elastic pouch.

[0025] In aspects, the deformable elastic pouch may be adapted and arranged to be accessible from at least one exterior surface of the housing (2) of the flame producing assembly (1). In examples, the deformable elastic pouch may be adapted and arranged to be accessible from two opposing exterior surfaces of the housing 2 of the flame producing assembly 1.

[0026] In aspects, the embedded air filling device may be a reciprocal piston pump.

[0027] In aspects, the flame producing assembly may further comprise a pressure relief valve. The pressure relief valve may be coupled to the compressed air container and configured to release air from the compressed air container if a pressure inside the compressed air container exceeds a predetermined limit. The predetermined limit of pressure when the pressure release valve is activated may be at most 0,5, at most 1bar, at most 2bar, at most 3bar, at most 4bar, at most 5bar, at most 10bar or at most 15bar. The pressure relief valve increases the safety of the device to prevent overpressure inside the container. If the pressure inside the compressed air container exceeds the predetermined limit, the pressure relief valve will open and air will be released, for instance to the environment. In that, the flame producing assembly may be protected from being damaged by overpressure and the user of the flame producing assembly may be protected from injuries due to damages of the flame producing assembly.

[0028] In aspects, the flame producing assembly may further comprise a compressed air main valve. The compressed air main valve may be arranged between the compressed air container and the nozzle arrangement. In examples, the flame producing assembly may comprise a main valve actuating mechanism for activating and deactivating the compressed air main valve. The compressed air main valve may be actuatable via the main valve actuating mechanism. The main valve actuating mechanism may be accessible from an exterior of the flame producing assembly housing. In examples, the main valve actuating mechanism may be arranged on or in a flame producing assembly housing surface. The compressed air main valve may be arranged upstream of the compressed air valve. In examples, the compressed air main valve may be arranged at an outlet of the compressed air container towards the compressed air channel, within the compressed air channel or at an inlet of the compressed air channel towards the nozzle arrangement. By the provision of a compressed air main valve, the creation of the air curtain may be controlled independently of the fuel actuating mechanism and/or the auxiliary actuating mechanism. Unwanted loss of compressed air, for instance in case a user accidentally activates the air curtain and/or the compressed air valve via the fuel actuating mechanism or the auxiliary actuating mechanism can be prevented.

[0029] In embodiments, the fuel may be used as compressed fluid. The compressed fluid supply may be provided by the fuel container, the fuel supply channel and a fuel supply branch. The fuel supply branch may extend from the fuel supply channel to the nozzle arrangement such that the nozzle arrangement is coupled to the fuel container. The compressed fluid valve may be a compressed fuel valve being arranged in the fuel supply branch. Thereby, ambient air is drawn into the fuel to create an at least partially encircling air-fuel curtain C around the flame F when the nozzle arrangement is supplied with compressed fuel during operation of the flame producing assembly. Using the fuel of the flame producing assembly as a compressed fluid source leads to a simple assembly as no separate compressed air equipment(s), e.g. compressed air container and compressed air channels, is/are required. During expansion the compressed fuel draws in ambient air into the expanding fuel whereby an air-fuel stream is generated which via the nozzle arrangement creates the at least partially encircling air-fuel curtain C around the flame. Specifically, the fuel supply branch comprises a plurality of orifices circumferentially distributed about the fuel supply branch. In examples, the orifices may be configured and arranged to establish a fluidic connection between the inside of the fuel supply branch and ambient air, e.g. from the surroundings of the flame producing assembly. Negative pressure is created right outside the fuel supply branch, i.e. right outside the one or more orifices. This creates a suction of air that is provided by the surrounding environment into the fuel supply branch. In turn, this results in the compressed fuel, specifically expanding fuel, being mixed with air inside the fuel supply branch. The high velocity mixture is guided through the nozzle arrangement, i.e. to the nozzle outlet and as it exits creates the air-gas curtain, i.e. the air-fuel curtain. In aspects, the size of the orifices may be designed so that the mixture of fuel with air is diluted enough to be inert in the presence of an accidental flame, but forceful enough (i.e., of high velocity) so it can protect the flame it surrounds.

[0030] In aspects, the fuel supply branch may open out into the nozzle arrangement through a branch outlet. In examples, the branch outlet may be shaped such that a branch direction of fuel flowing out of the branch outlet is inclined outwardly with respect to the flame direction f. In examples, the branch direction may be angled with respect to the flame direction f by about 1 ° to about 85°, specifically about 5° to about 45°, and more specifically about 15° to about 30°.

[0031] In aspects, the fuel valve may be arranged downstream of the compressed fuel valve.

[0032] In aspects, the fuel filled in the fuel container may be compressed fuel, particularly liquid butane, liquid isobutane or liquid propane. In aspects, the fuel container may be prefilled with compressed fuel. In aspects, the fuel container may be refillable with compressed fuel. The provision of a refillable fuel container leads to an improved lifetime cycle and a more sustainable device as there is no need of replacing an empty fuel container. In aspects, the flame producing assembly may comprise a fuel inlet valve coupled to the fuel container. The fuel inlet valve may be coupleable with an external fuel filling device to refill compressed fuel into the fuel container.

[0033] In aspects, the flame producing assembly may be configured to produce a laminar flame or a jet flame The present disclosure further relates to an air curtain device for a flame producing assembly, the flame producing assembly being configured to produce a flame along an axis in a flame direction. The air curtain device comprises a nozzle arrangement which is configured to create an air curtain around the flame produced by the flame producing assembly.

[0034] In aspects, the air curtain device may comprise a main body having a central lumen along the axis therethrough for receiving a fuel nozzle of the flame producing assembly. The main body may be releasably mountable on the flame producing assembly such that the fuel nozzle of the flame producing assembly is received in the central lumen. The air nozzle arrangement may be provided in the main body and may have a nozzle outlet which at least partially encircles the central lumen. The air curtain device may further comprise a compressed air container for storing compressed air. The compressed air container may be provided in the main body and may be coupled to the air nozzle arrangement via a compressed air channel. The air curtain device may further comprise a compressed air valve for controlling supply of compressed air from the compressed air container to the nozzle arrangement. The nozzle arrangement may be shaped such that, when being mounted on the flame producing assembly and when being supplied with compressed air during operation of the flame producing assembly, an at least partially encircling air curtain is created around the flame.

[0035] In aspects, the main body may be shaped such that the fuel nozzle of the flame producing assembly extends through the central lumen outside the central lumen in the flame direction.

[0036] In aspects, the main body may be shaped such that the fuel nozzle is coupleable with a first opening of the central lumen. Specifically, an auxiliary fuel nozzle may be formed on a second opening of the central lumen being opposite of the first opening. In aspects, the second opening may be oriented in the flame direction.

[0037] In aspects, the air nozzle arrangement may have one or more openings which together form the nozzle outlet.

[0038] In aspects, the nozzle outlet may extend circumferentially at least partially around a second opening of the central lumen being oriented in the flame direction.

[0039] In aspects, the nozzle outlet may be arranged radially distanced from the central lumen by a minimum predefined length to reduce or eliminate a disturbance of the flame by the air curtain. In other words, the nozzle outlet is configured and arranged such that the air curtain is created radially distanced from the axis A by the minimum predefined length.

[0040] In aspects, the air nozzle arrangement may be shaped such that an outlet direction of fluid flowing through the nozzle outlet is parallel to the axis.

[0041] In aspects, the air nozzle arrangement may be shaped such that an outlet direction of fluid flowing through the nozzle outlet is inclined outwardly with respect to the axis. In examples, the outlet direction may be angled with respect to the axis by about 1° to about 85°, specifically about 5° to about 45°, and more specifically about 15° to about 30°.

[0042] In aspects, the air nozzle arrangement may comprise an outer cylindrical wall and an inverted cone-shaped element which is arranged distanced from the outer cylindrical wall in the flame direction such that the nozzle outlet is formed between the outer cylindrical wall and the inverted cone-shaped element. In aspects, the inverted cone-shaped element may be arranged distanced from the outer cylindrical wall in the flame direction f such that a direction of fluid flowing from the nozzle outlet is diverted by the inverted cone shaped element so as to form the encircling fluid curtain.

[0043] In aspects, the air curtain device may further comprise an inner cylindrical wall which forms the central lumen inside the inner cylindrical wall. In aspects, the inverted cone-shaped element may be arranged concentrically to the central lumen.

[0044] In aspects, the compressed air valve may be operatively coupleable to a fuel actuating mechanism of the flame producing assembly such that the compressed air valve is activatable and deactivatable simultaneously with a fuel valve of the flame producing assembly by the fuel actuating mechanism.

[0045] In aspects, the air curtain device may further comprise an auxiliary actuating mechanism for activating and deactivating the compressed air valve separately of a fuel valve of the flame producing assembly.

Description of the Drawings

[0046] Other characteristics will be apparent from the accompanying drawings, which form a part of this disclosure. The drawings are intended to further explain the present disclosure and to enable a person skilled in the art to practice it. However, the drawings are intended as nonlimiting examples. Common reference numerals on different figures indicate like or similar features.

FIG. 1 shows an isometric view of the wind resistant flame producing assembly in operation with a schematically depicted fluid curtain around the flame;

FIG. 2 schematically depicts the upper portion of the wind resistant flame producing assembly with the nozzle arrangement in a side cut view.

Detailed Description

[0047] Embodiments of wind resistant flame producing assembly and the air curtain device according to the disclosure will be described with reference to the figures as follows. In the present disclosure, the term "radial" is be understood with respect to the axis A of the fuel nozzle opening 13.

[0048] Fig. 1 is a schematic view of a wind resistant flame producing assembly 1. The wind resistant flame producing assembly 1 depicted in **Fig.1** has a housing 2 and a fuel actuating mechanism 3. The depicted wind resistant flame producing assembly 1 has a sparkler igniter and produces a candle-like flame F. In embodiments, the wind resistant flame producing assembly 1 may have a piezoelectric or other igniter. In embodiments, the wind resistant flame producing assembly 1 according to the present disclosure may be a jet flame producing assembly. That means, the flame F may be either laminar (e.g., as produced by regular gas flame producing assemblies) or resemble a jet/turbo flame that premixes air with the compressed gas fuel before ignition (e.g., similar to the turbo gas flame producing assemblies). In general the wind resistant flame producing assembly 1 of the present disclosure is a hand-held flame producing assembly, for instance a pocket flame producing assembly which may be used by a user to light up, for instance a cigarette or a candle. The wind resistant flame producing assembly 1 is configured to create a protective fluid curtain C around the flame F. In other words the fluid curtain C may serve as a protective wall for the flame F. Thereby, the flame F may burn, e.g. may be produced and sustained, substantially uninterrupted from, e.g. lateral wind gusts. In the configuration shown in **Fig. 1** a fully encircling conical fluid curtain C is created concentrically around the flame F. Thereby, the flame F is ideally protected in the center of the fluid curtain C. However, in embodiments, the fluid curtain C may only be partially encircling and/or have another shape than conical.

[0049] With respect to **Fig. 2,** the specific structure of the wind resistant flame producing assembly 1 will be explained, whereby this figure only depicts an upper portion of the wind resistant flame producing assembly 1 where the flame F and the fluid curtain C are created. The wind resistant flame producing assembly 1 comprises a fuel container and a fuel nozzle arrangement 10. The fuel container is fillable with fuel. The fuel filled or fillable in the fuel container may be compressed fuel, particularly liquid butane, liquid isobutane or liquid propane. In aspects, the fuel container may be prefilled with compressed fuel. In aspects, the fuel container may be refillable with compressed fuel. The provision of a refillable fuel container leads to an improved lifetime cycle and a more sustainable device as there is no need of replacing an empty fuel container. In aspects, the flame producing assembly 1 may comprise a fuel inlet valve coupled to the fuel container. The fuel inlet valve may be coupleable with an external fuel filling device to refill compressed fuel into the fuel container. The external fuel filling device may be an external fuel cartridge. The fuel inlet valve may be arranged on the housing 2 of flame producing assembly 1. The wind resistant flame producing assembly 1 may further comprise a fuel valve which is activatable and deactivatable via the fuel actuating mechanism 3. The fuel nozzle 12 is suppliable with fuel from the fuel container via activation of the fuel valve. The fuel nozzle arrangement 10 is configured to produce the flame F. Therefore, the fuel nozzle arrangement comprises a fuel supply channel 14 and a fuel nozzle 12 having a fuel nozzle opening 13. The fuel supply channel 14 extends from the fuel container to the fuel nozzle opening 13. The fuel nozzle opening 13 is oriented along an axis A in a flame direction f. The wind resistant flame producing assembly 1 further comprises a nozzle arrangement 20, a compressed fluid supply for storing compressed fluid, and a compressed fluid valve.

[0050] The nozzle arrangement 20 has a nozzle outlet 22 which fully encircles the fuel nozzle arrangement 10 or the fuel nozzle 12. Specifically, the nozzle outlet 22 extends circumferentially around the fuel supply channel 14. In the example configuration of Fig. 2, the nozzle outlet 22 is formed by one circumferentially extending opening. Specifically, the nozzle outlet 22 is formed by one opening which extends 360° circumferentially about the axis A. In embodiments, wherein the nozzle outlet 22 is formed by one opening, the opening may extend less than 360°, for instance 270° or 180° circumferentially about the axis A. That means, the nozzle outlet 22 may only partially encircle the fuel nozzle arrangement 10, i.e. the axis A. In aspects, the nozzle arrangement 20 may have more than one opening which together form the nozzle outlet 22. For instance, the nozzle arrangement 20 may comprise several openings which are circumferentially distributed along the whole circumference of 360° or only a portion of the circumference of, for instance 180° or 270°. about 360° circumferentially around the fuel nozzle arrangement. In embodiments, the nozzle outlet 22 may extend at least about 180°, specifically at least about 270°, more specifically at least about 350° or about 360° circumferentially around the fuel nozzle arrangement 10. In the examples shown in the figures, the nozzle arrangement 20, in particular the nozzle outlet 22, is arranged coaxially with respect to the fuel nozzle 12. Thereby, the flame may be ideally protected in the center of the fluid curtain C. In examples, the nozzle arrangement 20, in particular the nozzle outlet 22, may be arranged slighty offset to the fuel nozzle 12, i.e. to the axis A. In the example shown in the figures, the nozzle outlet 22 is shaped circular to create a fluid curtain C which is circular-shaped in cross-section. In embodiments, the nozzle outlet 22 may be shaped oval, polygonal or may have any other shape suitable to provide a protective fluid curtain C around the flame F. The shape of the nozzle outlet 22 determines inter alia (e.g. orientation, pressure of compressed fluid etc.) the shape of the fluid curtain C. A nozzle outlet 22 extending, for instance, 360° around the fuel nozzle arrangement 10 may create a fully encircling fluid curtain which may protect the flame F from all lateral directions (see, e.g. **Fig. 1).** A nozzle outlet 22 extending, for instance, only 350° or less around the fuel nozzle arrangement 10 may be easier to implement and may have a decreased compressed fluid consumption.

[0051] The nozzle arrangement 20 is suppliable with compressed fluid from the compressed fluid supply via activation of the compressed fluid valve. The compressed fluid valve is operatively coupled to the fuel actuating mechanism 3 such that the compressed fluid valve is activated and deactivated simultaneously with the fuel valve by the fuel actuating mechanism 3. The fuel actuating mechanism 3 may be a main button or fuel gas release button. The fuel actuating mechanism 3 may comprise or be operatively coupled to the sparkler or igniter. In embodiments, the flame producing assembly 1 may further comprise an auxiliary actuating mechanism for activating and deactivating the compressed fluid valve separately of the fuel valve. In this context, separately can be understood as independently. The auxiliary actuating mechanism may be for instance a compressed fluid valve release button. The auxiliary actuating mechanism may be provided in, i.e. on the housing 2 of the flame producing assembly 1. The nozzle arrangement 20 is shaped such that, when being supplied with compressed fluid during operation of the flame producing assembly 1, an encircling fluid curtain C is created around the flame F. Supplying compressed fluid to the nozzle arrangement 20 leads to the compressed fluid expanding when entering the nozzle arrangement 20, i.e. when exiting through the nozzle outlet 22, thereby creating an accelerated fluid stream (see arrows in **Fig. 2).** The shape of the fluid stream is determined by the nozzle outlet 22 and is encircling, i.e. curtain-shaped or wall-shaped. Depending on the shape of the nozzle arrangement 20 and the nozzle outlet 22, the degree of encirclement of the fluid curtain C may be varied. Thus, the fluid curtain C may be fully encircling (as shown in the figures) or at least partially encircling. In general, the fluid curtain can be understood as a virtual ring-like, cone-like or tube-like fluid wall. Depending on which fluid is used as compressed fluid an air curtain or air-fluid curtain may be created. In other words, a gas-curtain may be created. The compressed fluid is to be understood as compressed, partially compressed or expanded depending on where it is located between the compressed fluid container and the nozzle outlet 22. The skilled person will understand that the expansion of the compressed fluid is a gradual process. The fact that compressed fluid is supplied to the nozzle arrangement 20 enables or at least enhances the expansion and acceleration of the compressed fluid (or partially compressed or expanded fluid) to create a fluid stream and thereby the fluid curtain C. In general terms, "compressed" is to be understood relative to ambient conditions of the environment of the flame producing assembly 1. For instance "compressed" may be understood as condition of more than about 1bar, specifically more than about 2bar or more than about 3bar.

[0052] As can be seen in Fig. 2, the nozzle arrangement 20 is positioned below the fuel nozzle opening 13 in a direction opposite to the flame direction f. Specifically, the nozzle outlet 22 is positioned below the fuel nozzle opening 13 at a predetermined distance 21. The predetermined distance 21 may be at least 0.1mm to 10mm, specifically 0.5mm to 5.0mm and particularly 1.0mm to 3.0mm. Positioning the nozzle arrangement 20, particularly the nozzle outlet 22 below the fuel nozzle opening 13 leads to the creation of a safer fluid curtain C without disturbance of the flame F. Furthermore, accidentally enhancing the flame F due to additional oxygen and/or fuel in the fluid curtain and/or dragged air within the fluid curtain may be prevented. In specific designs of flame producing assemblies which comprise a hood or a windshield above the fuel nozzle 12, the nozzle outlet 22 may be arranged below the level of flame detachment, i.e. below a flame opening of the hood or windshield, e.g. a flame detachment opening, through which the flame F detaches. Thus, in aspects, the nozzle arrangement 20, e.g. the nozzle outlet 22 may be arranged below a flame opening of the hood or windshield at a minimum predetermined distance of 0.1mm to 10mm, specifically 0.5mm to 5.0mm and particularly 1.0mm to 3.0mm in order to create a safer fluid curtain C without disturbance of the flame F. In other words, the nozzle arrangement 20, e.g. the nozzle outlet 22 may be positioned around the axis A and below a flame detachment opening in a direction opposite to the flame direction f. Alternatively described, the nozzle arrangement 20, e.g. the nozzle outlet 22 may be positioned around the axis A and below the flame, specifically a flame detachment, in a direction opposite to the flame direction f. With further reference to **Fig. 2,** the nozzle outlet 22 is arranged radially distanced from the axis A by a minimum predefined length 23. Specifically, the nozzle outlet 22 is arranged radially distanced from the axis A by the minimum predefined length 23 to reduce or eliminate a disturbance of the flame F by the fluid curtain C. In other words, the nozzle outlet 22 is configured and arranged such that the fluid curtain C is created radially distanced from the axis A by the minimum predefined length. In examples, the minimum predefined length may be 0.1mm to 10mm, specifically 0.5mm to 8.0mm and particularly 2.0mm to 5.0mm. In other words, the nozzle outlet 22, if it has a circumferential shape, has a predetermined (minimum) diameter to ensure an undisturbed production of the flame F. The diameter and/or dimensions of the length 23 are dependent of the dimensions of the flame F. The nozzle arrangement 20 is shaped such that an outlet direction o of fluid flowing through the nozzle outlet 22 is inclined outwardly with respect to the flame direction f. In this context, "outwardly" is to be understood in the meaning of radially outwardly with respect to axis A or flame direction f. In examples, the outlet direction o is inclined or angled with respect to axis A (or flame direction f). In the example of Fig. 2, the outlet direction o is angled with respect to the flame direction f by about 50°. In examples, the outlet direction o may be angled with respect to the flame direction f by about 1° to about 85°, specifically about 5° to about 45°, and more specifically about 15° to about 30°. Described in other words, the nozzle arrangement 20 has a circumferential opening which opens in a direction o inclined radially outward of the flame direction f. In embodiments, the nozzle arrangement 20 may be shaped such that the outlet direction o of fluid flowing through the nozzle outlet 22 is parallel to the flame direction f, i.e. parallel to the axis A. In examples, the nozzle arrangement 20 is configured and arranged to create a fluid stream which is separate from the flame F and does not interfere or disturb the flame F.

[0053] In general, the nozzle arrangement 20 may also be referred to as a nozzle assembly 20 for creating the fluid curtain C. The nozzle arrangement 20 (or nozzle assembly 20) comprises an outer cylindrical wall 26 and an inverted cone-shaped element 24 which is arranged distanced from the outer cylindrical wall 26 in the flame direction f such that the nozzle outlet 22 is formed between the outer cylindrical wall 26 and the inverted cone-shaped element 24 (see, **Fig. 2).** Specifically, the nozzle outlet 22 is formed between an inclinedly downward facing surface 24a of the inverted cone-shaped element 24 in a direction opposite to the flame direction f and an upper end 26a of the outer cylindrical wall 26. Thereby, a direction of fluid flowing from the nozzle outlet 22 is diverted by the inverted cone-shaped element 24 so as to form the encircling fluid curtain C. The inclinedly downward facing surface 24a can be understood as a surface which is generally oriented in a direction opposite to the flame direction f but thereby, inclined radially outwardly. In other words, the inclinedly downward facing surface 24a is facing in a direction perpendicular to the outlet direction o (see, Fig. 2). The inverted cone-shaped element 24 is generally formed triangular in cross-section having a centric hole, i.e. the central lumen 25. The outer cylindrical wall 26 is arranged concentrically to an inner cylindrical wall 16 of the flame producing assembly 1. At least a portion of the fuel supply channel 14 is formed by or inside the inner cylindrical wall 16. Thereby a ring-shaped chamber of the nozzle arrangement 20 formed between the inner cylindrical wall 16 and the outer cylindrical wall 26. By the provision of the ring-shaped chamber an improved distribution of compressed fluid can be achieved. The inverted cone-shaped element 24 is arranged concentrically to the fuel nozzle 12 and the inner cylindrical wall 16. The inverted cone-shaped element 24 is arranged axially between the fuel nozzle 12 and the inner cylindrical wall 16. In examples, the inverted cone-shaped element 24 has a central lumen 25 which forms together with the inner cylindrical wall 16 the fuel supply channel 14 to the fuel nozzle 12. In embodiments, the inner cylindrical wall 16 may extend through the central lumen 25 of the inverted cone-shaped element 24 towards the fuel nozzle 12. The lumen 25 is to be understood as a channel or a hollow portion configured to guide fuel or receive an additional fuel piping, e.g. the inner cylindrical wall 16. As can be taken from Fig. 2, compressed fluid which is guided from the compressed fluid supply to the nozzle arrangement 20 flows towards the nozzle outlet 22. Due to the specific shape of the nozzle arrangement 20, particularly the inverted cone-shaped element 24, the compressed fluid is guided radially outwardly along the outflow direction o, thereby expands and accelerates to create the air curtain C. It is to be understood, that the configuration as shown in Fig. 2 represents merely an example of how to implement the nozzle arrangement 20. Other arrangements than using the inverted cone-shaped element 24 are possible. For instance, a curved element may be used or the inner cylindrical wall 16 may be adapted, e.g. by having a cylindrical protrusion extending radially outwardly, to form together with the cylindrical outer wall 26 the nozzle outlet 22. In further embodiments, a horizontal wall portion (i.e. perpendicular to the axis A) may be provided which closes off the outer cylindrical wall 26 and which comprises one or more recesses, e.g. circumferentially distributed recesses, which form the nozzle outlet 22 and which may be inclined.

[0054] As explained above with respect to the general disclosure, the wind resistant flame producing assembly 1 is configured to create a protective fluid curtain C around the flame F. In the following two different embodiments of the wind resistant flame producing assembly 1 using different compressed fluids will be described in more detail which are combinable with any of the previously described.

First embodiment

[0055] In the first embodiment (shown in Fig. 2), compressed air is used as compressed fluid. In this embodiment, the compressed fluid supply comprises a compressed air container and one or more compressed air channels via which the compressed air container is coupled to the nozzle arrangement 20. In this embodiment, the compressed fluid supply may also be referred to as compressed air supply. The compressed air container is filled or fillable with compressed air. In other words, the compressed air container contains compressed air. The compressed fluid valve is a compressed air valve. In this embodiment, the compressed air is guided to the nozzle arrangement 20 from the compressed air container, expands and accelerates during expansion through the nozzle outlet 22. Thereby an encircling air curtain C, or partially encircling air curtain C (depending on the specific design of the nozzle arrangement 20 as explained above) is created around the flame F during operation of the flame producing assembly 1.

[0056] The compressed air container is embedded in the housing 2 of the flame producing assembly 1. Thereby, a compact device can be provided without need for additional auxiliary components for achieving full functionality. In configurations, the compressed air container may be removably attached to the housing 2 of the flame producing assembly 1 and coupled to the nozzle arrangement 20 via an air inlet valve, in particular an air-tight air inlet valve, and one or more compressed air supply channels. Thereby, compressed air containers can be used like disposable and/or exchangeable cartridges, whereby a user may simply exchange a used with a fresh compressed air container.

[0057] In some variations, the compressed air container is prefilled with compressed air. Specifically, the compressed air container may be prefilled with compressed air during the manufacturing process of the flame producing assembly 1. In examples, the compressed air container may be prefilled with compressed air immediately before acquisition of the flame producing assembly 1 by a user. However, it is not essential that the compressed air container is prefilled with compressed air. Specifically, the compressed air container is refillable with compressed air. The compressed air container may be refillable via an embedded air filling device and/or an external filling device. The provision of a refillable compressed air container leads to an improved lifetime cycle and a more sustainable device as there is no need of replacing an empty compressed air container. The skilled person will understand that the expression "refillable or prefilled with compressed air" can include filling compressed air from a compressed air source into the compressed air container, and/or may include pressing ambient air, partly compressed air or uncompressed air into the compressed air container to be compressed therein. In examples, a pressure differential with respect to the environmental conditions may be produced inside the compressed air container.

[0058] The flame producing assembly 1 comprises an air inlet valve. The air inlet valve is coupled to the compressed air container and may be coupleable to an external air filling device to refill compressed air into the compressed air container. In examples, the external air filling device may be a pump. Specifically, the external air filling device may be an electrical pump or a manual pump, e.g. a bicycle pump or a pouch pump. In examples, the external air filling device may be an auxiliary compressed air canister or another kind of compressed air source, e.g. an air pressure line. The air inlet valve is arranged on the housing 2 of the flame producing assembly 1, for instance on a bottom of the flame producing assembly 1, i.e. opposite of the fuel nozzle opening 13. In examples, the air inlet valve may be airtight. The configuration of the flame producing assembly 1 being coupleable to an external air filling device reduces the complexity and the cost of the flame producing assembly 1. Furthermore, a smaller and more light-weight device can be provided.

[0059] In aspects, where the flame producing assembly 1 comprises an embedded air filling device, the embedded air filling device is coupled to the compressed air container. The embedded air filling device is adapted to press air into the compressed air container. In examples, the embedded air filling device may be an electrical pump or a manual pump. In examples, the embedded air filling device may be configured to convert mechanical motion to compressed air. The embedded air filling device may be embedded into the flame producing assembly 1, particularly into the housing 2 of the flame producing assembly 1. In other words, the embedded air filling device is arranged within the housing 2 of the flame producing assembly 1. The embedded air filling device is fluidically coupled to the compressed air container via an internal valve. The internal valve may be a one-way valve which only allows air to be pumped into the compressed air container. The embedded air filling device is further fluidically coupled to the exterior of the flame producing assembly 1 via an external valve. The external valve may be a one-way valve which only allows ambient air to be drawn in from the environment. The external valve may also be configured to allow refilling the compressed air container via an external air filling device. The expression "adapted to refill compressed air into the container" can be understood that either ambient air can be filled into the container to be compressed therein or that compressed air is generated and then filled into the compressed air container. In both cases the compressed air container is refilled with compressed air.

[0060] In particular configurations of the first embodiment, the embedded air filling device comprises a deformable elastic pouch with a first valve coupled to the compressed air container to pump air into the compressed air container, and a second valve coupled to an exterior of the flame producing assembly 1 to draw in ambient air from the environment into the pouch. In examples, the first valve is a one-way valve only allowing air to be pumped out of the pouch into the compressed air container. In examples, the second valve is a one-way valve only allowing air to be drawn into the pouch from the environment. The deformable elastic pouch is configured to be reversibly mechanically deformable by external pressurization, e.g. by a user squeezing or pressing the pouch, such that, when being pressed, air is pumped into the compressed air container via the first valve, and when returning to its unpressed state, ambient air is drawn into the pouch from the environment, particularly via the second valve. The deformable elastic pouch is adapted and arranged to be accessible from at least one exterior surface of the housing 2 of the flame producing assembly 1. In some examples, the deformable elastic pouch is adapted and arranged to be accessible from two opposing exterior surfaces of the housing 2 of the flame producing assembly 1. Accessible in this context can be understood as being actuatable and/or reachable by a user to be deformed. In examples, the embedded air filling device further comprise one or more buttons. The button is mechanically coupled to the deformable elastic pouch and may be arranged to be accessible from outside the housing 2 of the flame producing assembly 1 to mechanically deform the deformable elastic pouch.

[0061] In configurations, the embedded air filling device may be a reciprocal piston pump.

[0062] In particular aspects of the first embodiment, the flame producing assembly 1 further comprises a pressure relief valve. The pressure relief valve is coupled to the compressed air container and configured to release air from the compressed air container if a pressure inside the compressed air container exceeds a predetermined limit. The predetermined limit of pressure when the pressure release valve is activated may be at most 0,5, at most 1bar, at most 2bar, at most 3bar, at most 4bar, at most 5bar, at most 10bar or at most 15bar. The pressure relief valve increases the safety of the device to prevent overpressure inside the compressed air container. If the pressure inside the compressed air container exceeds the predetermined limit, the pressure relief valve will open and air will be released, for instance to the environment. In that, the flame producing assembly may be protected from being damaged by overpressure and the user of the flame producing assembly may be protected from injuries due to damages of the flame producing assembly. In variations of this aspect, the pressure relief valve may be configured to release air to the air nozzle arrangement, e.g. via one or more separate bypass lines.

[0063] In aspects, the wind resistant flame producing assembly 1 further comprises a compressed air main valve. The compressed air main valve is arranged between the compressed air container and the nozzle arrangement 20. The flame producing assembly 1 further comprises a main valve actuating mechanism for activating and deactivating the compressed air main valve. In other words, the compressed air main valve is actuatable via the main valve actuating mechanism. The main valve actuating mechanism is accessible from an exterior of the flame producing assembly housing 2. In examples, the main valve actuating mechanism may be arranged on or in a flame producing assembly housing surface, i.e. an exterior flame producing assembly housing surface. In some examples, the valve actuating mechanism may be in the form of a sliding or push button. The compressed air main valve is arranged upstream of the compressed air valve. For instance, the compressed air main valve can be arranged at an outlet of the compressed air container towards the one or more compressed air channels leading to the nozzle arrangement 20. In examples, the compressed air main valve may be arranged within the compressed air channel or at an inlet of the compressed air channel towards the nozzle arrangement 20. By the provision of a compressed air main valve, the creation of the air curtain C may be controlled independently of the fuel actuating mechanism 3 and/or the auxiliary actuating mechanism. Unwanted loss of compressed air, for instance in case a user accidentally activates the air curtain C and/or the compressed air valve via the fuel actuating mechanism or the auxiliary actuating mechanism can be prevented. The term "upstream" can be understood as a relative position with respect to the flow of compressed air/fuel, wherein the flow direction extends from the compressed air container through the one or more compressed air channels through nozzle arrangement, e.g. the ring-chamber and out through nozzle outlet. That means, in this example, for instance, the compressed air container is arranged upstream of the one or more compressed air channels.

[0064] In configurations of this first embodiment, other gases or gas mixtures than air, e.g. carbon dioxide or inert gases, may be used. In embodiments (not shown in the figures), the compressed fluid supply may be an embedded air filling device and/or an external air filling device, e.g. an air pump with one or more air supply channels coupled to the nozzle arrangement 20. That means, in this embodiment, air is pressed or pushed through the nozzle arrangement 20 via the embedded or external air filling device, whereby the air filling device is only activated when the flame producing assembly 1 is in operation.

Second embodiment

[0065] In the second embodiment (not shown in the figures), the fuel of the fuel container is used as compressed fluid which is then supplied to the nozzle arrangement 20. In this embodiment, compressed fuel, particularly liquid butane, liquid isobutane or liquid propane may be used as fuel in the flame producing assembly 1 for producing the flame F. The compressed fluid supply of this embodiment is provided by the fuel container, the fuel supply channel 14 and a fuel supply branch. The fuel supply branch extends, i.e. branches of, from the fuel supply channel 14 to the nozzle arrangement 20 such that the nozzle arrangement 20 is coupled to the fuel container. The compressed fluid valve is a compressed fuel valve which is arranged in the fuel supply branch. Being arranged in the fuel supply branch includes the possibilities of arranging the compressed fuel valve within, at an inlet or at an outlet of the fuel supply branch. The fuel valve may be arranged downstream of the compressed fuel valve. When the compressed fuel is supplied to the nozzle arrangement 20 via the fuel supply branch, ambient air is drawn into the expanding fuel to create an at least partially (or fully - depending upon the above-described nozzle arrangement 20 design) encircling air-fuel curtain C around the flame F during operation of the flame producing assembly 1. Using the fuel of the flame producing assembly 1 as a compressed fluid source leads to a simpler and safer assembly as no separate compressed air equipment, e.g. compressed air container and compressed air channels, are required. During expansion, the compressed fuel draws in ambient air into the expanding fuel whereby an air-fuel stream is generated which, via the nozzle arrangement 20, creates the at least partially encircling air-fuel curtain C around the flame F. Specifically, the fuel supply branch comprises a plurality of orifices circumferentially distributed about the fuel supply branch. The orifices are configured and arranged to establish a fluidic connection between the inside of the fuel supply branch and ambient air. Negative pressure is created right outside the fuel supply branch, i.e. right outside the one or more orifices. This creates a suction of air that is provided by the surrounding environment into the fuel supply branch. In turn, this results in the compressed fuel, specifically expanding fuel, being mixed with air inside the fuel supply branch. The high velocity mixture is guided through the nozzle arrangement 20, i.e. to the nozzle outlet 22 and as it exits creates the air-gas curtain, i.e. the air-fuel curtain. In aspects, the size of the orifices may be designed so that the mixture of fuel with air is diluted enough to be inert in the presence of an accidental flame, but forceful enough (i.e., of high velocity) so it can protect the flame it surrounds. The fuel supply branch opens out into the nozzle arrangement 20 through a branch outlet. In examples, the branch outlet is shaped such that a branch direction of fuel flowing out of the branch outlet is inclined outwardly with respect to the flame direction f. Inclined outwardly is to be understood in the meaning of inclined radially outwardly with respect to axis A or flame direction f. In examples, the branch direction is angled with respect to the flame direction f by about 1° to about 85°, specifically about 5° to about 45°, and more specifically about 15° to about 30°. In other words, the branch outlet, i.e. the branch direction may be parallel to the outlet direction o.

Air curtain device

[0066] The present disclosure further relates to an air curtain device for a flame producing assembly, the flame producing assembly being configured to produce a flame F along an axis A in a flame direction f. The air curtain device comprises a nozzle arrangement which is configured to create an air curtain C around the flame F produced by the flame producing assembly. In other words, the air curtain device may be similarly configured as the wind resistant flame producing assembly shown in **Figs. 1 and 2,** however, the air curtain device may be used as an add-on for a standard flame producing assembly. In aspects, the air curtain device comprises a main body having a central lumen along the axis A therethrough for receiving a fuel nozzle of the flame producing assembly. The main body is releasably mountable on the flame producing assembly such that the fuel nozzle of the flame producing assembly is received in the central lumen. The air nozzle arrangement is provided in the main body and has a nozzle outlet which at least partially encircles the central lumen. The air curtain device further comprises a compressed air container for storing compressed air. The compressed air container is provided in the main body and is coupled to the air nozzle arrangement via a compressed air channel. The air curtain device further comprises a compressed air valve for controlling supply of compressed air from the compressed air container to the nozzle arrangement. The nozzle arrangement is shaped such that, when being mounted on the flame producing assembly and when being supplied with compressed air during operation of the flame producing assembly, an at least partially encircling air curtain C is created around the flame F.

[0067] In some examples, the main body is shaped such that the fuel nozzle of the flame producing assembly extends through the central lumen outside the central lumen in the flame direction f. In examples, the main body is shaped such that the fuel nozzle is coupleable with a first opening of the central lumen. Specifically, an auxiliary fuel nozzle is formed on a second opening of the central lumen being opposite of the first opening. In aspects, the second opening is oriented in the flame direction f.

[0068] The air nozzle arrangement has one or more openings which together form the nozzle outlet. The nozzle outlet extends circumferentially at least partially around the second opening of the central lumen being oriented in the flame direction f. In examples, the nozzle outlet is arranged radially distanced from the central lumen by a minimum predefined length to reduce or eliminate a disturbance of the flame F by the air curtain C. In other words, the nozzle outlet is configured and arranged such that the fluid curtain is created radially distanced from the axis A by the minimum predefined length.

[0069] In some examples, the air nozzle arrangement is shaped such that an outlet direction of fluid flowing through the nozzle outlet is parallel to the axis A. In examples, the air nozzle arrangement is shaped such that an outlet direction of fluid flowing through the nozzle outlet is inclined outwardly with respect to the axis A. In examples, the outlet direction may be angled with respect to the axis A by about 1° to about 85°, specifically about 5° to about 45°, and more specifically about 15° to about 30°.

[0070] In aspects, the air nozzle arrangement comprises an outer cylindrical wall and an inverted cone-shaped element which is arranged distanced from the outer cylindrical wall in the flame direction f such that the nozzle outlet is formed between the outer cylindrical wall and the inverted cone-shaped element. Thereby, a direction of fluid flowing from the nozzle outlet is diverted by the inverted cone-shaped element so as to form the encircling fluid curtain C. The air curtain device further comprises an inner cylindrical wall which forms the central lumen inside the inner cylindrical wall. The inverted cone-shaped element is arranged concentrically to the central lumen. In aspects, the compressed air valve is operatively coupleable to a fuel actuating mechanism of the flame producing assembly such that the compressed air valve is activatable and deactivatable simultaneously with a fuel valve of the flame producing assembly by the fuel actuating mechanism. In some examples, the air curtain device further comprises an auxiliary actuating mechanism for activating and deactivating the compressed air valve separately of a fuel valve of the flame producing assembly.

Example method

[0071] The present disclosure further relates to a method for creating an air curtain with a wind resistant flame producing assembly. A user is in an environment of forced air/wind conditions and has in their hands a wind resistant flame producing assembly according to the present disclosure. The user turns a switch which activates the compressed air main valve to enable circulation of the compressed air. The user presses the button that activates the fuel valve and sparkler/igniter as well as the compressed air valve. Fuel is released from the fuel nozzle and a flame is produced. In parallel to the flame compressed air is released through the nozzle arrangement. The previous step remains for the duration of the user keeping the fuel valve and the compressed air valve active. While active, the compressed air flows through the nozzle arrangement creating a protective curtain/wall of air, i.e. an air curtain around the flame thus protecting it from lateral winds/forced air. When the compressed air is exhausted the user can refill the compressed air container with compressed air by using, for instance, an embedded air pump, or a compressed air cannister.

[0072] It should be understood that the present disclosure can also be defined in accordance with the following configurations:

1. A wind resistant flame producing assembly (1) comprising:

   a fuel container fillable with fuel,
   a fuel nozzle arrangement (10) for producing a flame (F) comprising a fuel nozzle (12) and a fuel supply channel (14), the fuel supply channel (14) extending from the fuel container to a fuel nozzle opening (13) of the fuel nozzle (12), the fuel nozzle opening (13) being oriented along an axis (A) in a flame direction (f),
   characterized by
   a nozzle arrangement (20) having a nozzle outlet (22) which at least partially encircles the fuel nozzle arrangement (10),
   a compressed fluid supply for storing compressed fluid, and
   a compressed fluid valve,
   wherein the nozzle arrangement (20) is suppliable with compressed fluid from the compressed fluid supply via activation of the compressed fluid valve, and
   wherein the nozzle arrangement (20) is shaped such that, when being supplied with compressed fluid during operation of the flame producing assembly (1), an at least partially encircling fluid curtain (C) is created around the flame (F).

2. The flame producing assembly (1) of configuration 1, wherein the nozzle arrangement (20) is positioned below the fuel nozzle opening (13) in a direction opposite to the flame direction (f).

3. The flame producing assembly (1) of any one of configurations 1 or 2, wherein the nozzle arrangement (20) has one or more openings which together form the nozzle outlet (22).

4. The flame producing assembly (1) of any one of the preceding configurations, wherein the nozzle outlet (22) extends circumferentially at least partially around the fuel nozzle arrangement (10).

5. The flame producing assembly (1) of any one of the preceding configurations, wherein the nozzle outlet (22) is arranged radially distanced from the axis (A) by a minimum predefined length (23) to reduce or eliminate a disturbance of the flame (F) by the fluid curtain (C).

6. The flame producing assembly (1) of any one of the preceding configurations, wherein the nozzle arrangement (20) is shaped such that an outlet direction (o) of fluid flowing through the nozzle outlet (22) is parallel to the flame direction (f).

7. The flame producing assembly (1) of any one of configurations 1 to 5, wherein the nozzle arrangement (20) is shaped such that an outlet direction (o) of fluid flowing through the nozzle outlet (22) is inclined outwardly with respect to the flame direction (f).

8. The flame producing assembly (1) of configuration 7, wherein the outlet direction (o) is angled with respect to the flame direction (f) by about 1° to about 85°, specifically about 5° to about 45°, and more specifically about 15° to about 30°.

9. The flame producing assembly (1) of any one of configurations 7 or 8, wherein the nozzle arrangement (20) comprises an outer cylindrical wall (26) and an inverted cone-shaped element (24) which is arranged distanced from the outer cylindrical wall (26) in the flame direction (f) such that the nozzle outlet (22) is formed between the outer cylindrical wall (26) and the inverted cone-shaped element (24).

10. The flame producing assembly (1) of configuration 9, further comprising an inner cylindrical wall (16) which forms at least a portion of the fuel supply channel (14) inside the inner cylindrical wall (16).

11. The flame producing assembly (1) of configuration 10, wherein the inverted cone-shaped element (24) is arranged concentrically to and axially between the fuel nozzle (12) and the inner cylindrical wall (16), and wherein the inverted cone-shaped element (24) has a central lumen (25) which forms together with the inner cylindrical wall (16) the fuel supply channel (14) to the fuel nozzle (12).

12. The flame producing assembly (1) of any one of the preceding configurations, further comprising a fuel valve and a fuel actuating mechanism (3) for activating and deactivating the fuel valve, wherein the fuel nozzle (12) is suppliable with fuel from the fuel container via activation of the fuel valve.

13. The flame producing assembly (1) of configuration 11, wherein the compressed fluid valve is operatively coupled to the fuel actuating mechanism (3) such that the compressed fluid valve is activated and deactivated simultaneously with the fuel valve by the actuating mechanism (3).

14. The flame producing assembly (1) of any one of configurations 1 to 12, further comprising an auxiliary actuating mechanism for activating and deactivating the compressed fluid valve separately of the fuel valve.

15. The flame producing assembly (1) of any one of the preceding configurations, wherein the compressed fluid is compressed air,
wherein the compressed fluid supply comprises a compressed air container and a compressed air channel via which the compressed air container is coupled to the nozzle arrangement (20), the compressed air container being fillable with compressed air, and
wherein the compressed fluid valve is a compressed air valve,
such that an encircling air curtain (C) is created around the flame (F) when the nozzle arrangement (20) is supplied with compressed air during operation of the flame producing assembly (1).

16. The flame producing assembly (1) of configuration 15, wherein the compressed air container is embedded in a housing (2) of the flame producing assembly (1).

17. The flame producing assembly (1) of any one of configurations 15 or 16, wherein the compressed air container is prefilled with compressed air.

18. The flame producing assembly (1) of any one of configurations 15 to 17, wherein the compressed air container is refillable with compressed air.

19. The flame producing assembly (1) of any one of configurations 15 to 18, comprising an air inlet valve coupled to the compressed air container, the air inlet valve being coupleable to an external air filling device to refill compressed air into the compressed air container.

20. The flame producing assembly (1) of any one of configurations 15 to 19, comprising an embedded air filling device coupled to the compressed air container, wherein the embedded air filling device is adapted to press air into the compressed air container.

21. The flame producing assembly (1) of configuration 20, wherein the embedded air filling device is an electrical pump or a manual pump.

22. The flame producing assembly (1) of any one of configurations 20 or 21, wherein the embedded air filling device is configured to convert mechanical motion to compressed air.

23. The flame producing assembly (1) of any one of configurations 20 to 22, wherein the embedded air filling device comprises a deformable elastic pouch with a first valve coupled to the compressed air container to pump air into the compressed air container and a second valve coupled to an exterior of the flame producing assembly (1) to draw in ambient air from the environment into the pouch.

24. The flame producing assembly (1) of configuration 23, wherein the first valve is a one-way valve only allowing air to be pumped out of the pouch into the compressed air container, and wherein the second valve is a one-way valve only allowing air to be drawn into the pouch from the environment.

25. The flame producing assembly (1) of any one of configurations 23 or 24, wherein deformable elastic pouch is configured to be reversibly mechanically deformable by external pressurization such that, when being pressed, air is pumped into the compressed air container via the first valve, and when returning to its unpressed state, ambient air is drawn from the environment into the pouch.

26. The flame producing assembly (1) of any one of configurations 23 to 25, wherein the embedded air filling device further comprises a button which is mechanically coupled to the deformable elastic pouch, wherein the button is arranged to be accessible from outside the housing (2) of the flame producing assembly (1) to mechanically deform the deformable elastic pouch.

27. The flame producing assembly (1) of any one of configurations 23 to 26, wherein the deformable elastic pouch is arranged to be accessible from at least one exterior surface of the housing (2) of the flame producing assembly (1).

28. The flame producing assembly (1) of configuration 27, wherein the deformable elastic pouch is arranged to be accessible from two opposing exterior surfaces of the housing (2) of the flame producing

assembly (1).

29. The flame producing assembly (1) of any one of configurations 20 to 22, wherein the embedded air filling device is a reciprocal piston pump.

30. The flame producing assembly (1) of any one of configurations 18 to 29, further comprising a pressure relief valve coupled to the compressed air container and configured to release air from the compressed air container if a pressure inside the compressed air container exceeds a predetermined limit.

31. The flame producing assembly (1) of any one of configurations 15 to 30, further comprising a compressed air main valve which is arranged between the compressed air container and the nozzle arrangement (20) upstream of the compressed air valve.

32. The flame producing assembly (1) of configuration 31, further comprising a main valve actuating mechanism for activating and deactivating the compressed air main valve.

33. The flame producing assembly (1) of any one of configurations 1 to 14, wherein the fuel is used as compressed fluid,
wherein the compressed fluid supply is provided by the fuel container, the fuel supply channel (14) and a fuel supply branch extending from the fuel supply channel (14) to the nozzle arrangement (20) such that the nozzle arrangement (20) is coupled to the fuel container,
wherein the compressed fluid valve is a compressed fuel valve being arranged in the fuel supply branch, such that, when the nozzle arrangement (20) is supplied with compressed fuel during operation of the flame producing assembly (1), ambient air is drawn into the fuel to create an encircling air-fuel curtain (C) around the flame (F).

34. The flame producing assembly (1) of configuration 33, wherein the fuel supply branch comprises a plurality of orifices circumferentially distributed about the fuel supply branch.

35. The flame producing assembly (1) of configuration 34, wherein the orifices are configured and arranged to establish a fluidic connection between the inside of the fuel supply branch and ambient air.

36. The flame producing assembly (1) of any one of configurations 34 or 35, wherein the fuel supply branch opens out into the nozzle arrangement (20) through a branch outlet.

37. The flame producing assembly (1) of configuration 36, wherein the branch outlet is shaped such that a branch direction of fuel flowing out of the branch outlet is inclined outwardly with respect to the flame direction (f).

38. The flame producing assembly (1) of configuration 37, wherein the branch direction is angled with respect to the flame direction (f) by about 1° to about 85°, specifically about 5° to about 45°, and more specifically about 15° to about 30°.

39. The flame producing assembly (1) of any one of configurations 32 to 37, wherein the fuel valve is arranged downstream of the compressed fuel valve.

40. The flame producing assembly (1) of any one of the preceding configurations, wherein the fuel filled in the fuel container is compressed fuel, particularly liquid butane, liquid isobutane or liquid propane.

41. The flame producing assembly (1) of any one of the preceding configurations, wherein the fuel container is prefilled with compressed fuel.

42. The flame producing assembly (1) of any one of the preceding configurations, wherein the fuel container is refillable with compressed fuel.

43. The flame producing assembly (1) of configuration 42, comprising a fuel inlet valve coupled to the fuel container, the fuel inlet valve being coupleable with an external fuel filling device to refill compressed fuel into the fuel container.

44. The flame producing assembly (1) of any one of the preceding configurations, being configured to produce a laminar flame or a jet flame

45. An air curtain device for a flame producing assembly, the flame producing assembly being configured to produce a flame along an axis in a flame direction, the air curtain device comprising:

> a main body having a central lumen along the axis therethrough for receiving a fuel nozzle of the flame producing assembly, wherein the main body is releasably mountable on the flame producing assembly such that the fuel nozzle of the flame producing assembly is received in the central lumen,
> an air nozzle arrangement provided in the main body and having a nozzle outlet which at least partially encircles the central lumen,
> a compressed air container for storing compressed air, the compressed air container being provided in the main body and being coupled to the air nozzle arrangement via a compressed air channel,

and a compressed air valve for controlling supply of compressed air from the compressed air container to the nozzle arrangement,
wherein the nozzle arrangement is shaped such that, when being mounted on the flame producing assembly and when being supplied with compressed air during operation of the flame producing assembly, an encircling air curtain is created around the flame.

46. The air curtain device of configuration 45, wherein the main body is shaped such that the fuel nozzle of the flame producing assembly extends through the central lumen outside the central lumen in the flame direction.

47 The air curtain device of configuration 45, wherein the main body is shaped such that the fuel nozzle is coupleable with a first opening of the central lumen, wherein an auxiliary fuel nozzle is formed on a second opening of the central lumen being opposite of the first opening, and wherein the second opening is oriented in the flame direction.

48. The air curtain device of any one of configurations 45 to 47, wherein the air nozzle arrangement has one or more openings which together form the nozzle outlet.

49. The air curtain device of any one of configurations 45 to 48, wherein the nozzle outlet extends circumferentially at least partially around a second opening of the central lumen being oriented in the flame direction.

50. The air curtain device of any one of configurations 45 to 49, wherein the nozzle outlet is arranged radially distanced from the central lumen by a minimum predefined length to reduce or eliminate a disturbance of the flame by the air curtain.

51. The air curtain device of any one of configurations 45 to 50, wherein the air nozzle arrangement is shaped such that an outlet direction of fluid flowing through the nozzle outlet is parallel to the axis.

52. The air curtain device of any one of configurations 45 to 50, wherein the air nozzle arrangement is shaped such that an outlet direction of fluid flowing through the nozzle outlet is inclined outwardly with respect to the axis.

53. The air curtain device of configuration 52, wherein the outlet direction is angled with respect to the axis by about 1° to about 85°, specifically about 5° to about 45°, and more specifically about 15° to about 30°.

54. The air curtain device of any one of configurations 52 or 53, wherein the air nozzle arrangement comprises an outer cylindrical wall and an inverted cone-shaped element which is arranged distanced from the outer cylindrical wall in the flame direction such that the nozzle outlet is formed between the outer cylindrical wall and the inverted cone-shaped element.

55. The air curtain device of configuration 54, further comprising an inner cylindrical wall which forms the central lumen inside the inner cylindrical wall.

56. The air curtain device of configuration 55, wherein the inverted cone-shaped element is arranged concentrically to the central lumen.

57. The air curtain device of any one of configurations 45 to 56, wherein the compressed air valve is operatively coupleable to a fuel actuating mechanism of the flame producing assembly such that the compressed air valve is activatable and deactivatable simultaneously with a fuel valve of the flame producing assembly by the fuel actuating mechanism.

58. The air curtain device of any one of configurations 45 to 56, further comprising an auxiliary actuating mechanism for activating and deactivating the compressed air valve separately of a fuel valve of the flame producing assembly.

59. An air curtain device for a flame producing assembly comprising:
a nozzle arrangement being configured to create an air curtain around a flame produced by the flame producing assembly.

60. The air curtain device of configuration 59, wherein the nozzle arrangement comprises:

a nozzle outlet which at least partially encircles a fuel nozzle arrangement of the flame producing assembly,
a compressed fluid supply for storing compressed fluid, and
a compressed fluid valve,
wherein the nozzle arrangement is suppliable with compressed fluid from the compressed fluid supply via activation of the compressed fluid valve, and
wherein the nozzle arrangement is shaped such that, when being supplied with compressed fluid during operation of the flame producing assembly, an at least partially encircling fluid curtain is created around the flame.

61. The air curtain device of any one of configurations 59 of 60, comprising the features of any one of the

configurations 45 to 58.

Reference signs

1	Flame producing assembly
2	Housing
3	Fuel actuating mechanism
10	Fuel nozzle arrangement
12	Fuel nozzle
13	Fuel nozzle opening
14	Fuel supply channel
16	Inner cylindrical wall
20	Nozzle arrangement
21	Minimum predefined distance
22	Nozzle outlet
23	Minimum predefined length
24	Inverted-cone shaped element
24a	Downward facing surface
26	Outer cylindrical wall
26a	Upper end
A	Axis
F	Flame
f	Flame direction
C	Air curtain
o	Outlet direction

Claims

1. A flame producing assembly (1) comprising:

a fuel container fillable with fuel,
a fuel nozzle arrangement (10) for producing a flame (F) comprising a fuel nozzle (12) and a fuel supply channel (14), the fuel supply channel (14) extending from the fuel container to a fuel nozzle opening (13) of the fuel nozzle (12), the fuel nozzle opening (13) being oriented along an axis (A) in a flame direction (f),
wherein the flame producing assembly further comprises
a nozzle arrangement (20) having a nozzle outlet (22) which at least partially encircles the fuel nozzle arrangement (10),
a compressed fluid supply for storing compressed fluid, and
a compressed fluid valve,
wherein the nozzle arrangement (20) is suppliable with compressed fluid from the compressed fluid supply via activation of the compressed fluid valve, and
wherein the nozzle arrangement (20) is shaped such that, when being supplied with compressed fluid during operation of the flame producing assembly (1), an at least partially encircling fluid curtain (C) is created around the flame (F).

2. The flame producing assembly (1) of claim 1, wherein the nozzle arrangement (20) is positioned around the axis (A) and below the fuel nozzle opening (13) in a direction opposite to the flame direction (f).

3. The flame producing assembly (1) of any one of claims 1 or 2, wherein the nozzle arrangement (20) has one or more openings which together form the nozzle outlet (22).

4. The flame producing assembly (1) of any one of the preceding claims, wherein the nozzle outlet (22) extends circumferentially at least partially around the fuel nozzle arrangement (10).

5. The flame producing assembly (1) of any one of the preceding claims, wherein the nozzle outlet (22) is arranged radially distanced from the axis (A) by a minimum predefined length (23) to reduce or eliminate a disturbance of the flame (F) by the fluid curtain (C).

6. The flame producing assembly (1) of any one of the preceding claims, wherein the nozzle arrangement (20) is shaped such that an outlet direction (o) of fluid flowing through the nozzle outlet (22) is inclined outwardly with respect to the flame direction (f).

7. The flame producing assembly (1) of any one of the preceding claims, wherein the nozzle arrangement (20) comprises an outer cylindrical wall (26) and an inverted cone-shaped element (24) which is arranged around the axis (A), distanced from the outer cylindrical wall (26) in the flame direction (f) such that the nozzle outlet (22) is formed between the outer cylindrical wall (26) and the inverted cone-shaped element (24).

8. The flame producing assembly (1) of any one of the preceding claims, further comprising a fuel valve and a fuel actuating mechanism (3) for activating and deactivating the fuel valve, wherein the fuel nozzle (12) is suppliable with fuel from the fuel container via activation of the fuel valve, and optionally, wherein the compressed fluid valve is operatively coupled to the fuel actuating mechanism (3) such that the compressed fluid valve is activated and deactivated simultaneously with the fuel valve by the actuating mechanism (3).

9. The flame producing assembly (1) of any one of the preceding claims, wherein the compressed fluid is compressed air,
wherein the compressed fluid supply comprises a compressed air container and a compressed air channel via which the compressed air container is coupled to the nozzle arrangement (20), the compressed air container being fillable with compressed air, and
wherein the compressed fluid valve is a compressed air valve such that the encircling air curtain (C) is created at least partially around the flame (F) when the nozzle arrangement (20) is supplied with compressed air during operation of the flame producing assembly (1).

10. The flame producing assembly (1) of claim 9, wherein the compressed air container is refillable with compressed air.

11. The flame producing assembly (1) of any one of claims 9 or 10, comprising an air inlet valve coupled to the compressed air container, the air inlet valve being coupleable to an external air filling device to refill compressed air into the compressed air container.

12. The flame producing assembly (1) of any one of claims 9 to 11, comprising an embedded air filling device coupled to the compressed air container, wherein the embedded air filling device is adapted to press air into the compressed air container.

13. The flame producing assembly (1) of claim 12, wherein the embedded air filling device comprises a deformable elastic pouch with a first valve coupled to the compressed air container to pump air into the compressed air container and a second valve coupled to an exterior of the flame producing assembly (1) to draw in ambient air from the environment into the pouch.

14. The flame producing assembly (1) of any one of claims 1 to 8, wherein the fuel is used as compressed fluid,
wherein the compressed fluid supply is provided by the fuel container, the fuel supply channel (14) and a fuel supply branch extending from the fuel supply channel (14) to the nozzle arrangement (20) such that the nozzle arrangement (20) is coupled to the fuel container,
wherein the compressed fluid valve is a compressed fuel valve being arranged in the fuel supply branch such that, when the nozzle arrangement (20) is supplied with compressed fuel during operation of the flame producing assembly (1), ambient air is drawn into the fuel to create the encircling air-fuel curtain (C) at least partially around the flame (F).

15. An air curtain device for a flame producing assembly comprising:
a nozzle arrangement being configured to create an air curtain at least partially around a flame produced by the flame producing assembly.

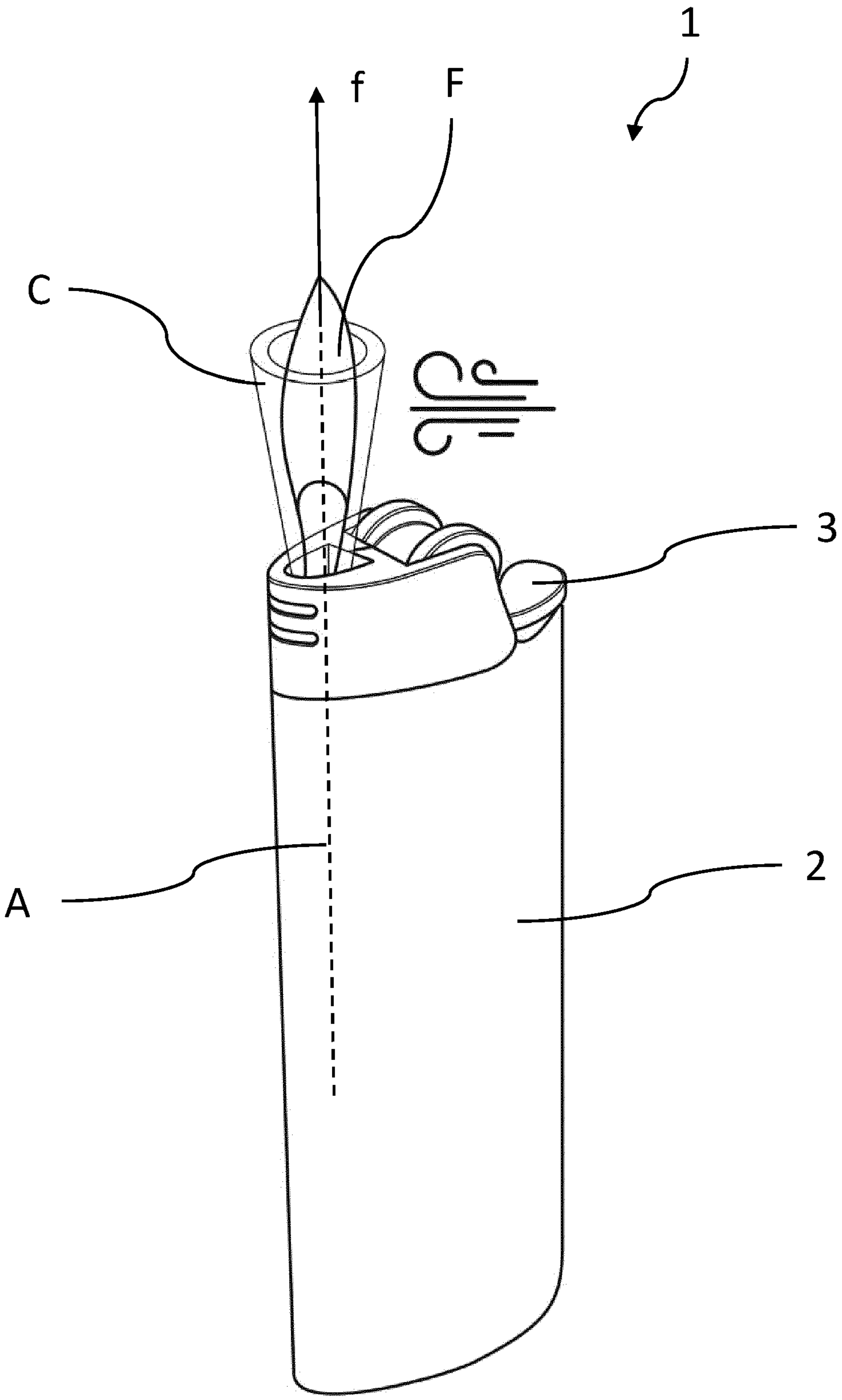

Fig. 1

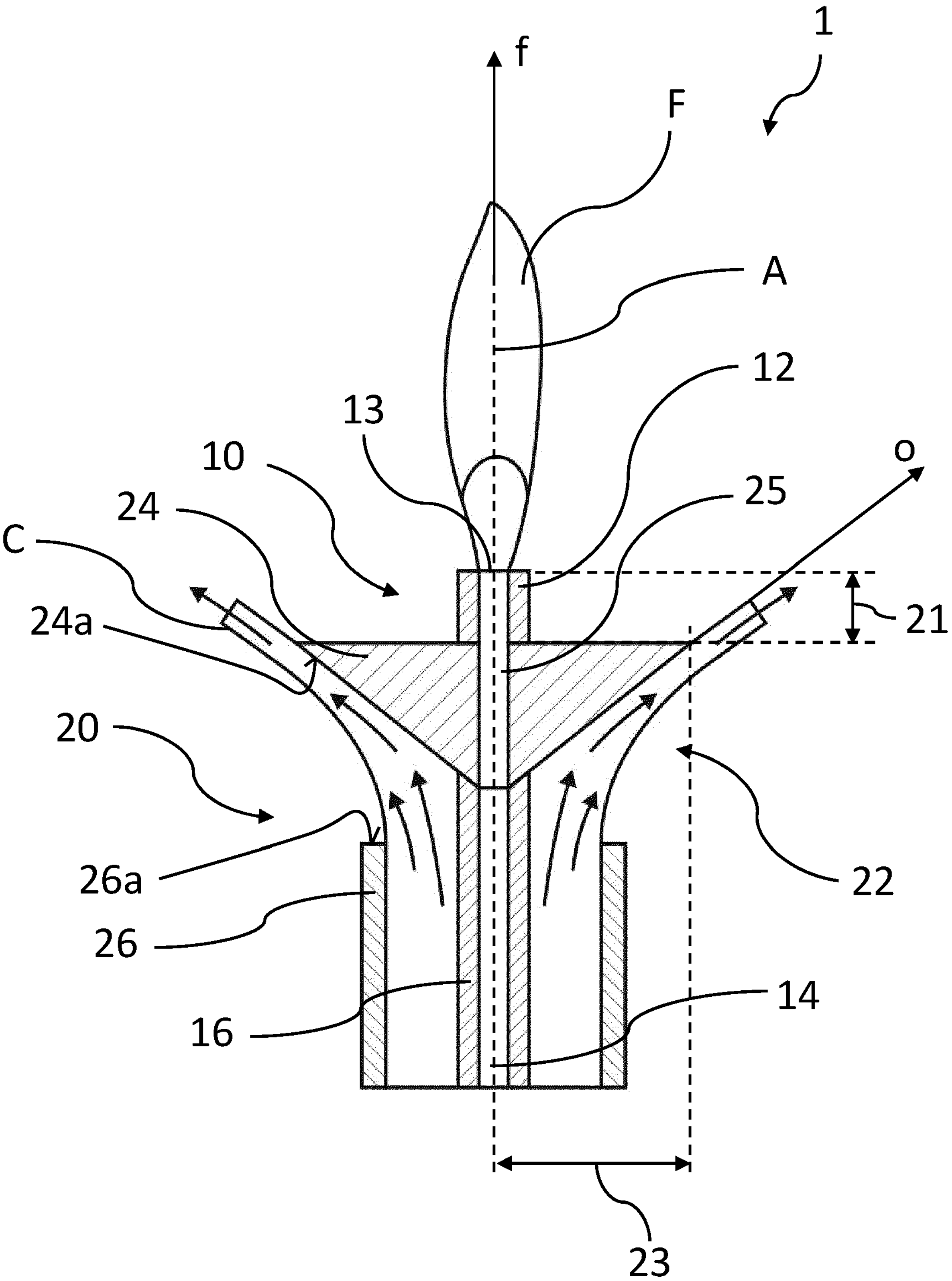

Fig. 2

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 21 17 6143

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 A	DE 11 32 756 B (ROWENTA METALLWARENFAB GMBH) 5 July 1962 (1962-07-05) * column 1, line 1 - line 7; figures 2,3 * * column 1, line 44 - line 52 * * column 2, line 27 - line 34 * -----	1-4,8,14 5-7,9-13	INV. F23D14/58 F23D99/00 F23Q2/16
X	US 3 716 324 A (PONTHOREAU M ET AL) 13 February 1973 (1973-02-13) * column 1, line 4 - line 7; figures 1,2 * * column 2, line 16 - line 43 * -----	15	
A	US 2004/202978 A1 (WONG MING KING [HK]) 14 October 2004 (2004-10-14) * paragraph [0002]; figures 2,3A,3B * -----	1,3	

TECHNICAL FIELDS SEARCHED (IPC)

F23D
F24C
F23Q

The present search report has been drawn up for all claims

1

Place of search	Date of completion of the search	Examiner
Munich	8 November 2021	Hauck, Gunther

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

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 21 17 6143

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.

08-11-2021

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
DE 1132756	B	05-07-1962	NONE	
US 3716324	A	13-02-1973	NONE	
US 2004202978	A1	14-10-2004	NONE	

EPO FORM P0459

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