

(19)



Europäisches
Patentamt
European
Patent Office
Office européen
des brevets



(11)

EP 3 832 210 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

09.06.2021 Bulletin 2021/23

(51) Int Cl.:

F24B 1/18 (2006.01)**F24C 3/00** (2006.01)**F24C 7/00** (2006.01)(21) Application number: **20211545.7**(22) Date of filing: **03.12.2020**

(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**KH MA MD TN**

(72) Inventors:

- **VAN LAAR, Christiaan**
8448 CC Heerenveen (NL)
- **TRAJCOV, Ljupco**
8448 CC Heerenveen (NL)

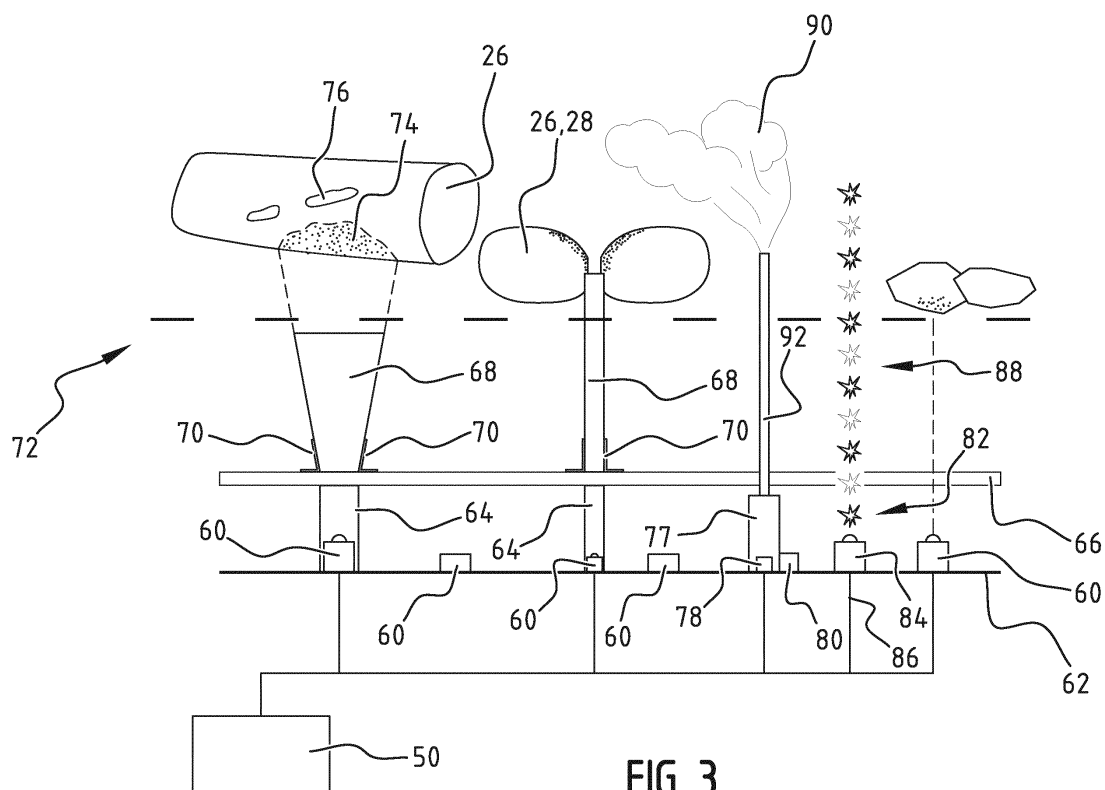
(74) Representative: **Arnold & Siedsma****Bezuidenhoutseweg 57****2594 AC The Hague (NL)**(30) Priority: **03.12.2019 NL 2024364**(71) Applicant: **Glen Dimplex Benelux B.V.****8448 CC Heerenveen (NL)****(54) FIREPLACE PROVIDED WITH GLOWING EFFECT AND METHOD THEREFOR**

(57) The invention relates to a fireplace provided with a glowing effect and method therefor. The fireplace comprises:

- a housing provided with a combustion space with one or more fireplace elements;
- at least one burner element arranged in the housing for

the purpose of providing a flame pattern in the housing;

- control means for controlling the at least one burner element; and
- a light source configured to provide the glowing effect on at least a part of the one or more fireplace elements.

**FIG. 3****EP 3 832 210 A1**

Description

[0001] The present invention relates to a fireplace, more particularly a gas fireplace.

[0002] Conventional gas fireplaces are provided with one or more gas burners whereby a flame pattern is brought about in a fireplace. The fireplace is usually provided here with fireplace elements, such as ceramic logs, stones and the like.

[0003] A problem with conventional decorative gas fireplaces is that, although with the ceramic logs and the gas burners a flame pattern can be realized for a so-called decorative gas fireplace, an authentic wood fire is however not entirely approximated thereby. It is thus difficult in practice to achieve a glowing effect. Only the heating of the ceramic elements may provide some glowing effect. Such heating is however detrimental to the visible flame height which is realized by gas burners. This is thereby detrimental to the visual effect which can be realized with the (decorative) fireplace for the benefit of a user.

[0004] The present invention has for its object to provide a fireplace whereby the above stated drawbacks are obviated or at least reduced.

[0005] This object is achieved with the fireplace according to the present invention, wherein the fireplace comprises:

- a housing provided with a combustion space with one or more fireplace elements;
- at least one burner element arranged in the housing for the purpose of providing a flame pattern in the housing;
- control means for controlling the at least one burner element; and
- a light source configured to provide the glowing effect on at least a part of the one or more fireplace elements.

[0006] By providing a housing with a combustion space this combustion space can be shielded in effective manner from the environment in which the fireplace is placed. It is hereby for instance possible to discharge combustion gases produced in the case of a gas fireplace in simple manner. The fireplace is preferably provided here with a window on at least one visible side of the fireplace. If desired, a window can be provided on a plurality of sides of the fireplace.

[0007] Flames and/or a flame pattern can be arranged in the housing, more particularly in the combustion space thereof, by providing at least one burner element. In the case of a gas burner the at least one burner element is usually provided with an ignition whereby the gas burner can be taken into use. The burner element is controlled using control means. In the case of a gas fireplace the control means are configured as gas control means for feeding a desired quantity of gas to the gas burner at the desired moments. The gas control means preferably like-

wise control the ignition. It is hereby possible to control the one or more gas burners and provide a desired flame pattern in the combustion space of the gas fireplace in effective manner. The invention relates to different types of fireplace, including gas fireplaces and electric fireplaces, such as a so-called e-Matrix fireplace. In a currently preferred embodiment the fireplace is specifically a gas fireplace, the burner element is a gas burner and the control means are gas control means.

[0008] According to the invention, the fireplace is further provided with a light source which is configured to provide a glowing effect on the one or more fireplace elements. Such fireplace elements are arranged in the combustion space and are for instance ceramic logs and/or stones. Other suitable fireplace elements can also be applied. The light source is provided such that it provides a glowing effect on the fireplace elements. Further decorative elements can optionally be provided, such as stones, ceramic materials, minerals and the like.

[0009] By providing a separate light source a glowing effect can be achieved independently of the at least one burner element. This means that the effect of the flame height can be set independently of the glowing effect. This further has the additional advantage that the gas consumption in the case of the gas fireplace according to the invention is lower at the same flame height as compared to conventional gas fireplaces wherein gas is lost by the heating of the fireplace elements for realizing a glowing effect thereby. A further advantage of an application of a separate light source for providing a glowing effect independently of the flame height is that the development of heat can be limited further. Such heat development is particularly undesirable in so-called decorative gas fireplaces.

[0010] In an advantageous preferred embodiment according to the invention the fireplace further comprises a glow control operatively connected to the light source.

[0011] The glow control controls the light source and is preferably configured to vary the control of the at least one light source in time. This variation for instance relates to adjustment of the power and/or an on-off switch of the light source. A timing effect can hereby be achieved for the glowing effect on the one or more fireplace elements. A realistic glowing effect is hereby imitated even more effectively.

[0012] This visual effect of the glowing effect varying in time can be enhanced still further by arranging shadow effects on the fireplace elements. This is for instance possible by arranging colour nuances or painting on such fireplace elements. It will be apparent that other options can also be used for providing the desired shadow effects. If desired, the glow control can be provided integrally, wholly or partially, with the gas control means for the purpose of controlling the at least one burner element.

[0013] In a further advantageous embodiment according to the invention the fireplace comprises a second light source.

[0014] Providing a second or even further light source

achieves that the glowing effect can be enhanced. This is advantageous inter alia in relatively large fireplaces. Still more variation in respect of the glowing effect can also be realized with the two or more light sources by varying power and/or on-off control. This makes the imitation of a wood fire even more authentic.

[0015] The at least one light source preferably comprises at least one LED lamp. Such an LED lamp provides a simple light source suitable for arranging a glowing effect on the one or more fireplace elements. It is further advantageous for such an LED lamp to provide options for providing the desired glowing effect in energy-efficient manner. Options are further provided for effectively positioning the light realized with the LED lamp for the desired glowing effect.

[0016] In an advantageous embodiment according to the invention the fireplace comprises a light conductor configured to guide the light from the light source to at least a part of the one or more fireplace elements.

[0017] Providing a light conductor makes it possible to direct light from the light source and guide it to the desired location on the one or more fireplace elements in effective manner. It has been found that application of a light conductor as alternative to or in combination with displacing of light through air provides a better positioning of the light effect. A glowing effect can hereby be imitated more effectively, since it appears to come directly from the fireplace element rather than being for instance a general illumination of the underside of the fireplace elements. This enables an even more authentic image of a fire, particularly in combination with varying powers and/or on-off switch of the light source or light sources in time.

[0018] In a currently preferred embodiment the light conductor can be placed at an angle to the vertical in order to thereby improve the visual effect still further. This is for instance possible by placing the holder for the light conductor at an angle and/or providing the light conductor with a curve or bend.

[0019] In a currently preferred embodiment a light conductor comprises a glass element. Such a glass element is for instance the same type of glass as used in a window for a fireplace. Such window pane glass is also referred to as glass-ceramic or heat-resistant glass, optionally of a resin. The thickness of the glass which is used for such a light conductor preferably lies in the range of 3-20 mm, more preferably in the range of 3-7 mm, and still more preferably in the range of 4-5 mm. The width and height of the light conductor can be adapted to the dimensions of the fireplace. Alternative conductors can optionally be envisaged, for instance manufactured from plastic material, metal tubes, glass tubes, other types of glass and the like.

[0020] In a further currently preferred embodiment at least one light source is provided with two or more light conductors. The light from the light source, preferably an LED lamp, can hereby be applied even more effectively. At least one of the light conductors is here preferably provided at an angle to the vertical in order to thereby

improve the visual effects still further.

[0021] The light conductor, or one of the arranged light conductors, can optionally extend into at least one of the fireplace elements and/or between adjacent fireplace elements. A visual effect is hereby achieved which imitates the glowing effect coming from the fireplace element itself. This enhances the desired visual glowing effect.

[0022] In an advantageous embodiment according to the invention the light source is arranged outside the combustion space.

[0023] By arranging the light source outside the combustion space a better control of the light source can be guaranteed. The temperature control of the light source, preferably an LED lamp, can here further be carried out better.

[0024] The fireplace preferably comprises a frame on which the one or more light sources can be mounted, and a support configured to mount thereon one of the light conductors as described above. This enables a modular whole which is provided with a support for a spacer and positioning of light conductors in relation to the light sources. It is further possible to provide the light conductor with a movable element which is driven, separately if necessary, whereby the location of the light conductor can also vary. This is for instance applied in combination with varying the power and/or on-off switch in time. This enhances the visual effect further.

[0025] In a further advantageous embodiment according to the invention the light source is configured to provide the glowing effect in a plurality of colours.

[0026] By providing a plurality of colours further visual effects can be realized. Use can for instance be made here of multiple colours of LED lamp, for instance multi-colour LEDs, such as RGB lighting.

[0027] In a further advantageous embodiment according to the invention the fireplace comprises a burner bed under at least a part of the fireplace elements.

[0028] By providing a separate burner bed a further glowing effect can be realized. Use is for instance made here of the decoration material already mentioned above in the form of ceramic materials and/or stones and/or minerals.

[0029] In a currently preferred embodiment the burner bed is provided with a perforated plate suitable for transmitting light and/or air. Use is preferably made here of a glass pane for further enhancing visual effects.

[0030] In a further advantageous embodiment according to the invention the light source is provided with a heat-conducting element configured to discharge surplus heat.

[0031] By providing a heat-conducting element surplus heat can be discharged in effective manner and overheating of the light source is prevented. This can for instance be realized using a metal housing or a metal conductor in which an LED lamp is arranged. The light source can hereby be used under desired conditions.

[0032] In a further advantageous embodiment according to the invention the fireplace comprises a spark sim-

ulator.

[0033] Providing a spark simulator enables the occurrence of sparks in the (decorative) gas fireplace to be simulated. This further improves the imitation of a fire. Such a spark simulator is for instance embodied with LED lamps which provide a projection in the combustion space, wherein these LED lamps are controlled on-off rapidly for the simulation of flying sparks. The control of such a spark simulator is preferably combined with a glow control, optionally separately or, if desired, integrally with a more central control.

[0034] In a further advantageous embodiment according to the invention the fireplace further comprises a smoke simulator.

[0035] The burning of a fire is further simulated by providing a smoke simulator. A smoke simulator can be embodied in diverse ways. A possible variant relates to providing a heating element with for instance an electric coil whereby liquid is evaporated. Such a technique is for instance applied in E-cigarettes. An alternative embodiment makes use of smoke simulators which are used in for instance nightclubs. Necessary agents to be supplied, in the form of a liquid, can be provided in a tank or other reservoir.

[0036] Providing the combination of sparks and smoke enhances the glowing effect such that the most optimal fire possible is achieved. It is possible, if desired, to provide a separate light source and/or to use one of the already present light sources to illuminate the smoke in order to increase the effect of the smoke. If desired, the smoke simulator can be provided with a pipe for through-feed of the smoke, for instance on the upper side of the fireplace elements. The glowing effect hereby remains readily visible, and a controllable degree of smoke is provided on the upper side of the fireplace elements. This further increases the effect of the decorative fireplace and makes a type of hybrid heater possible, whereby both heat demands and decorative demands can be met, even if the fireplace is not consuming gas, i.e. is not burning. This increases the flexibility of utility of the fireplace according to the invention still further.

[0037] In a further advantageous embodiment according to the invention the fireplace comprises at least two burner elements, more specifically gas burners, which are provided with a shared gas feed and provided with a three-way valve configured to supply gas to a maximum of one of the at least two gas burners.

[0038] By providing an additional three-way valve two or more of the gas burners present in the fireplace can be controlled in effective manner. Particularly the maximum installed power of the fireplace remains limited hereby, since only one of the at least two gas burners can be active at any given moment. Limiting the maximum power of the gas fireplace has the advantage that specific regulations can be adhered to more effectively. Additionally, a cost-effective fireplace with a good flame pattern can hereby be provided.

[0039] As a further advantage of a sub-system or mod-

ule of three-way valve with two gas burners, it is for instance possible to use one of the two gas burners as a kind of ignition burner, for instance for igniting a relatively far-removed burner which would otherwise be difficult to ignite. After this burner has actually been ignited, the gas can be utilized at a different position in a different burner, without the total (installed) power of the fireplace being increased thereby.

[0040] An alternative to a configuration with three-way valve by provision of open/close valves requires monitoring of valve positions, since both burners can otherwise be supplied with gas. This actually increases the maximum power of the fireplace.

[0041] It is optionally possible to apply separate units of at least two gas burners with a feed via a three-way valve, optionally in combination with additional single gas burners provided with a separate gas feed. It is thus for instance possible to apply seven 2 kW burners, wherein two of these burners are coupled via a three-way valve so that the total power is 12 kW rather than 14 kW, while the same flame pattern effect is realized.

[0042] Application of such a feed via one or more three-way valves can be combined in advantageous manner with a spark simulator and/or a smoke simulator and/or one of the other embodiments described above.

[0043] The invention further also relates to a method for providing a glowing effect in a fireplace, the method comprising the steps of:

- providing a fireplace in an embodiment according to the invention as described above; and
- providing the glowing effect on the one or more fireplace elements.

[0044] The method provides similar advantages and effects as described for the fireplace and more particularly the gas fireplace. The method optionally comprises further steps for providing a spark simulator and a further complete glowing effect using one or more of the measures as described above for the fireplace, particularly the gas fireplace. It is further possible to control two or more of the gas burners using a three-way valve in order to provide a further effect on power limitation and simultaneously realize the most optimal visual effect possible.

[0045] Further advantages, features and details of the invention are elucidated on the basis of preferred embodiments thereof, wherein reference is made to the accompanying drawings, in which:

- figure 1 shows a view of a gas fireplace according to the invention;
- figure 2 shows a schematic representation of the fireplace of figure 1;
- figure 3 shows the operation of the light source for the glowing effect in an embodiment according to the invention applicable in the fireplace of figures 1 and 2; and

- figure 4 shows a schematic representation of the combined three-way control of gas burners.

[0046] Space 2 (figure 1) is provided with ceiling 4, side wall 6, wall 7 and floor 8. Further arranged in space 2 is gas fireplace 10. During use fireplace 10 provides flames 12, resulting in flame pattern 13 in housing 15. Flames 12 are visible through glass window 14 on the front side. It will be apparent that a different configuration of fireplace 10 with only a single window or conversely more windows is also possible. In the shown embodiment fireplace 10 further comprises (closed) rear wall 18 and side wall 20. In the shown embodiment fireplace 10 is provided with panel or door 22 which can be opened using hinges 16 for access to the interior of fireplace 10.

[0047] Fireplace 10 (figure 2) is provided with a burner element 24, shown in the form of a gas burner, which is arranged in any suitable form at a desired position in fireplace 10. Provided in the shown embodiment is fireplace element 26 in the form of a ceramic log, and optionally further decorative elements in the form of chips, stones 28 and the like.

[0048] In the shown embodiment chimney 30 is provided with outer casing 34 for supplying air for the purpose of the combustion for realizing fire 12. Provided in outer casing 34 is inner casing 36 whereby combustion gases coming from fire 12 can be discharged. Casings 34, 36 here function during use as a heat exchanger for transferring heat from the hot combustion gases to the relatively cold ambient air. Optionally provided are fan 35 and mixing valve 37.

[0049] Also provided in the shown embodiment is convection duct 38 with inlet 40 and outlet 42, provided for the purpose of circulating air from space 2 for heating thereof. Heat produced by fireplace 10 can hereby be effectively used for space 2.

[0050] In the shown embodiment burner system 44 with burner 24, and glow system 46, are provided in installation space 47 provided under combustion space 48. Glow control 50 controls glow system 46. Burner controller 52 controls one or more burners 24. It is also possible, if desired, to combine the two controllers in a central controller. Various sensors can be provided in order to optimize control of gas fireplace 10, including for instance temperature sensor 54, pressure/temperature sensor 56 in or on chimney 30, door sensor 58 close to the front side of gas fireplace 10 and optional sensors in gas feed and for valve positions. It will be apparent that other sensors can additionally and/or alternatively also be applied. It will further likewise be apparent that the various components of fireplace 10 can also be applied in a different configuration for a fireplace in general and more particularly a gas fireplace.

[0051] Glow control 50 (figure 3) is connected to a number of LEDs 60 which in the shown embodiment are arranged on or at glow frame 62 and/or on bottom 62. LEDs 60 can be embodied as separate LEDs and/or LED strips. The emission angle of the light is preferably adapt-

ed to the design of fireplace 10, wherein variation in emission angle is optionally realized, for instance in the range of 10-130°. LEDs 60 are optionally wholly or partially arranged in (heat-conducting) housing 64. LEDs 60 can be activated (on-off) and their power (light output) optionally adjusted in time by glow control 50. Light is carried through glass pane 66 and, if desired, is carried via light conductor 68, which are preferably secured on support 70, to glow bed 72 in order to there provide the desired glowing effect 74 on fireplace element 26 and/or decoration material 28. Supports 70 are optionally provided integrally as a sort of spiderweb support structure with upright holders for positioning light conductors 68. In the shown embodiment light conductors 68 are provided as thin glass panes having a thickness of about 5 mm. The form and orientation of the pane is preferably adapted to the desired glowing effect 74. Fireplace element 26 is optionally provided with shadow elements 76 for further enhancing glowing effect 74. Light conductors 68 are optionally placed at an angle in order to further optimize glowing effect 74. It is possible, if desired, to provide a plurality of light conductors 68 with an individual LED 60. It is also possible to provide LEDs 60 at mutually differing heights.

[0052] Optionally provided in the shown embodiment is smoke simulator 77 with heater 78 and liquid reservoir 80. Additionally or alternatively provided is spark simulator 82 with LED 84. Visual spark effect 88 can be obtained by control 86 of LED 84. Control 86 is preferably provided using glow control 50. From glow control 50, smoke simulator 76 can likewise be activated to obtain smoke effect 90. Smoke conductor 92 is optionally provided for guiding smoke to the desired location in fireplace 10.

[0053] In a possible embodiment of burner system 44 (figure 4) a plurality of burners 24 are provided. Burners 24 are controlled from burner controller 52. Provided in the shown embodiment are a number of burner combinations 94 comprising two burners 24, wherein burner combination 94 is further provided with controllable three-way valve 96. Valve 96 provides for gas feed to a maximum of one of the two valves 24 of burner combination 94. The total installed/maximum power remains limited hereby, while a great effectiveness of burner system 44 is still obtained. Burners 24 are further preferably provided with an open/close valve (not shown), optionally provided with a position sensor.

[0054] Burner system 44 is activated for the purpose of obtaining flame pattern 13 in fireplace 10. Gas is hereby supplied to at least a part of burners 24. Burners 24 are ignited and flames 12 are started up. In order to obtain glowing effect 74 glow control 50 is activated, whereby LEDs 60 are switched on. Glow control 50 preferably controls switching on and off and variable power supply to LEDs 60. Heat produced by LEDs 60 is discharged via housing 64. LEDs 60 emit light which is carried via one or more light conductors 68 to fireplace elements 26 and/or decoration material 28 in order to obtain glowing

effect 74. Spark simulator 84 and/or smoke simulator 76 are optionally activated. A visual glowing effect 74 can be obtained by variation in time, which effect therefore varies in time in order to provide a realistic visual image. The same approach can also be realized with spark simulator 84 and/or smoke simulator 76 for respectively spark pattern 98 and smoke 90. In a currently preferred embodiment one or more burner combinations 94 are provided, wherein gas supply is fed to one of the two burners 24. Variation of flame pattern 13 in time can hereby be optimized further without increasing the total power of fireplace 10. When fireplace 10 is ignited, additional gas can hereby additionally be supplied to a location which is not igniting optimally. Additionally or alternatively, a curved tube/burner with holes can optionally be provided as burner pattern. This makes it even more readily possible to follow the (natural) shapes of the logs. The use of burner combination 94 enables even further variation so as to thereby provide an even more realistic image.

[0055] The present invention is by no means limited to the above described preferred embodiments thereof. The rights sought are defined by the following claims, within the scope of which many modifications can be envisaged.

Claims

1. Fireplace, comprising:
 - a housing provided with a combustion space with one or more fireplace elements;
 - at least one burner element arranged in the housing for the purpose of providing a flame pattern in the housing;
 - control means for controlling the at least one burner element; and
 - a light source configured to provide the glowing effect on at least a part of the one or more fireplace elements.
2. Fireplace according to claim 1, wherein the burner element comprises a gas burner.
3. Fireplace according to claim 1 or 2, further comprising a glow control operatively connected to the light source.
4. Fireplace according to claim 3, further comprising a second light source, wherein the first and/or second light source preferably comprises at least one LED lamp.
5. Fireplace according to any one of the foregoing claims, further comprising a light conductor configured to guide the light from the light source to at least a part of the one or more fireplace elements, wherein the light conductor preferably comprises a glass element.
6. Fireplace according to claim 5, wherein at least one light source is provided with two or more light conductors.
7. Fireplace according to any one of the foregoing claims 5 or 6, wherein the light conductor extends into at least one of the fireplace elements and/or between adjacent fireplace elements.
8. Fireplace according to any one of the foregoing claims, wherein the light source is arranged outside the combustion space, and further preferably comprising a frame on which the light source can be mounted, and preferably a support configured to mount thereon the light conductor according to any one of the claims 5-8.
9. Fireplace according to any one of the foregoing claims, wherein the light source is configured to provide the glowing effect in a plurality of colours.
10. Fireplace according to any one of the foregoing claims, further comprising a burner bed under at least a part of the fireplace elements, wherein the burner bed preferably comprises a perforated plate suitable for transmitting light and air.
11. Fireplace according to any one of the foregoing claims, wherein the light source is provided with a heat-conducting element configured to discharge surplus heat.
12. Fireplace according to any one of the foregoing claims, further comprising a spark simulator.
13. Fireplace according to any one of the foregoing claims, further comprising a smoke simulator.
14. Fireplace according to any one of the foregoing claims, further comprising at least two burner elements in the form of gas burners, which are provided with a shared gas feed and provided with a three-way valve configured to supply gas to a maximum of one of the at least two gas burners.
15. Method for providing a glowing effect in a fireplace, the method comprising the steps of:
 - providing a fireplace according to any one of the foregoing claims; and
 - providing the glowing effect on the one or more fireplace elements.

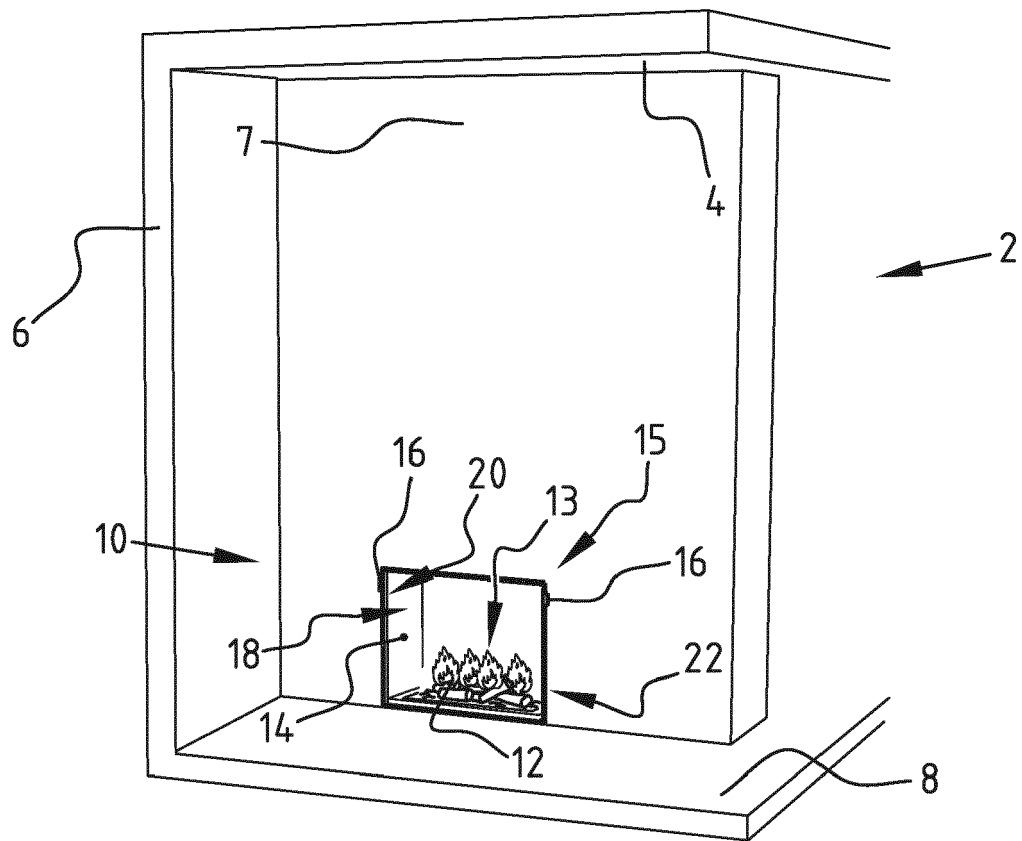


FIG. 1

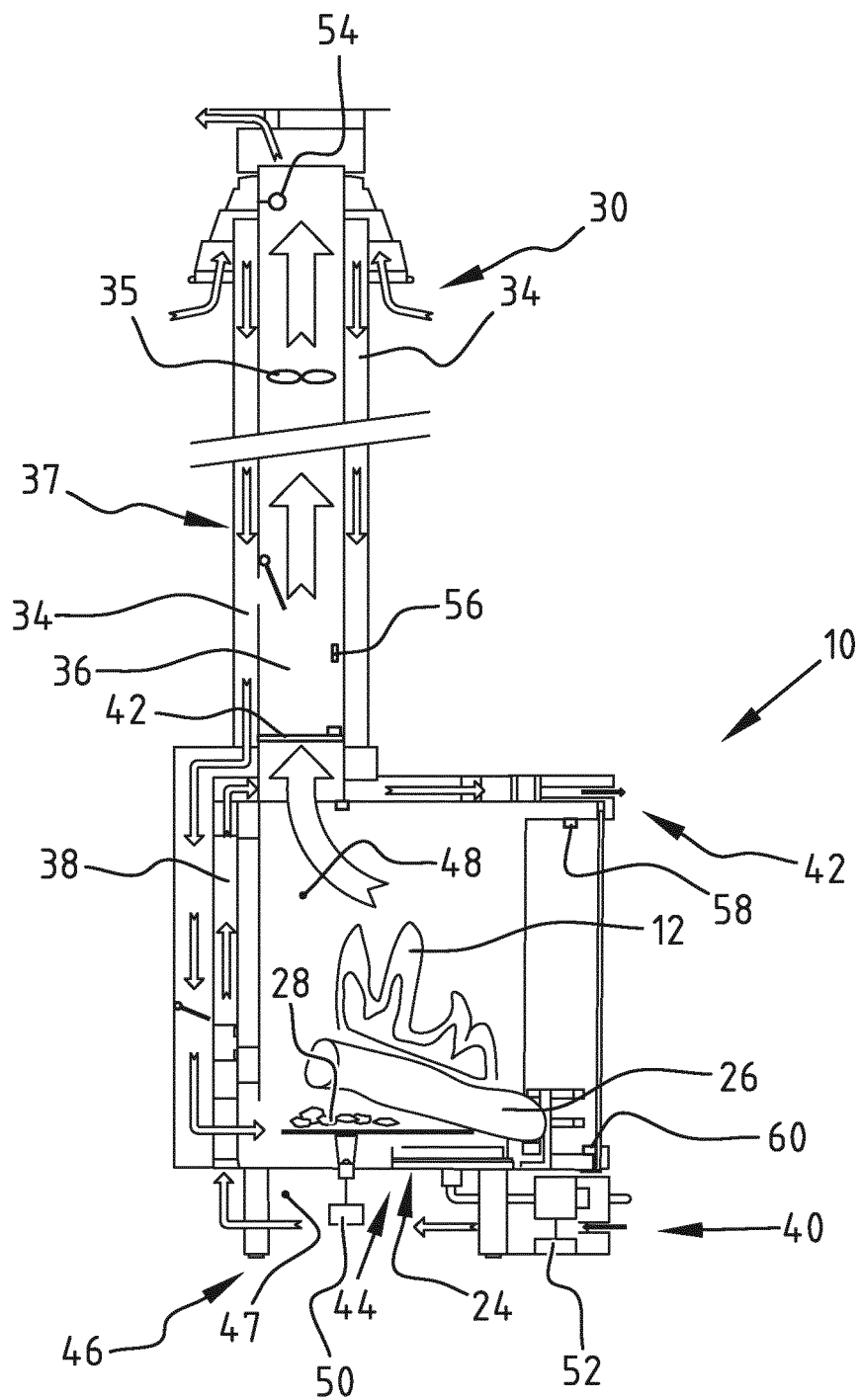


FIG. 2

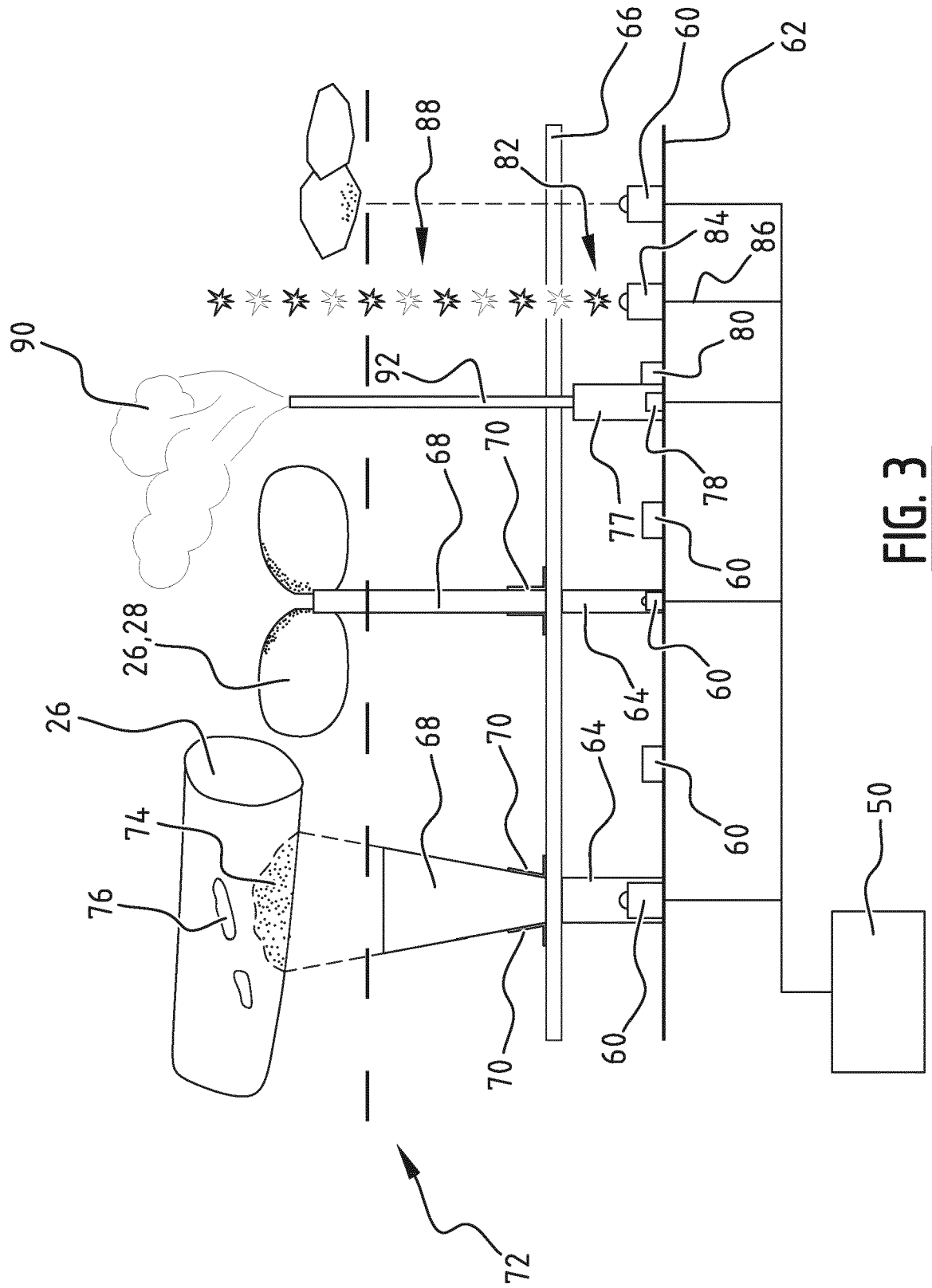


FIG. 3

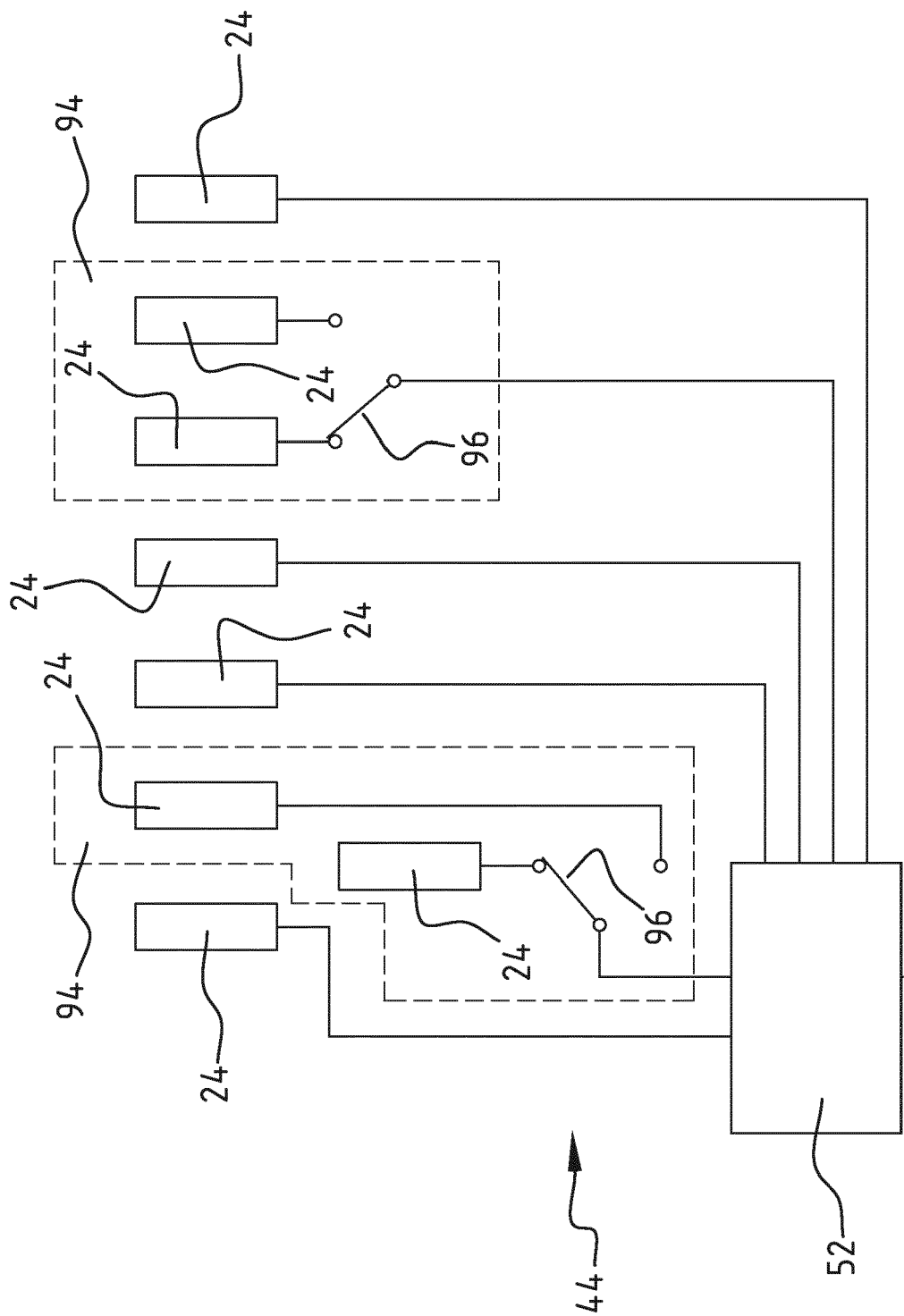


FIG. 4



EUROPEAN SEARCH REPORT

 Application Number
 EP 20 21 1545

5

10

15

20

25

30

35

40

45

50

55

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	US 2009/080871 A1 (CHIU HSIEN-JUNG [TW]) 26 March 2009 (2009-03-26)	1-6, 8-10, 12-15 11	INV. F24B1/18 F24C3/00 F24C7/00
Y	* paragraphs [0002], [0016], [0018], [0020], [0022] * * figure 2 *		
X	GB 2 459 923 A (LFL GROUP LTD [GB]) 18 November 2009 (2009-11-18) * page 1, line 2 - page 1, line 3 * * figure 2 * * page 5, line 18 - page 5, line 20 * * page 5, line 3 - page 5, line 5 * * page 4, line 16 - page 4, line 17 *	2-5, 7-10, 12-14	
Y	EP 2 388 527 A2 (BASIC HOLDINGS [IE]) 23 November 2011 (2011-11-23) * paragraph [0112]; figure 26 *	11	
A	US 8 230 626 B2 (ABILEAH ADIEL [US]; GARD ALLEN [US]; PLANAR SYSTEMS INC [US]) 31 July 2012 (2012-07-31) * figure 2 *	1-15	TECHNICAL FIELDS SEARCHED (IPC) F24B F24C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 19 April 2021	Examiner Jalal, Rashwan
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 20 21 1545

5 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.

19-04-2021

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2009080871 A1	26-03-2009	NONE	
GB 2459923 A	18-11-2009	NONE	
EP 2388527 A2	23-11-2011	AU 2007224634 A1 BR PI0708894 A2 CA 2645939 A1 CN 101438104 A DK 2029941 T3 DK 2388527 T3 EP 2029941 A2 EP 2388526 A2 EP 2388527 A2 ES 2396729 T3 ES 2605240 T3 GB 2436212 A JP 5281417 B2 JP 5496291 B2 JP 2009529649 A JP 2013040759 A JP 2013050296 A KR 20080113235 A NZ 571900 A PL 2029941 T3 PL 2388527 T3 RU 2008140317 A US 2009088263 A1 US 2011250978 A1 WO 2007104532 A2 ZA 200808702 B	20-09-2007 28-06-2011 20-09-2007 20-05-2009 07-01-2013 19-12-2016 04-03-2009 23-11-2011 23-11-2011 25-02-2013 13-03-2017 19-09-2007 04-09-2013 21-05-2014 20-08-2009 28-02-2013 14-03-2013 29-12-2008 26-08-2011 29-03-2013 30-06-2017 20-04-2010 02-04-2009 13-10-2011 20-09-2007 29-07-2009
US 8230626 B2	31-07-2012	US 2009241386 A1 WO 2008033949 A1	01-10-2009 20-03-2008

EPO FORM P0459

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