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(54) **SIMULATED FLAME EFFECT APPARATUS**

(57) Apparatus for creating a simulated flame effect and suitable for an electric fire comprising a housing having a base (12) and a top wall (11) spaced apart to define therebetween a housing interior (20), the housing additionally comprising a front for providing a line of sight into said interior, the top wall comprising a capture screen (15) that faces towards the base of the housing, a reflector (14) disposed within the housing to lie between the capture screen and the housing base, said reflector com-

prising a reflective front face (17) that is inclined relative to the line of sight into the housing interior, an image projector (16) to project an image towards the capture screen, and wherein the reflector is angled relative to the capture screen whereby an image received by the capture screen (15) from the image projector is seen on the reflector front face and reflected forwards in the direction of said line of sight.

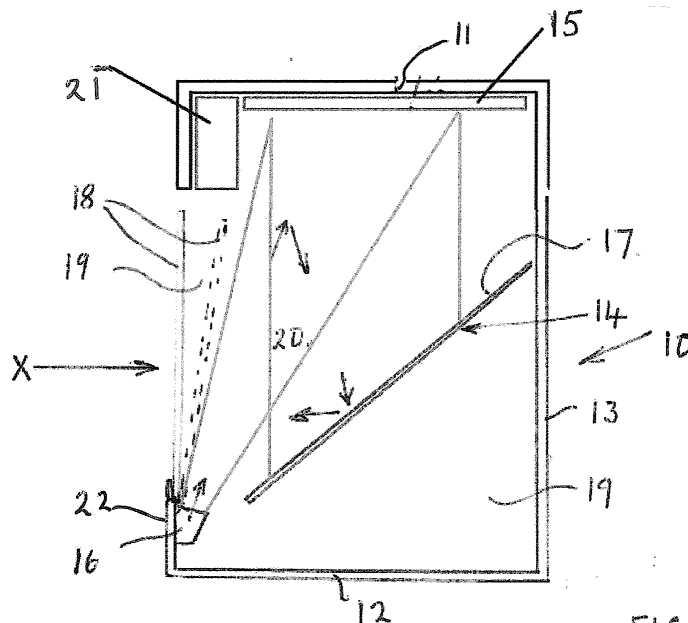


FIG. 1

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Description

[0001] This invention relates to an apparatus and a method for creating a realistic simulated flame effect, for example in an electric fire.

[0002] There are many designs of electric fires on the market that include some form of flame effect picture. Typically that flame effect picture is provided behind a fuel effect such as real or simulated coal or wood, or a decorative fuel effect such as one comprising bevels or glass spheres.

[0003] Various proposals have been advanced for seeking to improve on the realism of hitherto known simulated flame effects and an example of one proposal is that described in the specification of WO 2020/145819. However, a particular feature of an artificial fireplace described in that and other such publications is that they suffer a lack of compactness and require positioning of component parts in a manner that does not advantageously assist in manufacture and assembly of the artificial fireplace.

[0004] The present invention seeks to provide an apparatus and method that more efficiently and conveniently facilitates a provision of a realistic simulated flame effect.

[0005] In accordance with one aspect of the present invention apparatus for creating a simulated flame effect and suitable for an electric fire comprises:-

a housing comprising a base and a top wall spaced apart to define therebetween a housing interior, the housing additionally comprising a front for providing a line of sight into said interior,

the top wall comprising a capture screen that faces in a direction towards the base of the housing,

a reflector disposed within the housing to lie between the top wall capture screen and the housing base, said reflector comprising a reflective front face that is inclined relative to the line of sight into the housing interior,

an image projector to project an image towards the top wall capture screen, and

wherein the reflector is angled relative to the top wall capture screen whereby an image received by the top wall capture screen from the image projector is seen on the reflector front face thereby to be reflected forwards in the direction of said line of sight.

[0006] The housing may be referred to as "open fronted", meaning that it has a front which provides a line of sight into the interior of the housing irrespective of whether or not the front of the housing inhibits physical access to the interior of the housing. Thus the open fronted housing may comprise a front panel of a transparent or semi-

transparent material. The housing may comprise a movable, e.g. tiltable, front panel.

[0007] The top wall of the housing may be defined wholly by the capture screen or the housing may comprise a top wall that defines structure for support of a capture screen.

[0008] The reflector may be transparent, semi transparent or coated with a film so as to enhance the reflection whereby, in addition to reflecting an image received from the top wall capture screen, it allows an image at a rear of the reflector also to be viewed in the direction of said line of sight. The reflector may comprise a region which is transparent or semi transparent and a region which is opaque, thereby to be partly transparent. The reflector may comprise a transparent region and a semi transparent region.

[0009] The reflector preferably but not necessarily is angled relative to the top wall capture screen at an angle of between 35 degrees and 55 degrees, for example at an angle of 45 degrees.

[0010] The top wall capture screen preferably lies in a plane substantially parallel with the direction of said line of sight but the invention is not limited to that and the capture screen may lie in a plane angled relative to the direction of said line of sight.

[0011] The image projector may project a divergent image such that the area of image received by the top wall capture screen is greater than the area of the image at the projector. In consequence of that divergence, and with a substantially flat top wall capture screen, the area of the image on the capture screen, and thus received by the reflector, may be the same or greater than if the capture screen received a non-divergent image from the image projector.

[0012] The projector may comprise at least one media player means and an electronic image display device responsive to an input signal from the media player means. The media player means may be operable to provide the electronic display device with at least one moving flame image. The projector may comprise at least one media storage means that stores a sequence of frames of moving flame images. The projector may be operable to display in a continuous loop manner a plurality of moving flame images.

[0013] In addition or as an alternative to projecting a moving flame image the projector may project the image of a fuel element such as that of a piece of coal or a wooden log. The fuel element may be an artificial fuel element

[0014] The electronic image display device may be in the form of a TFT (thin film transistor) screen. The conventional backlighting means of a TFT screen may be omitted and instead the projector may comprise a separate light source, such as an LED light source. An illumination control means such as a dimmer control may be provided for varying the level of light emitted by the projector and the use of an RGB controller may change the colour of light emitted by the projector.

[0015] The image from the TFT screen may be transmitted through a lens or adjustable lenses whereby it is enlarged over a distance and captured on the screen at the top wall surface.

[0016] A secondary lens may be present in the projector to provide a keystone effect, therefore allowing the projector and capture screen to be set at different angles to each other.

[0017] In a first configuration the image projector is provided at a forwards position such that the image that it projects is transmitted substantially wholly in front of the reflector, across said line of sight, and not through the reflector. The projector may be located closer to the base of the housing than the top wall capture screen. The projector may be located close to or, for example, substantially adjacent a lower edge region of the reflector.

[0018] The projector of the first configuration may be located behind a screen such that at least a part of the projector is obscured and not visible in the direction of the said line of sight. Alternatively the projector may be incorporated within a fuel element such as a piece of coal or wooden log.

[0019] In a second configuration the image projector may be located behind the capture screen whereby an image such as a flame image is back-projected onto the capture screen and then reflected forwards, in the direction of said line of sight, by the reflector.

[0020] At least one projector may be provided in the first configuration in combination with at least one projector positioned in the second configuration.

[0021] A plurality of projectors may be provided. Each projector may play different media or the same media set at different time intervals during the loop to create a linear flame picture, for example across the width of an electric fire.

[0022] A controller may be provided to separately control each or a group of projectors. The controller may be operable to change the colours in addition to modulating the level of illumination in each projector.

[0023] A media player means may be of a type that enables the media to be split to allow multiple projectors to receive the same or different images.

[0024] A TFT screen may have multiple images split on the screen in areas where multiple projectors can be used to create a multiple areas of burn.

[0025] The front of the housing may be provided with a transparent or translucent front panel. A front panel may be inclined relative to a plane which is perpendicular relative to the direction of the said line of sight, for example to enhance an infinity flame effect.

[0026] In the case of the apparatus of the present invention being an electric or gas fire comprising a source of heat the front panel may be arranged to allow flow of air into and/or out of the housing interior. The front panel may be moveable whereby it may reside either in said inclined position or in another position at which it inhibits air flow into and/or out of the housing interior. The front panel may be moveable from an inclined position to one

in which it is in a plane substantially perpendicular to said line of sight into said interior of the housing.

[0027] In addition to an image projected onto the front face of the reflector, for a reflector that is for example semi-transparent, an image and/or at least one fuel element may be provided at the rear of the reflector thereby to be visible in the direction of said line of sight in addition to the image reflected by the reflector from the top wall capture screen. A stationary or moving image may be projected onto a fuel element or a rear capture screen of the housing.

[0028] An image display device such as a TFT screen may be provided at the rear of the reflector to display an image (such as a moving flame effect image or image of fuel elements) which can be viewed, through the reflector, in the direction of said line of sight.

[0029] Additional to receiving an image from the top wall capture screen the front face of the reflector may be employed also to receive an auxiliary image directly from an auxiliary projector, such as an auxiliary projector provided alongside or in proximity to the top wall capture screen. Additionally or alternatively an auxiliary projector may be employed to directly illuminate and/or provide a moving image on a fuel element positioned in front of the front face of the reflector.

[0030] The housing of the simulated flame effect apparatus of the invention may serve at least in part as the housing of a gas or electric fire that comprises a source of heat.

[0031] The projector may project a divergent image onto the top wall capture screen or a rear wall capture screen and at least one said top and rear wall capture screens may be tilted or angled, thereby to reflect optimally an image towards the front face of the reflector or towards the front opening through the reflector.

[0032] Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying diagrammatic drawings in which:-

Figure 1 is a cross-sectional side elevation view of an electric fire comprising apparatus in accordance with the present invention for providing a simulated flame effect;

Figure 2 is a view similar to that of Figure 1 and showing a first modification option for adding to the fire of Figure 1;

Figure 3 is a view similar to that of Figure 1 and showing a second modification option for adding to the fire of Figure 1;

Figure 4 is a cross-sectional side view of the electric fire of Figure 1 incorporating the options of Figures 2 and 3;

Figure 5 is a view similar to that of Figure 1 and showing a third modification option for adding to the fire

of Figure 1, and

Figure 6 is a view similar to that of Figure 1 of a fire in accordance with another embodiment of the invention.

[0033] An electric fire housing 10 in accordance with the present invention comprises a housing top 11, a base 12 and a rear wall 13 that define a housing interior 20.

[0034] The housing additionally comprises a pair of side walls 19, one of which is shown in Figure 1, and a heater 21.

[0035] The housing 10 additionally comprises a front panel 18 of clear glass whereby the housing is open fronted to provide a line of sight into the interior 20 of the housing along the direction of the arrow X.

[0036] Within the housing the top wall 11 is provided with a capture screen 15 that faces in a direction towards the base 12. Between the top wall 11 and base 12 there is provided a reflector 14 of transparent or semi-transparent material positioned at an angle of approximately 45° relative to the direction of the arrow X.

[0037] The reflector 14 comprises a front face 17 that reflects images falling thereon, and the reflector 14 additionally allows sight of the rear wall 13.

[0038] In accordance with the present invention an image projector 16 is provided in closer proximity to the base 12 than the top wall 11 of the housing and in use projects a diverging image towards the top wall capture screen 15. The top wall capture screen 15 then reflects that image onto the front face 17 of the reflector. In consequence of the inclined orientation of the reflector, the image received by the front face 17 is then reflected forwards through the front of the housing.

[0039] The projector is located behind a screen 22 such that at least a part of the projector is not visible when viewing the electric fire in the direction of the arrow X.

[0040] The projector 16 preferably is of a type as hereinbefore described and which provides moving flame images.

[0041] Optionally, as illustrated with reference to Figure 2, the housing 10 may comprise a second projector 25 provided underneath the reflector 14 to project an image, such as a moving flame effect image or image of fuel elements onto an internal capture screen 26 on the rear wall 13 of the housing. One or more fuel elements (not shown) may be positioned underneath the reflector and optionally may be illuminated and/or receive a moving image from the projector 25.

[0042] In a second option for modification of the fire of Figure 1 a second image projector 30 (see Figure 3) may be provided at a rear of a translucent type capture screen 15 whereby the front of the screen, facing the reflector 14, receives images from the lower projector 16 and also the second projector 30, both images then appearing on and being reflected forwards by the surface 17 of the inclined reflector 14.

[0043] The lower projector 16 may be employed not

only to provide an image on the capture screen 15 but also to illuminate one or more fuel elements 31 provided in front of the reflector. Alternatively said fuel elements may be illuminated by an auxiliary projector. An auxiliary projector for illuminating the fuel elements may be positioned alongside the upper capture screen 15 and the heater 21.

[0044] As shown in Figure 4 the options of Figures 2 and 3 may readily be combined with the configuration of Figure 1 whereby, as viewed in the direction X of the line of sight, there is visible the combination of fuel elements 31 illuminated by the projector 30, a moving flame image generated by the projector 16 and reflected by the front face 17 of the reflector via the capture screen 15 and thirdly, an image on the rear capture screen 26 of the housing 13 as provided by the projector 25 and which image is visible through the semi-transparent reflector 14.

[0045] In a third option for modification of the fire of Figure 1 the rear wall 13 is provided with a TFT screen 35 (see Figure 5) operable to display an image (such as a moving flame effect image or image of fuel elements) which can be viewed in the direction of the arrow X in combination with an image from the screen 15 as reflected forwards by the reflector 14.

[0046] In accordance with a further embodiment of the invention (see Figure 6) an electric fire 40 is devoid of the aforescribed lower projector 16. Instead the capture screen 15 is back illuminated by the projector 30 as earlier described with reference to Figures 3 and 4. Also, as in respect of the embodiment of Figures 3 and 4, in the embodiment of Figure 6 the projector 30 similarly provides a divergent image. That image is directed to the rear of the translucent capture screen 15. The image on the lower surface of the capture screen, facing the reflector 14 is then transmitted in a non-divergent manner to the reflective surface 17 of the reflector 14 for viewing in the direction of the arrow X.

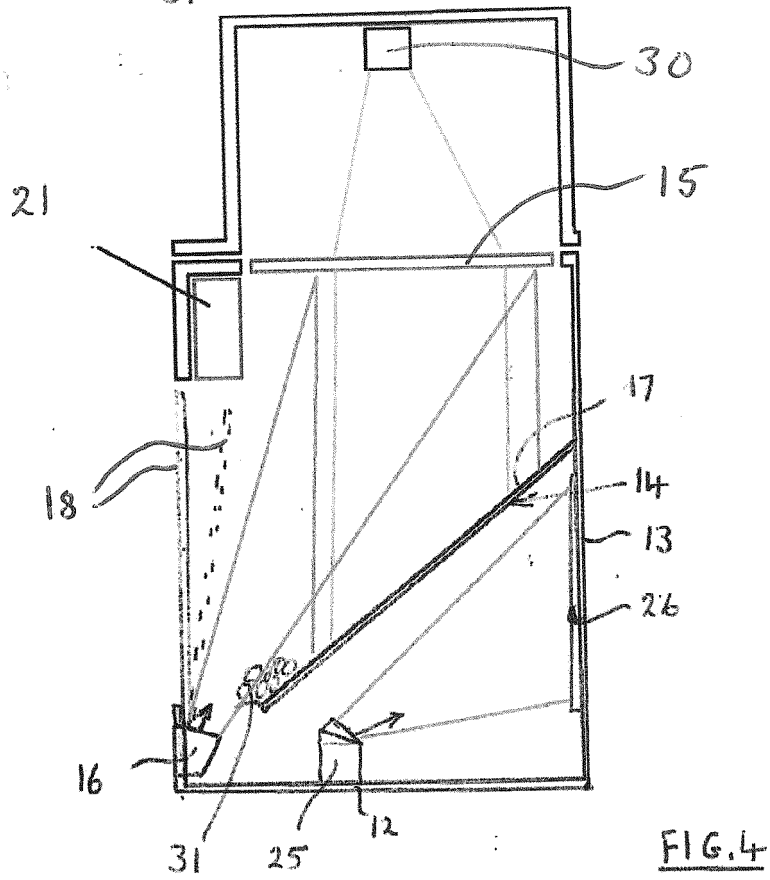
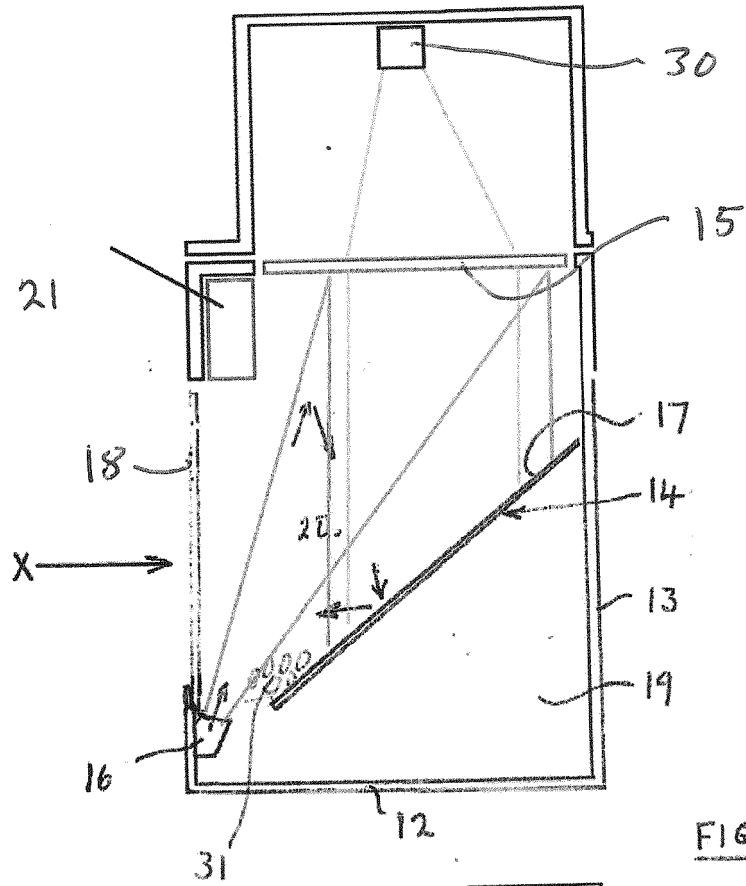
[0047] In the embodiment describing provision of a projector 13 for back projection onto the capture screen 15 the projector may be located in an auxiliary housing which is secured to an opening provided in the top 11 of the main housing shown in Figure 1.

[0048] Having regard to the features of the present invention there is provided an electric fire that is operable to display a realistic flame effect within a compact configuration.

50 Claims

1. Apparatus for creating a simulated flame effect and suitable for an electric fire comprises a housing (10) comprising a base (12) and a top wall (11) spaced apart to define therebetween a housing interior (20), the housing additionally comprising a front (18) for providing a line of sight (X) into said interior, **characterised in that:** -

- the top wall (11) comprises a capture screen (15) that faces in a direction towards the base of the housing,
 a reflector (14) is disposed within the housing to lie between the top wall capture screen and the housing base, said reflector comprising a reflective front face (17) that is inclined relative to the line of sight into the housing interior,
 an image projector (16) is provided to project an image towards the top wall capture screen, and wherein the reflector (14) is angled relative to the top wall capture screen whereby an image received by the top wall capture screen (15) from the image projector is seen on the reflector front face thereby to be reflected forwards in the direction of said line of sight.
2. Apparatus according to claim 1 **characterised in that** the image projector (16) projects a divergent image.
 3. Apparatus according to claim 1 or claim 2 **characterised in that** the reflector (14) is at least one of transparent, partly transparent, semi transparent or coated with a film for enhancing reflection.
 4. Apparatus according to any one of the preceding claims **characterised in that** the image projector (16) is located at a forwards position whereby the image which it projects is transmitted substantially wholly in front of the reflector, across said line of sight.
 5. Apparatus according to claim 4 **characterised in that** the projector (16) is located closer to the base of the housing than the top wall capture screen.
 6. Apparatus according to claim 4 or claim 5 **characterised in that** the image projector (16) is located substantially adjacent a lower edge region of the reflector behind a screen (22) such that at least a part of the projector is obscured as viewed in the direction of said line of sight.
 7. Apparatus according to any one of claims 4 to 6 **characterised in that** the image projector (16) is incorporated within a fuel element.
 8. Apparatus according to any one of claims 1 to 3 **characterised in that** an image projector (30) is located behind the capture screen whereby an image is back projected onto the capture screen.
 9. Apparatus according to any one of claims 1 to 3 **characterised in that** it comprises at least one image projector (16) in accordance with any one of claims 4 to 7 and at least one image projector (30) in accordance with claim 8.
 10. Apparatus according to any one of the preceding claims **characterised in that** an image display device (35) is provided at the rear of the reflector to display an image which can be viewed, through the reflector, in the direction X of said line of sight.
 11. Apparatus according to any one of the preceding claims **characterised in that** it comprises at least one image projector (16, 30) that comprises at least one media player means and an electronic image display device responsive to an input signal from the media player means.
 12. Apparatus according to any one of the preceding claims **characterised in that** at least two projectors are operable to play the same media in a loop manner, the media set of one projector being played at a time interval different from that of the media played by the other projector.
 13. Apparatus according to any one of the preceding claims **characterised in that** it comprises a plurality of projectors and wherein a controller is provided to control separately each or a group of projectors.
 14. Apparatus according to any one of the preceding claims **characterised in that** a projector (16, 30) comprises an electronic image display device which is a thin film transistor (TFT) screen, and wherein the projector comprises a light source separate from the TFT screen for back lighting the TFT screen.
 15. Apparatus according to any one of the preceding claims **characterised in that** the front of the housing is provided with a front panel (18) and wherein the front panel may be inclined relative to a plane which is perpendicular relative to the direction of said line of sight.



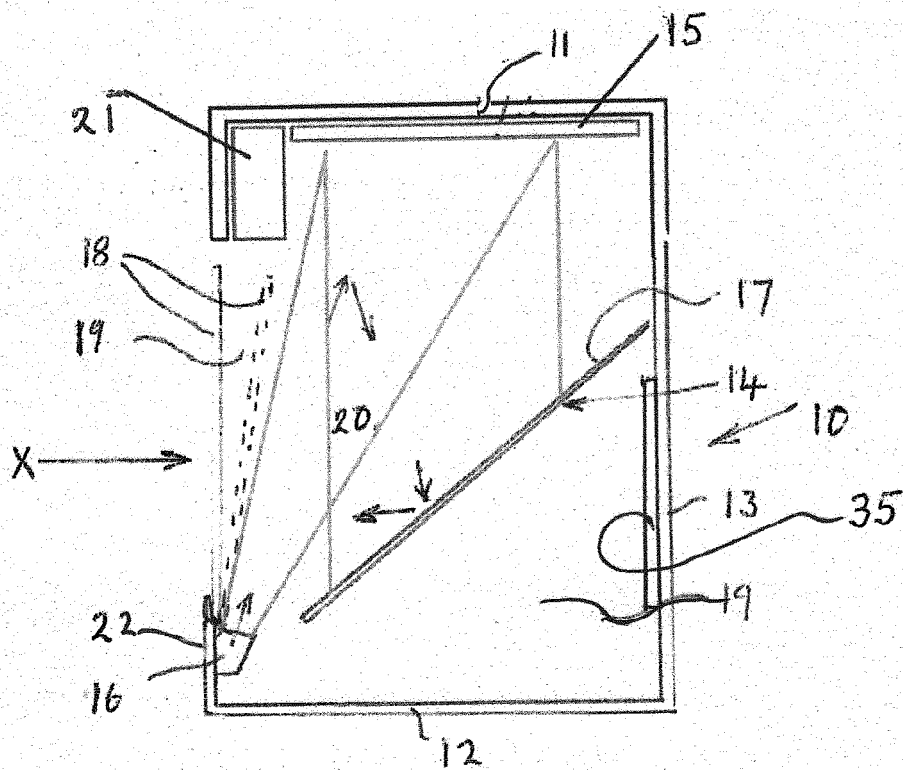


FIG. 5

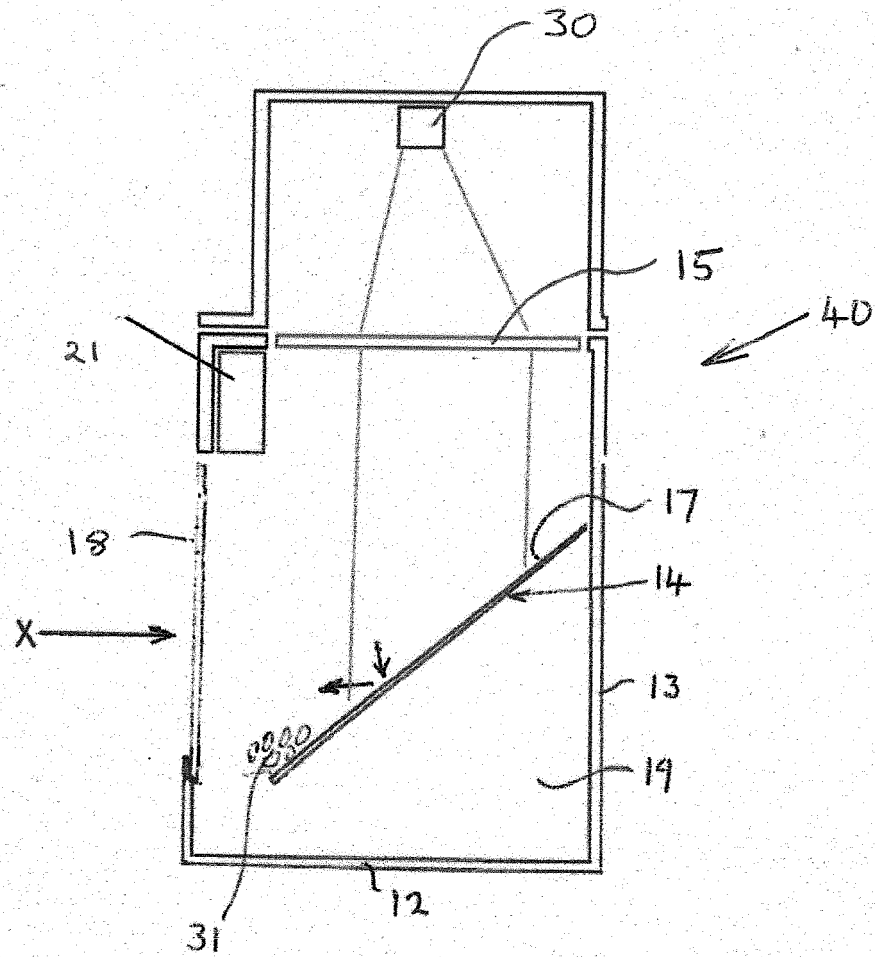


FIG. 6



EUROPEAN SEARCH REPORT

Application Number
EP 21 02 0578

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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	WO 02/077533 A1 (VALOR LTD [GB]; STOKES KEITH JONATHAN [GB]; BYRNE WILLIAM ANTHONY [GB]) 3 October 2002 (2002-10-03)	1-3, 15	INV. F24B1/18 F24C3/00
A	* page 1, line 3 * * page 1, line 5 - page 1, line 6 * * figure 9 * * page 12, line 12 - page 12, line 16 * * page 11, paragraph 1 *	5-7, 9, 10, 12, 13	F24C7/00
X	GB 2 571 677 A (LIPING PAN [CN]) 4 September 2019 (2019-09-04)	1-4, 8, 15	
Y	* page 1, paragraph 1 * * figure 1 *	11, 14	
Y	GB 2 467 219 A (FLAMERITE FIRES LTD [GB]) 28 July 2010 (2010-07-28) * figure 1 *	11, 14	
A	GB 2 298 073 A (BITECH ENG [IE]) 21 August 1996 (1996-08-21) * figure 3 *	1-15	
A	GB 2 290 865 A (EA TECH LTD [GB]) 10 January 1996 (1996-01-10) * figure 1 *	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 5 April 2022	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	

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

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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.

05-04-2022

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 02077533 A1	03-10-2002	GB 2377753 A	22-01-2003
		GB 2389650 A	17-12-2003
		WO 02077533 A1	03-10-2002
GB 2571677 A	04-09-2019	CN 206222233 U	06-06-2017
		GB 2571677 A	04-09-2019
		WO 2018095284 A1	31-05-2018
GB 2467219 A	28-07-2010	NONE	
GB 2298073 A	21-08-1996	NONE	
GB 2290865 A	10-01-1996	NONE	

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2020145819 A [0003]