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(71) Applicant : **BASIC PATENT**
41 Ailesbury Road
Dublin 4 (IE)

(72) Inventor : **O'Niell, Noel**
30 Riverview Mell
Drogheda, County Louth (IE)

(74) Representative : **Howick, Nicholas Keith**
CARPMAELS & RANSFORD
43 Bloomsbury Square
London WC1A 2RA (GB)

(54) Apparatus for simulating flames or a solid fuel fire.

(57) A simulated solid fuel fire includes a rear reflector, which may be curved, a screen which diffusely transmits light and reflects light and a flag-like member positioned between a rear reflector and screen. Simulated fuel is positioned in front of the screen and means are provided to illuminate the fuel, the flag-like member and the rear reflector. A reflecting surface reflects light in such a way as to cause perception of colours. The rear reflector includes reflective regions situated below a darkened area. Luminous flame-shaped images, tinged with colour, can be perceived between shadows on the screen, the images emanating between the fuel and its reflected image. When the simulated fuel resembles logs, light illuminates the upper surfaces to promote realism.

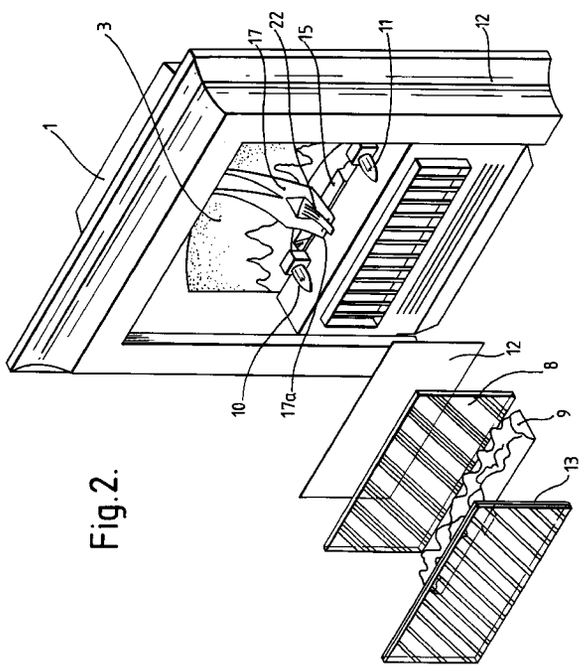

Fig.2.

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This invention relates to apparatus for simulating flames in a solid fuel fire. A simulated solid fuel fire may be part of, or embodied in a heating appliance, such as an electric or gas fire, in order to create an impression of flames due to burning fuel.

Numerous attempts have been made in the past to improve realism in a simulated flame display, or in devices which simulate a solid fuel fire and use mechanical parts which are illuminated in some way and set into motion to produce a visual effect resembling flames. Whilst some of these past attempts have achieved a degree of realism, many more have been poor imitations of flames and therefore unconvincing to the viewer. In view of the attraction of real flames, the Electrical Industry has constantly sought to achieve a form of realism that it is almost indistinguishable from real flames, particularly for creating the impression of combusting solid fuel (such as burning logs or coal). Such an effect is highly important in achieving commercial success with electrical fires.

In our UK Patent No. 2 180 927 we disclosed means for simulating fuel, a light source of illuminating the simulated fuel and first and second reflective means arranged to provide front-to-back multiple images of the simulated fuel. The first reflective means was capable of transmitting light as well as being capable of reflecting light, the means for simulating fuel being provided between the first and second reflective means. The reflective means were arranged so that the multiple images could be perceived, as a visible effect, from the exterior of heating apparatus. This multiple image effect is particularly useful in giving the impression of a deep or extensive fuel bed and thereby provided a distinct advantage when designing so-called "slim-line" electrical heaters.

In our UK Patent No. 2 230 335, we disclosed apparatus which included a source of light, simulated flame effect means for reflecting the light to simulate flames, simulated fuel means illuminated by the light source to simulate a bed of combusting fuel, and screen means on which to view an image of the simulated flames. The screen means was positioned between the flame effect means and the simulated fuel means and was capable of diffusely transmitting light reflected by the flame effect means. This provided a visual effect, on the screen means, which simulated flames. The screen means was also capable of reflecting light from the simulated fuel, so that the simulated flames appeared to emanate from between the simulated fuel and its reflected image in the screen. In the preferred embodiment, the simulated flame effect was created by a plurality of ribbons made of fabric which reflected light and which tended to undulate in an air stream, provided by a fan, so as to provide a constantly changing reflecting surface similar to the appearance of flames. This apparatus provided considerably more realism due to the capability of the screen to reflect light from the simulated fuel, whereby the simulated flames appeared to emanate from between the fuel and its image in the screen. This was a considerable improvement over earlier attempts such as those described in, for example, GB-A-957 591, 978 365 and 1 186 655, which disclosed the use of ribbons for simulating flames on a screen, but not the use of a screen capable of reflecting light in the manner mentioned above.

Whilst the invention disclosed in GB 2 230 335 improved realism and created a satisfactory impression of flames emanating from the simulated fuel, it still left room for improvement to provide a simulation comparable with true flames. One reason for this was due to the colour of light used. Another reason was due using a plurality of ribbons, which were caused to flutter in the air stream produced by the fan thereby casting reflected light onto the surface of the diffusing screen. For example, bulbs producing red light, i.e. having a red glass envelope, were used to create a red glow in the simulated fuel, thereby creating the impression of red hot regions in the simulated fuel. However, this red light was also used to illuminate the ribbons and hence the ribbons reflected this red light onto the diffusing screen. This created an impression of flames having an overall reddish or orange appearance. However, real flames have a predominantly whitish or yellowish colour and are tinged with various colours, such as blues and reds, due to the process of combustion in burning gases. Moreover, in a typical electrical fire, a row of ribbons hang in a parallel relationship behind the screen so that they are disposed in a wide and relatively narrow channel which receives the forced air output of a radial fan. Whilst the air stream from the fan caused all of the ribbons to move or flutter, the air flow tended to be greater in the centre of the channel, than at the outsides, so that the ribbons at each end of the array fluttered less than those positioned in the central region of the channel. A further disadvantage was due to using e.g. white fabric ribbons suspended against a totally non-reflective or dark background (i.e. to heighten the reflectivity of the ribbons). The totally dark or non-reflective background absorbed light, hence giving a rather dull display which is difficult to perceive in strong ambient lighting.

At least in its preferred embodiments, the present invention seeks to address these problems and to provide considerably more realism, especially where it is necessary to simulate flames emanating from simulated fuel.

GB-A-1 088 577 mentions (as prior art) a radiant electric fire which utilises a series of ribbons which move in a current of air from a fan. The reference states that coloured light is projected i.e. reflected from behind the ribbons so that the latter provide a series of moving shadows on a screen which forms the fire back above the imitation fuel and that such an effect is more realistic but expensive to produce. De-

spite the latter statement, it can be shown that if coloured light is projected onto a reflector and then reflected onto ribbons, this will cause cast shadows against the colour of the projection light. Consequently, the simulation of flames is not as realistic as it could be. The reference itself seeks to address the problem by producing a fire which may include ribbons of at least two different colours, such as red and yellow, so that movement of the ribbons provides a flickering shifting colour pattern on the screen. More specifically, the reference discloses a casing having an interior metallised or painted surface to act as a reflector whereby light is reflected from the interior face of the back panel of the casing, through the coloured ribbons, and whilst this may produce a reasonably satisfactory effect, at less cost, it is still not an optimum effect.

GB-A-1 272 644 discloses an alternative way of trying to introduce colour into apparatus for producing imitation fire effects. In this case, a reflective paddle wheel, which is rotated by a motor, reflects light onto the rear of a screen or screens having an etched or frosted pattern, representing an artistic design which diffuses or reflects light rays emanating from a light source. A reflective surface, which is concave about a horizontal axis, is positioned behind the reflecting panels and screen. The reflecting paddles, reflector and light source are coloured to produce coloured flames against a red background to simulate a fire effect. Whilst this again may produce a reasonably satisfactory result, it is not an optimum effect. Since rotation of the paddles is regular, the pattern of coloured light and shadows viewed on the screen will follow a cyclic sequence which will, after a while, be noticed by the user. Moreover, it is quite clear that the effect seen on this type of screen is more one of design, than realistic, because it does not truly imitate flames.

The present invention, at least in its preferred embodiments, greatly enhances the simulated flame effect and can create almost the same impression as a real flame.

According to one aspect of the invention, apparatus for simulating flames in a solid fuel fire comprises:

rear reflector means;

means for simulating flames including a member or members and means for causing said member or members to move so as to simulate flames;

a screen capable of diffusely transmitting light, said member or members being positioned between the rear reflecting means and the screen;

simulated fuel positioned in front of the screen; and

means for illuminating said simulated fuel, said member or members, and said rear reflecting means;

said screen also being capable of reflecting light so that a reflected image of the fuel is visible in the screen; said illuminating means including a source of light which is randomly intercepted by movement of said member or members; said rear reflecting means including reflecting regions situated below a darkened or blackened area which reflect said light in such a way as to cause a perception of colours; the arrangement being such that luminous flame-shaped images, tinged with colour, can be perceived between shadows on the screen, said flame-shaped images appearing to emanate from between the simulated fuel and its image on the screen.

Preferably, the rear reflecting means is concave about a vertical axis and the member is a flag-like member located centrally of the concave reflecting means. For example, the rear reflector means may be a curved sheet on which the reflecting regions are defined by a lower edge of the darkened or blacked area, which lower edge has inverted U-shaped portions. Such an arrangement enables, for example, a single flag-like member to replace a plurality of parallel ribbons as used in the prior art mentioned above. The blacked or darkened area tends to heighten the luminous appearance of the flame-shaped images, which are due to reflection of light from the rear reflecting regions. Preferably, substantially white light is used to illuminate the reflecting surface which thereby reflects the white light in such a way as to cause a perception of colours. This effect may be provided by a metallised film or foil, having a reflective surface which diffracts or refracts white light in such a way as to enable the different colours to be perceived. This reflecting surface can be positioned either adjacent, or in contact with a lower portion of the front surface of the rear reflector means.

A single flag-like member, made of thin opaque material, may intercept the light reflected from the rear reflector means onto the screen. This material may be cut or shaped to assist in producing an impression of flames, and preferably contains a slit and an aperture. For example, the member may be generally coffin-shaped and have a slit, as well as a diamond-shaped aperture therein. The flag-like member is preferably draped across an air outlet of a fan, so that it moves in an airstream from the fan, thereby intercepting the white light in a random fashion to cause the flame shaped images to be cast onto the screen. A bulb or bulbs may be situated at the side or sides of the flag-like member and positioned to give optimum shadows and patches of light on the screen, i.e. to give a good impression of flames.

Preferably, means are included for simulating sparks in the simulated flames. The means for simulating sparks may comprise a piece of reflective metallised plastics film or foil having portions which move in the airstream and thereby reflect flashes of light onto the screen. This film or foil is positioned in the airstream from the fan and may be mounted in-

dependently of the flag-like member, or be attached to it.

The front surface of the screen is preferably coated or treated so as to reflect light, the coating enabling light to be transmitted through the screen. This reflective coating provides a strong reflection of the simulated fuel to enhance the overall effect. The simulated fuel, especially logs, may also receive light cast downwardly from above, so that a corresponding reflected image of the fuel (e.g. log) can be clearly seen in the screen, thereby promoting realism.

The screen can alternatively include a transparent or translucent panel or panels, the front surface of the panel or leading panel reflecting light either due to a coating, or an inherent property of the panel. Such arrangements, however, do not give the optimum effect due to poorer reflection.

An additional panel may be fitted at the front which is capable of transmitting light, to enable the simulated flames to be perceived on the screen, whilst being tinted sufficiently so that components behind this additional panel are at least partly, if not wholly obscured when the source of illumination is switched off.

In accordance with another aspect of the invention, apparatus for simulating flames in a solid fuel fire comprises:

simulated fuel;

means for simulating flames including a fan and a member shaped and movable in an airstream from the fan so as to simulate flames;

means for illuminating the simulated fuel and said member; and

a screen positioned between the simulated fuel and said member, the screen being capable of both diffusely transmitting and reflecting light, whereby simulated flames are visible on the screen, which flames appear to emanate from between the simulated fuel and its reflected image in the screen;

the apparatus further including rear reflecting means which are substantially concave about a vertical axis; said member being a flag-like piece of material located centrally in front of the rear concave reflecting means and shaped and positioned so that it randomly intercepts the light which illuminates the rear reflecting means, whereby the simulated flames are perceived at different positions along the width of the screen.

This aspect of the invention is more concerned with using a single flag-like member together with a substantially concave rear reflecting means so as to avoid the need for a plurality of parallel ribbons as used in the prior art described above. In this aspect of the invention, the concave reflecting means may include reflecting the regions situated below a darkened or blackened area, and also a reflective surface which reflects, e.g. substantially white light in such a way as to cause a perception of colours, the arrangement being such that luminous flame-shaped images, tinged with colour, can be perceived between shadows on the screen.

Clearly, the features mentioned above, in connection said first aspect of the invention, may be used in the latter aspect of the invention. They will therefore not be recited again to avoid repetition.

A preferred embodiment of the invention will now be described with reference to the accompanying schematic drawings in which:

Fig. 1 is an exploded, perspective view of component parts used to simulate flames, emanating from simulated fuel, in an electrical fire;

Fig. 2 is a perspective view, partly exploded, showing certain components in their assembled state of the fire shown in Fig. 1, and

Fig. 3 is a pictorial representation of the visual effect.

Referring to the Drawings, an electrical fire comprises a casing 1 and a front facia 2 which is secured to the casing (as shown in Fig. 2). The components described below are located within the casing or adjacent the fascia.

A curved rear reflector 3, which can be made of metal (such as aluminium), having a polished front surface, preferably has selective regions 4 darkened or blackened by a suitable coating or layer of material. These regions 4 have a somewhat random pattern but generally exist at the top of the reflector and have lower edges defining inverted U-shaped portions 5. Portions 5 are not darkened or blackened and they present a fully reflective surface. However, coloured light producing means 6, preferably in the form of a sheet, is adhered, attached, or positioned adjacent a lower region of the rear reflector 3. These means 6 have a surface which reflects (e.g. substantially white) light but also causes the incident light to be separated into some of its constituent colours. This effect is comparable with selective diffraction or refraction of white light by e.g. prisms or optical gratings, whereby rays of light, having different optical frequencies, are bent through different angles, hence being perceived as colours (such as red, yellow, blue etc.). Various components and/or materials may be used to produce this effect, but we have found the use of thin metallised plastics or foil, having certain optical reflecting properties, to be particularly useful. Such foil is similar to that which is sometimes used for gift wrapping and it has the property of reflecting ambient light but tinged with various colours, depending on the angle from which it is viewed. In some respects, this is similar to the effect produced by a thin film of, e.g. petrol on water in which multi-coloured or rainbow effects can be seen. The material we used was manufactured by the Cobourn Corporation, in the USA or Germany, and this either has a plain finish, giving the impression of a pearly metallic surface on which there are very fine lines, or a pearly surface

on which there is a regular etched pattern, somewhat resembling facets of a crystal. For example, one sample was known as a "1/4 inch mosaic diffraction prismatic" pattern called "Diffractolite". An alternative material, available from the same Company, is called "Holographic Crystal". A further alternative, made by Markem Systems Limited, has a "Holofoil" pattern. Such materials generally include a plastics metallised film (e.g. aluminium) which is patterned by etched steel rollers, on a PE carrier, and which may be treated in some way so as to cause the required diffractions of refractions which result in reflections of coloured light. Where such material is used, its reflective, colour generating surface is the front surface of means 6, i.e. facing outwardly towards the fire opening. Also, its upper edge preferably resembles a pattern of flames (as see, for example, on burning fuel).

Materials having so-called "holographic" properties may be similar to photographic materials in which the surface of a substrate is covered with lenticular strips which have the effect of diffracting light. These strips may be of various cross-sections, e.g. triangular, and they extend in a direction so that light received, from a certain angle of incidence, is subject to a diffraction effect. Other holographic materials may be used including, for example, films produced by holographic techniques and/or substrates coated with materials, or used in conjunction with films, having the same effect.

Situated in front of the curved reflector and means 6 is a diffusing screen 7. This may include one or more panels, which are translucent or transparent, and which have the effect of diffusely transmitting light received from the reflector 3 and also of reflecting light from the front surface of the (leading) panel. In the example, shown, panel 8 is a sheet of glass with a front surface (i.e. facing the facia 2) which is capable of reflecting light from an illuminated fuel effect 9 immediately in front of panel 8. The simulated fuel may be in the form of a moulding, which is made of transparent or translucent material, and which is shaped, configured and decorated, e.g. with paint finishes, to resemble logs or coal. The simulated fuel moulding 9 is situated above a chamber or light box in which bulbs 10,11 are mounted. These bulbs, when switched on, cast substantially white light on the underside of the simulated fuel 9, thereby causing it to resemble glowing fuel. The front reflective surface of panel 8 is capable of reflecting an image of the fuel so that there appears to be a more extensive fuel bed when the fire is viewed from the front. The simulated flames (described below) then appear to emanate from between the fuel and its reflection in the screen 7. Preferably, but not essentially, the front surface of panel 8 includes a coating which reflects light, but is thin enough to enable light to be transmitted through panel 8, from the direction of reflector 4. Such a coating improves the reflection of the fuel in the screen 7. However, such a coating is not essential, because panel 8 may be made of transparent or translucent material which is either tinted, or made in such a way that the front surface is capable of reflecting an image of the illuminated fuel 9.

In Fig. 1, a separate diffusing sheet 12 is located behind panel 8. The main function of this component is to diffuse light received from reflector 4. It may be a translucent sheet (e.g. of glass) or it may be a sheet of thin material having light diffusing properties. Alternatively, the rear surface of panel 8 may be coated with material, or abraded, or etched, or otherwise treated so as to diffuse light. A diffusing sheet could also be adhered to the rear surface of panel 8.

At the front of the fire, in front of the simulated fuel 9, is a front panel 13 which is preferably made of tinted glass. This panel is transparent so as to enable simulated flames to be seen on screen 7. The degree of tinting of panel 13 may be such as to obscure the interior of the fire when the bulbs 10,11 and, an optional bulb 14, are switched off. Bulb 14 is located on casing 1 above a hole (not shown) in the casing, so that substantially white light is cast downwardly onto the upper surface of simulated fuel 9. In this case, the fuel resembles logs and the purpose of bulb 14 is to illuminate painted surfaces of the imitation logs, and thereby to promote realism. Reflections of these illuminated surfaces are more easily perceived in the screen 7 in promoting such realism. However, bulb 14 is optional and it is not required when the fuel resembles coal.

The front panel 13 can alternatively be lightly tinted, without necessarily obscuring the interior of the fire when the bulbs are switched off.

It would also possible to have a coating on panel 13, e.g. on its rear surface, which is capable of reflecting light, but is thin enough to transmit light. Whether or not the rear surface of the panel 13 is coated in this way, or is reflective due to its inherent nature (its tinting), certain arrangements of the fire could be made to enable at least a second image of the fuel 9 to be perceived from the front of the fire. This second image represents light reflected from fuel 9 onto the rear surface of panel 13, and then onto the front panel of screen 7. A first image of the fuel 9 is reflected directly by the front surface of screen 7. The effect is to produce the second image behind the first image and hence the illusion of a more extensive fuel bed. However, this multiple image effect may not be required and panel 13 may not be capable of producing this second image.

As best seen in Fig. 2, bulbs 10 and 11 are situated one on each side of a reflective "flag" 17. This flag is mounted so that it drapes across the outlet 15 of an electrically driven fan 16. The outlet 15 is in the form of a slot in order to blow a curtain of air upwardly onto the flag 17. The lower end 17a of the flag is attached to bulb mounting bracket 18, and at its upper

end 17b is attached to the upper edge of reflector 3. When the fan is off, the flag 17 tends to fall into a loose curve because it is made of very thin (but strong) material. The flag 17 is generally coffin-shaped with a diamond-shaped hole 19 in its lower portion. The upper portion is in the form of two arms 20a,20b separated by a slit 21. These arms tend to separate in the air stream produced by the fan. As shown in Fig. 1, small slits are provided in the upper and lower edges of flag 17 for the purpose of attachment to bracket 18 and reflector 3 respectively. The material of the flag 17 is preferably opaque and it may be coloured, e.g. ruby red. This material needs to be strong and thin and it is selected, with regard to the shape of flag 17 and the way it drapes (when the fan is off), and with regard to the performance of fan 16, so that the flag 17 ripples, flutters or undulates in the air stream and creates a continuously moving surface which intercepts substantially white light reflected by the rear reflector 3 from bulbs 10,11. These bulbs are situated, one on either side of flag 17, and slightly forward of the flag, so that the flag 17 casts moving shadows on the screen as it moves in the air stream. These shadows and reflected patches of light are visible on the screen 8 and form part of an illusion of real flames when the device is switched on. This will be explained in more detail below. In any event, the light intercepted by moving surfaces of flag 17, which is reflected by the curved reflector 3 casts shadows and moving patches of light onto the screen 7 where they can be seen as continuously moving, flame-shaped images. The shadows heighten the flame shaped images. Clearly, such a visual effect needs to be observed to be fully appreciated.

In addition to the flag 17, a reflective member 22 is provided in the form of a strip having arms at one end. This strip is used to simulate a spark effect, i.e. when sparks are occasionally seen to be generated in combusting fuel. The strip 22 is made of reflective metallised film or foil and it has a blank end secured to the bulb bracket 18 as shown in Fig. 2. The other end may be made in the form of a comb, i.e. teeth separated by slits. The member 22 is normally so flimsy that it hangs over the outlet 15 of fan 16. However, when the fan is switched on, the stream of air carries the teeth upwardly so that they flutter within the diamond-shaped hole in flag 17. The effect of this is to cast occasionally flashes of light onto the screen 7 and these are perceived in the manner of sparks. These flashes of light are received directly by screen 7 from member 22, but some reflections may be received indirectly from reflector 3 which are less distinct but occur in different places. The strip 22 may alternatively be attached to, or form part of the flag 17.

In Fig. 2, the screen (8,12), fuel (9) and front panel (13) are still shown in exploded form, but they would be fitted so that the diffusing sheet 12 touches panel 8 and form a screen (7) which abuts the vertical front edges of the curved reflector 3. The fuel moulding 9 would form a cover for bulbs 10 and 11 and its rear edge would be in contact with the screen 7. The front panel 13 would contact the front edge of the fuel moulding 9 and be almost flush with the fascia 2.

It is difficult to describe fully the visual effect achieved by the component parts described above, but this effect is surprisingly good and gives almost the same visual effect as real flames. In order to illustrate this effect in more detail, reference is made to Fig. 3. However, due to the limitations of black and white drawings and the lack of colour, this figure can only attempt to give some idea of the visual effect. Therefore, the directions given herein should be followed in order to construct the apparatus from which the visual effect, at its best, can be truly perceived.

In Fig. 3, imitation logs 9a,9b are made in the form of, e.g. a GRP moulding. When viewing the visual effect from the front of the fire, i.e. with the bulbs switched on, it is possible to see a first image of logs 9a and 9b in screen 7. These first images are represented as 9a′ and 9b′. However, it may also possible to see a second image 9a″, 9b″ behind these first images.

Extending upwardly from between at least logs 9a,9b and their first images are triangular shaped shadows 23a,23b. In between these shadows, and each side thereof, can be seen bright luminous triangular flame-shaped images, such as that indicated at 24a. Due to the effect of the colour generating member 6, these flame images 24a are not only luminous, i.e. in a yellow white form, but are also tinged with colours such as those normally associated with real flames.

In between the logs 9a,9b, there are indicated some small areas 25 which are intended to represent occasional flashes of light emanating from member 22.

Preferably, the bulbs 10,11 and the optional bulb 24 are bulbs which emit what may be generally called "white" light. Bulb 24 casts light onto the top of the imitation logs. These bulbs may be ordinary clear or translucent bulbs which would emit less than pure white light. However, the light emitted from the bulbs is diffracted or refracted into different colours by the effect of member 6. Bulbs of different tints could be used to create unusual effects, or different effects to those produced by using clear or white bulbs.

Only one flag 17 need be used in this optical effect, because the curved reflector spreads the reflections of light and shadows over a wider panoramic view, thereby giving the impression of flames appearing at different positions along the width of the simulated fuel. Moreover, in view of the reflective capability of screen 7 (and possibly also of the rear surface of the front panel 13), the imitation flames appear to emanate from between the actual imitation fuel and its reflected image (or images) in screen 7. An at-

tempt has been made to depict this in Fig. 3.

Certain other components of the fire, which have not been described in detail, but are illustrated in the drawings, include:

27 front glass panel retaining bracket
28 retaining side bracket
29 front glass channel
30 radiant element assembly
31 fascia retaining bracket
32 front support plate
33 air vent

As these components do not play an important role in the invention, they have been identified only.

Claims

1. Apparatus for simulating flames in a solid fuel fire, the apparatus comprising:

rear reflecting means;

means for simulating flames including a member or members and means for causing said member or members to move so as to simulate flames;

a screen capable of diffusely transmitting light, said member or members being positioned between the rear reflecting means and the screen;

simulated fuel positioned in front of the screen; and

means for illuminating said simulated fuel, said member or members, and said rear reflecting means;

said screen also being capable of reflecting light so that a reflected image of the fuel is visible in the screen; said illuminating means including a source of light which is randomly intercepted by movement of said member or members; said rear reflecting means including reflecting regions situated below a darkened or blackened area and also a reflecting surface which reflects said light in such a way as to cause a perception of colours; the arrangement being such that luminous flame-shaped images, tinged with colour, can be perceived between shadows on the screen, said flame-shaped images appearing to emanate from between the simulated fuel and its image on the screen.

2. Apparatus according to Claim 1, wherein said rear reflecting means is concave about a vertical axis and wherein said member is a flag-like member located centrally of the concave reflecting means.

3. Apparatus according to Claim 1 or 2, wherein said member or members are apertured and shaped to assist in producing a flame shaped image on the screen.

4. Apparatus according to Claim 3, wherein the member is a flag-like piece of material which is generally coffin-shaped and has a slit and a diamond shaped aperture therein.

5. Apparatus according to any of the Claims 2-4, wherein the means for illuminating the simulated fuel includes a source of substantially white light.

6. Apparatus according to any of Claims 2-6 in which the illuminating means includes a bulb or bulbs which are situated at the side or sides of the member and which are positioned to provide said flame-shaped images and shadows on said screen.

7. Apparatus according to any of the preceding Claims, wherein said reflecting surface comprises metallised film or foil which diffracts or refracts said white light in such a way as to enable said colours to be perceived.

8. Apparatus according to any of the preceding Claims, and further including means for simulating sparks in the simulated flames, the latter means including pieces of reflective material which move in the airstream from the fan and thereby reflect flashes of light onto the screen to simulate said sparks.

9. Apparatus according to any of the preceding Claims in which the simulated fuel is in the form of imitation logs and in which illuminating means also directs light onto an upper surface of the logs to promote realism.

10. Apparatus for simulating flames in a solid fuel fire, the apparatus comprising:

simulated fuel;

means for simulating flames including a fan and a member shaped and movable in an airstream from the fan so as to simulate flames;

means for illuminating the simulated fuel and said member; and

a screen positioned between the simulated fuel and said member, the screen being capable of both diffusely transmitting and reflecting light, whereby simulated flames are visible on the screen, which flames appear to emanate from between the simulated fuel and its reflected image in the screen;

the apparatus further including rear reflecting means which are substantially concave about a vertical axis; said member being a flag-like piece of material located centrally in front of the rear concave reflecting means and shaped

and positioned so that it randomly intercepts the light which illuminates the rear reflecting means, whereby the simulated flames are perceived at different positions along the width of the screen.

11. Apparatus according to Claim 10 wherein the concave reflecting means includes reflecting regions situated below a darkened or blackened area and also a reflective surface which reflects substantially white light in such a way as to cause a perception of colours, the arrangement being such that luminous flame-shaped images, tinged with colour, can be perceived between shadows on the screen.

12. Apparatus according to Claim 10 or 11 and including means for simulating sparks in the simulated flames, the latter means including pieces of reflective material which move in the airstream from the fan and thereby reflect flashes of light onto the screen to simulate said sparks.

13. Apparatus according to any of Claims 10-12 in which the simulated fuel is in the form of imitation logs and in which illuminating means also directs light onto an upper surface of the logs to promote realism.

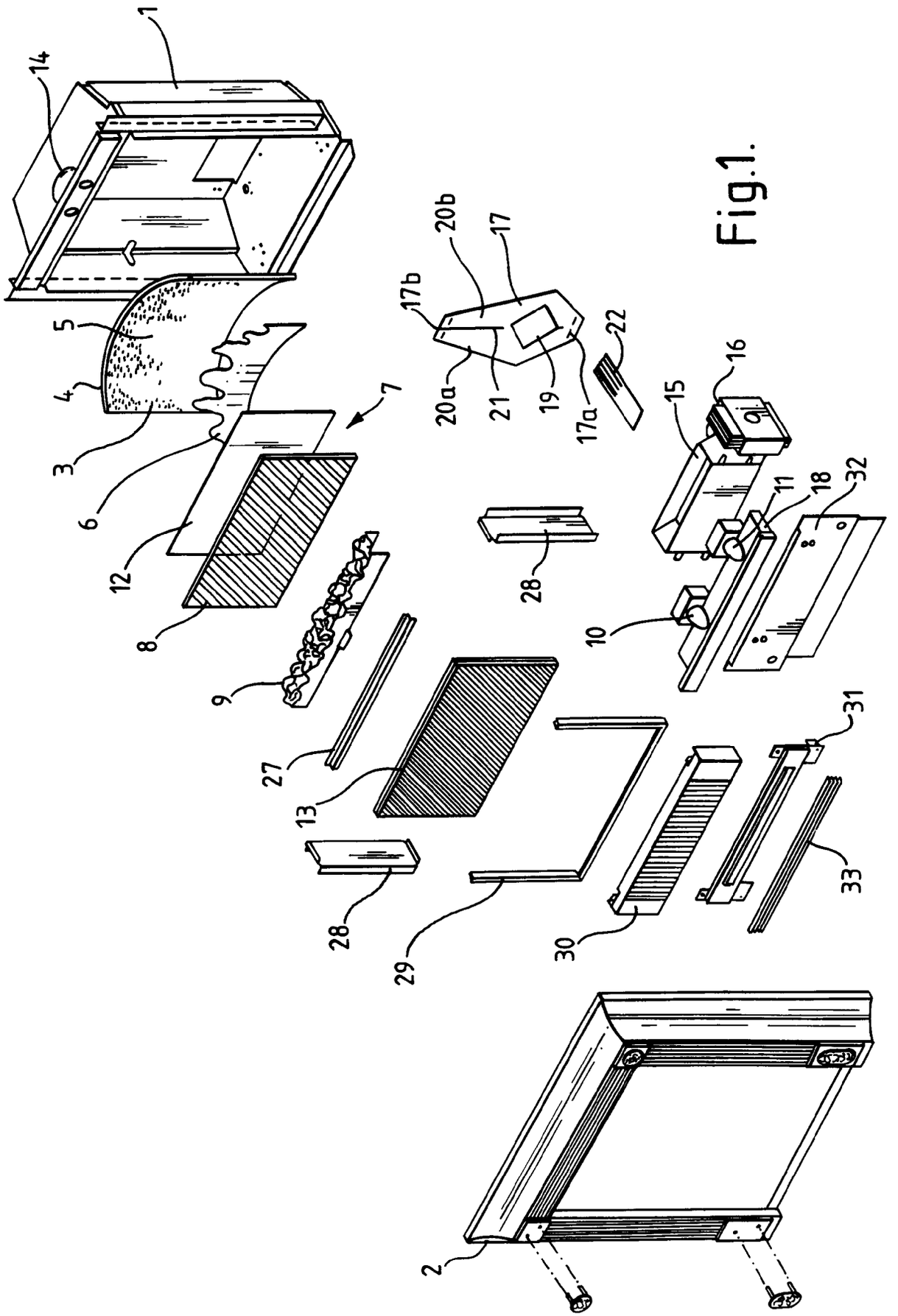
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Fig.1.

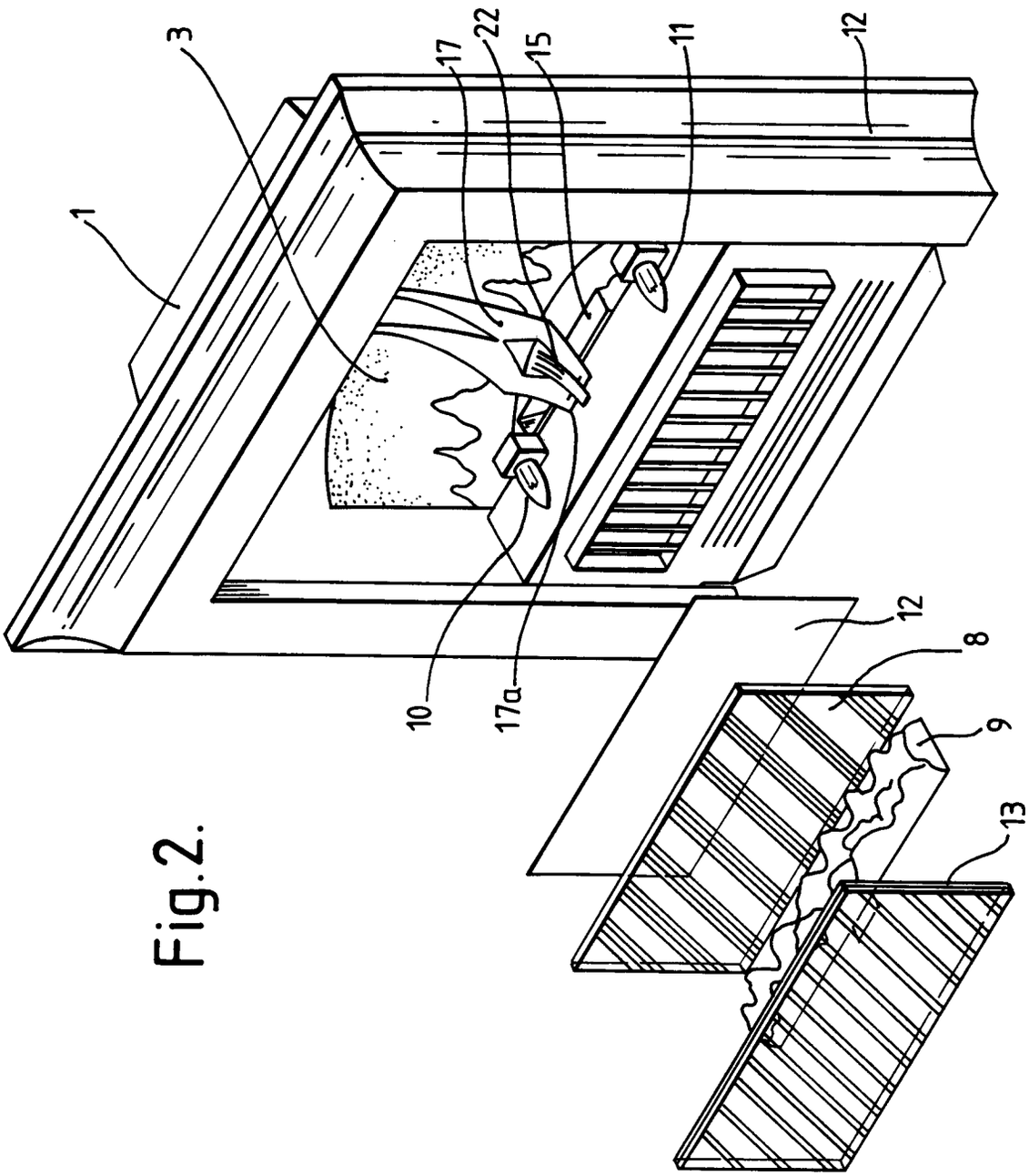

Fig.2.

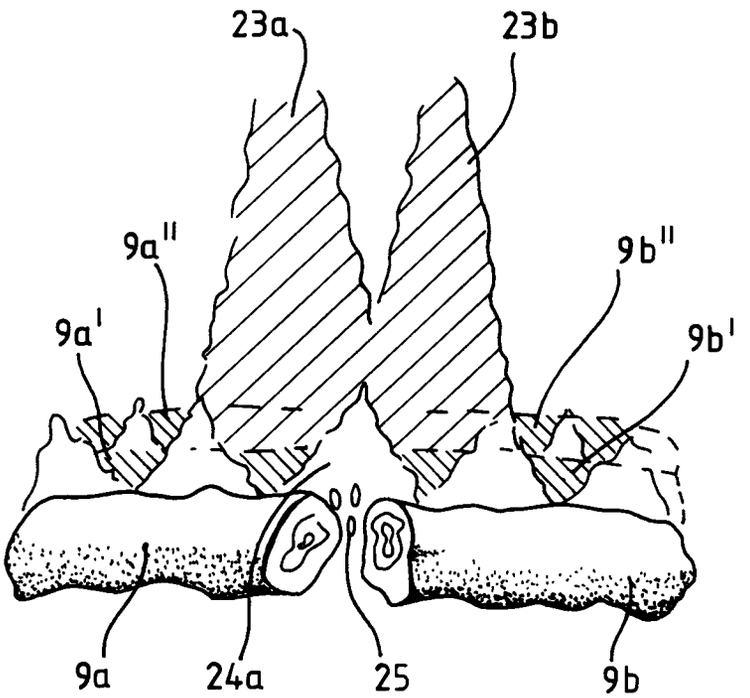

Fig.3.