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(54) **Apparatus for simulating moving flames**

(57) An apparatus for simulating moving flames has a source of light (36) which illuminates the rear, partially-reflective rear face of a flexible translucent fabric sheet (28) and means for agitating the flexible sheet. Light is reflected between the rear reflective face of the sheet (28) and a reflector (34) located behind the sheet. Light passing through the translucent sheet is viewed on and/or through a screen (46) and produces a realistic flame effect.

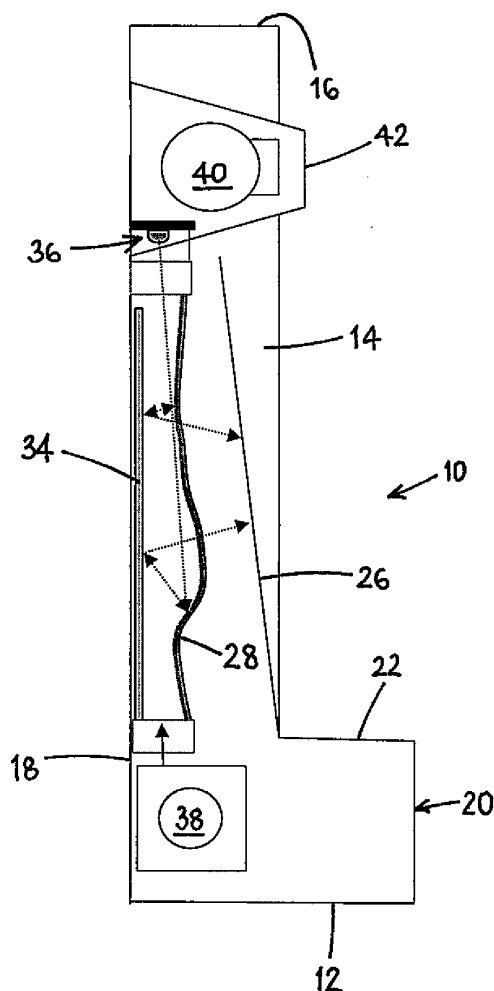


Fig. 2

Description

[0001] The present invention relates to a fuel effect apparatus and in particular, but not exclusively, to a fuel effect apparatus for use with, or as part of, a heating appliance.

[0002] It is known to provide an electrical heating appliance with a fuel effect device which simulates a flickering flame which gives the impression of being generated by a real fire. One such fuel effect device comprises a series of vertically aligned elongate ribbons secured at their upper and lower ends and located behind a screen. The ribbons are located in a current of air generated by a fan and are illuminated by a light source. In use, light from the light source reflected from the ribbons is visible through the screen (or, if the screen is translucent, is incident on the rear surface of the screen) and produces a flickering flame effect when viewed from the opposite side.

[0003] It is an object of the present invention to provide an improved fuel effect apparatus.

[0004] In accordance with the present invention, an apparatus for simulating moving flames comprises a source of light, simulated flame effect means for interrupting the said light to simulate flames, screen means on and/or through which to view an image of the simulated flames, and reflector means, the simulated flame effect means comprising a flexible, translucent sheet having a partially reflective rear face and means for agitating the flexible sheet, the source of light being adapted to illuminate the partially-reflective rear face of the sheet and the sheet being located between the screen means and the reflector means.

[0005] By illuminating the rear, reflective surface of the flexible sheet, multiple reflections take place between the sheet and the reflector means moved by the agitating means which, when viewed on and/or through the screen means, provide a realistic flame effect.

[0006] Preferably, the flexible translucent screen is substantially continuous.

[0007] In a preferred embodiment the agitating means comprises means for producing a current of air passing over the flexible translucent sheet, e.g. fan means

[0008] Preferably the sheet is adapted to flutter and/or flap in the current of air.

[0009] In one embodiment, the flexible sheet is generally rectangular and is secured along two opposite edges.

[0010] Preferably, the spacing between the secured edges of the sheet is less than the dimension of the sheet in that direction.

[0011] Preferably, the edges along which the flexible sheet is secured comprise the upper and lower edges.

[0012] Preferably, the flexible sheet covers the reflector means.

[0013] In one embodiment, the reflector means is generally planar.

[0014] The reflector means may comprise areas of different reflectivity. For example the reflector means may

comprise a plurality of areas of specular reflectivity and/or a plurality of retro-reflective areas.

[0015] Preferably, the light source is located above the flexible sheet.

5 [0016] The apparatus may further comprise means for producing a three-dimensional image of a bed, e.g. a holographic image of a bed.

[0017] Preferably, the screen means is located approximately in a position at which the three-dimensional image of the bed appears.

10 [0018] The screen means is preferably substantially planar.

[0019] The screen means may also be inclined.

15 [0020] The present invention also includes a heating appliance comprising an apparatus for simulating moving flames in accordance with the present invention.

[0021] The heating appliance preferably further comprises means for producing heat, e.g. a fan heater.

20 [0022] By way of example only, specific embodiments of the present invention will now be described, with reference to the accompanying drawings, in which:-

Fig. 1 is a perspective view, partly cut away, of a first embodiment of heating apparatus comprising a fuel effect apparatus in accordance with the present invention;

Fig. 2 is a vertical cross-section through the heating apparatus of Fig. 1, looking in the direction of arrows I-I;

Fig. 3 is a detailed exploded perspective view of a portion of the heating apparatus of Fig. 1;

35 Fig. 4 is a detailed exploded perspective view of a portion of a second embodiment of heating apparatus comprising a fuel effect apparatus in accordance with the present invention; and

40 Fig. 5 is a perspective view of a third embodiment of heating apparatus comprising a fuel effect apparatus in accordance with the present invention.

45 [0023] A heating apparatus 10 comprises a casing having a planar base wall 12, two parallel side walls 14 extending upwardly from the base wall, a planar top wall 16 interconnecting the upper ends of the two side walls 14 and a planar rear wall 18 interconnecting the rearmost edges of the base wall 12, side walls 14 and the top wall 16. The base of the casing is extended forwardly to form a hearth portion 20 having an upper surface 22.

50 [0024] The front wall of the casing has a rectangular opening 24 which receives a planar rectangular sheet 26 of tinted transparent glass, which forms a screen, as will be explained. The sheet 26 of glass is inclined slightly rearwardly such that its upper edge lies slightly within the casing 10, but this need not be the case, depending upon the circumstances.

[0025] Located behind the glass sheet 26 within the casing is a rectangular semi-transparent or translucent sheet of flexible black cloth 28, such as crepe de chine. The rectangular sheet of material is secured substantially continuously along its upper and lower edges but the spacings of the upper and lower anchor points 30, 32 are slightly less than the height of the sheet, whereby the sheet is allowed to flex and move.

[0026] The rear face of the sheet 28 is formed into a reflective metalised surface which reflects a portion of the light incident upon it but, since the fabric itself is semi-transparent or translucent, allows the remainder of the light to pass through.

[0027] A reflective sheet 34 is also secured to the inner face of the rear wall 18, whereby the fabric sheet is located between the rear reflector 34 and the glass sheet 26 forming the screen.

[0028] The cloth sheet 28, and in particular the surface of the sheet 28, is substantially continuous, i.e. It is not provided with any holes, slits, slots or other breaks through which light can pass. Moreover, the cloth sheet 28 extends over (covers) the whole of the rear reflective sheet 38, i.e. it is wider and taller than the reflective sheet 34 so that light from the reflector 34 must pass through the cloth sheet 28 before it reaches the screen 26. As a result, any light reflected from the rear reflective sheet 34 must pass through the material of the cloth sheet 28 as there are no holes, slits, slots or other breaks in the material through which the light could otherwise pass.

[0029] The rear, partially-reflective metalised face of the fabric sheet 28 is illuminated from above by means of a light-emitting diode (LED) lamp 36. A conventional tangential fan 38 is provided within the casing below the lowermost horizontal edge of the fabric sheet, to provide an upward current of air passing over the fabric sheet 28. A conventional fan heater 40 is also located in the uppermost portion of the casing, above the front opening 24, and is adapted to discharge heated air through an exhaust grille 42.

[0030] In use, actuation of the apparatus switches on the LED lamp 36 and the tangential fan 38 in the base of the housing. The fan heater 40 may additionally be switched on, if desired, by means of a separate control.

[0031] Actuation of the fan 38 produces an upward draught of air which passes over the fabric sheet 28. As mentioned previously, the fabric sheet is not held tautly between its upper and lower anchor points 30, 32 and thus the sheet 28 is caused to flutter and/or flap as a result of the air current.

[0032] Light from the LED lamp 36 is reflected between the rear reflective surface of the sheet 28 and the reflector 34 located on the inner face of the rear wall 18. However, the fabric sheet 28 is semi-transparent or translucent and the light passing through the sheet, after one or more reflections from the rear surface of the sheet 28 and/or the reflective surface 34 on the inner face of the rear wall 18, passes through the sheet 28. The light passing through the moving flexible sheet 28 is visible on and/or

through the glass sheet 26 and forms a realistic moving image which simulates real flames.

[0033] The effect produced by the present invention is considerably more realistic than known arrangements. In particular, by making the rear surface of the fabric 28 sheet reflective, it is possible for multiple reflections to occur between the rear face of the sheet and the reflector 34 on the inner face of the rear wall of the casing, which significantly improves the realism. The realism is also enhanced by making the cloth sheet 28 continuous and by ensuring that the cloth sheet 28 extends over all of the rear reflector 34.

[0034] As indicated in Fig. 3, the rear reflector 34 need not be uniformly reflective but may, for example, have regions 34a of different reflectivity. In Fig. 3, the regions 34a are of higher reflectivity than the rest of the reflector 34 and have the shape of tapering flames, to enhance the flame effect produced on the screen. However, the regions 34 may be of lower reflectivity and/or different shapes. Indeed, there may be regions of three or more different reflectivities.

[0035] A second embodiment of the present invention is illustrated in Fig. 4. The Fig. 4 embodiment is almost identical to the embodiment of Figs. 1 to 3, and the same reference numerals have been used to identify the same features. However, the main difference lies in the construction of the reflector 34' on the inner face of the rear wall 18 of the housing 10. As indicated in Fig. 4, the rear reflector is not uniform but instead has areas 44 of normal, specular reflection and other areas 46 which are retro-reflective. In the embodiment of Fig. 4, the reflective areas 44, 46 have the shape of tapering flames to enhance the flame effect.

[0036] As for the first embodiment, reflections occur between the reflective rear face of the semi-transparent sheet 28 and the reflective areas 44, 46 on the inner face of the rear wall 18. Reflection from the normally-reflective areas 44 provides a two-dimensional flame-like image and reflection from the retro-reflective areas 46 forms a three-dimensional image that appears to project in front of the sheet onto the front screen image. The overall result is a flame-like image which creates a three-dimensional depth to the flame effect.

[0037] A further embodiment of the present invention is illustrated in Fig. 5, in which the flame effect apparatus of Fig. 1 or Fig. 4 is used in conjunction with a three-dimensional holographic image of a fuel bed on a holographic screen 50 positioned in front of the screen 26 and illuminated by a separate LED light source 52 located in an aperture in the undersurface of the cowl of the fan heater 40. The three-dimensional image 56 of the illuminated fuel bed appears to be located at approximately the position of the screen 26 upon which the simulated images 58 of flickering flames are generated, and the simulated flickering flames therefore appear to emanate from the holographic image of the fuel bed. Real or simulated coal pieces 60 are also positioned on the upper surface 22 of the hearth portion 20, in front of and

behind the lowermost edge of the holographic screen 50, to further enhance the realism and to provide continuity with the three-dimensional holographic image 56 of the fuel bed.

[0038] The three-dimensional image 56 of the fuel bed, together with the flame effect means in accordance with the present invention, provides an extremely realistic simulation of a glowing fuel bed from which flames emanate.

[0039] The invention is not restricted to the details of the foregoing embodiments. For example, the sheet 26 may be plastic instead of glass. Moreover, the sheet may be translucent or semi-transparent, e.g. provided with a matt front and/or rear face, to allow the flame effect image to form more clearly on the sheet 26 and to make it more difficult to view the moving flexible sheet 28 directly through the sheet 28.

Claims

1. An apparatus for simulating moving flames, comprising a source of light, simulated flame effect means for interrupting the said light to simulate flames, screen means on and/or through which to view an image of the simulated flames, and reflector means, the simulated flame effect means comprising a flexible translucent sheet and having a partially reflective rear face, and means for agitating the flexible sheet, the source of light being adapted to illuminate the partially-reflective rear face of the sheet and the sheet being located between the screen means and the reflector means.
2. An apparatus as claimed in claim 1, wherein the flexible translucent sheet is substantially continuous.
3. An apparatus as claimed in claim 1 or claim 2, wherein the agitating means comprises means for producing a current of air passing over the flexible translucent sheet and, optionally, wherein the agitating means comprises fan means and, optionally, wherein the sheet is adapted to flutter and/or flap in the current of air.
4. An apparatus as claimed in any of the preceding claims, wherein the flexible sheet is generally rectangular and is secured along two opposite edges and, optionally, wherein the spacing between the secured edges of the sheet is less than the dimension of the sheet in that direction.
5. An apparatus as claimed in claim 4, wherein the edges along which the flexible sheet is secured comprise the upper and lower edges.
6. An apparatus as claimed in any of the preceding claims, wherein the flexible translucent sheet covers the reflector means.
7. An apparatus as claimed in any of the preceding claims, wherein the reflector means is generally planar.
8. An apparatus as claimed in claim 7, wherein the reflector means comprises areas of different reflectivity.
9. An apparatus as claimed in claim 8, comprising a plurality of areas of specular reflectivity.
10. An apparatus as claimed in claim 8 or claim 9, comprising a plurality of retro-reflective areas.
11. An apparatus as claimed in any of the preceding claims, wherein the light source is located above the sheet means.
12. An apparatus as claimed in any of the preceding claims, further comprising means for producing a three-dimensional image of a bed, for example means for producing a holographic image of a bed and, optionally, wherein the screen means is located approximately in a position at which the three-dimensional image of the bed appears.
13. An apparatus as claimed in any preceding claims, wherein the screen means is substantially planar and, optionally, wherein the screen means is inclined.
14. A heating appliance comprising an apparatus for simulating moving flames as claimed in any of the preceding claims.
15. A heating appliance as claimed in claim 14, further comprising means for producing heat and, optionally, wherein the means for producing heat comprises a fan heater.

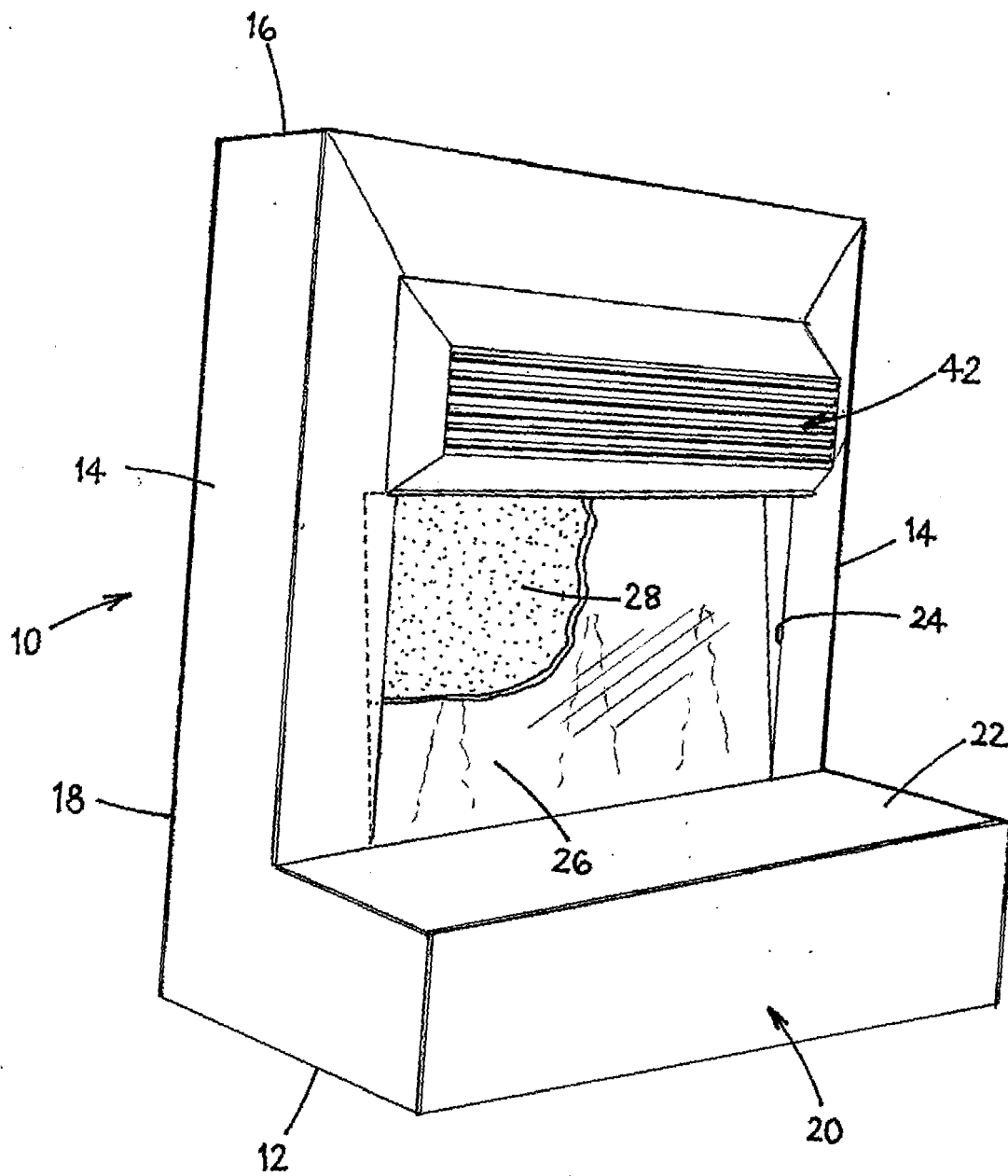


Fig. 1

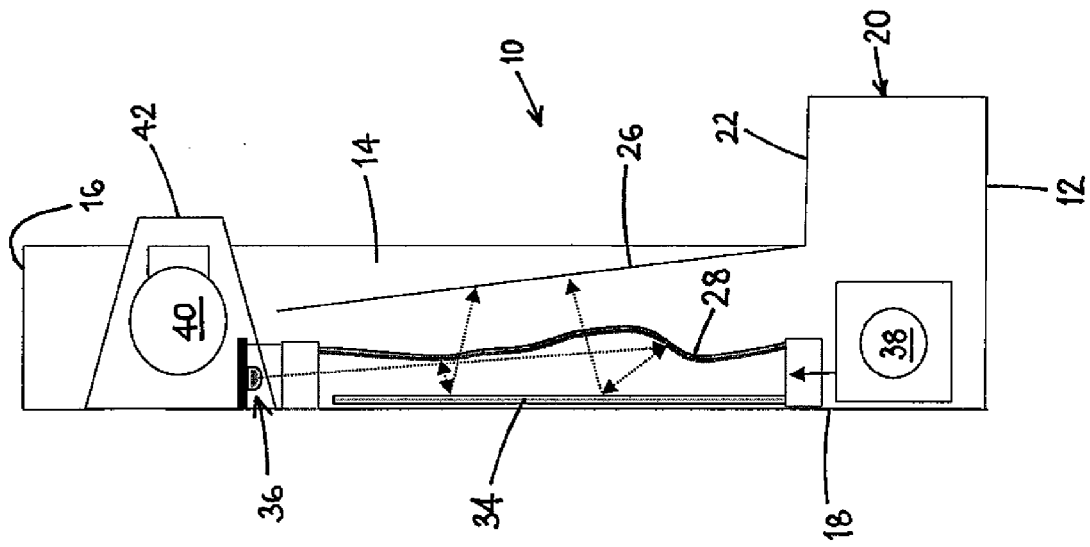


Fig. 2

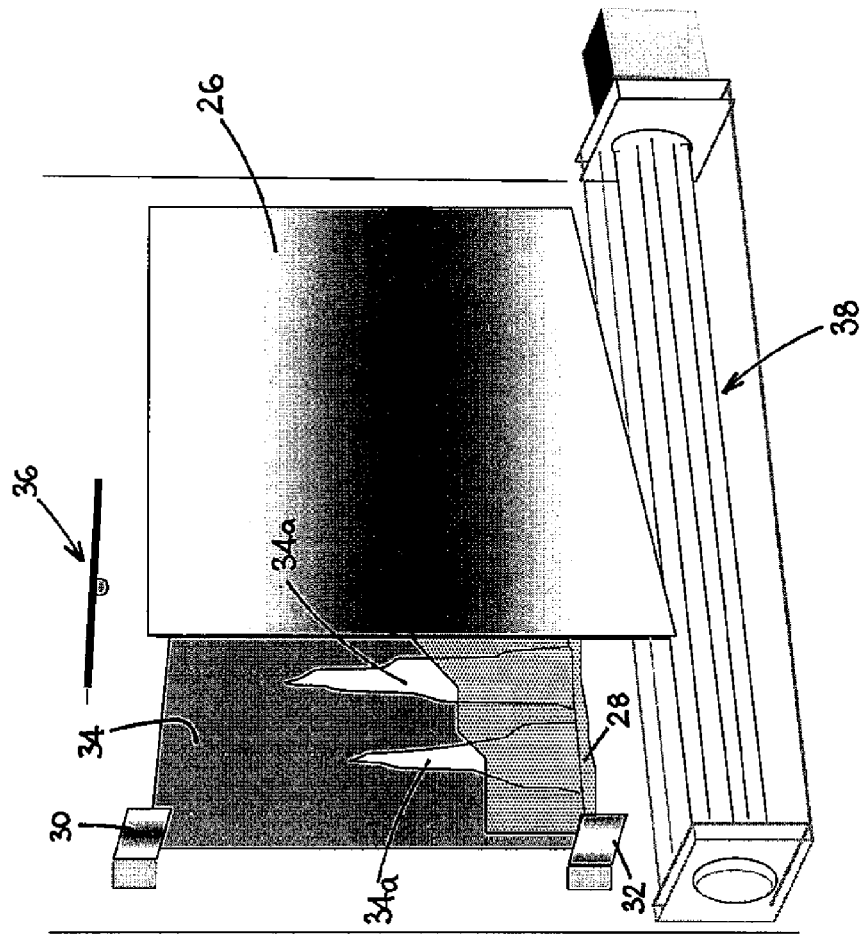


Fig. 3

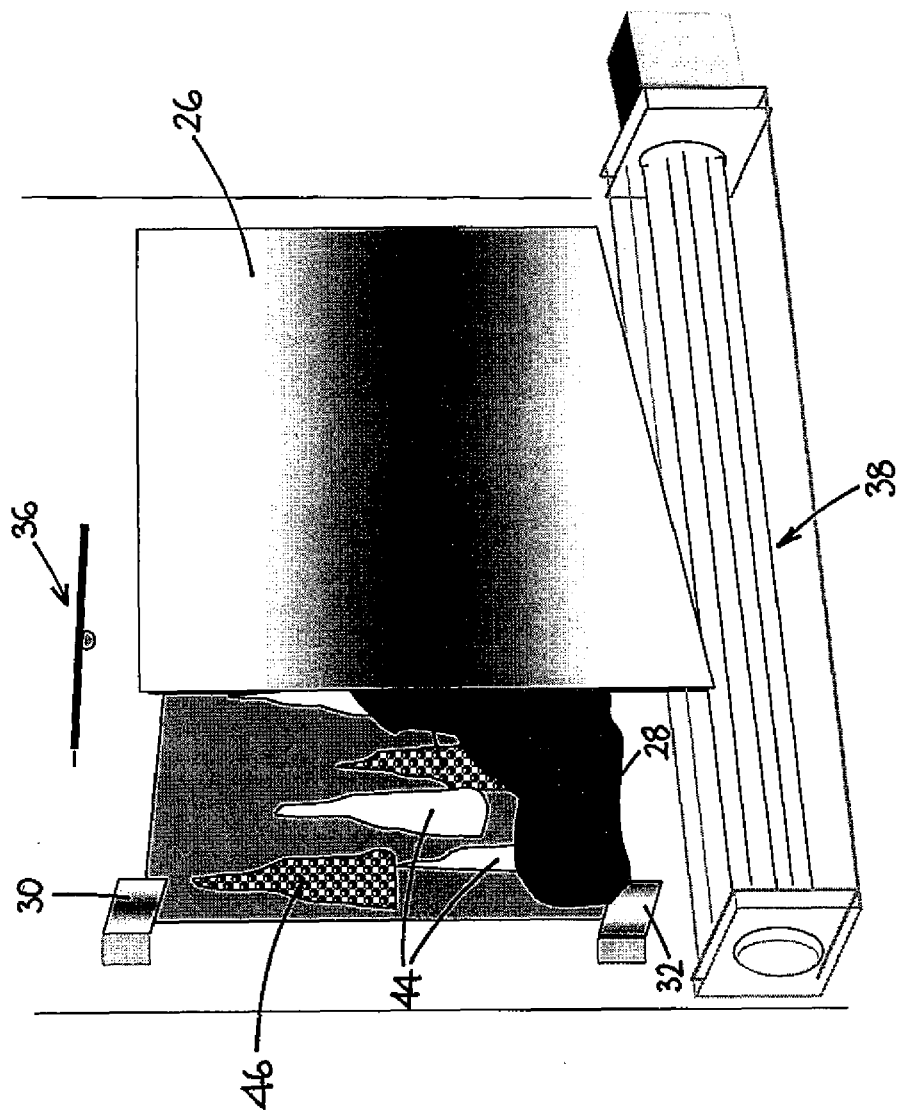


Fig. 4

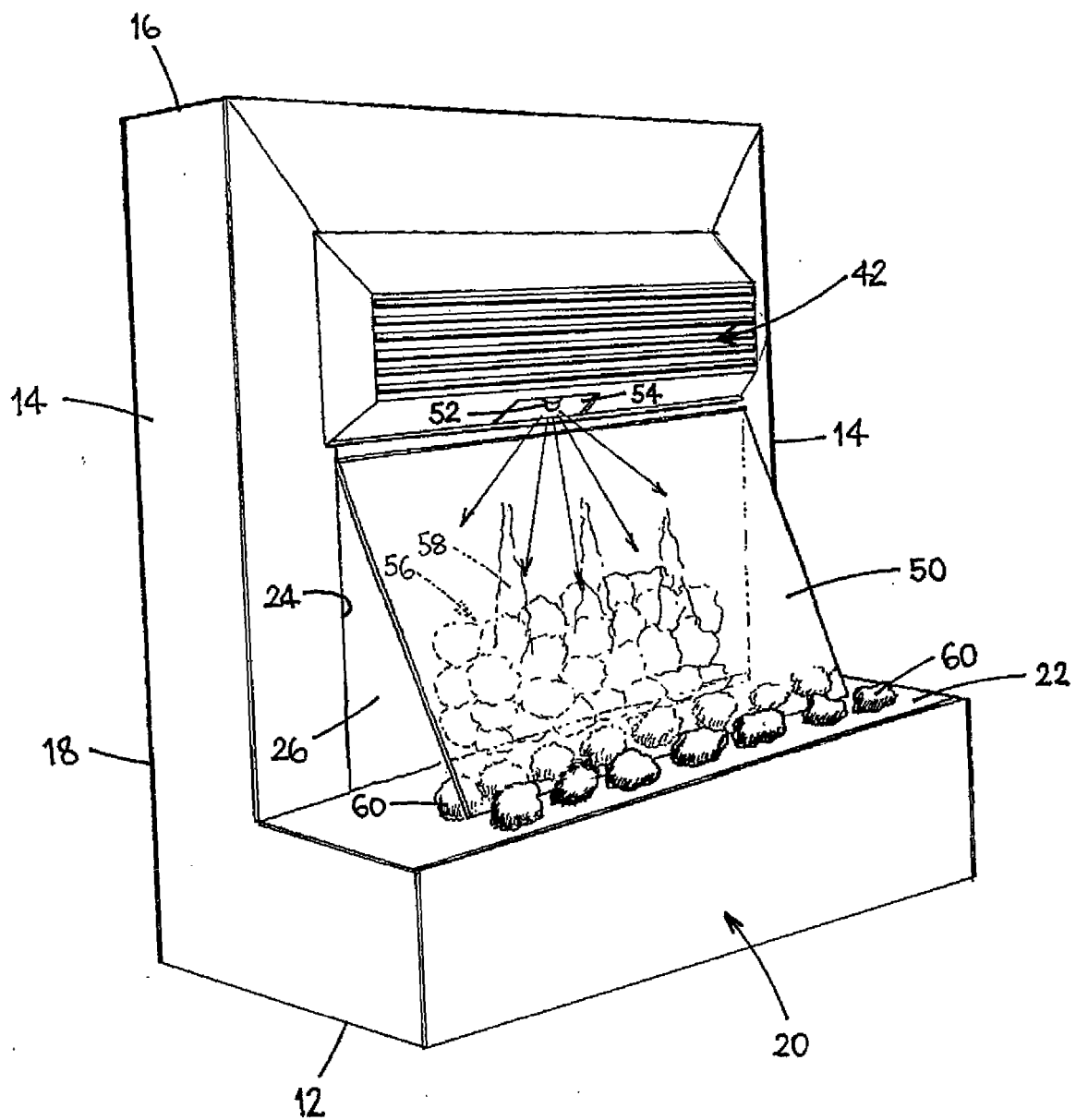


Fig. 5