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GB 2407633 A GB 2376287 A
EP 1469141 A1 WO 2003/025455 A1
WO 2001/029480 A1 US 20040185195 A1
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(54) Abstract Title: **Illuminated tile unit**

(57) An illuminating tile unit 101 comprising a cavity 103 in a wall 105 and an at least partially transparent tile 113, and a light source 107, such as an LED, wherein the light source 107 is operable to emit light which permeates through and illuminates the tile 113. The unit 101 may further comprise a light modification medium (213, fig.2; 323, fig.3) in place of the tile 113 for refracting, diffusing or focusing the emitted light.

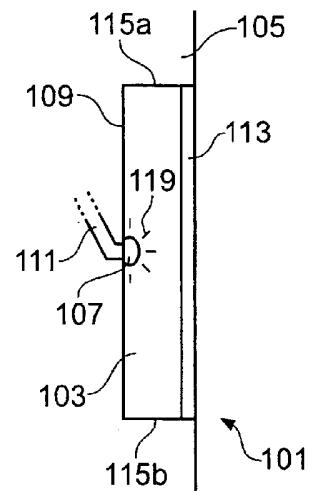


Fig. 1

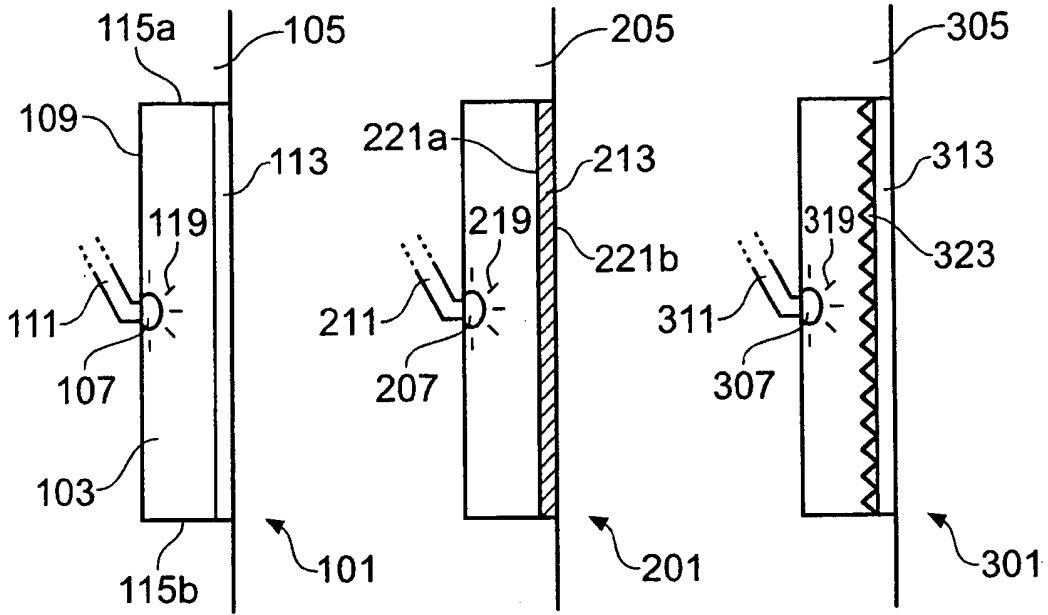


Fig. 1

Fig. 2

Fig. 3

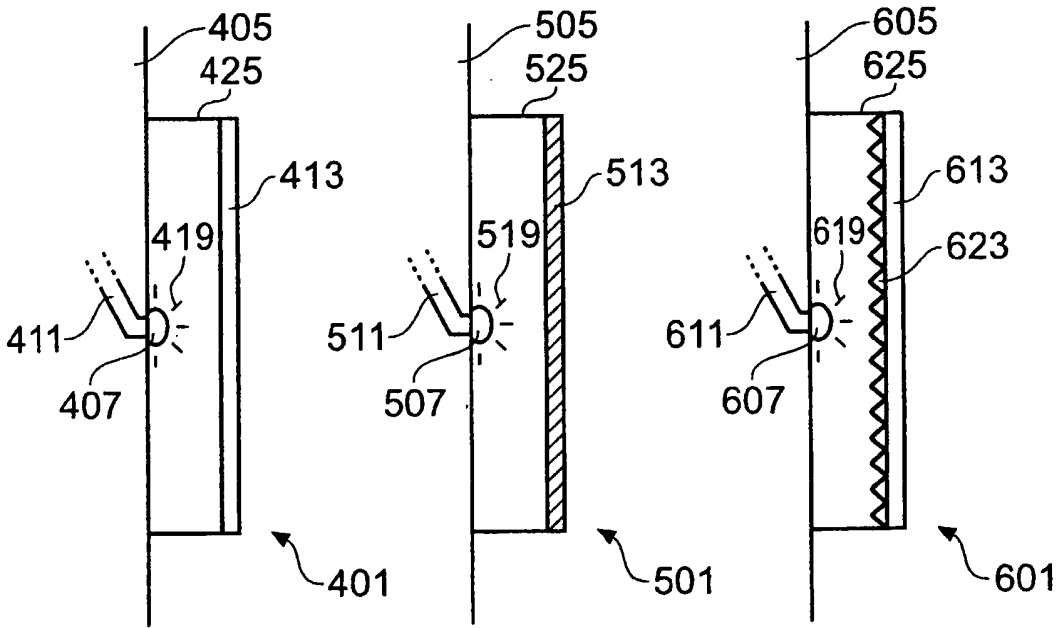
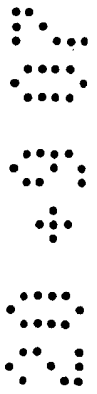


Fig. 4

Fig. 5

Fig. 6



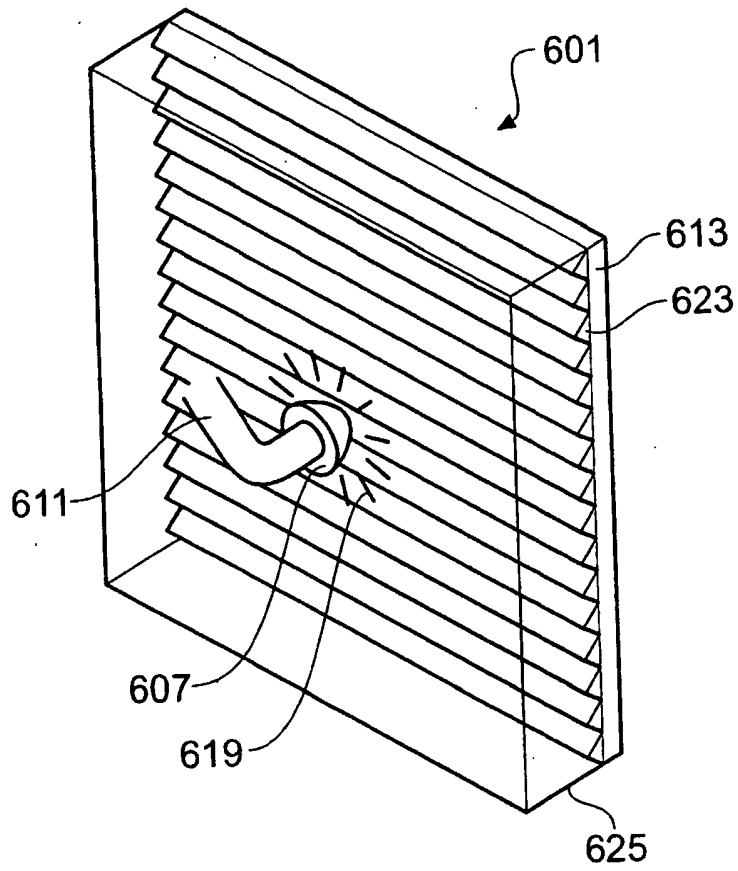
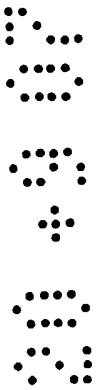


Fig. 7



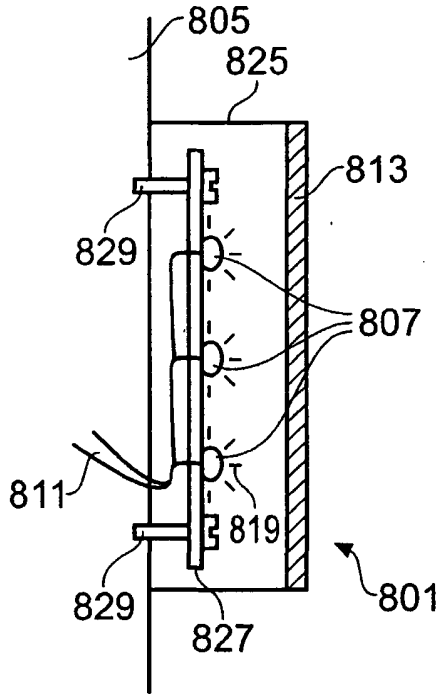


Fig. 8

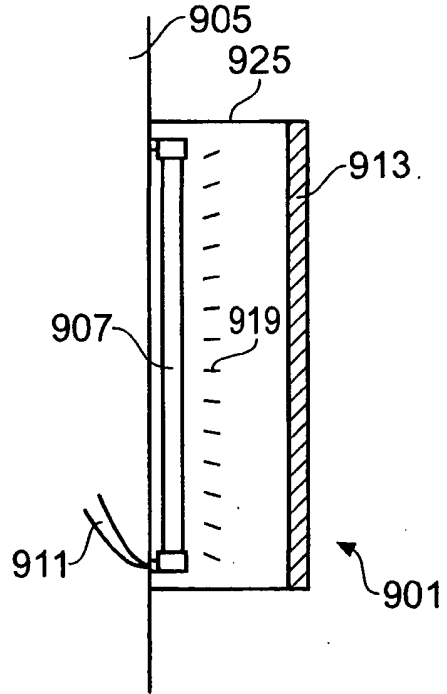


Fig. 9

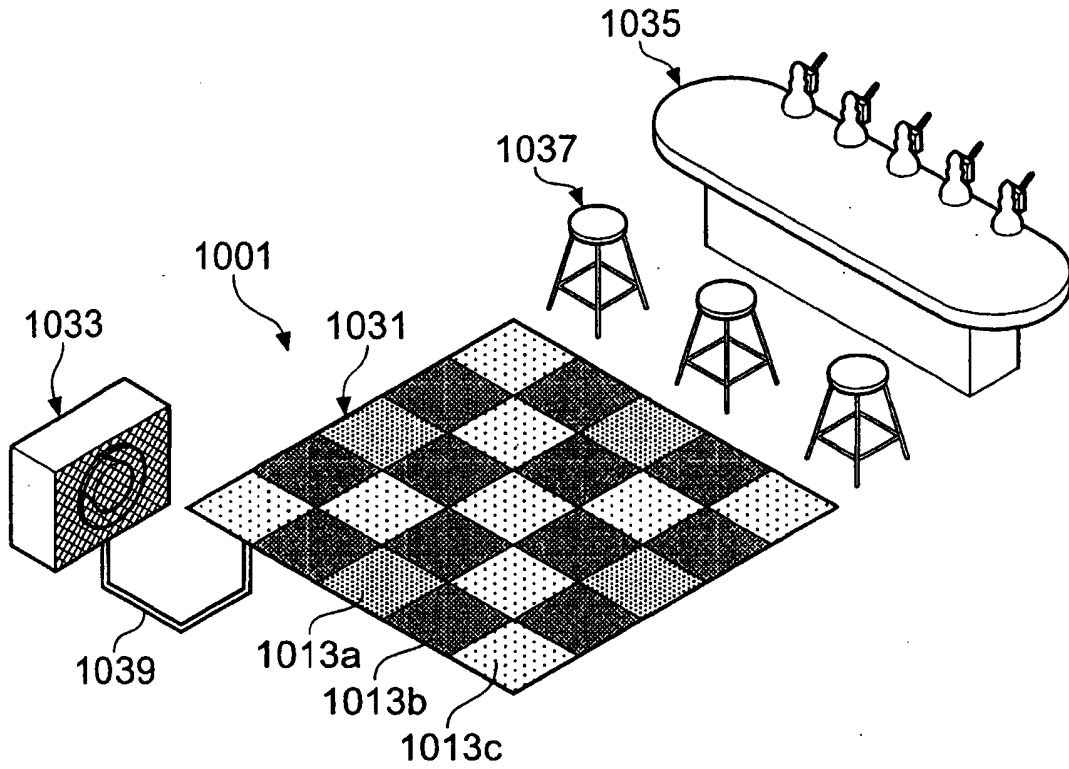
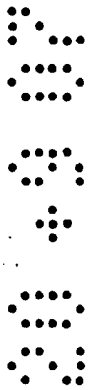


Fig. 10

4/5

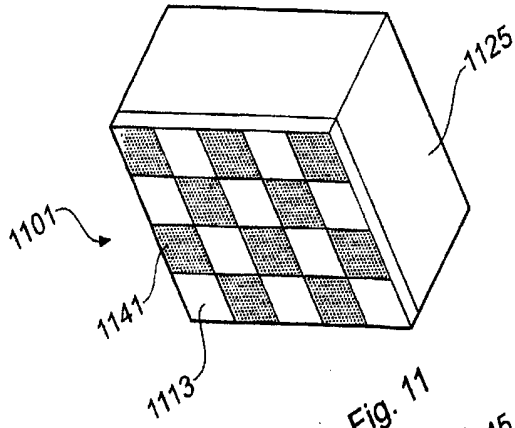


Fig. 11

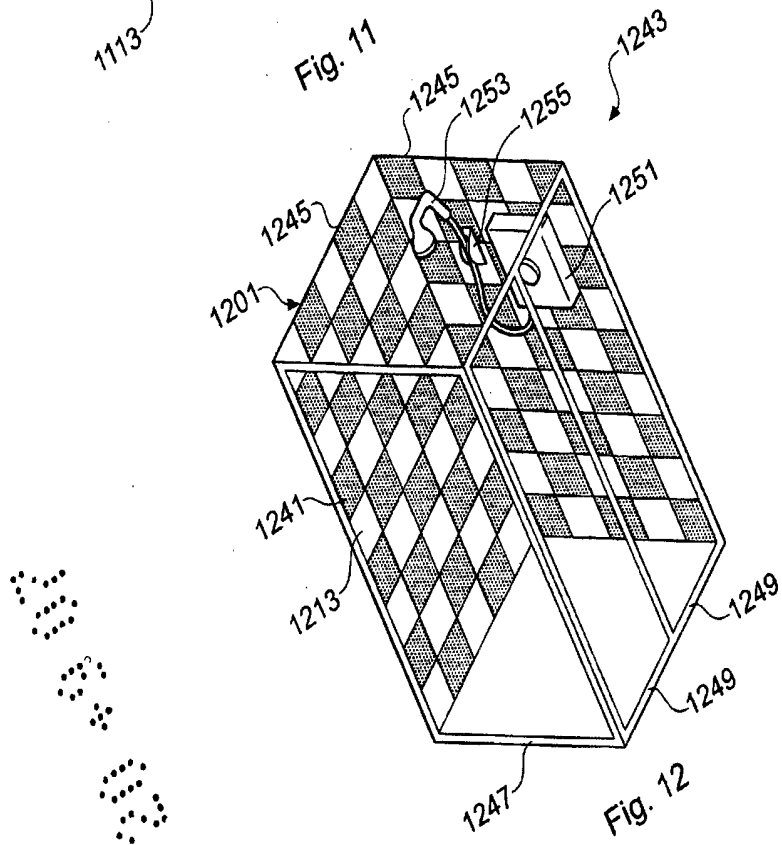


Fig. 12

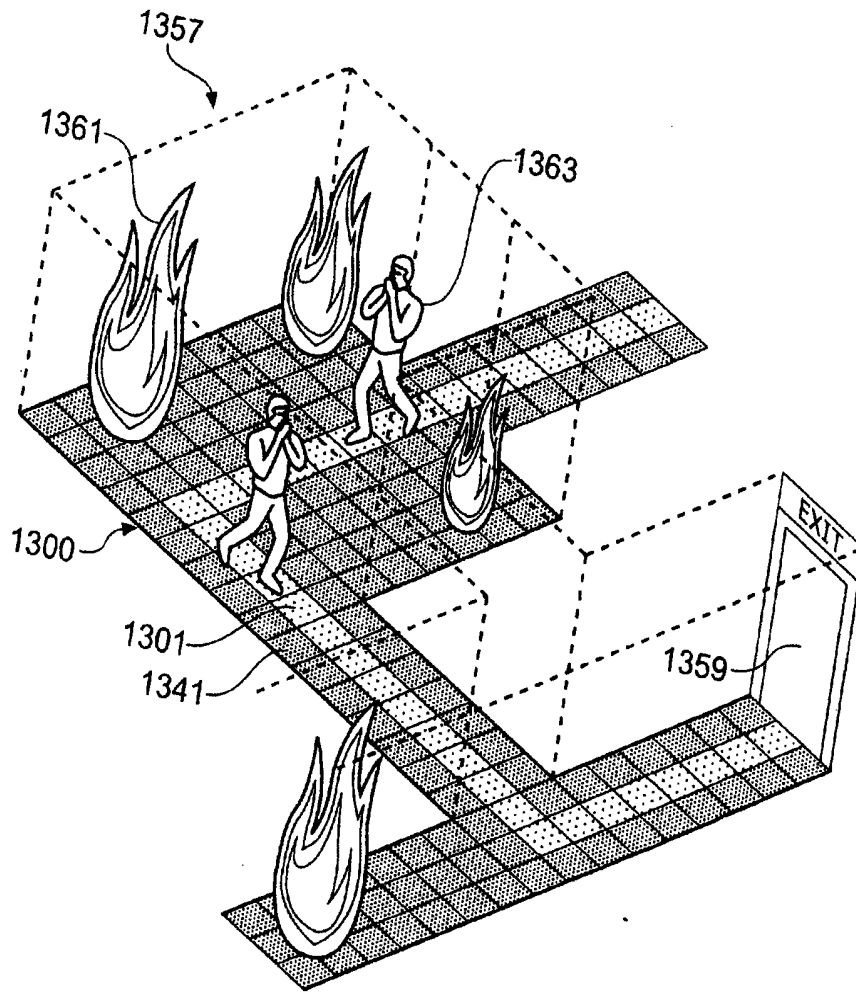


Fig. 13



A Tile Unit

The present invention relates generally to the field of tiles, and more particularly to tiles of the type which are commonly used in the interior of a building to produce
5 an aesthetic effect.

Tiles for covering the interior surfaces of a building, for example, have been known for many years now, and are usually employed for the purposes of improving the aesthetic appearance of such surfaces. Tiles may be used on
10 surfaces which include the floor, the walls or the ceiling for instance. As well as being used for purely aesthetic purposes, a tile can also provide a waterproof surface, which is especially pertinent to regions such as a bathroom.

From the discussion that is to follow it will become apparent how the present
15 invention improves, in particular, the aesthetic effect provided by a tile when compared to prior art constructions.

According to the present invention, there is provided an illuminating tile unit comprising an at least partially transparent tile and a light source, wherein the light
20 source is operable to emit light which permeates through and illuminates the tile.

The present invention presents a tile unit which allows a tile to be illuminated whereby to enhance its aesthetic appeal. Of course, it is possible that a tile unit of

this type may also be utilised for the purposes of illuminating the surrounding region where it is located.

Tile units formed according to the present invention may, for example, be located
5 intermittently in between conventional tiles. Alternatively, the entire surface of a wall, or other tile supporting surface, may be provided with one or more such tile units.

The tile unit may further comprise a light modification medium. The light
10 modification medium may, for instance, act to refract the emitted light from the light source. In this way, the light modification medium may diffuse or focus the emitted light. As a consequence of the emitted light being refracted in this manner, it becomes possible to either disperse or scatter the emitted light whilst it permeates through the semi-transparent tile, or alternatively to focus or concentrate
15 a beam of the emitted light through a particular region of the semi-transparent tile. The manner in which the light is modified will be dependent upon the effect to be achieved.

The light modification medium may be catadioptric. The term catadioptric refers
20 to optical systems which involve both lenses and mirrors. The inclusion of mirrors may further enhance the illuminating properties of the tile thereby increasing the aesthetic effect generated during use.

It may be that the light source emits light which is reflected by the catadioptric light modification medium, before or after the light traverses the tile.

The light modification medium may be at least one of a solid, liquid and gas.

5

The light modification medium may be capable of filtering certain wavelengths of light, and as a result the filtered light may produce a coloured effect, even through a clear tile, for example.

10 The light modification medium may comprise a plastics material, such as polymethyl methacrylate. Use of a plastics material offers the benefits of being able to easily and cheaply manufacture the light modification medium by a convenient method, such as extrusion or injection moulding for example. Given the reduced quantities of material used by employment of such methods, it follows
15 that the weight of the light modification may also be reduced. Similarly, the light modification medium may comprise a prismatic sheet, the use of which may serve to comprehensively cover the surface area of a tile in an efficient manner.

In an embodiment of the present invention, the light source may comprise at least
20 one light emitting diode (LED). A LED is a semi-conductor device that emits incoherent narrow-spectrum light when electrically biased in the forward direction. This effect is a form of electro-luminescence. The colour of the emitted light may be dependent upon the composition and condition of the semi-conducting material used. Conventional LEDs are made from a variety of inorganic semi conductor

materials which produce various colours. For example, the following materials are able to generate the following coloured light:

- aluminium gallium arsenide (AlGaAs)-red light
- aluminium gallium phosphide (AlGaP)-green light
- 5 - gallium phosphide (GaP)-red, yellow and green light

Some of the advantages of using LEDs include the following: LEDs are significantly more energy efficient than incandescent bulbs, which is particularly useful in battery powered devices; LEDs can emit light of an intended colour
10 without the use of coloured filters that traditional lighting methods require, which is more efficient and may lower initial manufacturing costs; LEDs have an extremely long life span which is typically ten years, which can be twice as long as conventional fluorescent bulbs and twenty times as long as conventional incandescent bulbs; LEDs emit much less heat than incandescent light bulbs with a
15 similar light output; and LEDs fail by dimming over time, rather than an abrupt burn-out which is normally the case with incandescent bulbs.

Unlike incandescent light bulbs which light up regardless of the electrical polarity, LEDs will only light with positive electrical polarity. If the voltage is of the wrong
20 polarity, the device is said to be reversed by this, very little current flows, and no light is emitted. LEDs may be operated on an alternating current (AC) voltage, which causes the LED to turn on and off at the frequency of the AC supply.

It will be understood, however, that the present invention envisages other forms of light source which are able to provide a similar function.

The emitted light may be white light which may be particularly suitable for illuminating tiles of different colours, for example. This may, for instance, reduce the manufacturing costs of a unit in that the same light source, which emits white light, may be utilised for illuminating a plurality of tiles having a variety of different colours.

10 The emitted light may be coloured light, which may be particularly suitable for use with a clear tile, for example. Alternatively, a coloured light may be used with a coloured tile further to amplify the existing colour of the tile. For example, a light source which emits red light may be utilised with a red semi-transparent tile whereby further to exaggerate the colour and glow of the tile.

15

In some embodiments, the light source may be capable of emitting at least one flashing light, the nature and advantages of which are described in greater detail below.

20 The at least partially transparent tile may be clear. Alternatively, the at least partially transparent tile may be coloured.

The at least partially transparent tile may be a wall tile, in which case the unit may be mounted on and supported by a wall. In some embodiments of the present

invention, the unit may be arranged on a wall so that it forms a particular picture or symbol, for example.

Conversely, the at least partially transparent tile may be a floor tile, in which case
5 the unit would be placed on and supported by the floor. A typical location would be a bathroom, for example.

The illuminating tile unit may further comprise means for playing music, which may comprise a loud speaker. In some embodiments of the present invention, the
10 light source may be capable of communicating with the means for playing music so that, in use, the music being played is synchronised with the at least one flashing light. This type of arrangement may be particularly appropriate for a discotheque where the unit may form part of a dance floor. It is, of course, possible that such an arrangement may be used in a kitchen-type environment
15 where the unit may be mounted on a kitchen wall, for example. The unit in this type of embodiment would provide a pleasant visual effect as well as a pleasant auditory effect which may, in some circumstances, have a therapeutic effect on persons in the vicinity of the unit.

20 Alternatively or additionally, the unit may further comprise features such as motion detection means, light detection means, touch detection means and heat detection means. The unit may be operable to control the light source in response to at least one of these said features. For example, the motion detection means may control the unit by causing it to activate upon detection of motion in the

region in which the unit is located, and may deactivate the unit when motion is no longer detected. Furthermore, motion detection means may allow the present invention to act as an inconspicuous burglar alarm.

- 5 The inclusion of heat detection means could provide a useful way of discerning the temperature of the atmosphere within a room, where the tile colour may change in response to the temperature of the room. For example, it may be that the tile appears as a red tile at higher temperatures and appears as a blue tile at lower temperatures. The same principle may be applied to discern the temperature of
- 10 water, in a bathroom for example. In this way the temperature of a room, through an air conditioning unit for example, or the temperature of bathwater, through a boiler unit for example, may be regulated by use of the present invention.

The at least partially transparent tile may be at least partially composed of the light

15 modification medium. This may be achieved by manufacturing the tile from a plastics material, such as polymethyl methacrylate, having convex or concave surfaces for the purpose of refracting any light shone therethrough. In this manner a unit which is devoid of a separate component which constitutes the light modification medium, may have a reduced weight which is advantageous for the

20 purpose of transportation and installation of the unit.

In alternative embodiments, the light modification medium may be provided as a separate component from the at least partially transparent tile. It may be preferred that the separate component is positioned so that the emitted light permeates

through the separate component before reaching the at least partially transparent tile. Moreover, it may be preferred that the light modification medium is positioned immediately adjacent the at least partially transparent tile. By providing the light modification medium as a separate component from the at least partially
5 transparent tile, the arrangement of the components within the unit may be so arranged as to accommodate the region in which the unit will be located. For example, in regions of limited space, such as a small bathroom, it may be preferred that the tile is at least partially composed of the light modification medium in order to minimise the space occupied by the said unit.

10

The unit may further comprise a housing, the object of this being to provide protection to the components contained interially of the housing. The housing would also fulfil the purpose of concealing the components of the unit so that the unit is presented in an aesthetically pleasing manner.

15

At least part of the unit may be composed of or treated with a waterproof and/or fireproof material. This is especially pertinent where the unit is installed within a bathroom, for instance, and more specifically within a shower cubicle where it is important that the shower cubicle has a water seal in order to prevent water from
20 leaking from the cubicle which could cause damage in other areas of the room and/or building.

Various embodiments of the present invention will now be more particularly described by way of example, with reference to, the accompanying drawings, in which:

Figure 1 is a section of a tile unit formed in accordance with the present invention;

Figure 2 is a section of an alternative embodiment of the present invention;

Figure 3 is a section of a further alternative embodiment of the present invention;

Figures 4 to 6 are sections of tile units similar to Figures 1 to 3, but in which the tile units further comprise a housing.

Figure 7 is a perspective view of the tile unit of Figure 6;

Figure 8 is a section of a further alternative embodiment of the present invention;

Figure 9 is a section of a still further alternative embodiment of the present invention;

Figure 10 is a perspective view of an embodiment of the present invention in which the tile unit comprises a floor tile for a dance floor;

Figure 11 is a perspective view of a tile unit array comprising a plurality of tile units formed according to the present invention;

Figure 12 is a perspective view of a shower cubicle having walls including a plurality of tile units formed according to the present invention; and

Figure 13 is a perspective view of a burning building incorporating a plurality of tile units formed according to an embodiment of the present invention.

Referring first to Figure 1 there is illustrated an illuminating tile unit, generally indicated 101. The tile unit 101 is incorporated into a parallelepiped shaped cavity 103 of a wall 105. Within the cavity 103 there is found a centrally located light emitting diode (LED) 107. More specifically, the bulbous shaped LED 107 abuts the back wall 109 of the cavity 103, such that the LED 107 may be connected to a power supplying wire 111, which is fed to the LED 107 through the wall 105. The tile unit 101 also comprises a glass tile 113. The cavity 103 has parallel side walls 115a and 115b which are spaced apart by a distance which is substantially similar to the width of the glass tile 113, such that the tile 113 fits snugly between the side walls 115a/115b by means of an interference fit. The glass tile 113, therefore, is flush with the outer surface 117 of the wall 105. The tile 113 may be held firmly in position by the application of a suitable adhesive between the edges of the tile 113 and side walls 115a/115b.

15 In use, the light source, here depicted as a LED 107, emits light 119 which permeates through and illuminates the glass tile 113 whereby to enhance its aesthetic appeal to an onlooker. It is, of course, possible that the tile unit 101 may be utilised to illuminate the surrounding exterior region of the tile unit 101.

20 Various embodiments of the tile unit will now be described in which the structural features differ but the function remains essentially the same. For this reason, like reference numerals indicate like features.

Referring now to Figure 2, there is shown a tile unit 201 which is substantially similar to the tile unit 101 of Figure 1. The only difference between these tile units being that in Figure 2 a tile 213 formed from polymethyl methacrylate replaces the glass tile 113, as shown in Figure 1. In this way, the polymethyl methacrylate material constitutes both a tile and a light modification medium, which can act to refract the light 219 which is emitted from the light source 207. The way in which the light is refracted may be dependent on the angle between the inner and outer surfaces of the tile 213. For example, if both the interior surface 221a and exterior surface 221b define concave planes then the tile 213 may diffuse the light 219 passing therethrough. Conversely, if, for example, the interior surface 221a defines a concave plane, but the exterior surface 221b defines a convex plane then the tile 213 may cause the light 219 to converge or focus as it passes therethrough.

Referring now to Figure 301, there is illustrated an illuminating tile unit 301 which is substantially similar to the tile unit 101 of Figure 1. In this embodiment, the tile unit 301 comprises a prismatic sheet 323 which constitutes the light modification medium. The prismatic sheet 323 is of similar size and dimensions to the glass tile 313, and is positioned immediately adjacent the glass tile 313. The prismatic sheet 323 acts to refract the light 319 emitted from the light source 307 in a similar manner to that detailed with reference to Figure 2.

Referring now to Figures 4, 5 and 6 there is shown embodiments of the tile unit which correspond to the tile units of Figures 1, 2 and 3, respectively. Figures 4, 5 and 6 differ from Figures 1, 2 and 3 only in that the tile units of Figures 4, 5 and 6

comprise a parallelepiped shaped housing, which sits proudly of the wall, as opposed to a cavity in the wall, as shown in Figure 1, 2 and 3. The housings 425, 525 and 625, of Figures 4, 5 and 6 respectively, are formed from a wood material which offers the benefits of properties such as being opaque, strong, durable, cheap and readily available. The opaque property of the housings 425, 525 and 625 facilitates the concealment of the internal features contained therein, such as an LED or prismatic sheet for instance. Of course the housings 425, 525, 625 could be sunken partially or completely into the wall.

10 A better understanding and appreciation of the tile unit 601, of Figure 6, may be had by reference to the perspective view of the tile unit 601 as shown in Figure 7. From this view it can be seen how the light source, more specifically the LED 607, is positioned centrally within the housing 625 so that all regions of the rear surface of the prismatic sheet 623 receive a substantially equal amount of emitted light
15 619.

Referring now to Figure 8, there is illustrated an illuminating tile unit 801 which is substantially similar to the tile unit 501, of Figure 5. The tile unit 801 differs from the tile unit 501 by virtue of the provision of a plurality of LEDs 807 which are
20 attached to a support strip 827. The LEDs 807 are equally spaced along the support strip 827 whereby to emit an array of light 819. The support strip 827 is itself connected to the wall 805 by means of two screws 829 which are located at either end of the support strip 827. Power to the LEDs 807 is supplied by a wire 811 from the rear of the LEDs 807, the wire 811 extending through the wall 805

towards a power source (not shown). The LEDs 807 emit, in this embodiment, light 819 of the same colour. Of course, in other embodiments, it is possible that the light source may provide light of a variety of different colours whereby to illuminate the or a plurality of semi-transparent tile or tiles with a variety of
5 different colours.

Referring now to Figure 9, there is illustrated an illuminating tile unit 901 which is substantially similar to the tile units 501 and 801 of Figures 5 and 8 respectively. In the embodiment shown in Figure 9, the light source is provided by a fluorescent
10 tube 907 which replaces the LED(s) shown in previous embodiments. The fluorescent tube 907 extends along substantially the entire length of the wall 905 which is enclosed within the housing 925.

Referring now to Figure 10, there is illustrated a perspective view of a discotheque
15 environment. The discotheque is shown to comprise a beverages bar 1035 having bar stools 1037 situated therealong, a dance floor 1031 and a loudspeaker 1033. The illuminating tile unit 1001 is, in this embodiment, represented by the dance floor 1031 and loudspeaker 1033. The dance floor 1031 and loudspeaker 1033 communicate by means of a cable 1039 which is located underground so as to be
20 concealed during use.

The dance floor 1031 is defined by a square grid having an array of five tiles by five tiles. The tiles 1013a, 1013b and 1013c are all different colours, with each tile colour being represented by a particular shading style. The different coloured tiles

1013a, 1013b and 1013c are coloured differently due to the colour of the material from which they are formed. Of course, it is possible, in other embodiments, that the tiles may be of the same colour, for example clear, but appear to be coloured differently due to the light source, which is able to provide them each with a
5 differently coloured light. The tiles 1013a, 1013b and 1013c are interspersed throughout the grid of the dance floor 1031 in order to provide an aesthetically pleasing arrangement.

Further, the illuminating tile unit 1001 is provided with a means for playing music,
10 this being provided by a loudspeaker 1033. The light source (not shown) is capable of emitting a flashing light through the tiles 1013a, 1013b and 1013c whereby to produce a flashing tile effect, which flashing tile effect can be synchronised with the music in order further to enhance the experience of persons within the vicinity of the illuminating tile unit 1001. The tiles 1013a, 1013b and
15 1013c are, in this embodiment, all floor tiles.

Referring now to Figure 11, there is shown a perspective view of an illuminating tile unit array 1101 which may be mounted on a surface such as a wall (not shown). The tile unit array 1101 comprises a plurality of glass tiles 1113 and
20 conventional opaque tiles 1141. The glass tiles 1113 and opaque tiles 1141 form a grid having a surface area of four tiles by five tiles in a chequered arrangement. In this embodiment, the tiles 1141 and 1113 are all wall tiles. The tile unit array 1101 further comprises a housing 1129 which encloses components such as a light source (not shown) and/or a light modification medium (not shown). The tile unit

array 1101 may comprise dedicated light sources for each tile or may comprise a single source for a plurality of tiles.

Figure 12 illustrates a shower cubicle 1243 having two adjacent walls 1245, an adjoining glass wall 1247, and two adjoining glass doors 1249 whereby to define a parallelepiped shaped structure. The shower cubicle 1243 further comprises a shower unit 1251 having a shower head 1253, the shower unit 1251 being directly attached to the wall 1245 and the shower head being attached to the wall 1245 by means of a shower bracket 1255.

10

Each of the walls 1245 is applied in a chequered pattern with a tile unit array 1201 in a recessed arrangement similar to that shown in Figure 1, for example. The tile unit array 1201 comprises glass tiles 1213 and opaque tiles 1241, and, in this embodiment, both the tiles 1213 and 1241 are formed from a suitably waterproof material, such as a plastics material, for example, due to the nature of the environment in which they are located.

Although not shown in Figure 12, the glass tiles 1213 have positioned therebehind a light source which is capable of emitting light of varying colours. The variety of colours could be utilised to indicate the temperature of water which is exiting or about to exit the shower head 1253. For example, warm water may be indicated by a red tile and cold water may be indicated by a blue tile. Accordingly, the water exiting the showerhead 1253 may be regulated in accordance with the requirements of the user.

20

Referring now to Figure 13, there is shown a part of a burning building 1357, the floor of which constitutes a tiled surface 1300. The tiled surface 1300 comprises a majority of opaque tiles 1341 and a minority of illuminating tile units 1301. The tile units 1301 are substantially similar to the tile unit 101 of Figure 1, but in this
5 embodiment the tile units 1301 are floor tiles.

In this application of the present invention, the tile units 1301 constitute an illuminated path which leads from various areas of the building towards the fire exit 1359. The fire 1361 within the building 1357 causes the environment within
10 the building to become saturated with smoke which has the effect of disorientating and impairing the visibility of persons 1363 trapped within this environment. Accordingly, it can be seen how the illuminating tile units 1301 are so arranged within the tiled surface 1300 whereby to define an illuminated path for persons 1363 to follow towards the fire exit 1359 which leads them to safety. It is, of
15 course, possible in other embodiments of the present invention that the tile unit is able to detect the heat emanating from a fire and may so intentionally arrange a particular pathway to safety in order to circumvent such dangerous regions within the building.

Claims

1. An illuminating tile unit comprising an at least partially transparent tile and a light source, wherein the light source is operable to emit light which permeates through and illuminates the tile.
5
2. A unit as claimed in Claim 1, further comprising a light modification medium.
- 10 3. A unit as claimed in Claim 2, wherein the light modification medium refracts the emitted light.
4. A unit as claimed in Claim 2 or Claim 3, wherein the light modification medium diffuses the emitted light.
15
5. A unit as claimed in any of Claims 2 to 4, wherein the light modification medium focuses the emitted light.
6. A unit as claimed in any of Claims 2 to 5, wherein the light modification medium is catadioptric.
20
7. A unit as claimed in any of Claims 2 to 6, wherein the light modification medium is at least one of a solid, liquid and gas.

8. A unit as claimed in any of Claims 2 to 7, wherein the light modification medium comprises a plastics material.
9. A unit as claimed in Claim 8, wherein the plastics material comprises polymethyl methacrylate.
10. A unit as claimed in any of Claims 2 to 9, wherein the light modification medium comprises a prismatic sheet.
11. A unit as claimed in any preceding Claim, wherein the light source comprises at least one light emitting diode.
12. A unit as claimed in any preceding Claim, wherein the emitted light is white light.
13. A unit as claimed in any of Claims 1 to 11, wherein the emitted light is coloured light.
14. A unit as claimed in any preceding Claim, wherein the light source is capable of emitting at least one flashing light.
15. A unit as claimed in any preceding Claim, wherein the said tile is clear.

16. A unit as claimed in any of Claims 1 to 14, wherein the said tile is coloured.
17. A unit as claimed in any preceding Claim, wherein the said tile is a wall tile.
18. A unit as claimed in any of Claims 1 to 16, wherein the said tile is a floor tile.
19. A unit as claimed in any preceding Claim, further comprising means for playing music.
20. A unit as claimed in Claim 19, wherein the means for playing music comprise a loud speaker.
21. A unit as claimed in Claim 19 or Claim 20, wherein the light source is capable of communicating with the means for playing music so that, in use, the music being played is synchronised with the at least one flashing light.
22. A unit as claimed in any preceding Claim, further comprising motion detection means.
23. A unit as claimed in any preceding Claim, further comprising light detection means.

24. A unit as claimed in any preceding Claim, further comprising touch detection means.

25. A unit as claimed in any preceding Claim, further comprising heat
5 detection means.

26. A unit as claimed in any of Claims 22 to 25, wherein the unit is operable to control the light source in response to at least one of the motion detection means, light detection means, heat detection means and touch
10 detection means.

27. A unit as claimed in any of Claims 2 to 26, wherein the said tile is at least partially composed of the light modification medium.

15 28. A unit as claimed in any of Claims 2 to 26, wherein the light modification medium is provided as a separate component from the said tile.

29. A unit as claimed in Claim 28, wherein the said separate component is positioned so that the emitted light permeates through the separate component
20 before reaching the said tile.

30. A unit as claimed in Claim 28 or Claim 29, wherein the light modification medium is positioned immediately adjacent the said tile.

31. A unit as claimed in any preceding Claim, further comprising a housing.

32. A unit as claimed in any preceding Claim, wherein at least part of the
5 said unit is composed of or treated with a waterproof material.

33. A surface comprising one or more tile units according to any preceding claim.

10 34. An illuminating tile unit array comprising one or more tile units according to any of Claims 1 to 32.

35. An illuminating tile unit substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.

15

20

Application No: GB0620863.1

Examiner: Gareth Bond

Claims searched: 1

Date of search: 6 February 2007

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1,11,14, 17,18, 31-34	GB2407633 A (Lee et al) See whole document.
X,Y	X:1,2,4, 7,8,11,13, 15,17,18, 28-31, 33,34 Y:19,20	GB2376287 A (Russell et al) See whole document.
X,Y	X:1,2,7, 8,17,18, 27,31, 33,34 Y:19,20	WO03/025455 A1 (McNaught) See whole document
X	1,11-15, 17,18, 22-26, 31	US2004/0185195 A1 (Anderson et al) see whole document, particularly paragraphs 4, 16, 17, 20, 23 and 45.
X	1,2,4, 7,8, 16-18, 27-30, 33,34	US2003/0077417 A1 (Hasecke et al) See whole document, particularly paragraphs 28 and 31 to 33.
X	1,2,4,5, 7,8,11, 17,18,27, 28,30, 33,34	EP1469141 A1 (Koninklijke) See whole document, particularly paragraphs 15, 16 and 19 and figure 2.
Y	19,20	WO01/29480 A1 (Kurig) See figure 2.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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For Innovation

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|---|---|---|--|
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Field of Search:

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