

17 DEC 2002

COLOUR WASH LIGHT

This invention relates to the mixing of a plurality of electronically controlled light sources which are filtered to produce specific colours and then mixed to make any one of a range of colours including, with appropriate filtering, any colour in the visual spectrum.

Systems for mixing red, green and blue coloured light to produce other colours has long been used to produce colour television pictures. However, in the area of direct lighting the larger the light sources and high powers involved have made it difficult to produce beams of light with homogeneous colour. This difficulty arises because of the relatively large size of light sources and the fact that a compromise has to be made between effective colour mixing and efficient beams of light. Colour mixing can be best achieved by diffusing the light whilst efficient beams of light are produced by focusing the light.

A preferred embodiment of the present invention overcomes these problems by creating a wide angle mixing beam in one plane of illumination whilst maintaining a narrow beam in a substantially perpendicular plane. Using such a system makes it possible to illuminate a surface with uniformly coloured light of any colour in the spectrum using apparatus containing only three suitably filtered light sources.

A further preferred embodiment of the invention uses semi specular or linear prismatic reflectors combined with small viewing shields to minimise the colour mixing zone and obscure it from view. This allows lighting units embodying the invention to be mounted within low height ceiling voids thus greatly enhancing the number of applications to which they can be put.



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17 DEC 2002

- 2 -

In a further preferred embodiment the surface being illuminated has its base inclined towards the viewer.

Preferably, a single action user interface is incorporated which may be a rotary knob or a slider with a purpose made colour scale that defines a set number of colours or change cycles to enable the user to turn the knob or slide the slider to a given colour and that colour will appear.

The invention is defined in the appended claims to which reference should now be made.

A preferred embodiment of the invention will now be described in detail by way of example with reference to the accompanying drawings which:

Figs 1 and 2 show schematic block diagrams of systems embodying the invention;

Fig. 3 is a schematic plan view of a lighting unit embodying the invention;

Fig. 4 is a side view of a lighting unit for use at the top of a wall to be illuminated;

Fig. 5 is a front view of a similar unit.

Fig. 6 shows a variety of mounting arrangements for the lighting unit; and

Figures 7 and 8 show plan and side views of an embodiment of the invention to be used behind e.g., a picture hung on the wall.

The schematic diagram of Fig. 1 shows a lighting unit 2 containing three light sources. A red source 4, a green source 6, and a blue source 8. Each of these is connected to a voltage transformer device 10 which supplies voltage to operate each of the light sources. The human interface 12 with a rotary knob 14 supplies control signals to a power controller 16 which in turn supplies power to the voltage transformers 10 in proportions dependent upon the position of the rotary knob 14. The human interface 12 is

17 DEC 2002

- 3 -

able to supply control signals to supply power to the voltage transformers 10 and thus to the light sources 4, 6, 8 in desired proportions so that any desired colour can be obtained.

5 Alternatively in Figure 2, the schematic diagram shows a lighting unit 2 containing three light sources, as above, which are connected to a three channel combined dimmer/transformer 15 which supplies power to operate each of the light sources. The human interface 12 with a
10 rotary knob 14 supplies control signals direct to the transformation device 15 which in turn supplies power to the lamps in proportion dependent upon the position of rotary knob 14. The human interface 12 is able to supply control signals to supply power to the light sources 4, 6,
15 8 in desired proportions so that any desired colour can be obtained.

 The light sources 4, 6 and 8 are positioned adjacent to each other and if a wider field of illumination is required then additional banks of red, green and blue
20 light sources can be provided next to the lighting unit to give whatever width of illumination is required.

 The lighting unit is illustrated in more detail in Fig. 3. Each of the light sources 4, 6 and 8 comprises a lamp 20 positioned at the end of a reflector 22 which
25 reflects light through colour filters red 5, green 7, and blue 9 from the lamp into a columniation tube 24. At the end of each columniation tube is a diffuser 26 which diffuses the light from the light sources and transmits it to a spread lens 28 which covers the whole of the front of
30 the lighting unit. This comprises a set of parallel semi-specular or linear prismatic reflectors which are perpendicular to the plane of Fig. 3 and which cause the light to be diffused further up and down the plane of Fig. 3 as shown by the ray lines 30. Thus, the lighting unit
35 produces a wide beam up and down the plane of Fig. 3

17 DEC 2002

- 4 -

whilst maintaining a narrow beam in a plane perpendicular to Fig. 3. This gives very good mixing of the three colours and enables a surface such as a wall to be washed with the colour. This may be further enhanced by an
5 auxilliary reflector of either semi-specular or prismatic material which further mixes the colour and turns the beam through an appropriate angle.

Fig. 4 shows a side view of a unit in which the lighting unit 2 of Fig. 3 can be mounted. The unit is thus
10 perpendicular to its position in Fig 3 and the wide beam of the unit is therefore perpendicular to the plane of Fig. 4.

Usually unit 2 is mounted so that its primary direction of illumination is perpendicular to a wall 32. A
15 reflector 34 reflects the narrow beam of mixed light 36 downwards onto the wall 32. A shield 38 is provided to stop a viewer seeing the mixing zone.

As can be seen, the wall 32 has its base inclined towards the viewing side. This improves the uniformity of
20 illumination of the wall. Additionally, a mirror placed at the base of the wall will reflect the beam back up the wall and double the effect.

Alternatively, unit 2 can be mounted in the following positions relative to the wall with the noted different
25 arrangements of lens and reflector and thus achieving the effects described as shown in Figure 6.

1. Mounted to ceiling at an appropriate angle.
Unit shall have linear refractor and no reflector achieving a soft spread of light to the ceiling.
- 30 2. Mounted in ceiling at right angles to wall.
Unit shall have a linear refractor lens and reflector 82 achieving a soft spread of coloured light on the wall.
3. Mounted to the ceiling at right angles to the
35 floor using linear ref. actor and no reflector

17 DEC 2002

- 5 -

achieving a soft spread of light on the wall. Effect can be doubled by return mirror 80.

4. Mounted from the ceiling at right angles to wall. Unit shall have a linear refractor lens and reflector 82 achieving a soft spread of coloured light on the wall. Effect can be doubled by return mirror 80.

5. Mounted in the floor at right angles to wall. Unit shall have a linear refractor lens and reflector 82 achieving a soft spread of coloured light on the wall. Effect can be doubled by ceiling mounted return mirror 80.

6. Mounted to the floor at right angles to ceiling, using linear refractor and no reflector achieving a soft spread of light on the wall and ceiling. Effect can be doubled by ceiling mounted return mirror 80.

7. (Not shown) Mounted to ceiling at right angles to floor. Unit shall have diffuser and columnating lens in place of a linear refractor achieving a clearly defined circular area of light.

A front view of the lighting unit 2 is shown in Fig 5. As can be seen the lighting unit is terminated by an end of unit cut-off shield 40 to prevent any light escaping to the side of the unit. The unit 2 is adjacent to a further unit 2 and additional units may be fixed adjacent to this according to the width of illumination required.

Using units as shown in Fig. 4 and Fig. 5 enables lighting units embodying the invention to be mounted within low height ceiling voids.

Alternatively, with a different arrangement of reflector and cut-off shields the unit could be mounted at the base of a wall shining light towards it.

17 DEC 2002

- 6 -

The knob 14 on the human interface 12 is a single action knob and has a colour scale around it such that control sequences are sent to the power controller to send power to the voltage transformers 10 in desired proportions to ensure that a desired colour is produced by the lighting unit. This is intended to simplify the three separate controls which would usually be provided for the red, green and blue light sources.

The embodiment described above shows the use of red, green and blue light sources which will enable any colour in the spectrum to be produced with appropriate control signals. However, the invention could also be used with only two light sources, thus giving a narrower range of available colours.

The unit need not be used to produce only a wash of light. Using a suitable arrangement of lenses, the unit could be used to produce e.g., a focused beam of light. Such an application is shown in Figure 7 and 8 which shows a diagram of the invention arranged as a "Picture Light" as it is mounted behind e.g., a picture hung on the wall.

Lamps 50, connected to transformers as described above, project a narrow beam of light through dichroic filters in red 52, green 54, and blue 56 this coloured light passes along tubes 58 and is diffused by diffuser 60 and spread by refractor 62, the three beams mix into a single colour with the help of a diffusing dome 64 which reflects and mixes the diffused light. The groups of three lamps and optical system are repeated around the dome 64 to form a continuous ring. The assembly is hung a small distance from a surface with the concave surface of the dome towards the surface, and illuminates the surface with whatever colour the user sets with the control system described above. This happens as light is reflected and mixed by the concave surface of the dome onto the surface to be illuminated.

17 DEC 2002

- 7 -

In accordance with a first aspect of the invention, there is provided a lighting system comprising a plurality of adjacent light sources of different colours, each positioned behind a spread lens which expands the beam width of the light source in a first plane common to the light sources and maintains a narrower beam width in a second plane substantially perpendicular to the first plane whereby efficient mixing of light sources is achieved in the plane.

In accordance with a second aspect of the invention, there is provided a lighting system comprising a plurality of adjacent light sources of different colours, each light source having a wide angled beam in a first plane and a narrower angled beam in a substantially perpendicular second plane, whereby efficient mixing of light is achieved in the first plane, a power supply for providing power to each light source thereby varying its power output and causing different colours of light to be produced as a result of the mixing of light in the first plane.

17 DEC 2002

- 8 -

1. A lighting system comprising a plurality of adjacent light sources of different colours, each positioned behind a spread lens which expands the beam width of the light source in a first plane common to the light sources and maintains a narrower beam width in a second plane substantially perpendicular to the first plane whereby efficient mixing of light sources is achieved in the first plane.

2. A lighting system according to claim 1 in which the light sources are positioned behind a spread lens which expands the beam width of the light sources in the first plane.

3. A lighting system according to claim 2 in which the spread lens comprises a set of parallel linear prismatic refractors.

4. A lighting system according to claim 3 in which the spread lens comprises a plurality of parallel semi-specular elements.

5. A lighting system according to claim 3 in which the spread lens comprises a set of parallel linear prismatic reflectors.

6. A lighting system according to any of claims 2 to 5 including a diffuser positioned between each light source and the spread lens.

7. A lighting system according to any preceding claim comprising means for supplying power to each of the light sources in desired proportions whereby predetermined colours can be produced

17 DEC 2002

- 9 -

8. A lighting system according to claim 7 comprising means for controlling the means for supplying power to the light sources in differing proportions such that the plurality of predetermined colours may be produced.

9. A lighting system according to claim 5 wherein the means for controlling the means for supplying power to the light sources comprises a rotary knob.

10. A lighting system according to claim 8 wherein the means for controlling the means for supplying power to the light sources comprises a slider.

11. A lighting system according to any preceding claim in which the light sources are arranged in a linear array.

12. A lighting system according to any of claims 1 to 10 in which the light sources are arranged in a circular array, each pointing towards the centre of the circle.

13. A lighting system according to claim 12 in which the circular array surrounds a convex dome which mixes and reflects light from the sources onto a surface facing the convex surface of the dome.

14. A lighting system comprising a plurality of adjacent light sources of different colours, each light source having a wide angled beam in a first plane and a narrower angled beam in a substantially perpendicular second plane, whereby efficient mixing of light is achieved in the first plane, a power supply for providing power to each light source thereby varying its power output and causing different colours of light to be produced as a result of the mixing of light in the first plane.