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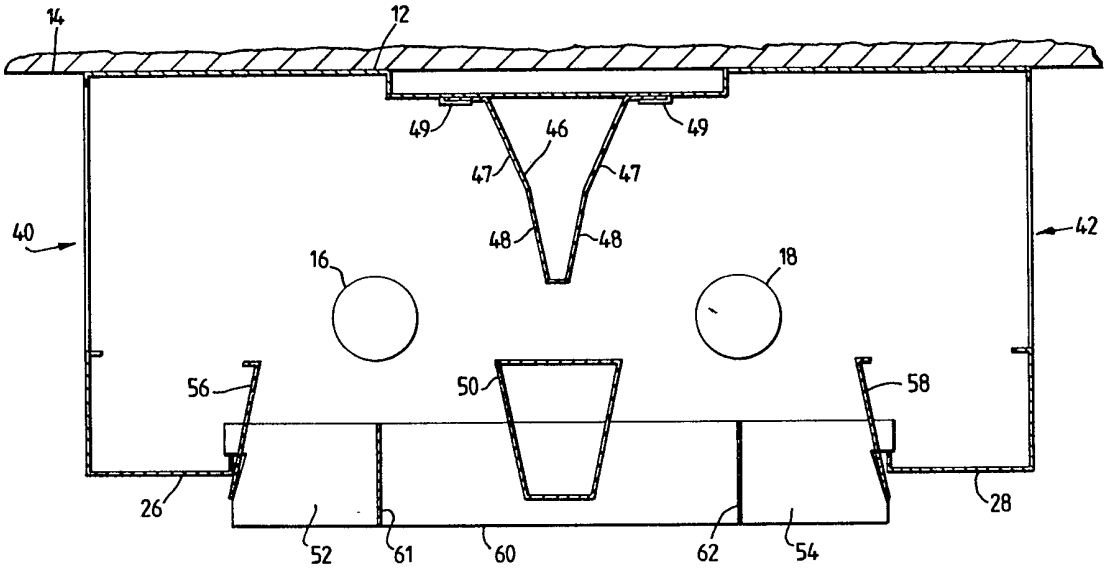
(54) Light fitting

(57) A light fitting for mounting on a ceiling includes one or more tubular lamps (16, 18) carried in a supporting structure (12) which has for the or each respective lamp a first light outlet (52, 54) through which light is emitted generally downwards and a second light outlet (40, 42) around the same level as the lamp through which light is emitted generally horizontally and upwardly for illuminating the ceiling and upper wall areas of a room. Predetermined zones of the room are shielded from light directly from the lamp(s) by longitudinal light obstructing means (26,56,28,58) intermediate the first and second outlets. Louvres (60, 61, 62) and reflectors (46, 50) are used for light output optimisation and directional control.

The fitting is particularly useful in hospital wards where the light obstructed zones are arranged to coincide with bed head regions thus preventing glare to patients, and in offices for preventing reflections from VDU screens.

Fig.1.



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The drawing(s) originally filed was/were informal and the print here reproduced is taken from a later filed formal copy.

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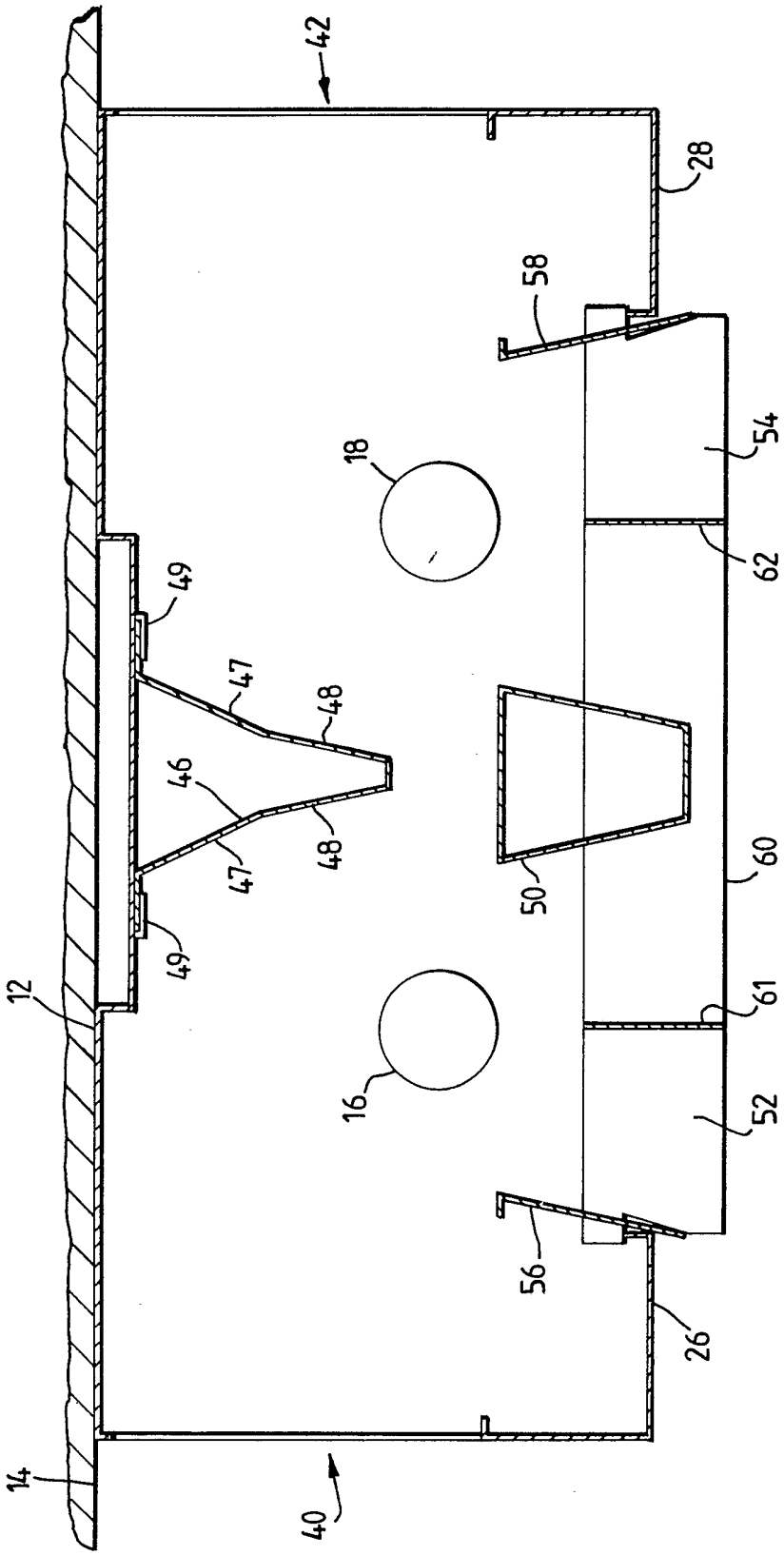

Fig.1.

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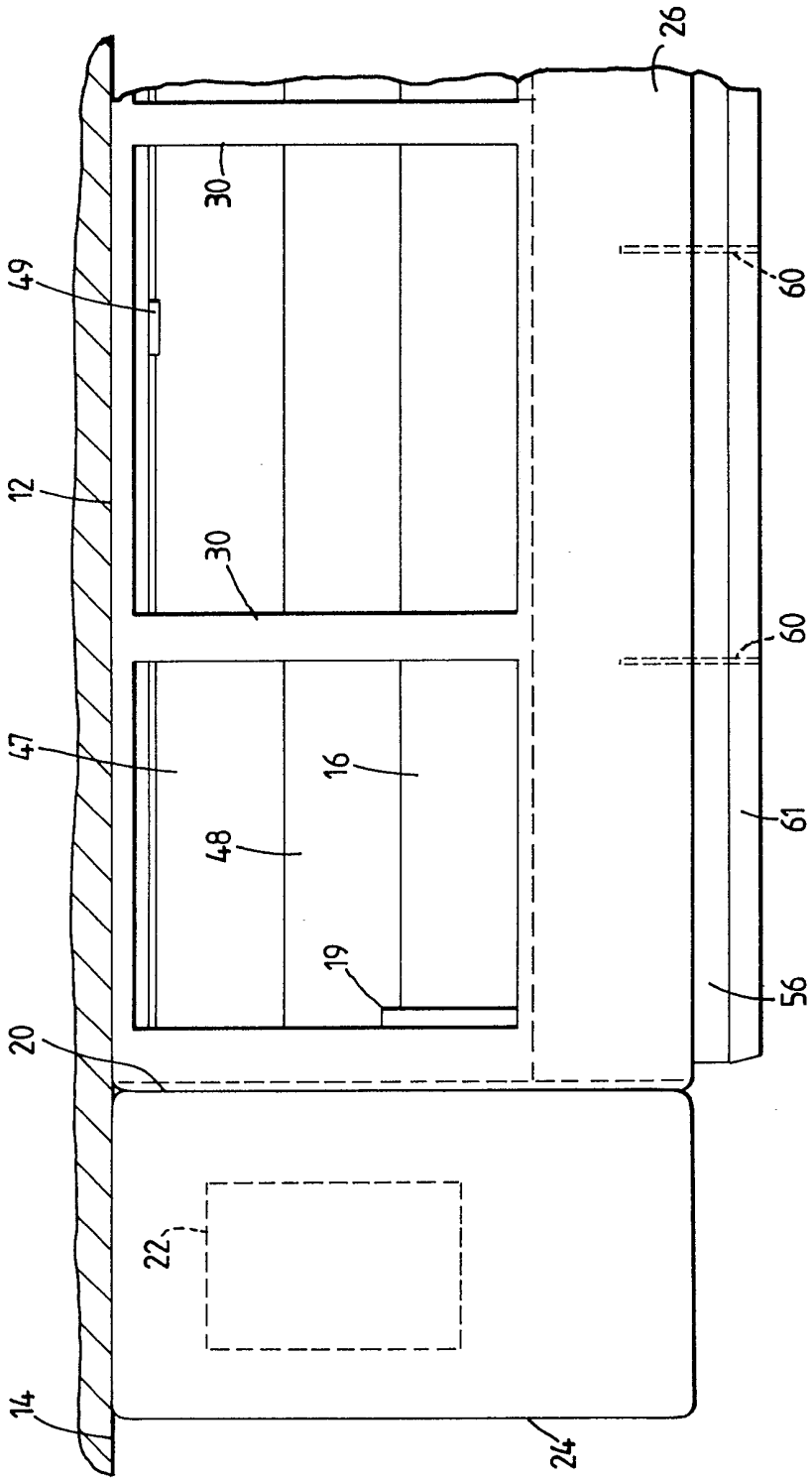
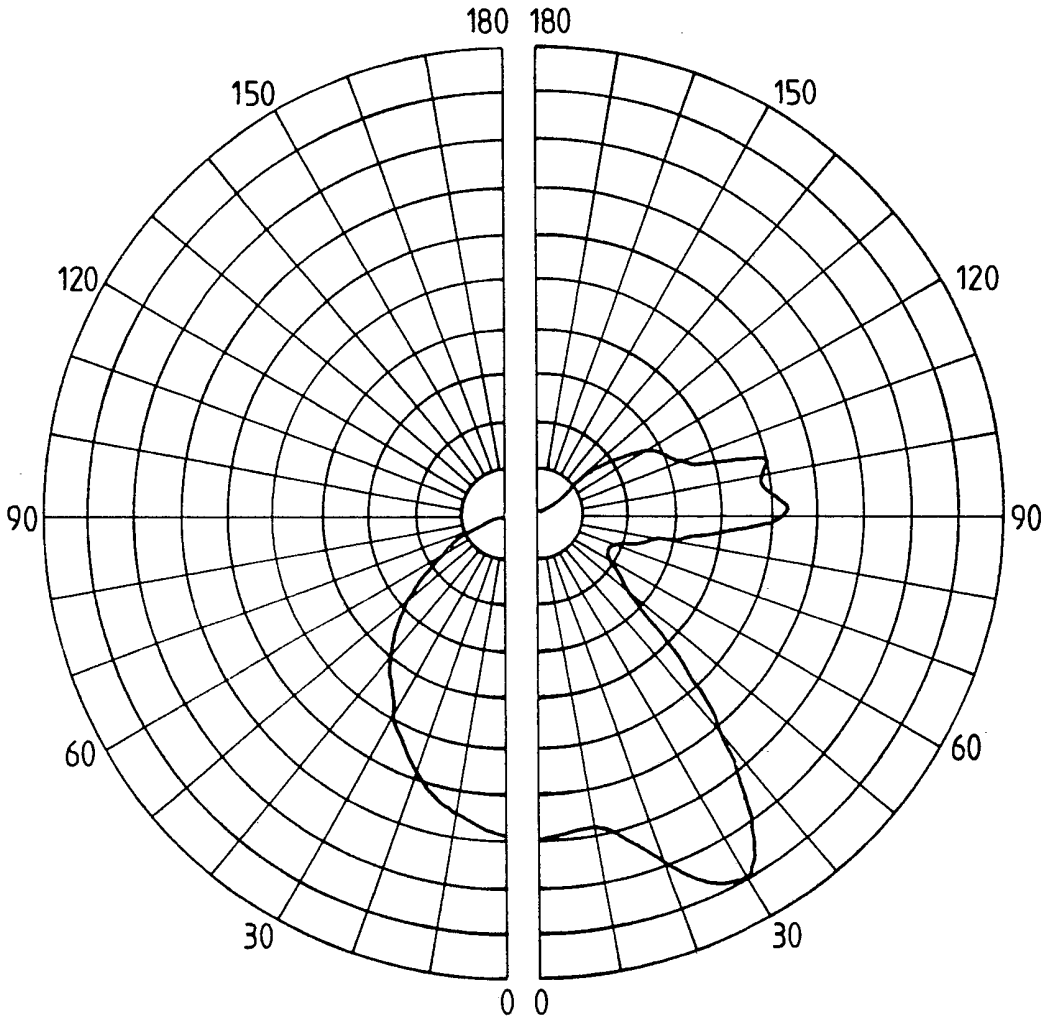


Fig.2.

Fig. 3.



SPECIFICATION

Light fittings

This invention relates to a light fitting for mounting on a ceiling and having at least one horizontally-extending elongate light source mounted on a supporting structure which has an output aperture extending parallel to, and beneath, the light source through which light emitted by the source during operation is directed generally dohnwardly.

In a known form of such a light fitting (luminaire), the supporting structure comprises a trough-shape housing whose base is mounted on a ceiling and in which the light source, typically a fluorescent tube, is contained. Light emitted by the light source in a generally downward direction passes directly through the open bottom of the housing. Light emitted in other directions subsequently exits through the open bottom as a result of reflection by the inner surfaces of the housing. In order to spread the light output of the fitting over a wider area the open bottom of the housing may be covered by a plastics diffusing cover or a transparent plastics cover with prismatic elements which re-directs a portion of the generally downwardly-directed light laterally. These light fittings, when mounted on a ceiling, can provide adequate illumination over a wide area below the fitting but, even with the aforementioned covers, provide relatively poor illumination to other areas of a room such as the ceiling and upper wall areas and particularly the corners between the ceiling and walls and they rely to a large extent on reflectances from room surfaces for this purpose. Moreover, the use of plastics diffusers or covers can be considered undesirable because they present a fire hazard and can, over a period of time, become soiled, thus reducing light output and necessitating regular cleaning.

There is a need in many situations for certain regions of a room not to be subjected directly to intense light such as light radiating directly from the light source as this causes glare.

For example, in rooms containing video display units (VDUs), reflections of bright light sources from the screens of the VDUs in some circumstances can lead to display hash-out or at the very least prove distracting and irritating to an operator. Also, in hospital hards where generally speaking good, bright illumination is required, it is undesirable for patient comfort that the patients when lying in bed should experience glare directly from a bright light source. There is a need here therefore for a light fitting giving good overall room illumination but without the risk of glare to a patient in bed. Similarly, glare causing or dazzling light reflections from medical equipment and other objects positioned next to the patient should also be avoided.

It is an object of the present invention to provide a light fitting which is of simple construction and which is capable of satisfying the above described needs.

According to the present invention, there is provided a light fitting for mounting on a ceiling of the kind mentioned in the opening paragraph which is characterised in that the fitting has a second elongate light output aperture extending substantially parallel to, and generally at the same level as, the light source through which, in operation, light is directed generally horizontally for illuminating the ceiling and wall regions adjacent the ceiling, and light obstructing means extending substantially parallel to the light source in a region intermediate the two light output apertures.

The first outlet aperture of the fittings allows light emitted by the light source, for example, a fluorescent tube radiating flux substantially evenly in all transverse directions, to exit the fitting with a selected angular spread without deflection generally downwards to provide good illuminance in a region below the fitting. The second outlet aperture allows light emitted by the light source to leave the fitting in a generally horizontally direction with some angular spread, dependent on the size of the aperture and its position with respect to the light source, and without deflection upwardly and downwardly whereby, with the fitting mounted against a ceiling, the ceiling area to the side of the light source and the adjacent upper wall surface are well illuminated by light travelling directly from the light source. Consequently there are no dark corners in these regions. Moreover, this bright light will then be reflected by the ceiling and upper wall areas generally downwards to improve light distribution and give good overall room illuminance. The obstructing means prevents light from the light source directly reaching a certain zone of the room intermediate those regions illuminated by direct light exiting from the first and second outlet apertures, with location of this zone of occlusion being dependent on the size and positioning with respect to the light source of the obstructing means. Thus, in a room containing VDUs, reflection of bright light direct from the light source by the VDU screens can readily be prevented simply by arranging that the VDUs are positioned in the light obstructed zone. Adequate illuminance over the VDUs is obtained by light reflected by the ceiling and upper wall areas but without the risk of glare from the screens, and consequent display wash-out, caused by light from the light source falling directly on the screens. In a hospital ward, the bed heads are normally located adjacent the room side wall. With the fitting suitably located away from, and parallel to, the side wall, the bed heads are conveniently situated within the light obstructed zone so that the patients therefore are not subjected to undesirable glare from

the light fitting. Adequate illuminance of the bed head regions is still achieved by light reflection from the ceiling and upper wall areas with the light emitted downwardly from the fitting giving good illumination of, for example, the foot of the bed, where patient medical notes are usually located, and surrounding floor areas.

A further advantage of the light fitting according to the invention is that, as a result of the relative dispositions of the two output apertures and the light source, an air flow is created through the fitting between the two apertures through heat generated by the light source in operation. This air flow serves both to stabilise to some extent the temperature within the light fitting and also to prevent dust settling inside the fitting so that frequent cleaning becomes unnecessary.

The light obstructing means may comprise a opaque member for example, metal, extending along the length of the fitting. This member, which may conveniently for ease of construction constitute part of the supporting structure, may also define one side of at least one of the two light output apertures.

The light fitting may be mounted on a ceiling to one side of a room or corridor parallel and adjacent one wall providing good illuminance downwardly and generally horizontally over the ceiling and upper area of the opposite wall.

In a preferred embodiment, the light fitting includes two elongate light sources arranged side by side with each light source having associated therewith a respective said second elongate light output aperture and light obstructing means, the respective output apertures and obstructing means being arranged on opposite sides of the fitting.

This fitting can be mounted on a ceiling centrally in a room to provide ceiling and upper wall area illuminance to both sides of the fitting and obstructed light zones on both sides of the fitting. Thus, when mounted centrally on a ceiling in, for example, a hospital ward having rows of beds along either side, the fitting provides good, bright illumination downwardly over the floor area of the passageway between the rows of beds and the bed end regions, good ceiling and upper side wall area illumination to both sides of the fitting, and light obstructed zones in the regions of the bed heads of both rows of beds to prevent discomfort to patients, and medical staff, through glare. Glare causing reflections from medical equipment and other objects in these regions are, of course, also avoided.

In this preferred embodiment, the first light outlet aperture may be common to both light sources. More preferably, however, for ease of improving light distribution each light source has associated therewith a respective said first light output aperture arranged below the light source.

The or each first output aperture may be defined by surfaces extending parallel to and away from the light source on opposite sides of the light source. These surfaces may diverge away from the light source and are highly reflective, preferably diffusely reflective, for example semi-matt, so that light emitted by the light source is deflected cross-wise as well. In this way intense light is directed by the fitting downwardly over a wide angular spread, dependent on the inclination of the reflective surfaces. The surface closest to the second output aperture may constitute part of the light obstructing means.

The fitting may further include a plurality of louvres arranged transversely of the or each first light output aperture at spaced intervals therealong. Also, a longitudinally-extending louvre may be arranged in the or each first output aperture directly beneath the associated light source. These louvres reduce glare in axial and transverse planes in the region below the fitting.

The fitting may also include, associated with the or each light source, at least one highly reflecting surface, preferably specularly reflective, extending parallel to the light source to the side thereof opposite its associated second light output aperture which is adapted to deflect light emitted by the light source in directions away from that aperture so as to travel through the aperture. In this way, light output through the second output aperture is optimised. By appropriately shaping this at least one reflecting surface, and taking into account both its position and that of the second output aperture relative to the light source, the angular spread and intensity pattern of light emanating from the second output aperture can be controlled according to required illumination levels for the ceiling and upper wall areas. In particular, the at least one reflective surface may deflect light both generally horizontally and at an angle upwardly with respect to horizontal whereby a greater proportion of illumination can be provided for the ceiling areas than the upper wall areas to give more beneficial overall room illumination through light reflected from the ceiling. In the case of the fitting having two, transversely separated, light sources, these reflecting surfaces may be arranged back to back and project generally downwards into a region between the light sources.

A light fitting in accordance with the present invention will now be described, by way of example, with reference to the accompanying drawings in which:

Figure 1 is a schematic cross-sectional view through the light fitting;

Figure 2 is a side elevation of a portion of the light fitting, and

Figure 3 is a polar curve diagram illustrating the output light intensity distribution for the light fitting.

Referring to Figures 1 and 2, the light fitting (luminaire) is intended to be mounted directly against a ceiling and includes a supporting structure comprising a pressed steel base plate (ceiling plate) 12 defining the fitting's upper surface which extends along the length of the fitting and which is adapted to be secured, for example by means of screws, flush with the ceiling, referenced 14 in Figure 1. Supported within the supporting structure are two laterally spaced, horizontally-extending, 36W fluorescent tube lamps 16 and 18 extending parallel to one another along the length of the fitting.

The light fitting is symmetrical about a vertical plane extending through the centre of the base 12 and intermediate the lamps. Each lamp is 1200mm long and mounted at its ends in lampholders 19 (only one of which is visible in Figure 2) fixed on end walls 20 of the fitting. The respective control gear 22 for the two lamps consisting of a ballast, starter circuit, and running gear, are situated respectively at opposite ends of the fitting and enclosed by removable covers, e.g. 24, of sheet steel.

The supporting structure further includes two members 26 and 28 of L-shape section which extend parallel to the lamps along the length of the fitting on opposite sides and which act as light obstructing means as will be described. These members 26 and 28 can be smoothly curved rather than comprised of straight sections as shown in the figures. The members 26 and 28, constituting part of the supporting structure, are formed integrally with the base 12 and are connected therewith by strips at their ends and optionally, for additional support along their length, by narrow vertical support strips, two of which are shown at 30 in Figure 2, spaced at regular intervals along their lengths and defined by stamping. The ends of the members 26 and 28 are fixed to the end walls 20 for further support.

The upper edges of the vertical arms of the members 26 and 28 respectively, having inwardly turned lips, together with the associated outermost edges of the base 12, having downwardly turned lips, define elongate, vertical, light output apertures 40 and 42 on opposite sides of the fitting along the length of the fitting and parallel with the lamps 16 and 18. The lamps are arranged within the fitting so as to be level with the lower portions of these side apertures with the lowermost surface of the lamps approximately level with the upper edge of the members 26 and 28 whereby light radiating from the lamps 16 and 18 passes generally horizontally and upwardly directly through the apertures 40 and 42 respectively. Although the support strips 30 cross these apertures 40 and 42, their width is such that the effect on light output is negligible. Light output through these apertures 40 and 42 is enhanced by an elongate V-shape reflector element 46 disposed centrally of the fitting parallel with, and along the length of the lamps. The element 46 is mounted on the base 12 by means of clips 49, stamped out of the base 12 and spaced at regular intervals along the base 12, and projects downwardly towards the space intermediate the two lamps to approximately the level of the upper surfaces of the lamps. The outwardly facing, back to back surfaces of this element 46 comprise specularly-reflecting mirror surfaces which, being arranged to the side of the lamps 16 and 18 opposite their associated output apertures 40 and 42, serve to deflect light which is emitted from the associated lamp in directions away from the side output apertures 40 and 42 back through those apertures. As can be seen from Figure 1, each of these reflective mirror surfaces consists of adjoining, mutually inclined upper and lower flat surfaces 47 and 48. The lower surface 48 is inclined at around 12 degrees to the vertical and arranged to deflect light from the associated lamp generally upwardly and horizontally through the respective side output aperture and the upper surface 47 is inclined at around 25 degrees to the vertical and reflects light through the aperture again generally horizontally and upwardly at a small angle with respect to the horizontal. The element 46 is formed from chemically brightened and anodised aluminium having a high specular reflectance.

The opposed inner edges of the horizontal arms of members 26 and 28 define an elongate opening running along the length of the fitting beneath the lamps 16 and 18. This opening is effectively divided by a closed channel member 50 into two separate light output apertures 52 and 54 extending parallel with the lamps 16 and 18 each of which is associated with a respective one of the lamps 16 and 18 with the lamp being arranged centrally above the associated aperture. The channel member 50 has a truncated V-shape cross-section. Its mutually inclined flat sides extend parallel to, and away from, the lamps at an angle of around 12 degrees to the vertical and have high diffuse (semi-matt) reflectance surfaces formed from brightened aluminium material. Along the opposite side of each of the output apertures 52 and 54 there is provided a respective flat, longitudinal, deflector plate 56 and 58 overlying the inner edges of the members 26 and 28. The surfaces of the plates 56 and 58 facing the lamps, being similarly formed of brightened aluminium, also have diffuse (semi-matt) reflectance and are inclined with respect to the vertical at around 12 degrees in the opposite direction to the opposed surfaces of the channel member 50, so that the facing surfaces of the deflector plate 56 and member 50 and the plate 58 and member 50 diverge away from

their associated lamp 16 and 18.

A plurality of regularly spaced, white-painted louvres 60 extend transversely across both output apertures 52 and 54. The louvres are supported by the members 26 and 28 and have tongues at their ends which pass through slots in the reflector plates 56 and 58 and rest on upwardly-turned flanges on the horizontal arms of the members 26 and 28. The louvres 60 pass through slots provided in the channel member 50 and serve to support the member 50 and the plates 56 and 58, these components forming a sub-assembly. A pair of axial, white-painted louvres 61 and 62 are also provided. These louvres are supported by the transverse louvres 60 by means of inter-engaging slots with each of these axial louvres being disposed centrally of a respective one of the output apertures 52 and 54 directly beneath and parallel to the associated lamp 16 and 18.

The internal surfaces of the base 10 and members 26 and 28 are painted with white gloss paint to improve light output and for ease of cleaning.

Operation of the light fitting will now be described in greater detail. As the fitting is symmetrical about a vertical longitudinal plane the following description will, for brevity concern itself only with the emission of light from one half of the fitting, in particular with the half to the left in Figure 1 of that central vertical plane, it being understood that the operation of the other half of the fitting is identical except in the transversely opposite sense.

The lamp 16, when energised, emits light substantially uniformly in all directions. Light radiated in a downwards direction passes through the output aperture 52 and has a free beam angle width of around 80 degrees, this angle being determined by the relative positioning of the lamp and the lower edges of the reflector plate 56 and the member 50. Light radiated generally downwardly but at greater angles with respect to the vertical is diffusely reflected and scattered downwards and cross-wise by the surfaces of the reflector plate 56 and member 50 providing increased angular spread. The white-painted louvres 60 and 61 also diffusely reflect light so as to enhance the spread and uniformity of downwardly and sideways directed light giving good distribution as well as reducing glare by preventing direct viewing of the lamp both axially and transversely from regions below the fitting or by reflective articles, for example VDU screens, in that region. As a result, good bright illumination is obtained over a wide region below the fitting.

Light radiated generally horizontally by the lamp 16 passes directly through the output aperture 40. The position and size of the aperture in relation to the lamp gives a free beam angle width for light emanating from the aperture 40 directly from the lamp 16 of around 60 degrees. In use, this light subsequently impinges on the ceiling and upper wall surface areas of the room giving bright illumination of those surface areas, and, by reflection from those surfaces, a high level of overall room illumination. Light radiating from the lamp 16 from its side remote from the output aperture 40 is reflected by the mirror surfaces 47 and 48 of the reflector element 46 through the aperture 40. The inclined lower and upper mirror surfaces 47 and 48 are positioned with respect to the lamp 16 so as to deflect light in a generally horizontal direction with small vertical spread to increase illumination of the upper wall areas of the room and also slightly upwardly to provide further illumination of the ceiling area from immediately adjacent the fitting to the wall. Light is also deflected by the white painted surface of base 12 so that light emanating from aperture 40 contains direct, specularly reflected and diffusely reflected components.

Illumination of a zone intermediate the regions of illumination provided by the output apertures 52 and 40 by light radiating directly from the lamp 16 is prevented by the member 26, and to some extent the reflector plate 56, which together act as light obstructing means. Light intercepted by the member 26 is reflected back into the fitting and eventually emerges through one or other of the output apertures 52 and 40 following deflection by internal surfaces of the fitting. In this way, a zone of the room generally wedge shaped and subtending an angle predetermined by the size and position of the member 26 relative to the lamp 16 is shielded from light emitted directly from the lamp 16. Some of the light emitted by the lamp 16 travelling towards that zone is intercepted by the reflector plate 56, constituting part of the obstructing means, and redirected by diffuse reflection downwardly as previously described. Bright illumination of this zone of occlusion of the room is achieved by indirect lighting through reflection by wall and ceiling surfaces, assuming of course these surfaces of appropriately painted.

The relative positions of the longitudinal axis of the lamp 16, the upper and lower edges of the outlet aperture 40, the lower edges of the surfaces 47 and 48, the upper and lower edges of the member 50 and plate 56, and the lower edge of louvre 62 as shown in Figure 1 are important in optimising light output from the fitting.

During operation, a convection air flow is established through the fitting between the apertures 52 and 40 as a result of heat generated by the lamp 16. Besides serving to stabilise the internal temperature of the fitting, this air flow also entrains dust particles and the like, preventing them to some extent from settling on the fitting's internal surfaces and providing the fitting with a self-cleaning action thus making frequent cleaning unnecessary.

The other half of the fitting operates in identical manner, with light emanating generally downwards through aperture 54 and sideways through aperture 42 and with member 28, together with plate 58, defining an intermediate zone, on the opposite side of the fitting, shielded from light direct from the lamp 18.

With a number of light fittings in, for example, a hospital ward in a row at central location on the ceiling and with their longitudinal axes parallel to the ward's side walls, the light fittings provides very good overall illumination with particularly bright illumination over a wide central region below the fitting and over the ceiling and upper side-wall areas with the zones on either side of the fitting extending over the lower side-wall areas where bed heads are normally located being shielded from direct light from the lamps by the light obstructing means constituted by members 26 and 28 and reflector plates 56 and 58 so that a patient is not subjected to glare.

Similarly, with a number of the light fittings installed in a room containing VDUs, glare from the VDU screens is easily prevented by appropriately positioning the screens in the light-shielded zones.

Figure 3 is a polar curve diagram illustrating the shape of light intensity distribution provided by the light fitting. In this diagram, as is customary with such diagrams, the left and right hand-sides indicate respectively light intensity distribution in a plane axially of the light fitting (azimuth equal to 90 degrees) and light intensity distribution in a plane transversely of the fitting (azimuth equal to 0 degrees). The radial lines indicate angles starting at immediately below the fitting (0 degrees) and the concentric circles indicate light intensity levels increasing in value radially outwardly.

The light distribution curves are of course symmetrical about respective centre lines of the fitting only one half being shown in the diagram in respect of each plane.

As can be seen from the azimuth 0 degrees curve, good illumination levels are obtained in a region extending from directly below the fitting (0 degrees elevation) to around 40 degrees elevation through light emanating from the output aperture 54. Between elevations of approximately 40 degrees and 90 degrees, the intensity level falls off sharply to a comparatively low value as a result of the light obstructing means. The intensity level then increases to a high level over the elevation range approximately of 90 degrees to 105 degrees, this being produced by light emanating from the output aperture 42, to give good, bright, illumination generally laterally of the fitting over the ceiling and upper side-wall areas.

The described light fitting, having two lamps with respective, symmetrically arranged light output apertures, is intended to be mounted against a ceiling away from the side-walls of the room so as to provide illumination on both sides of the fitting. However, in another embodiment of the invention, the light fitting has only one lamp and associated light output apertures, (side and bottom), this fitting comprising in effect the half of the fitting described above to one side of the axis of symmetry. This fitting is suitable for mounting against a ceiling adjacent the corner of the ceiling and a side-wall to provide light output downwardly for illuminating the region below the fitting and generally horizontally to one side to illuminate the ceiling area and the upper area of the opposite side-wall.

CLAIMS

1. A light fitting for mounting on a ceiling and having at least one horizontally-extending elongate light source mounted on a supporting structure which has an output aperture extending parallel to, and beneath, the light source through which light emitted by the source during operation is directed generally downwardly, characterised in that the fitting has a second elongate light output aperture extending substantially parallel to, and generally at the same level as, the light source through which, in operation, light is directed generally horizontally for illuminating the ceiling and wall regions adjacent the ceiling, and light obstructing means extending substantially parallel to the light source in a region intermediate the two light output apertures.

2. A light fitting according to Claim 1, characterised in that the light obstructing means comprises a opaque member extending along the length of the fitting.

3. A light fitting according to Claim 2, characterised in that the light obstructing means constitutes a part of the supporting structure.

4. A light fitting according to Claim 3, characterised in that the light obstructing means defines one side of at least one of the two said light output apertures.

5. A light fitting according to any one of the preceding claims, characterised in that the fitting includes two elongate light sources arranged side by side with each light source having associated therewith a respective said second elongate light output aperture and light obstructing means, the respective second output apertures and obstructing means being arranged on opposite sides of the fitting.

6. A light fitting according to Claim 5, characterised in that the first light output aperture is common to both light sources.

7. A light fitting according to Claim 5, characterised in that each light source has associated therewith a respective said first light output aperture arranged below the light source.

8. A light fitting according to any one of the preceding claims, characterised in that the or each said first light output aperture is defined by surfaces extending parallel to, and

away from the light source on opposite sides of the light source.

9. A light fitting according to Claim 8, characterised in that the surfaces diverge away from the light source and are highly reflective.

10. A light fitting according to any one of the preceding claims, characterised in that the fitting further includes a plurality of louvres arranged transversely of the or each first light output aperture at spaced intervals therealong.

11. A light fitting according to Claim 10, characterised in that a longitudinally-extending louvre is arranged in the or each first light output aperture directly beneath the associated light source.

12. A light fitting according to any one of the preceding claims, characterised in that, associated with the or each light source, there is provided at least one highly reflective surface which extends parallel to the light source to the side thereof opposite its associated said second light output aperture, the at least one reflective surface being adopted to deflect light emitted by the light source in directions aways from that aperture so as to travel through the aperture.

13. A light fitting according to Claim 12, characterised in that the at least one reflective surface deflects light emitted by the light source both generally horizontally and at an angle upwardly with respect to the horizontal through the second light output aperture.

14. A light fitting according to Claim 12 or Claim 13, characterised in that the at least one reflective surface is specularly reflective.

15. A light fitting substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.

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